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(56) Related Art
WO 2008/046649 A1
WO 2006/110581 A2
WAALER et al. "Novel Synthetic Antagonists of Canonical Wnt Signaling Inhibit Colorectal Cancer Cell Growth", Cancer Research, 2011, Vol. 71, No. 1, Pages 197-205.
CALLAHAN et al. "Common Integration Sites for MMTV in Viral Induced Mouse Mammary Tumors", Journal of Mammary Gland Biological Neoplasia, 2008, Vol. 13, Pages 309-321.
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STARR et al. "A Transposon-Based Genetic Screen in Mice Identifies Genes Altered in Colorectal Cancer", Science, 2009, Vol. 323, Pages 1747-1750.

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(54) **Title**: R-SPONDIN TRANSLOCATIONS AND METHODS USING THE SAME

(57) **Abstract**: Provided are therapies related to the treatment of pathological conditions, such as cancer.

R-SPONDIN TRANSLOCATIONS AND METHODS USING THE SAME

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims benefit to United States Patent Application No. 61/597,746 filed on February 11, 2012 and 61/674,763 filed on July 23, 2012, the entire contents of which are incorporated herein by reference.

SEQUENCE LISTING

[0002] The instant application contains a Sequence Listing.

FIELD

[0003] Provided are therapies related to the treatment of pathological conditions, such as cancer.

BACKGROUND

[0004] Colorectal cancer (CRC) with over 100,000 new cases reported annually is the fourth most prevalent cancer and accounts for over 50,000 deaths per year in the United States (Siegel, R. *et al.*, *CA: A Cancer Journal for Clinicians* 61:212-236 (2011)). Approximately 15% of CRCs exhibit microsatellite instability (MSI) arising from defects in DNA mismatch repair (MMR) system (Fearon, E. R., *Annu. Rev. Pathol.* 6:479-507 (2011)). The other ~85% of microsatellite stable (MSS) CRCs are the result of chromosomal instability (CIN) (Fearon, E. R., *Annu. Rev. Pathol.* 6:479-507 (2011)). Genomic studies have identified acquisition of mutations in genes like *APC*, *KRAS*, and *TP53* during CRC progression (Fearon, E. R., *Annu. Rev. Pathol.* 6:479-507 (2011)). Sequencing colon cancer protein-coding exons and whole genomes in a small number of samples have identified several additional mutations and chromosomal structural variants that likely contribute to oncogenesis (Wood, L. D. *et al.*, *Science* 318:1108-1113 (2007); Timmermann, B. *et al.*, *PloS One* 5:e15661 (2010)). However, recent insertional mutagenesis screens in mouse models of colon cancer suggested involvement of additional genes and pathways in CRC development (Starr, T. K. *et al.*, *Science* 323:1747-1750 (2009); March, H. N. *et al.*, *Nat. Genet.* 43:1202-1209 (2011)).

[0005] There remains a need to better understand the pathogenesis of cancers, in particular, human colon cancers and also to identify new therapeutic targets.

[0005a] It is to be understood that if any prior art publication is referred to herein, such reference does not constitute an admission that the publication forms a part of the common general knowledge in the art in Australia or any other country.

2013216753 04 Sep 2017

SUMMARY

[0006] The invention relates to wnt pathway antagonists including R-spondin-translocation antagonists and methods of using the same.

[0006a] A first aspect provides a method of treating colorectal cancer in an individual comprising administering to the individual an effective amount of an anti-R-spondin 2 (RSPO2) antibody, wherein treatment is based upon the individual having cancer comprising an R-spondin (RSPO) translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2.

[0006b] A second aspect provides a method of treating a colorectal cancer cell, wherein the cancer cell comprises an R-spondin (RSPO) translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2, and wherein the method comprises providing an effective amount of an anti-RSPO2 antibody.

[0006c] A third aspect provides a method of treating colorectal cancer in an individual provided that the individual has been found to have colorectal cancer comprising an R-spondin (RSPO) translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2, the method comprising administering to the individual an effective amount of an anti-RSPO2 or anti-RSPO3 antibody.

[0006d] A fourth aspect provides a method for treating colorectal cancer in an individual, the method comprising determining that a sample obtained from the individual comprises an R-spondin (RSPO) translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2, and administering an effective amount of an anti-cancer therapy comprising an anti-RSPO2 antibody to the individual.

[0006e] A fifth aspect provides a method of treating colorectal cancer, comprising selecting an individual having colorectal cancer, wherein the colorectal cancer comprises an R-spondin translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2, and administering to the individual thus selected an effective amount of an anti-RSPO2 antibody.

[0006f] A sixth aspect provides a method of identifying an individual with colorectal cancer who is more or less likely to exhibit benefit from treatment with an anti-cancer therapy comprising an anti-RSPO2 antibody, the method comprising determining presence or absence of an R-spondin (RSPO) translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2 in a sample obtained from the individual, wherein presence of the RSPO translocation in the sample indicates that the individual is more likely to exhibit benefit from treatment with the anti-cancer therapy comprising the anti-RSPO2 antibody, and wherein absence of the RSPO translocation indicates that the individual is less likely to exhibit benefit from treatment with the anti-cancer therapy comprising the anti-RSPO2 antibody.

[0006g] A seventh aspect provides a method for predicting whether an individual with colorectal cancer is more or less likely to respond effectively to treatment with an anti-cancer therapy comprising an anti-RSPO2 antibody, the method comprising determining an R-spondin (RSPO) translocation *EIF3E* exon 1 and *RSPO2* exon 2, wherein presence of the RSPO translocation indicates that the individual is more likely to respond effectively to treatment with the anti-RSPO2 antibody and absence of the RSPO translocation indicates that the individual is less likely to respond effectively to treatment with the anti-RSPO2 antibody.

[0006h] An eighth aspect provides a method of predicting response or lack of response of an individual with colorectal cancer to an anti-cancer therapy comprising an anti-RSPO2 antibody comprising detecting in a sample obtained from the individual presence or absence of an R-spondin (RSPO) translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2, wherein presence of the RSPO translocation is predictive of response of the individual to the anti-cancer therapy comprising the anti-RSPO2 antibody and absence of the RSPO translocation is predictive of lack of response of the individual to the anti-cancer therapy comprising the anti-RSPO2 antibody.

[0006i] A ninth aspect provides a method of treating colorectal cancer in an individual comprising administering to the individual an effective amount of an anti-R-spondin 3 (RSPO3) antibody, wherein treatment is based upon the individual having cancer comprising an R-spondin (RSPO) translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b) *PTPRK* exon 7 and *RSPO3* exon 2.

[0006j] A tenth aspect provides a method of treating a colorectal cancer cell, wherein the cancer cell comprises an R-spondin (RSPO) translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b) PTPRK exon 7 and RSPO3 exon 2, and wherein the method comprises providing an effective amount of an anti-RSPO3 antibody.

[0006k] An eleventh aspect provides a method of treating colorectal cancer in an individual provided that the individual has been found to have colorectal cancer comprising an R-spondin (RSPO) translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b) *PTPRK* exon 7 and *RSPO3* exon 2, the method comprising administering to the individual an effective amount of an anti-RSPO3 antibody.

[0006l] A twelfth aspect provides a method for treating colorectal cancer in an individual, the method comprising: determining that a sample obtained from the individual comprises an R-spondin (RSPO) translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b)

PTPRK exon 7 and *RSPO3* exon 2, and administering an effective amount of an anti-cancer therapy comprising an anti-RSPO3 to the individual.

[0006m] A thirteenth aspect provides a method of treating colorectal cancer, comprising: (a) selecting an individual having colorectal cancer, wherein the colorectal cancer comprises an R-spondin translocation comprising (i) *PTPRK* exon 1 and *RSPO3* exon 2 or (ii) *PTPRK* exon 7 and *RSPO3* exon 2, and administering to the individual thus selected an effective amount of an anti-RSPO3 antibody.

[0006n] A fourteenth aspect provides a method of identifying an individual with colorectal cancer who is more or less likely to exhibit benefit from treatment with an anti-cancer therapy comprising an anti-RSPO3 antibody, the method comprising: determining presence or absence of an R-spondin (RSPO) translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b) *PTPRK* exon 7 and *RSPO3* exon 2 in a sample obtained from the individual, wherein presence of the RSPO translocation in the sample indicates that the individual is more likely to exhibit benefit from treatment with the anti-cancer therapy comprising the anti-RSPO3 antibody, and wherein absence of the RSPO translocation indicates that the individual is less likely to exhibit benefit from treatment with the anti-cancer therapy comprising the anti-RSPO3 antibody.

[0006o] A fifteenth aspect provides a method for predicting whether an individual with colorectal cancer is more or less likely to respond effectively to treatment with an anti-cancer therapy comprising an anti-RSPO3 antibody, the method comprising determining an R-spondin (RSPO) translocation, the RSPO translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b) *PTPRK* exon 7 and *RSPO3* exon 2, wherein presence of the RSPO translocation indicates that the individual is more likely to respond effectively to treatment with the anti-RSPO3 antibody and absence of the RSPO translocation indicates that the individual is less likely to respond effectively to treatment with the anti-RSPO3 antibody.

[0006p] A sixteenth aspect provides a method of predicting response or lack of response of an individual with colorectal cancer to an anti-cancer therapy comprising an anti-RSPO3 antibody comprising detecting in a sample obtained from the individual presence or absence of an R-spondin (RSPO) translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b) *PTPRK* exon 7 and *RSPO3* exon 2, wherein presence of the RSPO translocation is predictive of response of the individual to the anti-cancer therapy comprising the anti-RSPO3

antibody and absence of the RSPO translocation is predictive of lack of response of the individual to the anti-cancer therapy comprising the anti-RSPO3 antibody.

[0006q] A seventeenth aspect provides use of an anti-R-spondin 2 (RSPO2) antibody in the manufacture of a medicament for treating colorectal cancer or a colorectal cancer cell, wherein the colorectal cancer or colorectal cancer cell comprises an R-spondin (RSPO) translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2.

[0006r] An eighteenth aspect provides use of an anti-R-spondin 3 (RSPO3) antibody in the manufacture of a medicament for treating colorectal cancer or a colorectal cancer cell, wherein the colorectal cancer or colorectal cancer cell comprises an R-spondin (RSPO) translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b) *PTPRK* exon 7 and *RSPO3* exon 2.

[0007] Disclosed herein are methods of inhibiting cell proliferation of a cancer cell comprising contacting the cancer cell with an effective amount of an R-spondin-translocation antagonist. Further disclosed herein are methods of treating cancer in an individual comprising administering to the individual an effective amount of an R-spondin-translocation antagonist. In some embodiments of any of the methods, the cancer or cancer cell comprises an R-spondin translocation.

[0008] Disclosed herein are methods of treating cancer in an individual comprising administering to the individual an effective amount of a wnt pathway antagonist, wherein treatment is based upon the individual having cancer comprising an R-spondin translocation. Disclosed herein are methods of treating a cancer cell, wherein the cancer cell comprises an R-spondin translocation, and wherein the method comprises providing an effective amount of a

wnt pathway antagonist. Also disclosed herein are methods of treating cancer in an individual provided that the individual has been found to have cancer comprising an R-spondin translocation, the treatment comprising administering to the individual an effective amount of a wnt pathway antagonist.

[0009] Further, disclosed herein are methods for treating cancer in an individual, the method comprising: determining that a sample obtained from the individual comprises an R-spondin translocation, and administering an effective amount of an anti-cancer therapy comprising a wnt pathway antagonist to the individual, whereby the cancer is treated.

[0010] Disclosed herein are methods of treating cancer, comprising: (a) selecting an individual having cancer, wherein the cancer comprising an R-spondin translocation; and (b) administering to the individual thus selected an effective amount of a wnt pathway antagonist, whereby the cancer is treated.

[0011] Disclosed herein are also methods of identifying an individual with cancer who is more likely or less likely to exhibit benefit from treatment with an anti-cancer therapy comprising a wnt pathway antagonist, the method comprising: determining presence or absence of an R-spondin translocation in a sample obtained from the individual, wherein presence of the R-spondin translocation in the sample indicates that the individual is more likely to exhibit benefit from treatment with the anti-cancer therapy comprising the wnt pathway antagonist or absence of the R-spondin translocation indicates that the individual is less likely to exhibit benefit from treatment with the anti-cancer therapy comprising the wnt pathway antagonist. In some embodiments, the method further comprises administering an effective amount of the anti-cancer therapy comprising a wnt pathway antagonist.

[0012] Disclosed herein are methods for predicting whether an individual with cancer is more or less likely to respond effectively to treatment with an anti-cancer therapy comprising a wnt pathway antagonist, the method comprising determining an R-spondin translocation, whereby presence of the R-spondin translocation indicates that the individual is more likely to respond effectively to treatment with the wnt pathway antagonist and absence of the R-spondin translocation indicates that the individual is less likely to respond effectively to treatment with the wnt pathway antagonist. In some embodiments, the method further comprises administering an effective amount of the anti-cancer therapy comprising a wnt pathway antagonist.

[0013] Further disclosed herein are methods of predicting the response or lack of response of an individual with cancer to an anti-cancer therapy comprising a wnt pathway antagonist comprising

detecting in a sample obtained from the individual presence or absence of an R-spondin translocation, wherein presence of the R-spondin translocation is predictive of response of the individual to the anti-cancer therapy comprising the wnt pathway antagonist and absence of the R-spondin translocation is predictive of lack of response of the individual to the anti-cancer therapy comprising the wnt pathway antagonist. In some embodiments, the method further comprises administering an effective amount of the anti-cancer therapy comprising a wnt pathway antagonist.

[0014] In some embodiments of any of the methods, the R-spondin translocation is a RSPO1 translocation, RSPO2 translocation, RSPO3 translocation and/or RSPO4 translocation. In some embodiments, the R-spondin translocation is a RSPO2 translocation. In some embodiments, the RSPO2 translocation comprises *EIF3E* and *RSPO2*. In some embodiments, the RSPO2 translocation comprises *EIF3E* exon 1 and *RSPO2* exon 2. In some embodiments, the RSPO2 translocation comprises *EIF3E* exon 1 and *RSPO2* exon 3. In some embodiments, the RSPO2 translocation comprises SEQ ID NO:71 In some embodiments, the R-spondin translocation is a RSPO3 translocation. In some embodiments, the RSPO3 translocation comprises *PTPRK* and *RSPO3*. In some embodiments, the RSPO3 translocation comprises *PTPRK* exon 1 and *RSPO3* exon 2. In some embodiments, the RSPO3 translocation comprises *PTPRK* exon 7 and *RSPO3* exon 2. In some embodiments, the RSPO3 translocation comprises SEQ ID NO:72 and/or SEQ ID NO:73. In some embodiments of any of the methods, the R-spondin translocation is detected at the chromosomal level (e.g., FISH), DNA level, RNA level (*e.g.*, RSPO1-translocation fusion transcript), and/or protein level (*e.g.*, RSPO1-translocation fusion polypeptide).

[0015] In some embodiments of any of the methods, the cancer is colorectal cancer. In some embodiments, the cancer is a colon cancer or rectal cancer.

[0015a] In some embodiments of any of the methods, the wnt pathway antagonist is an antibody, binding polypeptide, small molecule, or polynucleotide. In some embodiments, the wnt pathway antagonist is an R-spondin antagonist. In some embodiments, the R-spondin antagonist is a RSPO1 antagonist, RSPO2 antagonist, RSPO3 antagonist, and/or RSPO4 antagonist. In some embodiments, the wnt pathway antagonist is an isolated monoclonal antibody which binds R-spondin. In some embodiments, the R-spondin is RSPO2 and/or RSPO3. In some embodiments, the R-spondin antagonist is an R-spondin-translocation antagonist. In some embodiments, the R-spondin-translocation antagonist binds a RSPO1-translocation fusion polypeptide and/or polynucleotide, RSPO2-translocation fusion polypeptide and/or polynucleotide, RSPO3-

translocation fusion polypeptide and/or polynucleotide and/or RSPO4-translocation fusion polypeptide and/or polynucleotide. In some embodiments, the R-spondin-translocation antagonist binds a RSPO2-translocation fusion polypeptide and/or polynucleotide. In some embodiments, the RSPO2-translocation fusion polypeptide and/or polynucleotide comprises *EIF3E* and *RSPO2*. In some embodiments, the RSPO2-translocation fusion polypeptide and/or polynucleotide comprises *EIF3E* exon 1 and *RSPO2* exon 2. In some embodiments, the RSPO2-translocation fusion polypeptide and/or polynucleotide comprises *EIF3E* exon 1 and *RSPO2* exon 3. In some embodiments, the RSPO2-translocation fusion polypeptide and/or polynucleotide comprises SEQ ID NO:71. In some embodiments, the R-spondin-translocation fusion polypeptide and/or polynucleotide is a RSPO3-translocation fusion polypeptide and/or polynucleotide. In some embodiments, the RSPO3-translocation fusion polypeptide and/or polynucleotide comprises *PTPRK* and *RSPO3*. In some embodiments, the RSPO3-translocation fusion polypeptide and/or polynucleotide comprises *PTPRK* exon 1 and *RSPO3* exon 2. In some embodiments, the RSPO3-translocation fusion polypeptide and/or polynucleotide comprises *PTPRK* exon 7 and *RSPO3* exon 2. In some embodiments, the RSPO3-translocation fusion polypeptide and/or polynucleotide comprises SEQ ID NO:72 and/or SEQ ID NO:73. In some embodiments, the method further comprises an additional therapeutic agent.

[0016] Disclosed herein are isolated R-spondin-translocation antagonists, wherein the R-spondin-translocation antagonist is an antibody, binding polypeptide, small molecule, or polynucleotide. In some embodiments, the R-spondin-translocation antagonist binds a RSPO1-translocation fusion polypeptide and/or polynucleotide, RSPO2-translocation fusion polypeptide and/or polynucleotide, RSPO3-translocation fusion polypeptide and/or polynucleotide and/or RSPO4-translocation fusion polypeptide and/or polynucleotide. In some embodiments, the R-spondin-translocation antagonist binds a RSPO2-translocation fusion polypeptide and/or polynucleotide. In some embodiments, the RSPO2-translocation fusion polypeptide and/or polynucleotide comprises *EIF3E* and *RSPO2*. In some embodiments, the RSPO2-translocation fusion polypeptide and/or polynucleotide comprises *EIF3E* exon 1 and *RSPO2* exon 2. In some embodiments, the RSPO2-translocation fusion polypeptide and/or polynucleotide comprises *EIF3E* exon 1 and *RSPO2* exon 3. In some embodiments, the RSPO2-translocation fusion polypeptide and/or polynucleotide comprises SEQ ID NO:71. In some embodiments, the R-spondin-translocation fusion polypeptide and/or polynucleotide is a RSPO3-translocation fusion polypeptide and/or polynucleotide. In some embodiments, the RSPO3-translocation fusion

polypeptide and/or polynucleotide comprises *PTPRK* and *RSPO3*. In some embodiments, the RSPO3-translocation fusion polypeptide and/or polynucleotide comprises *PTPRK* exon 1 and *RSPO3* exon 2. In some embodiments, the RSPO3-translocation fusion polypeptide and/or polynucleotide comprises *PTPRK* exon 7 and *RSPO3* exon

2. In some embodiments, the RSPO3-translocation fusion polypeptide and/or polynucleotide comprises SEQ ID NO:72 and/or SEQ ID NO:73.

BRIEF DESCRIPTION OF THE FIGURES

[0017] Figure 1 | **(A)** Activation of an alternate novel 5' exon of *MRPL33* in a tumor specific manner alters the N-terminal end of MRPL33 and makes the protein longer. **(B)** The boxplot shows the read counts for the upstream exon normalized by total number of reads aligning to *MRPL33* for each sample. **(C)** Also shown is evidence of an alternate upstream *MRPL33* promoter region showing H3K27Ac marking by USCS genome browser as well as an EST mapping to the upstream exon. MRLP33 Amino Acid Sequence ***MFLSAVFF AKSKSN***ETKSPLRGKEKNTLPLNGGLKMTLIYKEKTEGG DTDSEIL (SEQ ID NO:9); MRLP33 alternative promoter amino acid sequence ***MMAHLDFFLTYKWRAPKSKSLDQLSPNFLLRGRS*** ETKSPLRGKEKNTLPLNGGLKMTLIYKEKTEGGDTDSEIL (SEQ ID NO:10).

[0018] Figure 2 | Recurrent R-spondin translocations. **(A)** List of the type and frequency of R-spondin gene fusions in colon cancer. **(B)** Cartoon depicting the location, orientation and exon-intron architecture of *EIF3E-RSPO2* fusion on the genome. The read evidence for *EIF3E(e1)-RSPO2(e2)* fusion identified using RNA-seq data are shown. **(C)** Independent RT-PCR derived products confirming the *EIF3E-RSPO2* somatic fusion resolved on an agarose gel. RT-PCR products were Sanger sequenced to confirm the fusion junction and a relevant representative chromatogram is presented. **(D)** Schematic of the resulting EIF3E-RSPO2 fusion protein. **(E)** Tumors harboring R-spondin fusions show elevated expression of the corresponding *RSPO* gene shows on a heatmap. Figure 2 discloses SEQ ID NOS 85-92 and 71, respectively, in order of appearance.

[0019] Figure 3 | Recurrence of *PTPRK-RSPO3* gene fusion. **(A)** Cartoon depicting the location, orientation and exon-intron architecture of *PTPRK-RSPO3* gene fusion on the genome. The read evidence for *PTPRK(e1)-RSPO3(e2)* fusion identified using RNA-seq data are shown. **(B)** Independent RT-PCR derived products confirming the *PTPRK-RSPO3* somatic fusion resolved on an agarose gel. RT-PCR products were Sanger sequenced to confirm the fusion junction and a relevant representative chromatogram is presented. **(C)** Schematic of PTPRK, RSPO3 and the resulting PTPRK-RSPO3 fusion proteins. Figure 3 discloses SEQ ID NOS 93-99 and 72, respectively, in order of appearance.

[0020] Figure 4 | **(A)** *PTPRK(e7)-RSPO3*(e2) fusion. **(B)** Gel showing the validation of this fusion by RT-PCR. **(C)** Schematic diagram of the native and fusion proteins. Figure 4 discloses SEQ ID NOS 100-104 and 73, respectively, in order of appearance.

[0021] Figure 5 | RSPO fusion products activate Wnt signaling. (**A**) Secreted RSPO fusion proteins detected by Western blot in media from 293T cells transfected with expression constructs encoding the fusion proteins. The expected product is RSPO 1-387. (**B** and **C**) RSPO fusion proteins activate and potentiate Wnt signaling as measured using a luciferase reporter assay. Data shown are from condition media derived from cells transfected with the fusion constructs or directly transfected into the cell along with the reporter construct. Representative data from at least three experiments are shown. (**D**) Cartoon representing R-spondin mediated Wnt signaling pathway activation. (**E**) Plot depicting *RSPO* fusions and somatic mutations across a select set of Wnt signaling pathway genes.

[0022] Figure 6 | (**A**) *KRAS* mutations overlap with *RSPO* gene fusions. (**B**) RAS/RTK pathway alterations in colon cancer.

[0023] Figure 7 | Whole genome EIF3E-RSPO2 coordinates schematic and sequences. Figure 7 discloses SEQ ID NOS 105-108, respectively, in order of appearance.

[0024] Figure 8 | Whole genome EIF3E-RSPO2 coordinates schematic and sequences. Figure 8 discloses SEQ ID NOS 109-111, respectively, in order of appearance.

[0025] Figure 9 | Whole genome PTPRK-RSPO3 coordinates schematic and sequences. Figure 9 discloses SEQ ID NOS 112-116, respectively, in order of appearance.

[0026] Figure 10 | Whole genome PTPRK-RSPO3 coordinates schematic and sequences. Figure 10 discloses SEQ ID NOS 112 and 117-120, respectively, in order of appearance.

DETAILED DESCRIPTION

I. Definitions

[0026a] In the claims which follow and in the description of the invention, except where the context requires otherwise due to express language or necessary implication, the word "comprise" or variations such as "comprises" or "comprising" is used in an inclusive sense, i.e. to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the invention.

[0027] The terms "R-spondin" and "RSPO" refer herein to a native R-spondin from any vertebrate source, including mammals such as primates (*e.g.,* humans) and rodents (*e.g.,* mice and rats), unless otherwise indicated. The term encompasses "full-length," unprocessed R-spondin as well as any form of R-spondin that results from processing in the cell. The term also encompasses naturally occurring variants of R-spondin, *e.g.,* splice variants or allelic variants. R-spondin is a family of four proteins, R-spondin 1 (RSPO1), R-spondin 2 (RSPO2), R-spondin 3 (RSPO3), and R-spondin 4 (RSPO4). In some embodiments, the R-spondin is RSPO1. The

sequence of an exemplary human RSPO1 nucleic acid sequence is SEQ ID NO:1 or an exemplary human RSPO1 is amino acid sequence of SEQ ID NO:2. In some embodiments, the R-spondin is RSPO2. The sequence of an exemplary human RSPO2 nucleic acid sequence is SEQ ID NO:3 or an exemplary human RSPO2 is amino acid sequence of SEQ ID NO:4. In some embodiments, the R-spondin is RSPO3. The sequence of an exemplary human RSPO3 nucleic acid sequence is SEQ ID NO:5 or an exemplary human RSPO3 is amino acid sequence of SEQ ID NO:6. In some embodiments, the R-spondin is RSPO4. The sequence of an exemplary human RSPO4 nucleic acid sequence is SEQ ID NO:7 or an exemplary human RSPO4 is amino acid sequence of SEQ ID NO:8.

[0028] "R-Spondin variant," "RSPO variant," or variations thereof, means an R-spondin polypeptide or polynucleotide, generally being or encoding an active R-Spondin polypeptide, as defined herein having at least about 80% amino acid sequence identity with any of the R-Spondin as disclosed herein. Such R-Spondin variants include, for instance, R-Spondin wherein one or more nucleic acid or amino acid residues are added or deleted. Ordinarily, an R-spondin variant will have at least about 80% sequence identity, alternatively at least about 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% sequence identity, to R-Spondin as disclosed herein. Ordinarily, R-Spondin variant are at least about 10 residues in length, alternatively at least about 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300, 310, 320, 330, 340, 350, 360, 370, 380, 390, 400, 410, 420, 430, 440, 450, 460, 470, 480, 490, 500, 510, 520, 530, 540, 550, 560, 570, 580, 590, 600 in length, or more. Optionally, R-Spondin variant will have or encode a sequence having no more than one conservative amino acid substitution as compared to R-Spondin, alternatively no more than 2, 3, 4, 5, 6, 7, 8, 9, or 10 conservative amino acid substitution as compared to R-Spondin.

[0029] The terms "R-spondin translocation" and "RSPO translocation" refer herein to an R-spondin wherein a portion of a broken chromosome including, for example, R-spondin, variant, or fragment thereof or a second gene, variant, or fragment thereof, reattaches in a different chromosome location, for example, a chromosome location different from R-spondin native location or a chromosome location in and/or around the R-spondin native location which is different from the second gene's native location. The R-spondin translocation may be a RSPO1 translocation, RSPO2 translocation, RSPO3 translocation, and/or RSPO4 translocation.

[0030] The terms "R-spondin-translocation fusion polynucleotide" and "RSPO-translocation fusion polynucleotide" refer herein to the nucleic acid sequence of an R-spondin translocation gene product or fusion polynucleotide. The R-spondin-translocation fusion polynucleotide may be a RSPO1-translocation fusion polynucleotide, RSPO2-translocation fusion polynucleotide, RSPO3-translocation fusion polynucleotide, and/or RSPO4-translocation fusion polynucleotide. The terms "R-spondin-translocation fusion polypeptide" and "RSPO-translocation fusion polypeptide" refer herein to the amino acid sequence of an R-spondin translocation gene product or fusion polynucleotide. The R-spondin-translocation fusion polypeptide may be a RSPO1-translocation fusion polypeptide, RSPO2-translocation fusion polypeptide, RSPO3-translocation fusion polypeptide, and/or RSPO4-translocation fusion polypeptide.

[0031] The term "R-spondin-translocation antagonist" as defined herein is any molecule that partially or fully blocks, inhibits, or neutralizes a biological activity mediated by an R-spondin-translocation fusion polypeptide. In some embodiments such antagonist binds to R-spondin-

translocation fusion polypeptide. According to one embodiment, the antagonist is a polypeptide. According to another embodiment, the antagonist is an anti-R-spondin-translocation antibody. According to another embodiment, the antagonist is a small molecule antagonist. According to another embodiment, the antagonist is a polynucleotide antagonist. The R-spondin translocation may be a RSPO1-translocation antagonist, RSPO2-translocation antagonist, RSPO3-translocation antagonist, and/or RSPO4-translocation antagonist.

[0032] The term "wnt pathway antagonist" as defined herein is any molecule that partially or fully blocks, inhibits, or neutralizes a biological activity mediated by the wnt pathway (*e.g.,* wnt pathway polypeptide). In some embodiments such antagonist binds to a wnt pathway polypeptide. According to one embodiment, the antagonist is a polypeptide. According to another embodiment, the antagonist is an antibody antagonist. According to another embodiment, the antagonist is a small molecule antagonist. According to another embodiment, the antagonist is a polynucleotide antagonist.

[0033] "Polynucleotide" or "nucleic acid" as used interchangeably herein, refers to polymers of nucleotides of any length, and include DNA and RNA. The nucleotides can be deoxyribonucleotides, ribonucleotides, modified nucleotides or bases, and/or their analogs, or any substrate that can be incorporated into a polymer by DNA or RNA polymerase or by a synthetic reaction. A polynucleotide may comprise modified nucleotides, such as methylated nucleotides and their analogs. A sequence of nucleotides may be interrupted by non-nucleotide components. A polynucleotide may comprise modification(s) made after synthesis, such as conjugation to a label. Other types of modifications include, for example, “caps,” substitution of one or more of the naturally occurring nucleotides with an analog, internucleotide modifications such as, for example, those with uncharged linkages (*e.g.,* methyl phosphonates, phosphotriesters, phosphoamidates, carbamates, etc.) and with charged linkages (*e.g.,* phosphorothioates, phosphorodithioates, etc.), those containing pendant moieties, such as, for example, proteins (*e.g.,* nucleases, toxins, antibodies, signal peptides, ply-L-lysine, etc.), those with intercalators (*e.g.,* acridine, psoralen, etc.), those containing chelators (*e.g.,* metals, radioactive metals, boron, oxidative metals, etc.), those containing alkylators, those with modified linkages (*e.g.,* alpha anomeric nucleic acids, etc.), as well as unmodified forms of the polynucleotides(s). Further, any of the hydroxyl groups ordinarily present in the sugars may be replaced, for example, by phosphonate groups, phosphate groups, protected by standard protecting groups, or activated to prepare additional linkages to additional nucleotides, or may be conjugated to solid or semi-solid supports. The 5’ and 3’ terminal OH can be phosphorylated or substituted with amines or organic capping group moieties of from 1 to 20 carbon atoms. Other hydroxyls may also be derivatized to standard protecting groups. Polynucleotides can also contain analogous forms of ribose or deoxyribose sugars that are generally known in the art, including, for

example, 2'-O-methyl-, 2'-O-allyl-, 2'-fluoro- or 2'-azido-ribose, carbocyclic sugar analogs, α-anomeric sugars, epimeric sugars such as arabinose, xyloses or lyxoses, pyranose sugars, furanose sugars, sedoheptuloses, acyclic analogs, and basic nucleoside analogs such as methyl riboside. One or more phosphodiester linkages may be replaced by alternative linking groups. These alternative linking groups include, but are not limited to, embodiments wherein phosphate is replaced by P(O)S ("thioate"), P(S)S ("dithioate"), (O)NR_2 ("amidate"), P(O)R, P(O)OR', CO, or CH2 ("formacetal"), in which each R or R' is independently H or substituted or unsubstituted alkyl (1-20 C) optionally containing an ether (-O-) linkage, aryl, alkenyl, cycloalkyl, cycloalkenyl or araldyl. Not all linkages in a polynucleotide need be identical. The preceding description applies to all polynucleotides referred to herein, including RNA and DNA.

[0034] "Oligonucleotide," as used herein, refers to generally single-stranded, synthetic polynucleotides that are generally, but not necessarily, less than about 200 nucleotides in length. The terms "oligonucleotide" and "polynucleotide" are not mutually exclusive. The description above for polynucleotides is equally and fully applicable to oligonucleotides.

[0035] The term "primer" refers to a single stranded polynucleotide that is capable of hybridizing to a nucleic acid and following polymerization of a complementary nucleic acid, generally by providing a free 3'-OH group.

[0036] The term "small molecule" refers to any molecule with a molecular weight of about 2000 Daltons or less, preferably of about 500 Daltons or less.

[0037] The terms "host cell," "host cell line," and "host cell culture" are used interchangeably and refer to cells into which exogenous nucleic acid has been introduced, including the progeny of such cells. Host cells include "transformants" and "transformed cells," which include the primary transformed cell and progeny derived therefrom without regard to the number of passages. Progeny may not be completely identical in nucleic acid content to a parent cell, but may contain mutations. Mutant progeny that have the same function or biological activity as screened or selected for in the originally transformed cell are included herein.

[0038] The term "vector," as used herein, refers to a nucleic acid molecule capable of propagating another nucleic acid to which it is linked. The term includes the vector as a self-replicating nucleic acid structure as well as the vector incorporated into the genome of a host cell into which it has been introduced. Certain vectors are capable of directing the expression of nucleic acids to which they are operatively linked. Such vectors are referred to herein as "expression vectors."

[0039] An "isolated" antibody is one which has been separated from a component of its natural environment. In some embodiments, an antibody is purified to greater than 95% or 99% purity as determined by, for example, electrophoretic (*e.g.,* SDS-PAGE, isoelectric focusing (IEF), capillary electrophoresis) or chromatographic (*e.g.,* ion exchange or reverse phase HPLC). For review of

methods for assessment of antibody purity, *see*, *e.g.,* Flatman *et al.*, *J. Chromatogr. B* 848:79-87 (2007).

[0040] An "isolated" nucleic acid refers to a nucleic acid molecule that has been separated from a component of its natural environment. An isolated nucleic acid includes a nucleic acid molecule contained in cells that ordinarily contain the nucleic acid molecule, but the nucleic acid molecule is present extrachromosomally or at a chromosomal location that is different from its natural chromosomal location.

[0041] The term "antibody" herein is used in the broadest sense and encompasses various antibody structures, including but not limited to monoclonal antibodies, polyclonal antibodies, multispecific antibodies (*e.g.,* bispecific antibodies), and antibody fragments so long as they exhibit the desired antigen-binding activity.

[0042] An "antibody fragment" refers to a molecule other than an intact antibody that comprises a portion of an intact antibody that binds the antigen to which the intact antibody binds. Examples of antibody fragments include but are not limited to Fv, Fab, Fab', Fab'-SH, $F(ab')_2$; diabodies; linear antibodies; single-chain antibody molecules (*e.g.,* scFv); and multispecific antibodies formed from antibody fragments.

[0043] An "antibody that binds to the same epitope" as a reference antibody refers to an antibody that blocks binding of the reference antibody to its antigen in a competition assay by 50% or more, and conversely, the reference antibody blocks binding of the antibody to its antigen in a competition assay by 50% or more. An exemplary competition assay is provided herein.

[0044] The terms "full length antibody," "intact antibody," and "whole antibody" are used herein interchangeably to refer to an antibody having a structure substantially similar to a native antibody structure or having heavy chains that contain an Fc region as defined herein.

[0045] The term "monoclonal antibody" as used herein refers to an antibody obtained from a population of substantially homogeneous antibodies, *i.e.*, the individual antibodies comprising the population are identical and/or bind the same epitope, except for possible variant antibodies, *e.g.,* containing naturally occurring mutations or arising during production of a monoclonal antibody preparation, such variants generally being present in minor amounts. In contrast to polyclonal antibody preparations, which typically include different antibodies directed against different determinants (epitopes), each monoclonal antibody of a monoclonal antibody preparation is directed against a single determinant on an antigen. Thus, the modifier "monoclonal" indicates the character of the antibody as being obtained from a substantially homogeneous population of antibodies, and is not to be construed as requiring production of the antibody by any particular method. For example, the monoclonal antibodies to be used in accordance with the present invention may be made by a variety of techniques, including but not limited to the hybridoma method, recombinant DNA

methods, phage-display methods, and methods utilizing transgenic animals containing all or part of the human immunoglobulin loci, such methods and other exemplary methods for making monoclonal antibodies being described herein.

[0046] "Native antibodies" refer to naturally occurring immunoglobulin molecules with varying structures. For example, native IgG antibodies are heterotetrameric glycoproteins of about 150,000 Daltons, composed of two identical light chains and two identical heavy chains that are disulfide-bonded. From N- to C-terminus, each heavy chain has a variable region (VH), also called a variable heavy domain or a heavy chain variable domain, followed by three constant domains (CH1, CH2, and CH3). Similarly, from N- to C-terminus, each light chain has a variable region (VL), also called a variable light domain or a light chain variable domain, followed by a constant light (CL) domain. The light chain of an antibody may be assigned to one of two types, called kappa (κ) and lambda (λ), based on the amino acid sequence of its constant domain.

[0047] The term "chimeric" antibody refers to an antibody in which a portion of the heavy and/or light chain is derived from a particular source or species, while the remainder of the heavy and/or light chain is derived from a different source or species.

[0048] A "human antibody" is one which possesses an amino acid sequence which corresponds to that of an antibody produced by a human or a human cell or derived from a non-human source that utilizes human antibody repertoires or other human antibody-encoding sequences. This definition of a human antibody specifically excludes a humanized antibody comprising non-human antigen-binding residues.

[0049] A "humanized" antibody refers to a chimeric antibody comprising amino acid residues from non-human HVRs and amino acid residues from human FRs. In certain embodiments, a humanized antibody will comprise substantially all of at least one, and typically two, variable domains, in which all or substantially all of the HVRs (*e.g.,* CDRs) correspond to those of a non-human antibody, and all or substantially all of the FRs correspond to those of a human antibody. A humanized antibody optionally may comprise at least a portion of an antibody constant region derived from a human antibody. A "humanized form" of an antibody, *e.g.,* a non-human antibody, refers to an antibody that has undergone humanization.

[0050] The "class" of an antibody refers to the type of constant domain or constant region possessed by its heavy chain. There are five major classes of antibodies: IgA, IgD, IgE, IgG, and IgM, and several of these may be further divided into subclasses (isotypes), *e.g.,* IgG_1, IgG_2, IgG_3, IgG_4, IgA_1, and IgA_2. The heavy chain constant domains that correspond to the different classes of immunoglobulins are called α, δ, ε, γ, and μ, respectively.

[0051] "Effector functions" refer to those biological activities attributable to the Fc region of an antibody, which vary with the antibody isotype. Examples of antibody effector functions include: C1q binding and complement dependent cytotoxicity (CDC); Fc receptor binding; antibody-dependent cell-mediated cytotoxicity (ADCC); phagocytosis; down regulation of cell surface receptors (*e.g.,* B cell receptor); and B cell activation.

[0052] The term "Fc region" herein is used to define a C-terminal region of an immunoglobulin heavy chain that contains at least a portion of the constant region. The term includes native sequence Fc regions and variant Fc regions. In one embodiment, a human IgG heavy chain Fc region extends from Cys226, or from Pro230, to the carboxyl-terminus of the heavy chain. However, the C-terminal lysine (Lys447) of the Fc region may or may not be present. Unless otherwise specified herein, numbering of amino acid residues in the Fc region or constant region is according to the EU numbering system, also called the EU index, as described in Kabat *et al., Sequences of Proteins of Immunological Interest*, 5th Ed. Public Health Service, National Institutes of Health, Bethesda, MD, 1991.

[0053] "Framework" or "FR" refers to variable domain residues other than hypervariable region (HVR) residues. The FR of a variable domain generally consists of four FR domains: FR1, FR2, FR3, and FR4. Accordingly, the HVR and FR sequences generally appear in the following sequence in VH (or VL): FR1-H1(L1)-FR2-H2(L2)-FR3-H3(L3)-FR4.

[0054] A "human consensus framework" is a framework which represents the most commonly occurring amino acid residues in a selection of human immunoglobulin VL or VH framework sequences. Generally, the selection of human immunoglobulin VL or VH sequences is from a subgroup of variable domain sequences. Generally, the subgroup of sequences is a subgroup as in Kabat *et al.*, *Sequences of Proteins of Immunological Interest*, Fifth Edition, NIH Publication 91-3242, Bethesda MD (1991), vols. 1-3. In one embodiment, for the VL, the subgroup is subgroup kappa I as in Kabat *et al., supra.* In one embodiment, for the VH, the subgroup is subgroup III as in Kabat *et al., supra*.

[0055] An "acceptor human framework" for the purposes herein is a framework comprising the amino acid sequence of a light chain variable domain (VL) framework or a heavy chain variable domain (VH) framework derived from a human immunoglobulin framework or a human consensus framework, as defined below. An acceptor human framework "derived from" a human immunoglobulin framework or a human consensus framework may comprise the same amino acid sequence thereof, or it may contain amino acid sequence changes. In some embodiments, the number of amino acid changes are 10 or less, 9 or less, 8 or less, 7 or less, 6 or less, 5 or less, 4 or less, 3 or less, or 2 or less. In some embodiments, the VL acceptor human framework is identical in

sequence to the VL human immunoglobulin framework sequence or human consensus framework sequence.

[0056] The term "variable region" or "variable domain" refers to the domain of an antibody heavy or light chain that is involved in binding the antibody to antigen. The variable domains of the heavy chain and light chain (VH and VL, respectively) of a native antibody generally have similar structures, with each domain comprising four conserved framework regions (FRs) and three hypervariable regions (HVRs). (*See*, *e.g.,* Kindt *et al., Kuby Immunology*, 6th ed., W.H. Freeman and Co., page 91 (2007).) A single VH or VL domain may be sufficient to confer antigen-binding specificity. Furthermore, antibodies that bind a particular antigen may be isolated using a VH or VL domain from an antibody that binds the antigen to screen a library of complementary VL or VH domains, respectively. *See*, *e.g.,* Portolano *et al.*, *J. Immunol.* 150:880-887 (1993); Clarkson *et al.*, *Nature* 352:624-628 (1991).

[0057] The term "hypervariable region" or "HVR," as used herein, refers to each of the regions of an antibody variable domain which are hypervariable in sequence and/or form structurally defined loops ("hypervariable loops"). Generally, native four-chain antibodies comprise six HVRs; three in the VH (H1, H2, H3), and three in the VL (L1, L2, L3). HVRs generally comprise amino acid residues from the hypervariable loops and/or from the "complementarity determining regions" (CDRs), the latter being of highest sequence variability and/or involved in antigen recognition. Exemplary hypervariable loops occur at amino acid residues 26-32 (L1), 50-52 (L2), 91-96 (L3), 26-32 (H1), 53-55 (H2), and 96-101 (H3). (Chothia and Lesk, *J. Mol. Biol.* 196:901-917 (1987).) Exemplary CDRs (CDR-L1, CDR-L2, CDR-L3, CDR-H1, CDR-H2, and CDR-H3) occur at amino acid residues 24-34 of L1, 50-56 of L2, 89-97 of L3, 31-35B of H1, 50-65 of H2, and 95-102 of H3. (Kabat *et al., Sequences of Proteins of Immunological Interest*, 5th Ed. Public Health Service, National Institutes of Health, Bethesda, MD (1991).) With the exception of CDR1 in VH, CDRs generally comprise the amino acid residues that form the hypervariable loops. CDRs also comprise "specificity determining residues," or "SDRs," which are residues that contact antigen. SDRs are contained within regions of the CDRs called abbreviated-CDRs, or a-CDRs. Exemplary a-CDRs (a-CDR-L1, a-CDR-L2, a-CDR-L3, a-CDR-H1, a-CDR-H2, and a-CDR-H3) occur at amino acid residues 31-34 of L1, 50-55 of L2, 89-96 of L3, 31-35B of H1, 50-58 of H2, and 95-102 of H3. (*See* Almagro and Fransson, *Front. Biosci.* 13:1619-1633 (2008).) Unless otherwise indicated, HVR residues and other residues in the variable domain (*e.g.,* FR residues) are numbered herein according to Kabat *et al., supra*.

[0058] "Affinity" refers to the strength of the sum total of noncovalent interactions between a single binding site of a molecule (*e.g.,* an antibody) and its binding partner (*e.g.,* an antigen). Unless indicated otherwise, as used herein, "binding affinity" refers to intrinsic binding affinity which

reflects a 1:1 interaction between members of a binding pair (*e.g.,* antibody and antigen). The affinity of a molecule X for its partner Y can generally be represented by the dissociation constant (Kd). Affinity can be measured by common methods known in the art, including those described herein. Specific illustrative and exemplary embodiments for measuring binding affinity are described in the following.

[0059] An "affinity matured" antibody refers to an antibody with one or more alterations in one or more hypervariable regions (HVRs), compared to a parent antibody which does not possess such alterations, such alterations resulting in an improvement in the affinity of the antibody for antigen.

[0060] The terms "anti-R-spondin-translocation antibody" and "an antibody that binds to R-spondin-translocation fusion polypeptide" refer to an antibody that is capable of binding R-spondin-translocation fusion polypeptide with sufficient affinity such that the antibody is useful as a diagnostic and/or therapeutic agent in targeting R-spondin translocation. In one embodiment, the extent of binding of an anti-R-spondin translocation antibody to an unrelated, non-R-spondin-translocation fusion polypeptide, and/or nontranslocated-R-spondin polypeptide is less than about 10% of the binding of the antibody to R-spondin-translocation fusion polypeptides measured, *e.g.,* by a radioimmunoassay (RIA). In certain embodiments, an antibody that binds to R-spondin-translocation fusion polypeptide has a dissociation constant (Kd) of $\leq$ 1μM, $\leq$ 100 nM, $\leq$ 10 nM, $\leq$ 1 nM, $\leq$ 0.1 nM, $\leq$ 0.01 nM, or $\leq$ 0.001 nM (*e.g.,*10^{-8} M or less, *e.g.,* from 10^{-8} M to 10^{-13} M, *e.g.,* from 10^{-9} M to 10^{-13} M). In certain embodiments, an anti- R-spondin translocation antibody binds to an epitope of R-spondin translocation that is unique among R-spondin translocations.

[0061] A "blocking" antibody or an "antagonist" antibody is one which inhibits or reduces biological activity of the antigen it binds. Preferred blocking antibodies or antagonist antibodies substantially or completely inhibit the biological activity of the antigen.

[0062] A "naked antibody" refers to an antibody that is not conjugated to a heterologous moiety (*e.g.,* a cytotoxic moiety) or radiolabel. The naked antibody may be present in a pharmaceutical formulation.

[0063] An "immunoconjugate" is an antibody conjugated to one or more heterologous molecule(s), including but not limited to a cytotoxic agent.

[0064] "Percent (%) amino acid sequence identity" with respect to a reference polypeptide sequence is defined as the percentage of amino acid residues in a candidate sequence that are identical with the amino acid residues in the reference polypeptide sequence, after aligning the sequences and introducing gaps, if necessary, to achieve the maximum percent sequence identity, and not considering any conservative substitutions as part of the sequence identity. Alignment for purposes of determining percent amino acid sequence identity can be achieved in various ways that are within the skill in the art, for instance, using publicly available computer software such as BLAST,

BLAST-2, ALIGN or Megalign (DNASTAR) software. Those skilled in the art can determine appropriate parameters for aligning sequences, including any algorithms needed to achieve maximal alignment over the full length of the sequences being compared. For purposes herein, however, % amino acid sequence identity values are generated using the sequence comparison computer program ALIGN-2. The ALIGN-2 sequence comparison computer program was authored by Genentech, Inc., and the source code has been filed with user documentation in the U.S. Copyright Office, Washington D.C., 20559, where it is registered under U.S. Copyright Registration No. TXU510087. The ALIGN-2 program is publicly available from Genentech, Inc., South San Francisco, California, or may be compiled from the source code. The ALIGN-2 program should be compiled for use on a UNIX operating system, including digital UNIX V4.0D. All sequence comparison parameters are set by the ALIGN-2 program and do not vary.

[0065] In situations where ALIGN-2 is employed for amino acid sequence comparisons, the % amino acid sequence identity of a given amino acid sequence A to, with, or against a given amino acid sequence B (which can alternatively be phrased as a given amino acid sequence A that has or comprises a certain % amino acid sequence identity to, with, or against a given amino acid sequence B) is calculated as follows:

100 times the fraction X/Y

where X is the number of amino acid residues scored as identical matches by the sequence alignment program ALIGN-2 in that program's alignment of A and B, and where Y is the total number of amino acid residues in B. It will be appreciated that where the length of amino acid sequence A is not equal to the length of amino acid sequence B, the % amino acid sequence identity of A to B will not equal the % amino acid sequence identity of B to A. Unless specifically stated otherwise, all % amino acid sequence identity values used herein are obtained as described in the immediately preceding paragraph using the ALIGN-2 computer program.

[0066] The term "detection" includes any means of detecting, including direct and indirect detection.

[0067] The term "biomarker" as used herein refers to an indicator, *e.g.,* predictive, diagnostic, and/or prognostic, which can be detected in a sample. The biomarker may serve as an indicator of a particular subtype of a disease or disorder (*e.g.,* cancer) characterized by certain, molecular, pathological, histological, and/or clinical features. In some embodiments, the biomarker is a gene. In some embodiments, the biomarker is a variation (*e.g.*, mutation and/or polymorphism) of a gene. In some embodiments, the biomarkers is a translocation. Biomarkers include, but are not limited to, polynucleotides (*e.g.,* DNA, and/or RNA), polypeptides, polypeptide and polynucleotide

modifications (*e.g.,* posttranslational modifications), carbohydrates, and/or glycolipid-based molecular markers.

[0068] The "presence," "amount," or "level" of a biomarker associated with an increased clinical benefit to an individual is a detectable level in a biological sample. These can be measured by methods known to one skilled in the art and also disclosed herein. The expression level or amount of biomarker assessed can be used to determine the response to the treatment.

[0069] The terms "level of expression" or "expression level" in general are used interchangeably and generally refer to the amount of a biomarker in a biological sample. "Expression" generally refers to the process by which information (*e.g.,* gene-encoded and/or epigenetic) is converted into the structures present and operating in the cell. Therefore, as used herein, "expression" may refer to transcription into a polynucleotide, translation into a polypeptide, or even polynucleotide and/or polypeptide modifications (*e.g.,* posttranslational modification of a polypeptide). Fragments of the transcribed polynucleotide, the translated polypeptide, or polynucleotide and/or polypeptide modifications (*e.g.,* posttranslational modification of a polypeptide) shall also be regarded as expressed whether they originate from a transcript generated by alternative splicing or a degraded transcript, or from a post-translational processing of the polypeptide, *e.g.,* by proteolysis. "Expressed genes" include those that are transcribed into a polynucleotide as mRNA and then translated into a polypeptide, and also those that are transcribed into RNA but not translated into a polypeptide (for example, transfer and ribosomal RNAs).

[0070] "Elevated expression," "elevated expression levels," or "elevated levels" refers to an increased expression or increased levels of a biomarker in an individual relative to a control, such as an individual or individuals who are not suffering from the disease or disorder (*e.g.,* cancer) or an internal control (*e.g.,* housekeeping biomarker).

[0071] "Reduced expression," "reduced expression levels," or "reduced levels" refers to a decrease expression or decreased levels of a biomarker in an individual relative to a control, such as an individual or individuals who are not suffering from the disease or disorder (*e.g.,* cancer) or an internal control (*e.g.,* housekeeping biomarker).

[0072] The term "housekeeping biomarker" refers to a biomarker or group of biomarkers (*e.g.,* polynucleotides and/or polypeptides) which are typically similarly present in all cell types. In some embodiments, the housekeeping biomarker is a "housekeeping gene." A "housekeeping gene" refers herein to a gene or group of genes which encode proteins whose activities are essential for the maintenance of cell function and which are typically similarly present in all cell types.

[0073] "Amplification," as used herein generally refers to the process of producing multiple copies of a desired sequence. "Multiple copies" mean at least two copies. A "copy" does not necessarily mean perfect sequence complementarity or identity to the template sequence. For example, copies

can include nucleotide analogs such as deoxyinosine, intentional sequence alterations (such as sequence alterations introduced through a primer comprising a sequence that is hybridizable, but not complementary, to the template), and/or sequence errors that occur during amplification.

[0074] The term "multiplex-PCR" refers to a single PCR reaction carried out on nucleic acid obtained from a single source (*e.g.,* an individual) using more than one primer set for the purpose of amplifying two or more DNA sequences in a single reaction.

[0075] "Stringency" of hybridization reactions is readily determinable by one of ordinary skill in the art, and generally is an empirical calculation dependent upon probe length, washing temperature, and salt concentration. In general, longer probes require higher temperatures for proper annealing, while shorter probes need lower temperatures. Hybridization generally depends on the ability of denatured DNA to reanneal when complementary strands are present in an environment below their melting temperature. The higher the degree of desired homology between the probe and hybridizable sequence, the higher the relative temperature which can be used. As a result, it follows that higher relative temperatures would tend to make the reaction conditions more stringent, while lower temperatures less so. For additional details and explanation of stringency of hybridization reactions, *see* Ausubel *et al.*, Current Protocols in Molecular Biology, Wiley Interscience Publishers, (1995).

[0076] "Stringent conditions" or "high stringency conditions", as defined herein, can be identified by those that: (1) employ low ionic strength and high temperature for washing, for example 0.015 M sodium chloride/0.0015 M sodium citrate/0.1% sodium dodecyl sulfate at 50°C; (2) employ during hybridization a denaturing agent, such as formamide, for example, 50% (v/v) formamide with 0.1% bovine serum albumin/0.1% Ficoll/0.1% polyvinylpyrrolidone/50mM sodium phosphate buffer at pH 6.5 with 750 mM sodium chloride, 75 mM sodium citrate at 42°C; or (3) overnight hybridization in a solution that employs 50% formamide, 5 x SSC (0.75 M NaCl, 0.075 M sodium citrate), 50 mM sodium phosphate (pH 6.8), 0.1% sodium pyrophosphate, 5 x Denhardt's solution, sonicated salmon sperm DNA (50 μg/ml), 0.1% SDS, and 10% dextran sulfate at 42°C, with a 10 minute wash at 42°C in 0.2 x SSC (sodium chloride/sodium citrate) followed by a 10 minute high-stringency wash consisting of 0.1 x SSC containing EDTA at 55°C.

[0077] "Moderately stringent conditions" can be identified as described by Sambrook *et al.*, Molecular Cloning: A Laboratory Manual, New York: Cold Spring Harbor Press, 1989, and include the use of washing solution and hybridization conditions (*e.g.,* temperature, ionic strength and %SDS) less stringent that those described above. An example of moderately stringent conditions is overnight incubation at 37°C in a solution comprising: 20% formamide, 5 x SSC (150 mM NaCl, 15 mM trisodium citrate), 50 mM sodium phosphate (pH 7.6), 5 x Denhardt's solution, 10% dextran sulfate, and 20 mg/ml denatured sheared salmon sperm DNA, followed by washing the filters in 1 x

SSC at about 37-50°C. The skilled artisan will recognize how to adjust the temperature, ionic strength, etc. as necessary to accommodate factors such as probe length and the like.

[0078] The term "diagnosis" is used herein to refer to the identification or classification of a molecular or pathological state, disease or condition (*e.g.,* cancer). For example, “diagnosis” may refer to identification of a particular type of cancer. “Diagnosis” may also refer to the classification of a particular subtype of cancer, *e.g.,* by histopathological criteria, or by molecular features (*e.g.,* a subtype characterized by expression of one or a combination of biomarkers (*e.g.,* particular genes or proteins encoded by said genes)).

[0079] The term “aiding diagnosis” is used herein to refer to methods that assist in making a clinical determination regarding the presence, or nature, of a particular type of symptom or condition of a disease or disorder (*e.g.,* cancer). For example, a method of aiding diagnosis of a disease or condition (*e.g.,* cancer) can comprise detecting certain biomarkers in a biological sample from an individual.

[0080] The term “sample,” as used herein, refers to a composition that is obtained or derived from a subject and/or individual of interest that contains a cellular and/or other molecular entity that is to be characterized and/or identified, for example based on physical, biochemical, chemical and/or physiological characteristics. For example, the phrase “disease sample” and variations thereof refers to any sample obtained from a subject of interest that would be expected or is known to contain the cellular and/or molecular entity that is to be characterized. Samples include, but are not limited to, primary or cultured cells or cell lines, cell supernatants, cell lysates, platelets, serum, plasma, vitreous fluid, lymph fluid, synovial fluid, follicular fluid, seminal fluid, amniotic fluid, milk, whole blood, blood-derived cells, urine, cerebro-spinal fluid, saliva, sputum, tears, perspiration, mucus, tumor lysates, and tissue culture medium, tissue extracts such as homogenized tissue, tumor tissue, cellular extracts, and combinations thereof.

[0081] By "tissue sample” or “cell sample" is meant a collection of similar cells obtained from a tissue of a subject or individual. The source of the tissue or cell sample may be solid tissue as from a fresh, frozen and/or preserved organ, tissue sample, biopsy, and/or aspirate; blood or any blood constituents such as plasma; bodily fluids such as cerebral spinal fluid, amniotic fluid, peritoneal fluid, or interstitial fluid; cells from any time in gestation or development of the subject. The tissue sample may also be primary or cultured cells or cell lines. Optionally, the tissue or cell sample is obtained from a disease tissue/organ. The tissue sample may contain compounds which are not naturally intermixed with the tissue in nature such as preservatives, anticoagulants, buffers, fixatives, nutrients, antibiotics, or the like.

[0082] A “reference sample”, “reference cell”, “reference tissue”, “control sample”, “control cell”, or “control tissue”, as used herein, refers to a sample, cell, tissue, standard, or level that is used for

comparison purposes. In one embodiment, a reference sample, reference cell, reference tissue, control sample, control cell, or control tissue is obtained from a healthy and/or non-diseased part of the body (*e.g.,* tissue or cells) of the same subject or individual. For example, healthy and/or non-diseased cells or tissue adjacent to the diseased cells or tissue (*e.g.,* cells or tissue adjacent to a tumor). In another embodiment, a reference sample is obtained from an untreated tissue and/or cell of the body of the same subject or individual. In yet another embodiment, a reference sample, reference cell, reference tissue, control sample, control cell, or control tissue is obtained from a healthy and/or non-diseased part of the body (*e.g.,* tissues or cells) of an individual who is not the subject or individual. In even another embodiment, a reference sample, reference cell, reference tissue, control sample, control cell, or control tissue is obtained from an untreated tissue and/or cell of the body of an individual who is not the subject or individual.

[0083] For the purposes herein a “section” of a tissue sample is meant a single part or piece of a tissue sample, *e.g.,* a thin slice of tissue or cells cut from a tissue sample. It is understood that multiple sections of tissue samples may be taken and subjected to analysis, provided that it is understood that the same section of tissue sample may be analyzed at both morphological and molecular levels, or analyzed with respect to both polypeptides and polynucleotides.

[0084] By “correlate” or “correlating” is meant comparing, in any way, the performance and/or results of a first analysis or protocol with the performance and/or results of a second analysis or protocol. For example, one may use the results of a first analysis or protocol in carrying out a second protocols and/or one may use the results of a first analysis or protocol to determine whether a second analysis or protocol should be performed. With respect to the embodiment of polynucleotide analysis or protocol, one may use the results of the polynucleotide expression analysis or protocol to determine whether a specific therapeutic regimen should be performed.

[0085] "Individual response" or “response” can be assessed using any endpoint indicating a benefit to the individual, including, without limitation, (1) inhibition, to some extent, of disease progression (*e.g.,* cancer progression), including slowing down and complete arrest; (2) a reduction in tumor size; (3) inhibition (*i.e.*, reduction, slowing down or complete stopping) of cancer cell infiltration into adjacent peripheral organs and/or tissues; (4) inhibition (*i.e.* reduction, slowing down or complete stopping) of metasisis; (5) relief, to some extent, of one or more symptoms associated with the disease or disorder (*e.g.,* cancer); (6) increase in the length of progression free survival; and/or (9) decreased mortality at a given point of time following treatment.

[0086] The phrase “substantially similar,” as used herein, refers to a sufficiently high degree of similarity between two numeric values (generally one associated with a molecule and the other associated with a reference/comparator molecule) such that one of skill in the art would consider the difference between the two values to not be of statistical significance within the context of the

biological characteristic measured by said values (*e.g.,* Kd values). The difference between said two values may be, for example, less than about 20%, less than about 10%, and/or less than about 5% as a function of the reference/comparator value. The phrase "substantially normal" refers to substantially similar to a reference (*e.g.*, normal reference).

[0087] The phrase "substantially different," refers to a sufficiently high degree of difference between two numeric values (generally one associated with a molecule and the other associated with a reference/comparator molecule) such that one of skill in the art would consider the difference between the two values to be of statistical significance within the context of the biological characteristic measured by said values (*e.g.,* Kd values). The difference between said two values may be, for example, greater than about 10%, greater than about 20%, greater than about 30%, greater than about 40%, and/or greater than about 50% as a function of the value for the reference/comparator molecule.

[0088] The word "label" when used herein refers to a detectable compound or composition. The label is typically conjugated or fused directly or indirectly to a reagent, such as a polynucleotide probe or an antibody, and facilitates detection of the reagent to which it is conjugated or fused. The label may itself be detectable (*e.g.,* radioisotope labels or fluorescent labels) or, in the case of an enzymatic label, may catalyze chemical alteration of a substrate compound or composition which results in a detectable product.

[0089] An "effective amount" of an agent refers to an amount effective, at dosages and for periods of time necessary, to achieve the desired therapeutic or prophylactic result.

[0090] A "therapeutically effective amount" of a substance/molecule of the invention, agonist or antagonist may vary according to factors such as the disease state, age, sex, and weight of the individual, and the ability of the substance/molecule, agonist or antagonist to elicit a desired response in the individual. A therapeutically effective amount is also one in which any toxic or detrimental effects of the substance/molecule, agonist or antagonist are outweighed by the therapeutically beneficial effects. A "prophylactically effective amount" refers to an amount effective, at dosages and for periods of time necessary, to achieve the desired prophylactic result. Typically but not necessarily, since a prophylactic dose is used in subjects prior to or at an earlier stage of disease, the prophylactically effective amount will be less than the therapeutically effective amount.

[0091] The term "pharmaceutical formulation" refers to a preparation which is in such form as to permit the biological activity of an active ingredient contained therein to be effective, and which contains no additional components which are unacceptably toxic to a subject to which the formulation would be administered.

[0092] A “pharmaceutically acceptable carrier” refers to an ingredient in a pharmaceutical formulation, other than an active ingredient, which is nontoxic to a subject., A pharmaceutically acceptable carrier includes, but is not limited to, a buffer, excipient, stabilizer, or preservative.

[0093] As used herein, “treatment” (and grammatical variations thereof such as “treat” or “treating”) refers to clinical intervention in an attempt to alter the natural course of the individual being treated, and can be performed either for prophylaxis or during the course of clinical pathology. Desirable effects of treatment include, but are not limited to, preventing occurrence or recurrence of disease, alleviation of symptoms, diminishment of any direct or indirect pathological consequences of the disease, preventing metastasis, decreasing the rate of disease progression, amelioration or palliation of the disease state, and remission or improved prognosis. In some embodiments, antibodies of the invention are used to delay development of a disease or to slow the progression of a disease.

[0094] The terms "cancer" and "cancerous" refer to or describe the physiological condition in mammals that is typically characterized by unregulated cell growth/proliferation. Examples of cancer include, but are not limited to, carcinoma, lymphoma (*e.g.*, Hodgkin’s and non-Hodgkin’s lymphoma), blastoma, sarcoma, and leukemia. More particular examples of such cancers include squamous cell cancer, small-cell lung cancer, non-small cell lung cancer, adenocarcinoma of the lung, squamous carcinoma of the lung, cancer of the peritoneum, hepatocellular cancer, gastrointestinal cancer, pancreatic cancer, glioma, cervical cancer, ovarian cancer, liver cancer, bladder cancer, hepatoma, breast cancer, colon cancer, colorectal cancer, endometrial or uterine carcinoma, salivary gland carcinoma, kidney cancer, liver cancer, prostate cancer, vulval cancer, thyroid cancer, hepatic carcinoma, leukemia and other lymphoproliferative disorders, and various types of head and neck cancer.

[0095] The term “anti-cancer therapy” refers to a therapy useful in treating cancer. Examples of anti-cancer therapeutic agents include, but are limited to, *e.g.,* chemotherapeutic agents, growth inhibitory agents, cytotoxic agents, agents used in radiation therapy, anti-angiogenesis agents, apoptotic agents, anti-tubulin agents, and other agents to treat cancer , anti-CD20 antibodies, platelet derived growth factor inhibitors (*e.g.,* Gleevec™ (Imatinib Mesylate)), a COX-2 inhibitor (*e.g.,* celecoxib), interferons, cytokines, antagonists (*e.g.,* neutralizing antibodies) that bind to one or more of the following targets PDGFR-beta, BlyS, APRIL, BCMA receptor(s), TRAIL/Apo2, and other bioactive and organic chemical agents, etc. Combinations thereof are also included in the invention.

[0096] The term "cytotoxic agent" as used herein refers to a substance that inhibits or prevents a cellular function and/or causes cell death or destruction. Cytotoxic agents include, but are not limited to, radioactive isotopes (*e.g.,* At^{211}, I^{131}, I^{125}, Y^{90}, Re^{186}, Re^{188}, Sm^{153}, Bi^{212}, P^{32}, Pb^{212} and radioactive isotopes of Lu); chemotherapeutic agents or drugs (*e.g.,* methotrexate, adriamicin, vinca

alkaloids (vincristine, vinblastine, etoposide), doxorubicin, melphalan, mitomycin C, chlorambucil, daunorubicin or other intercalating agents); growth inhibitory agents; enzymes and fragments thereof such as nucleolytic enzymes; antibiotics; toxins such as small molecule toxins or enzymatically active toxins of bacterial, fungal, plant or animal origin, including fragments and/or variants thereof; and the various antitumor or anticancer agents disclosed below.

[0097] A "chemotherapeutic agent" refers to a chemical compound useful in the treatment of cancer. Examples of chemotherapeutic agents include alkylating agents such as thiotepa and cyclosphosphamide (CYTOXAN®); alkyl sulfonates such as busulfan, improsulfan and piposulfan; aziridines such as benzodopa, carboquone, meturedopa, and uredopa; ethylenimines and methylamelamines including altretamine, triethylenemelamine, triethylenephosphoramide, triethylenethiophosphoramide and trimethylomelamine; acetogenins (especially bullatacin and bullatacinone); delta-9-tetrahydrocannabinol (dronabinol, MARINOL®); beta-lapachone; lapachol; colchicines; betulinic acid; a camptothecin (including the synthetic analogue topotecan (HYCAMTIN®), CPT-11 (irinotecan, CAMPTOSAR®), acetylcamptothecin, scopolectin, and 9-aminocamptothecin); bryostatin; callystatin; CC-1065 (including its adozelesin, carzelesin and bizelesin synthetic analogues); podophyllotoxin; podophyllinic acid; teniposide; cryptophycins (particularly cryptophycin 1 and cryptophycin 8); dolastatin; duocarmycin (including the synthetic analogues, KW-2189 and CB1-TM1); eleutherobin; pancratistatin; a sarcodictyin; spongistatin; nitrogen mustards such as chlorambucil, chlornaphazine, chlorophosphamide, estramustine, ifosfamide, mechlorethamine, mechlorethamine oxide hydrochloride, melphalan, novembichin, phenesterine, prednimustine, trofosfamide, uracil mustard; nitrosoureas such as carmustine, chlorozotocin, fotemustine, lomustine, nimustine, and ranimnustine; antibiotics such as the enediyne antibiotics (e. g., calicheamicin, especially calicheamicin gamma1I and calicheamicin omegaI1 (*see, e.g.,* Nicolaou *et al.*, *Angew. Chem Intl. Ed. Engl.*, 33: 183-186 (1994)); CDP323, an oral alpha-4 integrin inhibitor; dynemicin, including dynemicin A; an esperamicin; as well as neocarzinostatin chromophore and related chromoprotein enediyne antibiotic chromophores), aclacinomysins, actinomycin, authramycin, azaserine, bleomycins, cactinomycin, carabicin, carminomycin, carzinophilin, chromomycins, dactinomycin, daunorubicin, detorubicin, 6-diazo-5-oxo-L-norleucine, doxorubicin (including ADRIAMYCIN®, morpholino-doxorubicin, cyanomorpholino-doxorubicin, 2-pyrrolino-doxorubicin, doxorubicin HCl liposome injection (DOXIL®), liposomal doxorubicin TLC D-99 (MYOCET®), pegylated liposomal doxorubicin (CAELYX®), and deoxydoxorubicin), epirubicin, esorubicin, idarubicin, marcellomycin, mitomycins such as mitomycin C, mycophenolic acid, nogalamycin, olivomycins, peplomycin, porfiromycin, puromycin, quelamycin, rodorubicin, streptonigrin, streptozocin, tubercidin, ubenimex, zinostatin, zorubicin; anti-metabolites such as methotrexate, gemcitabine (GEMZAR®), tegafur

(UFTORAL®), capecitabine (XELODA®), an epothilone, and 5-fluorouracil (5-FU); folic acid analogues such as denopterin, methotrexate, pteropterin, trimetrexate; purine analogs such as fludarabine, 6-mercaptopurine, thiamiprine, thioguanine; pyrimidine analogs such as ancitabine, azacitidine, 6-azauridine, carmofur, cytarabine, dideoxyuridine, doxifluridine, enocitabine, floxuridine; androgens such as calusterone, dromostanolone propionate, epitiostanol, mepitiostane, testolactone; anti-adrenals such as aminoglutethimide, mitotane, trilostane; folic acid replenisher such as frolinic acid; aceglatone; aldophosphamide glycoside; aminolevulinic acid; eniluracil; amsacrine; bestrabucil; bisantrene; edatraxate; defofamine; demecolcine; diaziquone; elfornithine; elliptinium acetate; an epothilone; etoglucid; gallium nitrate; hydroxyurea; lentinan; lonidainine; maytansinoids such as maytansine and ansamitocins; mitoguazone; mitoxantrone; mopidanmol; nitraerine; pentostatin; phenamet; pirarubicin; losoxantrone; 2-ethylhydrazide; procarbazine; PSK® polysaccharide complex (JHS Natural Products, Eugene, OR); razoxane; rhizoxin; sizofiran; spirogermanium; tenuazonic acid; triaziquone; 2,2',2'-trichlorotriethylamine; trichothecenes (especially T-2 toxin, verracurin A, roridin A and anguidine); urethan; vindesine (ELDISINE®, FILDESIN®); dacarbazine; mannomustine; mitobronitol; mitolactol; pipobroman; gacytosine; arabinoside ("Ara-C"); thiotepa; taxoid, *e.g.,* paclitaxel (TAXOL®), albumin-engineered nanoparticle formulation of paclitaxel (ABRAXANE™), and docetaxel (TAXOTERE®); chloranbucil; 6-thioguanine; mercaptopurine; methotrexate; platinum agents such as cisplatin, oxaliplatin (*e.g.,* ELOXATIN®), and carboplatin; vincas, which prevent tubulin polymerization from forming microtubules, including vinblastine (VELBAN®), vincristine (ONCOVIN®), vindesine (ELDISINE®, FILDESIN®), and vinorelbine (NAVELBINE®); etoposide (VP-16); ifosfamide; mitoxantrone; leucovorin; novantrone; edatrexate; daunomycin; aminopterin; ibandronate; topoisomerase inhibitor RFS 2000; difluoromethylornithine (DMFO); retinoids such as retinoic acid, including bexarotene (TARGRETIN®); bisphosphonates such as clodronate (for example, BONEFOS® or OSTAC®), etidronate (DIDROCAL®), NE-58095, zoledronic acid/zoledronate (ZOMETA®), alendronate (FOSAMAX®), pamidronate (AREDIA®), tiludronate (SKELID®), or risedronate (ACTONEL®); troxacitabine (a 1,3-dioxolane nucleoside cytosine analog); antisense oligonucleotides, particularly those that inhibit expression of genes in signaling pathways implicated in aberrant cell proliferation, such as, for example, PKC-alpha, Raf, H-Ras, and epidermal growth factor receptor (EGF-R); vaccines such as THERATOPE® vaccine and gene therapy vaccines, for example, ALLOVECTIN® vaccine, LEUVECTIN® vaccine, and VAXID® vaccine; topoisomerase 1 inhibitor (*e.g.,* LURTOTECAN®); rmRH (*e.g.,* ABARELIX®); BAY439006 (sorafenib; Bayer); SU-11248 (sunitinib, SUTENT®, Pfizer); perifosine, COX-2 inhibitor (*e.g.,* celecoxib or etoricoxib), proteosome inhibitor (*e.g.,* PS341); bortezomib (VELCADE®); CCI-779; tipifarnib (R11577); orafenib, ABT510; Bcl-2 inhibitor such as

oblimersen sodium (GENASENSE®); pixantrone; EGFR inhibitors (*see* definition below); tyrosine kinase inhibitors (*see* definition below); serine-threonine kinase inhibitors such as rapamycin (sirolimus, RAPAMUNE®); farnesyltransferase inhibitors such as lonafarnib (SCH 6636, SARASAR™); and pharmaceutically acceptable salts, acids or derivatives of any of the above; as well as combinations of two or more of the above such as CHOP, an abbreviation for a combined therapy of cyclophosphamide, doxorubicin, vincristine, and prednisolone; and FOLFOX, an abbreviation for a treatment regimen with oxaliplatin (ELOXATIN™) combined with 5-FU and leucovorin.

[0098] Chemotherapeutic agents as defined herein include "anti-hormonal agents" or "endocrine therapeutics" which act to regulate, reduce, block, or inhibit the effects of hormones that can promote the growth of cancer. They may be hormones themselves, including, but not limited to: anti-estrogens with mixed agonist/antagonist profile, including, tamoxifen (NOLVADEX®), 4-hydroxytamoxifen, toremifene (FARESTON®), idoxifene, droloxifene, raloxifene (EVISTA®), trioxifene, keoxifene, and selective estrogen receptor modulators (SERMs) such as SERM3; pure anti-estrogens without agonist properties, such as fulvestrant (FASLODEX®), and EM800 (such agents may block estrogen receptor (ER) dimerization, inhibit DNA binding, increase ER turnover, and/or suppress ER levels); aromatase inhibitors, including steroidal aromatase inhibitors such as formestane and exemestane (AROMASIN®), and nonsteroidal aromatase inhibitors such as anastrazole (ARIMIDEX®), letrozole (FEMARA®) and aminoglutethimide, and other aromatase inhibitors include vorozole (RIVISOR®), megestrol acetate (MEGASE®), fadrozole, and 4(5)-imidazoles; lutenizing hormone-releaseing hormone agonists, including leuprolide (LUPRON® and ELIGARD®), goserelin, buserelin, and tripterelin; sex steroids, including progestines such as megestrol acetate and medroxyprogesterone acetate, estrogens such as diethylstilbestrol and premarin, and androgens/retinoids such as fluoxymesterone, all transretionic acid and fenretinide; onapristone; anti-progesterones; estrogen receptor down-regulators (ERDs); anti-androgens such as flutamide, nilutamide and bicalutamide; and pharmaceutically acceptable salts, acids or derivatives of any of the above; as well as combinations of two or more of the above.

[0099] The term "prodrug" as used in this application refers to a precursor or derivative form of a pharmaceutically active substance that is less cytotoxic to tumor cells compared to the parent drug and is capable of being enzymatically activated or converted into the more active parent form. *See, e.g.,* Wilman, "Prodrugs in Cancer Chemotherapy" *Biochemical Society Transactions*, 14, pp. 375-382, 615th Meeting Belfast (1986) and Stella *et al.*, "Prodrugs: A Chemical Approach to Targeted Drug Delivery," *Directed Drug Delivery*, Borchardt *et al.,* (ed.), pp. 247-267, Humana Press (1985). The prodrugs of this invention include, but are not limited to, phosphate-containing prodrugs, thiophosphate-containing prodrugs, sulfate-containing prodrugs, peptide-containing prodrugs, D-

amino acid-modified prodrugs, glycosylated prodrugs, β-lactam-containing prodrugs, optionally substituted phenoxyacetamide-containing prodrugs or optionally substituted phenylacetamide-containing prodrugs, 5-fluorocytosine and other 5-fluorouridine prodrugs which can be converted into the more active cytotoxic free drug. Examples of cytotoxic drugs that can be derivatized into a prodrug form for use in this invention include, but are not limited to, those chemotherapeutic agents described above.

[0100] A "growth inhibitory agent" when used herein refers to a compound or composition which inhibits growth of a cell (*e.g.,* a cell whose growth is dependent upon a wnt pathway gene and/or R-spondin translocation expression either *in vitro* or *in vivo*). Examples of growth inhibitory agents include agents that block cell cycle progression (at a place other than S phase), such as agents that induce G1 arrest and M-phase arrest. Classical M-phase blockers include the vincas (vincristine and vinblastine), taxanes, and topoisomerase II inhibitors such as doxorubicin, epirubicin, daunorubicin, etoposide, and bleomycin. Those agents that arrest G1 also spill over into S-phase arrest, for example, DNA alkylating agents such as tamoxifen, prednisone, dacarbazine, mechlorethamine, cisplatin, methotrexate, 5-fluorouracil, and ara-C. Further information can be found in The Molecular Basis of Cancer, Mendelsohn and Israel, eds., Chapter 1, entitled "Cell cycle regulation, oncogenes, and antineoplastic drugs" by Murakami *et al.,* (WB Saunders: Philadelphia, 1995), especially p. 13. The taxanes (paclitaxel and docetaxel) are anticancer drugs both derived from the yew tree. Docetaxel (TAXOTERE®, Rhone-Poulenc Rorer), derived from the European yew, is a semisynthetic analogue of paclitaxel (TAXOL®, Bristol-Myers Squibb). Paclitaxel and docetaxel promote the assembly of microtubules from tubulin dimers and stabilize microtubules by preventing depolymerization, which results in the inhibition of mitosis in cells.

[0101] By “radiation therapy” is meant the use of directed gamma rays or beta rays to induce sufficient damage to a cell so as to limit its ability to function normally or to destroy the cell altogether. It will be appreciated that there will be many ways known in the art to determine the dosage and duration of treatment. Typical treatments are given as a one time administration and typical dosages range from 10 to 200 units (Grays) per day.

[0102] An “individual” or “subject” is a mammal. Mammals include, but are not limited to, domesticated animals (*e.g.,* cows, sheep, cats, dogs, and horses), primates (*e.g.,* humans and non-human primates such as monkeys), rabbits, and rodents (*e.g.,* mice and rats). In certain embodiments, the individual or subject is a human.

[0103] The term “concurrently” is used herein to refer to administration of two or more therapeutic agents, where at least part of the administration overlaps in time. Accordingly, concurrent administration includes a dosing regimen when the administration of one or more agent(s) continues after discontinuing the administration of one or more other agent(s).

[0104] By "reduce" or "inhibit" is meant the ability to cause an overall decrease of 20%, 30%, 40%, 50%, 60%, 70%, 75%, 80%, 85%, 90%, 95%, or greater. Reduce or inhibit can refer to the symptoms of the disorder being treated, the presence or size of metastases, or the size of the primary tumor.

[0105] The term "package insert" is used to refer to instructions customarily included in commercial packages of therapeutic products, that contain information about the indications, usage, dosage, administration, combination therapy, contraindications and/or warnings concerning the use of such therapeutic products.

[0106] An "article of manufacture" is any manufacture (*e.g.*, a package or container) or kit comprising at least one reagent, *e.g.*, a medicament for treatment of a disease or disorder (*e.g.*, cancer), or a probe for specifically detecting a biomarker described herein. In certain embodiments, the manufacture or kit is promoted, distributed, or sold as a unit for performing the methods described herein.

[0107] A "target audience" is a group of people or an institution to whom or to which a particular medicament is being promoted or intended to be promoted, as by marketing or advertising, especially for particular uses, treatments, or indications, such as individuals, populations, readers of newspapers, medical literature, and magazines, television or internet viewers, radio or internet listeners, physicians, drug companies, etc.

[0108] As is understood by one skilled in the art, reference to "about" a value or parameter herein includes (and describes) embodiments that are directed to that value or parameter per se. For example, description referring to "about X" includes description of "X".

[0109] It is understood that aspect and embodiments of the invention described herein include "consisting" and/or "consisting essentially of" aspects and embodiments. As used herein, the singular form "a", "an", and "the" includes plural references unless indicated otherwise.

II. Methods and Uses

[0110] Provided herein are methods utilizing a wnt pathway antagonist. In particular, provided herein are methods utilizing an R-spondin-translocation antagonist. For example, provided herein are methods of inhibiting cell proliferation of a cancer cell comprising contacting the cancer cell with an effective amount of an R-spondin-translocation antagonist. Also provided herein are methods of treating cancer in an individual comprising administering to the individual an effective amount of an R-spondin-translocation antagonist. In some embodiments, the cancer or cancer comprises an R-spondin translocation.

[0111] Also provided herein are methods of treating cancer in an individual comprising administering to the individual an effective amount of an anti-cancer therapy, wherein treatment is based upon the individual having cancer comprising one or more biomarkers. In some embodiments,

the anti-cancer therapy comprises a wnt pathway antagonist. For example, provided are methods of treating cancer in an individual comprising administering to the individual an effective amount of a wnt pathway antagonist, wherein treatment is based upon the individual having cancer comprising an R-spondin translocation. In some embodiments, the wnt pathway antagonist is an R-spondin antagonist (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4 antagonist). In some embodiments, the wnt pathway antagonist is an R-spondin-translocation antagonist. In some embodiments, the R-spondin antagonist and/or R-spondin translocation antagonist is an isolated antibody that binds R-spondin (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4).

[0112] Further provided herein are methods of treating cancer in an individual provided that the individual has been found to have cancer comprising one or more biomarkers, the treatment comprising administering to the individual an effective amount of an anti-cancer therapy. In some embodiments, the anti-cancer therapy comprises a wnt pathway antagonist. For example, provided herein are methods of treating cancer in an individual provided that the individual has been found to have cancer comprising an R-spondin translocation, the treatment comprising administering to the individual an effective amount of a wnt pathway antagonist. In some embodiments, the wnt pathway antagonist is an R-spondin antagonist (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4 antagonist). In some embodiments, the wnt pathway antagonist is an R-spondin-translocation antagonist. In some embodiments, the R-spondin antagonist and/or R-spondin translocation antagonist is an isolated antibody that binds R-spondin (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4).

[0113] Provided herein are methods of treating a cancer cell, wherein the cancer cell comprises one or more biomarkers, the method comprising providing an effective amount of a wnt pathway antagonist. For example, provided herein are methods of treating a cancer cell, wherein the cancer cell comprises an R-spondin translocation, the method comprising providing an effective amount of a wnt pathway antagonist. In some embodiments, the wnt pathway antagonist is an R-spondin antagonist (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4 antagonist). In some embodiments, the wnt pathway antagonist is an R-spondin-translocation antagonist. In some embodiments, the R-spondin antagonist and/or R-spondin translocation antagonist is an isolated antibody that binds R-spondin (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4).

[0114] Provided herein are methods for treating cancer in an individual, the method comprising: determining that a sample obtained from the individual comprises one or more biomarkers, and administering an effective amount of an anti-cancer therapy comprising a wnt pathway antagonist to the individual, whereby the cancer is treated. For example, provided herein are methods for treating cancer in an individual, the method comprising: determining that a sample obtained from the individual comprises an R-spondin translocation, and administering an effective amount of an anti-cancer therapy comprising a wnt pathway antagonist to the individual, whereby the cancer is treated.

In some embodiments, the wnt pathway antagonist is an R-spondin antagonist (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4 antagonist). In some embodiments, the wnt pathway antagonist is an R-spondin-translocation antagonist. In some embodiments, the R-spondin antagonist and/or R-spondin translocation antagonist is an isolated antibody that binds R-spondin (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4).

[0115] Provided herein are also methods of treating cancer, comprising: (a) selecting an individual having cancer, wherein the cancer comprises one or more biomarkers; and (b) administering to the individual thus selected an effective amount of a wnt pathway antagonist, whereby the cancer is treated. For example, provided herein are also methods of treating cancer, comprising: (a) selecting an individual having cancer, wherein the cancer comprises an R-spondin translocation; and (b) administering to the individual thus selected an effective amount of a wnt pathway antagonist, whereby the cancer is treated. In some embodiments, the wnt pathway antagonist is an R-spondin antagonist (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4 antagonist). In some embodiments, the wnt pathway antagonist is an R-spondin-translocation antagonist. In some embodiments, the R-spondin antagonist and/or R-spondin translocation antagonist is an isolated antibody that binds R-spondin (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4).

[0116] Further provided herein are methods of identifying an individual with cancer who is more or less likely to exhibit benefit from treatment with an anti-cancer therapy, the method comprising: determining presence or absence of one or more biomarkers in a sample obtained from the individual, wherein presence of the one or more biomarkers in the sample indicates that the individual is more likely to exhibit benefit from treatment with the anti-cancer therapy or absence of the one or more biomarkers indicates that the individual is less likely to exhibit benefit from treatment with the anti-cancer therapy. In some embodiments, the anti-cancer therapy comprises a wnt pathway antagonist. For example, provided herein are methods of identifying an individual with cancer who is more or less likely to exhibit benefit from treatment with an anti-cancer therapy comprising a wnt pathway antagonist, the method comprising: determining presence or absence of an R-spondin translocation in a sample obtained from the individual, wherein presence of the R-spondin translocation in the sample indicates that the individual is more likely to exhibit benefit from treatment with the anti-cancer therapy comprising the wnt pathway antagonist or absence of the R-spondin translocation indicates that the individual is less likely to exhibit benefit from treatment with the anti-cancer therapy comprising the wnt pathway antagonist. In some embodiments, the method further comprises administering an effective amount of a wnt pathway antagonist. In some embodiments, the wnt pathway antagonist is an R-spondin antagonist (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4 antagonist). In some embodiments, the wnt pathway antagonist is an R-spondin-translocation antagonist. In some embodiments, the R-spondin antagonist

and/or R-spondin translocation antagonist is an isolated antibody that binds R-spondin (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4).

[0117] Provided herein are methods for predicting whether an individual with cancer is more or less likely to respond effectively to treatment with an anti-cancer therapy comprising a wnt pathway antagonist, the method comprising determining one or more biomarkers, whereby presence of the one or more biomarkers indicates that the individual is more likely to respond effectively to treatment with the wnt pathway antagonist and absence of the one or more biomarkers indicates that the individual is less likely to respond effectively to treatment with the wnt pathway antagonist. For example, provided herein are methods for predicting whether an individual with cancer is more or less likely to respond effectively to treatment with an anti-cancer therapy comprising a wnt pathway antagonist, the method comprising determining an R-spondin translocation, whereby presence of the R-spondin translocation indicates that the individual is more likely to respond effectively to treatment with the wnt pathway antagonist and absence of the R-spondin translocation indicates that the individual is less likely to respond effectively to treatment with the wnt pathway antagonist. In some embodiments, the method further comprises administering an effective amount of a wnt pathway antagonist. In some embodiments, the wnt pathway antagonist is an R-spondin antagonist (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4 antagonist). In some embodiments, the wnt pathway antagonist is an R-spondin-translocation antagonist. In some embodiments, the R-spondin antagonist and/or R-spondin translocation antagonist is an isolated antibody that binds R-spondin (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4).

[0118] Provided herein are methods of predicting the response or lack of response of an individual with cancer to an anti-cancer therapy comprising a wnt pathway antagonist comprising detecting in a sample obtained from the individual presence or absence of one or more biomarkers, wherein presence of the one or more biomarkers is predictive of response of the individual to the anti-cancer therapy comprising the wnt pathway antagonist and absence of the one or more biomarkers is predictive of lack of response of the individual to the anti-cancer therapy comprising the wnt pathway antagonist. For example, provided herein are methods of predicting the response or lack of response of an individual with cancer to an anti-cancer therapy comprising a wnt pathway antagonist comprising detecting in a sample obtained from the individual presence or absence of an R-spondin translocation, wherein presence of the R-spondin translocation is predictive of response of the individual to the anti-cancer therapy comprising the wnt pathway antagonist and absence of the R-spondin translocation is predictive of lack of response of the individual to the anti-cancer therapy comprising the wnt pathway antagonist. In some embodiments, the method further comprises administering an effective amount of a wnt pathway antagonist. In some embodiments, the wnt pathway antagonist is an R-spondin antagonist (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4

antagonist). In some embodiments, the wnt pathway antagonist is an R-spondin-translocation antagonist. In some embodiments, the R-spondin antagonist and/or R-spondin translocation antagonist is an isolated antibody that binds R-spondin (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4).

[0119] In some embodiments of any of the methods, the one or more biomarkers comprise one or more genes listed in Table 2. In some embodiments, the presence of one or more biomarkers comprises the presence of a variation (*e.g.*, polymorphism or mutation) of one or more genes listed in Table 2 (*e.g.*, a variation (*e.g.*, polymorphism or mutation) in Table 2). In some embodiments of any of the methods, the one or more biomarkers comprise one or more genes listed in Table 3. In some embodiments, the presence of one or more biomarkers comprises the presence of a variation (*e.g.*, polymorphism or mutation) of one or more genes listed in Table 3 (*e.g.*, a variation (*e.g.*, polymorphism or mutation) in Table 3). In some embodiments of any of the methods, the one or more biomarkers comprise one or more genes listed in Table 4. In some embodiments, the presence of one or more biomarkers comprises the presence of a variation (*e.g.*, polymorphism or mutation) of one or more genes listed in Table 4 (*e.g.*, a variation (*e.g.*, polymorphism or mutation) in Table 4). In some embodiments of any of the methods, the one or more biomarkers comprise one or more genes listed in Table 5. In some embodiments, the presence of one or more biomarkers comprises the presence of a variation (*e.g.*, polymorphism or mutation) of one or more genes listed in Table 5 (*e.g.*, a variation (*e.g.*, polymorphism or mutation) in Table 5). In some embodiments, the variation (*e.g.*, polymorphism or mutation) is a somatic variation (*e.g.*, polymorphism or mutation).

[0120] In some embodiments of any of the methods, the one or more biomarkers comprise one or more genes selected from the group consisting of *KRAS, TP53, APC, PIK3CA, SMAD4, FBXW7, CSMD1, NRXN1, DNAH5, MRVI1, TRPS1, DMD, KIF2B, ATM, FAM5C, EVC2, OR2W3, SIN3A, SMARCA5, NCOR1, JARID2, TCF12, TCF7L2, PHF2, SOS2*, *RASGRF2*, *ARHGAP10*, *ARHGEF33*, *Rab40c, TET2*, *TET3*, *EP400*, *MLL, TMPRSS11A, ERBB3*, *EPHB4*, *EFNB3*, *EPHA1*, *TYRO3*, *TIE1*, *FLT, RIOK3*, *PRKCB*, *MUSK*, *MAP2K7, MAP4K5, PTPRN2, GPR4*, *GPR98, TOPORS,* and *SCN10A*. In some embodiments, the one or more biomarkers comprise one or more genes selected from the group consisting of *CSMD1, NRXN1, DNAH5, MRVI1, TRPS1, DMD, KIF2B, ATM, FAM5C, EVC2, OR2W3, TMPRSS11A,* and *SCN10A*. In some embodiments, the one or more biomarkers comprise *RAB40C, TCF12, C20orf132, GRIN3A*, and/or *SOS2*. In some embodiments, the one or more biomarkers comprise *ETV4, GRIND2D, FOXQ1*, and/or *CLDN1*. In some embodiments, the one or more biomarkers comprise *MRPL33*. In some embodiments In some embodiments, the one or more biomarkers comprise one or more transcriptional regulators (*e.g.*, *TCF12*, *TCF7L2* and/or *PHF2*) In some embodiments, the one or more biomarkers comprise one or more Ras/Rho related regulators (*e.g.*, *SOS1* (*e.g.*, R547W, T614M R854*, G1129V), *SOS2* (*e.g.*,

R225*, R854C, and Q1296H) *RASGRF2*, *ARHGAP10*, *ARHGEF33* and/or *Rab40c (e.g.*, G251S*)*). In some embodiments, the one or more biomarkers comprise one or more chromatin modifying enzymes (*e.g.*, *TET1*, *TET2*, *TET3*, *EP400* and/or *MLL*). In some embodiments, the one or more chromatin modifying enzymes are *TET1* and/or *TET3*. In some embodiments, the one or more chromatin modifying enzymes are *TET1 (e.g.*, R81H, E417A, K540T, K792T, S879L, S1012*, Q1322*, C1482Y, A1896V, and A2129V), *TET2 (e.g.*, K108T, T118I, S289L, F373L, K1056N, Y1169*, A1497V, and V1857M), and/or *TET3 (e.g.*, T165M, A874T, M977V, G1398R, and R1576Q/W). In some embodiments, the one or more biomarkers comprise one or more receptor tyrosine kinases (*e.g.*, *ERBB3*, *EPHB4*, *EFNB3*, *EPHA1*, *TYRO3*, *TIE1* and *FLT4*). In some embodiments, the one or more biomarkers comprise one or more kinases (*e.g.*, *RIOK3*, *PRKCB*, *MUSK*, *MAP2K7* and *MAP4K5*). In some embodiments, the one or more biomarkers comprise one or more protein phosphatase (*e.g.*, *PTPRN2*). In some embodiments, the one or more biomarkers comprise one or more GPRCs (*e.g.*, *GPR4* and/or *GPR98*). In some embodiments, the one or more biomarkers comprise one or more E3-ligase (*e.g.*, *TOPORS*). In some embodiments, the presence of the one or more biomarkers comprise presence of a variation (*e.g.*, polymorphism or mutation) of the one or more biomarkers listed in Table 2, 3, 4, and/or 5 (*e.g.*, a variation (*e.g.*, polymorphism or mutation) in Table 2, 3, 4, and/or 5). In some embodiments, the variation (*e.g.*, polymorphism or mutation) comprise a somatic variation (*e.g.*, polymorphism or mutation).

[0121] In some embodiments of any of the methods, the one or more biomarkers comprise one or more RSPO (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4). In some embodiments, presence of the one or more biomarkers is indicated by the presence of elevated expression levels (*e.g.*, compared to reference) of one or more RSPO (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4). In some embodiments, the one or more biomarkers comprises RSPO1. In some embodiments, the one or more biomarkers comprises RSPO2. In some embodiments, the one or more biomarkers comprises RSPO3. In some embodiments, the one or more biomarkers comprises RSPO4.

[0122] In some embodiments of any of the methods, the one or more biomarkers comprise one or more genes listed in Table 6. In some embodiments, presence of the one or more biomarkers is indicated by the presence of elevated expression levels (*e.g.*, compared to reference) of one or more genes listed in Table 6. In some embodiments, the one or more biomarkers comprise *FOXA1*, *CLND1*, and/or *IGF2*. In some embodiments, presence of the one or more biomarkers is indicated by presence of elevated expression levels (*e.g.*, compared to reference) of *FOXA1*, *CLND1*, and/or *IGF2*. In some embodiments, the one or more biomarkers comprise a differentially expressed signaling pathway including, but not limited to, Calcium Signaling, cAMP-mediated signaling, Glutamate Receptor Signaling, Amyotrophic Lateral Sclerosis Signaling, Nitrogen Metabolism, Axonal Guidance Signaling, Role of IL-17A in Psoriasis, Serotonin Receptor Signaling, Airway

Pathology in Chronic Obstructive Pulmonary Disease, Protein Kinase A Signaling, Bladder Cancer Signaling, HIF1α Signaling, Cardiac β-adrenergic Signaling, Synaptic Long Term Potentiation, Atherosclerosis Signaling, Circadian Rhythm Signaling, CREB Signaling in Neurons, G-Protein Coupled Receptor Signaling, Leukocyte Extravasation Signaling, Complement System, Eicosanoid Signaling, Tyrosine Metabolism, Cysteine Metabolism, Synaptic Long Term Depression, Role of IL-17A in Arthritis, Cellular Effects of Sildenafil (Viagra), Neuropathic Pain Signaling In Dorsal Horn Neurons, D-arginine and D-ornithine Metabolism, Role of IL-17F in Allergic Inflammatory Airway Diseases, Thyroid Cancer Signaling, Hepatic Fibrosis / Hepatic Stellate Cell Activation, Dopamine Receptor Signaling, Role of NANOG in Mammalian Embryonic Stem Cell Pluripotency, Chondroitin Sulfate Biosynthesis, Endothelin-1 Signaling, Keratan Sulfate Biosynthesis, Phototransduction Pathway, Wnt/β-catenin Signaling, Chemokine Signaling, Alanine and Aspartate Metabolism, Glycosphingolipid Biosynthesis – Neolactoseries, Bile Acid Biosynthesis, Role of Macrophages, Fibroblasts and Endothelial Cells in Rheumatoid Arthritis, α-Adrenergic Signaling, Taurine and Hypotaurine Metabolism, LPS/IL-1 Mediated Inhibition of RXR Function, Colorectal Cancer Metastasis Signaling, CCR3 Signaling in Eosinophils, and/or O-Glycan Biosynthesis.

[0123] In some embodiments of any of the methods, the one or more biomarkers comprise one or more genes listed in Table 7. In some embodiments, presence of the one or more biomarkers is indicated by the presence of elevated gene copy number (*e.g.*, compared to reference) of one or more genes listed in Table 7. In some embodiments, the one or more biomarkers comprise *IGF2*, *KRAS*, and/or *MYC*. In some embodiments, presence of the one or more biomarkers is indicated by the presence of elevated gene copy number (*e.g.*, compared to reference) of *IGF2*, *KRAS*, and/or *MYC*. In some embodiments, presence of the one or more biomarkers is indicated by the presence of reduced gene copy number (*e.g.*, compared to reference) of one or more genes listed in Table 7. In some embodiments, the one or more biomarkers comprise *FHIT*, *APC*, and/or *SMAD4*. In some embodiments, presence of the one or more biomarkers is indicated by the presence of reduced gene copy number (*e.g.*, compared to reference) of *FHIT*, *APC*, and/or *SMAD4*. In some embodiments, presence of the one or more biomarkers is indicated by the presence of elevated copy number (*e.g.*, compared to reference) of chromosome 20q. In some embodiments, presence of the one or more biomarkers is indicated by the presence of reduced copy number (*e.g.*, compared to reference) of chromosome 18q.

[0124] In some embodiments of any of the methods, the one or more biomarkers comprise one or more genes listed in Table 9. In some embodiments, presence of the one or more biomarkers is indicated by the presence of a variation (*e.g.*, polymorphism or mutation) of one or more genes listed in Table 9 (*e.g.*, a variation (*e.g.*, polymorphism or mutation) in Table 9) and/or alternative splicing (*e.g.*, compared to reference) of one or more genes listed in Table 9. In some embodiments,

the one or more biomarkers comprise *TP53*, *NOTCH2, MRPL33,* and/or *EIF5B*. In some embodiments, the one or more biomarkers is *MRPL33.* In some embodiments, presence of the one or more biomarkers is indicated by the presence of a variation (*e.g.*, polymorphism or mutation) of *TP53*, *NOTCH2, MRPL33,* and/or *EIF5B* (*e.g.*, a variation (*e.g.*, polymorphism or mutation) in Table 9) and/or alternative splicing (*e.g.*, compared to reference) of *TP53*, *NOTCH2, MRPL33,* and/or *EIF5B*.

[0125] In some embodiments of any of the methods, the one or more biomarkers comprise a translocation (*e.g.*, rearrangement and/or fusion) of one or more genes listed in Table 10. In some embodiments, the presence of one or more biomarkers comprises the presence of a translocation (*e.g.*, rearrangement and/or fusion) of one or more genes listed in Table 10 (*e.g.*, a translocation (*e.g.*, rearrangement and/or fusion) in Table 10). In some embodiments of any of the methods, the translocation (*e.g.*, rearrangement and/or fusion) is a PVT1 translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the PVT1 translocation (*e.g.*, rearrangement and/or fusion) comprises *PVT1* and *MYC*. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) comprises *PVT1* and *IncDNA*. In some embodiments of any of the methods, the translocation (*e.g.*, rearrangement and/or fusion) is an R-spondin translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the R-spondin translocation (*e.g.*, rearrangement and/or fusion) is a RSPO1 translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the R-spondin translocation (*e.g.*, rearrangement and/or fusion) is a RSPO2 translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) comprises *EIF3E* and *RSPO2*. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) comprises *EIF3E* exon 1 and *RSPO2* exon 2. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) comprises *EIF3E* exon 1 and *RSPO2* exon 3. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) comprises SEQ ID NO:71. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) is detectable by primers which include SEQ ID NO:12, 41, and/or 42. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) is driven by the *EIF3E* promoter. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) is driven by the *RSPO2* promoter. In some embodiments, the R-spondin translocation (*e.g.*, rearrangement and/or fusion) is a RSPO3 translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) comprises *PTPRK* and *RSPO3*. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) comprises *PTPRK* exon 1 and *RSPO3* exon 2. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) comprises *PTPRK* exon 7 and *RSPO3* exon 2. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) comprises SEQ ID NO:72 and/or SEQ

ID NO:73. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) is detectable by primers which include SEQ ID NO:13, 14, 43, and/or 44. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) is driven by the *PTPRK* promoter. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) is driven by the *RSPO3* promoter. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) comprises the PTPRK secretion signal sequence (and/or does not comprise the RSPO3 secretion signal sequence). In some embodiments, the R-spondin translocation (*e.g.*, rearrangement and/or fusion) is a RSPO4 translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the R-spondin translocation (*e.g.*, rearrangement and/or fusion) results in elevated expression levels of R-spondin (*e.g.*, compared to a reference without the R-spondin translocation). In some embodiments, the R-spondin translocation (*e.g.*, rearrangement and/or fusion) results in elevated activity and/or activation of R-spondin (*e.g.*, compared to a reference without the R-spondin translocation). In some embodiments, the presence of one or more biomarkers comprises an R-spondin translocation (*e.g.*, rearrangement and/or fusion), such as a translocation (*e.g.*, rearrangement and/or fusion) in Table 10, and *KRAS* and/or *BRAF*. In some embodiments, the presence of one or more biomarkers is presence of an R-spondin translocation (*e.g.*, rearrangement and/or fusion), such as a translocation (*e.g.*, rearrangement and/or fusion) in Table 10, and a variation (*e.g.*, polymorphism or mutation) *KRAS* and/or *BRAF*. In some embodiments, the presence of one or more biomarkers is presence of an R-spondin translocation (*e.g.*, rearrangement and/or fusion), such as a translocation (*e.g.*, rearrangement and/or fusion) in Table 10, and the absence of one or more biomarkers is absence of a variation (*e.g.*, polymorphism or mutation) *CTNNB1* and/or *APC*.

[0126] In some embodiments of any of the translocation (*e.g.*, rearrangement and/or fusion), the translocation (*e.g.*, rearrangement and/or fusion) is a somatic translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the translocation (*e.g.*, rearrangement and/or fusion) is an intra-chromosomal translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the translocation (*e.g.*, rearrangement and/or fusion) is an inter-chromosomal translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the translocation (*e.g.*, rearrangement and/or fusion) is an inversion. In some embodiments, the translocation (*e.g.*, rearrangement and/or fusion) is a deletion. In some embodiments, the translocation (*e.g.*, rearrangement and/or fusion) is a functional translocation fusion polynucleotide (*e.g.*, functional R-spondin-translocation fusion polynucleotide) and/or functional translocation fusion polypeptide (*e.g.*, functional R-spondin-translocation fusion polypeptide). In some embodiments, the functional translocation fusion polypeptide (*e.g.*, functional R-spondin-translocation fusion polypeptide) activates a pathway known to be modulated by one of the tranlocated genes (*e.g.*, wnt signaling pathway). In some embodiments, the pathway is canonical wnt signaling pathway. In some embodiments, the pathway

is noncanonical wnt signaling pathway. In some embodiments, the Methods of determining pathway activation are known in the art and include luciferase reporter assays as described herein.

[0127] Examples of cancers and cancer cells include, but are not limited to, carcinoma, lymphoma, blastoma (including medulloblastoma and retinoblastoma), sarcoma (including liposarcoma and synovial cell sarcoma), neuroendocrine tumors (including carcinoid tumors, gastrinoma, and islet cell cancer), mesothelioma, schwannoma (including acoustic neuroma), meningioma, adenocarcinoma, melanoma, and leukemia or lymphoid malignancies. More particular examples of such cancers include squamous cell cancer (*e.g.,* epithelial squamous cell cancer), lung cancer including small-cell lung cancer (SCLC), non-small cell lung cancer (NSCLC), adenocarcinoma of the lung and squamous carcinoma of the lung, cancer of the peritoneum, hepatocellular cancer, gastric or stomach cancer including gastrointestinal cancer, pancreatic cancer, glioblastoma, cervical cancer, ovarian cancer, liver cancer, bladder cancer, hepatoma, breast cancer (including metastatic breast cancer), colon cancer, rectal cancer, colorectal cancer, endometrial or uterine carcinoma, salivary gland carcinoma, kidney or renal cancer, prostate cancer, vulval cancer, thyroid cancer, hepatic carcinoma, anal carcinoma, penile carcinoma, testicular cancer, esophageal cancer, tumors of the biliary tract, as well as head and neck cancer. In some embodiments, the cancer is colorectal cancer. In some embodiments, the cancer is colon cancer. In some embodiments, the cancer is rectal cancer.

[0128] Presence and/or expression levels/amount of a biomarker (*e.g.,* R-spondin translocation) can be determined qualitatively and/or quantitatively based on any suitable criterion known in the art, including but not limited to DNA, mRNA, cDNA, proteins, protein fragments and/or gene copy number. In certain embodiments, presence and/or expression levels/amount of a biomarker in a first sample is increased as compared to presence/absence and/or expression levels/amount in a second sample. In certain embodiments, presence/absence and/or expression levels/amount of a biomarker in a first sample is decreased as compared to presence and/or expression levels/amount in a second sample. In certain embodiments, the second sample is a reference sample, reference cell, reference tissue, control sample, control cell, or control tissue. Additional disclosures for determining presence/absence and/or expression levels/amount of a gene are described herein.

[0129] In some embodiments of any of the methods, elevated expression refers to an overall increase of about any of 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 95%, 96%, 97%, 98%, 99% or greater, in the level of biomarker (*e.g.,* protein or nucleic acid (*e.g.,* gene or mRNA)), detected by standard art known methods such as those described herein, as compared to a reference sample, reference cell, reference tissue, control sample, control cell, or control tissue. In certain embodiments, the elevated expression refers to the increase in expression level/amount of a biomarker in the sample wherein the increase is at least about any of 1.5X, 1.75X, 2X, 3X, 4X, 5X,

6X, 7X, 8X, 9X, 10X, 25X, 50X, 75X, or 100X the expression level/amount of the respective biomarker in a reference sample, reference cell, reference tissue, control sample, control cell, or control tissue. In some embodiments, elevated expression refers to an overall increase of greater than about 1.5 fold, about 1.75 fold, about 2 fold, about 2.25 fold, about 2.5 fold, about 2.75 fold, about 3.0 fold, or about 3.25 fold as compared to a reference sample, reference cell, reference tissue, control sample, control cell, control tissue, or internal control (*e.g.,* housekeeping gene).

[0130] In some embodiments of any of the methods, reduced expression refers to an overall reduction of about any of 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 95%, 96%, 97%, 98%, 99% or greater, in the level of biomarker (*e.g.,* protein or nucleic acid (*e.g.,* gene or mRNA)), detected by standard art known methods such as those described herein, as compared to a reference sample, reference cell, reference tissue, control sample, control cell, or control tissue. In certain embodiments, reduced expression refers to the decrease in expression level/amount of a biomarker in the sample wherein the decrease is at least about any of 0.9X, 0.8X, 0.7X, 0.6X, 0.5X, 0.4X, 0.3X, 0.2X, 0.1X, 0.05X, or 0.01X the expression level/amount of the respective biomarker in a reference sample, reference cell, reference tissue, control sample, control cell, or control tissue.

[0131] Presence and/or expression level/amount of various biomarkers in a sample can be analyzed by a number of methodologies, many of which are known in the art and understood by the skilled artisan, including, but not limited to, immunohistochemical ("IHC"), Western blot analysis, immunoprecipitation, molecular binding assays, ELISA, ELIFA, fluorescence activated cell sorting ("FACS"), MassARRAY, proteomics, quantitative blood based assays (as for example Serum ELISA), biochemical enzymatic activity assays, in situ hybridization, Southern analysis, Northern analysis, whole genome sequencing, polymerase chain reaction ("PCR") including quantitative real time PCR ("qRT-PCR") and other amplification type detection methods, such as, for example, branched DNA, SISBA, TMA and the like), RNA-Seq, FISH, microarray analysis, gene expression profiling, and/or serial analysis of gene expression ("SAGE"), as well as any one of the wide variety of assays that can be performed by protein, gene, and/or tissue array analysis. Typical protocols for evaluating the status of genes and gene products are found, for example in Ausubel *et al.,* eds., 1995, Current Protocols In Molecular Biology, Units 2 (Northern Blotting), 4 (Southern Blotting), 15 (Immunoblotting) and 18 (PCR Analysis). Multiplexed immunoassays such as those available from Rules Based Medicine or Meso Scale Discovery ("MSD") may also be used.

[0132] In some embodiments, presence and/or expression level/amount of a biomarker is determined using a method comprising: (a) performing gene expression profiling, PCR (such as rtPCR), RNA-seq, microarray analysis, SAGE, MassARRAY technique, or FISH on a sample (such as a subject cancer sample); and b) determining presence and/or expression level/amount of a biomarker in the sample. In some embodiments, the microarray method comprises the use of a

microarray chip having one or more nucleic acid molecules that can hybridize under stringent conditions to a nucleic acid molecule encoding a gene mentioned above or having one or more polypeptides (such as peptides or antibodies) that can bind to one or more of the proteins encoded by the genes mentioned above. In one embodiment, the PCR method is qRT-PCR. In one embodiment, the PCR method is multiplex-PCR. In some embodiments, gene expression is measured by microarray. In some embodiments, gene expression is measured by qRT-PCR. In some embodiments, expression is measured by multiplex-PCR.

[0133] Methods for the evaluation of mRNAs in cells are well known and include, for example, hybridization assays using complementary DNA probes (such as in situ hybridization using labeled riboprobes specific for the one or more genes, Northern blot and related techniques) and various nucleic acid amplification assays (such as RT-PCR using complementary primers specific for one or more of the genes, and other amplification type detection methods, such as, for example, branched DNA, SISBA, TMA and the like).

[0134] Samples from mammals can be conveniently assayed for mRNAs using Northern, dot blot or PCR analysis. In addition, such methods can include one or more steps that allow one to determine the levels of target mRNA in a biological sample (*e.g.,* by simultaneously examining the levels a comparative control mRNA sequence of a "housekeeping" gene such as an actin family member). Optionally, the sequence of the amplified target cDNA can be determined.

[0135] Optional methods of the invention include protocols which examine or detect mRNAs, such as target mRNAs, in a tissue or cell sample by microarray technologies. Using nucleic acid microarrays, test and control mRNA samples from test and control tissue samples are reverse transcribed and labeled to generate cDNA probes. The probes are then hybridized to an array of nucleic acids immobilized on a solid support. The array is configured such that the sequence and position of each member of the array is known. For example, a selection of genes whose expression correlates with increased or reduced clinical benefit of anti-angiogenic therapy may be arrayed on a solid support. Hybridization of a labeled probe with a particular array member indicates that the sample from which the probe was derived expresses that gene.

[0136] According to some embodiments, presence and/or expression level/amount is measured by observing protein expression levels of an aforementioned gene. In certain embodiments, the method comprises contacting the biological sample with antibodies to a biomarker (*e.g.,* anti-R-spondin translocation antibodies) described herein under conditions permissive for binding of the biomarker, and detecting whether a complex is formed between the antibodies and biomarker. Such method may be an in vitro or in vivo method. In one embodiment, an antibody is used to select subjects eligible for therapy with wnt pathway antagonist, in particular R-spondin-translocation antagonist, *e.g.,* a biomarker for selection of individuals.

[0137] In certain embodiments, the presence and/or expression level/amount of biomarker proteins in a sample is examined using IHC and staining protocols. IHC staining of tissue sections has been shown to be a reliable method of determining or detecting presence of proteins in a sample. In one aspect, expression level of biomarker is determined using a method comprising: (a) performing IHC analysis of a sample (such as a subject cancer sample) with an antibody; and b) determining expression level of a biomarker in the sample. In some embodiments, IHC staining intensity is determined relative to a reference value.

[0138] IHC may be performed in combination with additional techniques such as morphological staining and/or fluorescence in-situ hybridization. Two general methods of IHC are available; direct and indirect assays. According to the first assay, binding of antibody to the target antigen is determined directly. This direct assay uses a labeled reagent, such as a fluorescent tag or an enzyme-labeled primary antibody, which can be visualized without further antibody interaction. In a typical indirect assay, unconjugated primary antibody binds to the antigen and then a labeled secondary antibody binds to the primary antibody. Where the secondary antibody is conjugated to an enzymatic label, a chromogenic or fluorogenic substrate is added to provide visualization of the antigen. Signal amplification occurs because several secondary antibodies may react with different epitopes on the primary antibody.

[0139] The primary and/or secondary antibody used for IHC typically will be labeled with a detectable moiety. Numerous labels are available which can be generally grouped into the following categories: (a) Radioisotopes, such as 35S, 14C, 125I, 3H, and 131I; (b) colloidal gold particles; (c) fluorescent labels including, but are not limited to, rare earth chelates (europium chelates), Texas Red, rhodamine, fluorescein, dansyl, Lissamine, umbelliferone, phycocrytherin, phycocyanin, or commercially available fluorophores such SPECTRUM ORANGE7 and SPECTRUM GREEN7 and/or derivatives of any one or more of the above; (d) various enzyme-substrate labels are available and U.S. Patent No. 4,275,149 provides a review of some of these. Examples of enzymatic labels include luciferases (*e.g.,* firefly luciferase and bacterial luciferase; U.S. Patent No. 4,737,456), luciferin, 2,3-dihydrophthalazinediones, malate dehydrogenase, urease, peroxidase such as horseradish peroxidase (HRPO), alkaline phosphatase, β-galactosidase, glucoamylase, lysozyme, saccharide oxidases (*e.g.,* glucose oxidase, galactose oxidase, and glucose-6-phosphate dehydrogenase), heterocyclic oxidases (such as uricase and xanthine oxidase), lactoperoxidase, microperoxidase, and the like.

[0140] Examples of enzyme-substrate combinations include, for example, horseradish peroxidase (HRPO) with hydrogen peroxidase as a substrate; alkaline phosphatase (AP) with para-Nitrophenyl phosphate as chromogenic substrate; and β-D-galactosidase (β-D-Gal) with a chromogenic substrate

(*e.g.,* p-nitrophenyl-β-D-galactosidase) or fluorogenic substrate (*e.g.,* 4-methylumbelliferyl-β-D-galactosidase). For a general review of these, *see* U.S. Patent Nos. 4,275,149 and 4,318,980.

[0141] Specimens thus prepared may be mounted and coverslipped. Slide evaluation is then determined, *e.g.,* using a microscope, and staining intensity criteria, routinely used in the art, may be employed. In some embodiments, a staining pattern score of about 1+ or higher is diagnostic and/or prognostic. In certain embodiments, a staining pattern score of about 2+ or higher in an IHC assay is diagnostic and/or prognostic. In other embodiments, a staining pattern score of about 3 or higher is diagnostic and/or prognostic. In one embodiment, it is understood that when cells and/or tissue from a tumor or colon adenoma are examined using IHC, staining is generally determined or assessed in tumor cell and/or tissue (as opposed to stromal or surrounding tissue that may be present in the sample).

[0142] In alternative methods, the sample may be contacted with an antibody specific for said biomarker (*e.g.,* anti-R-spondin translocation antibody) under conditions sufficient for an antibody-biomarker complex to form, and then detecting said complex. The presence of the biomarker may be detected in a number of ways, such as by Western blotting and ELISA procedures for assaying a wide variety of tissues and samples, including plasma or serum. A wide range of immunoassay techniques using such an assay format are available, *see, e.g.,* U.S. Pat. Nos. 4,016,043, 4,424,279 and 4,018,653. These include both single-site and two-site or "sandwich" assays of the non-competitive types, as well as in the traditional competitive binding assays. These assays also include direct binding of a labeled antibody to a target biomarker.

[0143] Presence and/or expression level/amount of a selected biomarker in a tissue or cell sample may also be examined by way of functional or activity-based assays. For instance, if the biomarker is an enzyme, one may conduct assays known in the art to determine or detect the presence of the given enzymatic activity in the tissue or cell sample.

[0144] In certain embodiments, the samples are normalized for both differences in the amount of the biomarker assayed and variability in the quality of the samples used, and variability between assay runs. Such normalization may be accomplished by detecting and incorporating the expression of certain normalizing biomarkers, including well known housekeeping genes, such as ACTB. Alternatively, normalization can be based on the mean or median signal of all of the assayed genes or a large subset thereof (global normalization approach). On a gene-by-gene basis, measured normalized amount of a subject tumor mRNA or protein is compared to the amount found in a reference set. Normalized expression levels for each mRNA or protein per tested tumor per subject can be expressed as a percentage of the expression level measured in the reference set. The presence and/or expression level/amount measured in a particular subject sample to be analyzed will fall at some percentile within this range, which can be determined by methods well known in the art.

[0145] In certain embodiments, relative expression level of a gene is determined as follows:
Relative expression gene1 sample1 = 2 exp (Ct housekeeping gene – Ct gene1) with Ct determined in a sample.
Relative expression gene1 reference RNA = 2 exp (Ct housekeeping gene – Ct gene1) with Ct determined in the reference sample.
Normalized relative expression gene1 sample1 = (relative expression gene1 sample1 / relative expression gene1 reference RNA) x 100
Ct is the threshold cycle. The Ct is the cycle number at which the fluorescence generated within a reaction crosses the threshold line.

[0146] All experiments are normalized to a reference RNA, which is a comprehensive mix of RNA from various tissue sources (*e.g.,* reference RNA #636538 from Clontech, Mountain View, CA). Identical reference RNA is included in each qRT-PCR run, allowing comparison of results between different experimental runs.

[0147] In one embodiment, the sample is a clinical sample. In another embodiment, the sample is used in a diagnostic assay. In some embodiments, the sample is obtained from a primary or metastatic tumor. Tissue biopsy is often used to obtain a representative piece of tumor tissue. Alternatively, tumor cells can be obtained indirectly in the form of tissues or fluids that are known or thought to contain the tumor cells of interest. For instance, samples of lung cancer lesions may be obtained by resection, bronchoscopy, fine needle aspiration, bronchial brushings, or from sputum, pleural fluid or blood. Genes or gene products can be detected from cancer or tumor tissue or from other body samples such as urine, sputum, serum or plasma. The same techniques discussed above for detection of target genes or gene products in cancerous samples can be applied to other body samples. Cancer cells may be sloughed off from cancer lesions and appear in such body samples. By screening such body samples, a simple early diagnosis can be achieved for these cancers. In addition, the progress of therapy can be monitored more easily by testing such body samples for target genes or gene products.

[0148] In certain embodiments, a reference sample, reference cell, reference tissue, control sample, control cell, or control tissue is a single sample or combined multiple samples from the same subject or individual that are obtained at one or more different time points than when the test sample is obtained. For example, a reference sample, reference cell, reference tissue, control sample, control cell, or control tissue is obtained at an earlier time point from the same subject or individual than when the test sample is obtained. Such reference sample, reference cell, reference tissue, control sample, control cell, or control tissue may be useful if the reference sample is obtained during initial diagnosis of cancer and the test sample is later obtained when the cancer becomes metastatic.

[0149] In certain embodiments, a reference sample, reference cell, reference tissue, control sample, control cell, or control tissue is a combined multiple samples from one or more healthy individuals who are not the subject or individual. In certain embodiments, a reference sample, reference cell, reference tissue, control sample, control cell, or control tissue is a combined multiple samples from one or more individuals with a disease or disorder (*e.g.,* cancer) who are not the subject or individual. In certain embodiments, a reference sample, reference cell, reference tissue, control sample, control cell, or control tissue is pooled RNA samples from normal tissues or pooled plasma or serum samples from one or more individuals who are not the subject or individual. In certain embodiments, a reference sample, reference cell, reference tissue, control sample, control cell, or control tissue is pooled RNA samples from tumor tissues or pooled plasma or serum samples from one or more individuals with a disease or disorder (*e.g.,* cancer) who are not the subject or individual.

[0150] In some embodiments of any of the methods, the wnt pathway antagonist is an R-spondin antagonist (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4 antagonist). In some embodiments of any of the methods, the R-spondin antagonist in particular R-spondin-translocation antagonist is an antibody, binding polypeptide, binding small molecule, or polynucleotide. In some embodiments, the R-spondin antagonist in particular R-spondin-translocation antagonist is an antibody. In some embodiments, the antibody is a monoclonal antibody. In some embodiments, the antibody is a human, humanized, or chimeric antibody. In some embodiments, the antibody is an antibody fragment and the antibody fragment binds wnt pathway polypeptide in particular R-spondin antagonist and/or R-spondin-translocation fusion polypeptide.

[0151] In some embodiments of any of the methods, the individual according to any of the above embodiments may be a human.

[0152] In some embodiments of any of the methods, the method comprises administering to an individual having such cancer an effective amount of a wnt pathway antagonist in particular R-spondin-translocation antagonist. In one such embodiment, the method further comprises administering to the individual an effective amount of at least one additional therapeutic agent, as described below. In some embodiments, the individual may be a human.

[0153] The wnt pathway antagonist, in particular R-spondin-translocation antagonist, described herein can be used either alone or in combination with other agents in a therapy. For instance, a wnt pathway antagonist, in particular R-spondin-translocation antagonist, described herein may be co-administered with at least one additional therapeutic agent including another wnt pathway antagonist. In certain embodiments, an additional therapeutic agent is a chemotherapeutic agent.

[0154] Such combination therapies noted above encompass combined administration (where two or more therapeutic agents are included in the same or separate formulations), and separate administration,

in which case, administration of the wnt pathway antagonist, in particular R-spondin-translocation antagonist, can occur prior to, simultaneously, and/or following, administration of the additional therapeutic agent and/or adjuvant. Wnt pathway antagonist, in particular R-spondin-translocation antagonist, can also be used in combination with radiation therapy.

[0155] A wnt pathway antagonist, in particular R-spondin-translocation antagonist (*e.g.,* an antibody, binding polypeptide, and/or small molecule) described herein (and any additional therapeutic agent) can be administered by any suitable means, including parenteral, intrapulmonary, and intranasal, and, if desired for local treatment, intralesional administration. Parenteral infusions include intramuscular, intravenous, intraarterial, intraperitoneal, or subcutaneous administration. Dosing can be by any suitable route, *e.g.,* by injections, such as intravenous or subcutaneous injections, depending in part on whether the administration is brief or chronic. Various dosing schedules including but not limited to single or multiple administrations over various time-points, bolus administration, and pulse infusion are contemplated herein.

[0156] Wnt pathway antagonist, in particular R-spondin antagonist (*e.g.,* an antibody, binding polypeptide, and/or small molecule) described herein may be formulated, dosed, and administered in a fashion consistent with good medical practice. Factors for consideration in this context include the particular disorder being treated, the particular mammal being treated, the clinical condition of the individual, the cause of the disorder, the site of delivery of the agent, the method of administration, the scheduling of administration, and other factors known to medical practitioners. The wnt pathway antagonist, in particular R-spondin antagonist, need not be, but is optionally formulated with one or more agents currently used to prevent or treat the disorder in question. The effective amount of such other agents depends on the amount of the wnt pathway antagonist, in particular R-spondin antagonist, present in the formulation, the type of disorder or treatment, and other factors discussed above. These are generally used in the same dosages and with administration routes as described herein, or about from 1 to 99% of the dosages described herein, or in any dosage and by any route that is empirically/clinically determined to be appropriate.

[0157] For the prevention or treatment of disease, the appropriate dosage of a wnt pathway antagonist, in particular R-spondin antagonist, described herein (when used alone or in combination with one or more other additional therapeutic agents) will depend on the type of disease to be treated, the severity and course of the disease, whether the wnt pathway antagonist, in particular R-spondin antagonist, is administered for preventive or therapeutic purposes, previous therapy, the subject's clinical history and response to the wnt pathway antagonist, and the discretion of the attending physician. The wnt pathway antagonist, in particular R-spondin antagonist, is suitably administered to the individual at one time or over a series of treatments. One typical daily dosage might range from about 1 μg/kg to 100 mg/kg or more, depending on the factors mentioned above. For repeated administrations over several days or longer, depending on the condition, the treatment would generally be sustained until a desired

suppression of disease symptoms occurs. Such doses may be administered intermittently, *e.g.,* every week or every three weeks (*e.g.,* such that the individual receives from about two to about twenty, or *e.g.,* about six doses of the wnt pathway antagonist). An initial higher loading dose, followed by one or more lower doses may be administered. An exemplary dosing regimen comprises administering. However, other dosage regimens may be useful. The progress of this therapy is easily monitored by conventional techniques and assays.

[0158] It is understood that any of the above formulations or therapeutic methods may be carried out using an immunoconjugate of the invention in place of or in addition to the wnt pathway antagonist, in particular R-spondin antagonist.

III. Therapeutic Compositions

[0159] Provided herein are wnt pathway antagonists useful in the methods described herein. In some embodiments, the wnt pathway antagonists are an antibody, binding polypeptide, binding small molecule, and/or polynucleotide. In some embodiments, the wnt pathway antagonists are canonical wnt pathway antagonists. In some embodiments, the wnt pathway antagonists are non-canonical wnt pathway antagonists.

[0160] In some embodiments, the wnt pathway antagonists are R-spondin antagonists. In some embodiments, the R-spondin antagonists are R-spondin-translocation antagonists. In some embodiments, the R-spondin antagonist inhibits LPR6 mediated wnt signaling. In some embodiments, the R-spondin antagonist inhibits and/or blocks the interaction of R-spondin and LRP6. In some embodiments, the R-spondin antagonist inhibits LGR5 mediated wnt signaling. In some embodiments, the R-spondin antagonist inhibits and/or blocks the interaction of R-spondin and LGR5. In some embodiments, the R-spondin antagonist inhibits KRM mediated wnt signaling. In some embodiments, the R-spondin antagonist inhibits and/or blocks the interaction of R-spondin and KRM. In some embodiments, the R-spondin antagonist inhibits syndecan (*e.g.*, syndecan 4) mediated wnt signaling. In some embodiments, the R-spondin antagonist inhibits and/or blocks the interaction of R-spondin and syndecan (*e.g.*, syndecan 4). Examples of R-spondin antagonists include, but are not limited to, those described in WO 2008/046649, WO 2008/020942, WO 2007/013666, WO 2005/040418, WO 2009/005809, US 8,088,374, US 7,541,431, WO 2011/076932, and/or US 2009/0074782, which are incorporated by reference in their entirety.

[0161] A wnt signaling pathway component or wnt pathway polypeptide is a component that transduces a signal originating from an interaction between a Wnt protein and an Fz receptor. As the wnt signaling pathway is complex, and involves extensive feedback regulation. Example of wnt signaling pathway components include Wnt (*e.g.*, WNT1, WNT2, WNT2B, WNT3, WNT3A, WNT4, WNT5A, WNT5B, WNT6, WNT7A, WNT7B, WNT8A, WNT8B, WNT9A, WNT9B, WNT10A, WNT10B, WNT11, WNT16), Frizzled (*e.g.*, Frz 1-10), RSPO (*e.g.*, RSPO1, RSPO2, RSPO3, and/or RSPO4), LGR (*e.g.*, LGR5), WTX, WISP (*e.g.,* WISP1, WISP2, and/or WISP3), βTrCp, STRA6, the membrane associated

proteins LRP (*e.g.,* LRP5 and/or LRP6), Axin, and Dishevelled, the extracellular Wnt interactive proteins sFRP, WIF-1, the LRP inactivating proteins Dkk and Krn, the cytoplasmic protein β-catenin, members of the β-catenin "degradation complex" APC, GSK3β, CKIα and PP2A, the nuclear transport proteins APC, pygopus and bcl9/legless, and the transcription factors TCF/LEF, Groucho and various histone acetylases such as CBP/p300 and Brg-1.

A. Antibodies

[0162] In one aspect, provided herein isolated antibodies that bind to a wnt pathway polypeptide. In any of the above embodiments, an antibody is humanized. In a further aspect of the invention, an anti-wnt pathway antibody according to any of the above embodiments is a monoclonal antibody, including a chimeric, humanized or human antibody. In one embodiment, an anti-wnt pathway antibody is an antibody fragment, *e.g.,* an Fv, Fab, Fab', scFv, diabody, or $F(ab')_2$ fragment. In another embodiment, the antibody is a full length antibody, *e.g.,* an intact IgG1" antibody or other antibody class or isotype as defined herein.

[0163] In some embodiments of any of the antibodies, the anti-wnt pathway antibody is an anti-LRP6 antibody. Examples of anti-LRP6 antibodies include, but are not limited to, the anti-LRP6 antibodies described in U.S. Patent Application No. 2011/0256127, which is incorporated by reference in its entirety. In some embodiments, the anti-LRP6 antibody inhibits signaling induced by a first Wnt isoform and potentiates signaling induced by a second Wnt isoform. In some embodiments, the first Wnt isoform is selected from the group consisting of Wnt3 and Wnt3a and the second Wnt isoform is selected from the group consisting of Wnt 1, 2, 2b, 4, 6, 7a, 7b, 8a, 9a, 9b, 10a, and 10b. In some embodiments, the first Wnt isoform is selected from the group consisting of Wnt 1, 2, 2b, 6, 8a, 9a, 9b, and 10b and the second Wnt isoform is selected from the group consisting of Wnt3 and Wnt3a.

[0164] In some embodiments of any of the antibodies, the anti-wnt pathway antibody is an anti-Frizzled antibody. Examples of anti-Frizzled antibodies include, but are not limited to, the anti-Frizzled antibodies described in U.S. Patent No. 7,947,277, which is incorporated by reference in its entirety.

[0165] In some embodiments of any of the antibodies, the anti-wnt pathway antibody is an anti-STRA6 antibody. Examples of anti-STRA6 antibodies include, but are not limited to, the anti-STRA6 antibodies described in U.S. Patent No. 7,173,115, 7,741,439, and/or 7,855,278, which are incorporated by reference in their entirety.

[0166] In some embodiments of any of the antibodies, the anti-wnt pathway antibody is an anti-S100-like cytokine polypeptide antibody. In some embodiments, the anti-S100-like cytokine polypeptide antibody is an anti-S100-A14 antibody. Examples of anti-S100-like cytokine polypeptide antibodies include, but are not limited to, the anti-S100-like cytokine polypeptide antibodies described in U.S. Patent No. 7,566,536 and/or 7,005,499, which are incorporated by reference in their entirety.

[0167] In some embodiments of any of the antibodies, the anti-wnt pathway antibody is an anti-R-spondin antibody. In some embodiment, the R-spondin is RSPO1. In some embodiment, the R-spondin is

RSPO2. In some embodiment, the R-spondin is RSPO3. In some embodiment, the R-spondin is RSPO4. In some embodiments, the R-spondin antagonist inhibits LPR6 mediated wnt signaling. In some embodiments, the R-spondin antagonist inhibits and/or blocks the interaction of R-spondin and LRP6. In some embodiments, the R-spondin antagonist inhibits LGR5 mediated wnt signaling. In some embodiments, the R-spondin antagonist inhibits and/or blocks the interaction of R-spondin and LGR5. In some embodiments, the R-spondin antagonist inhibits LGR4 mediated wnt signaling. In some embodiments, the R-spondin antagonist inhibits and/or blocks the interaction of R-spondin and LGR4. In some embodiments, the R-spondin antagonist inhibits ZNRF3 and/or RNF43 mediated wnt signaling. In some embodiments, the R-spondin antagonist inhibits and/or blocks the interaction of R-spondin and ZNRF3 and/or RNF43. In some embodiments, the R-spondin antagonist inhibits KRM mediated wnt signaling. In some embodiments, the R-spondin antagonist inhibits and/or blocks the interaction of R-spondin and KRM. In some embodiments, the R-spondin antagonist inhibits syndecan (*e.g.*, syndecan 4) mediated wnt signaling. In some embodiments, the R-spondin antagonist inhibits and/or blocks the interaction of R-spondin and syndecan (*e.g.*, syndecan 4). Examples of R-spondin antibodies include, but are not limited to, any antibody disclosed in US 2009/0074782, US 8088374, US 8,158,757, US8,1587,58 and/or US Biological R9417-50C, which are incorporated by reference in their entirety.

[0168] In some embodiments, the anti-R-spondin antibody binds to an R-spondin-translocation fusion polypeptide. In some embodiments, the antibodies that bind to an R-spondin-translocation fusion polypeptide specifically bind an R-spondin-translocation fusion polypeptide, but do not substantially bind wild-type R-spondin and/or a second gene of the translocation. In some embodiments, the R-spondin-translocation fusion polypeptide is RSPO1-translocation fusion polypeptide. In some embodiments, the R-spondin-translocation fusion polypeptide is RSPO2-translocation fusion polypeptide. In some embodiments, the R-spondin-translocation fusion polypeptide is RSPO3-translocation fusion polypeptide. In some embodiments, the R-spondin-translocation fusion polypeptide is RSPO4-translocation fusion polypeptide. In some embodiments, the RSPO2-translocation fusion polypeptide comprises *EIF3E* and *RSPO2*. In some embodiments, the RSPO2 -translocation fusion polypeptide comprises *EIF3E* exon 1 and *RSPO2* exon 2. In some embodiments, the RSPO2-translocation fusion polypeptide comprises *EIF3E* exon 1 and *RSPO2* exon 3. In some embodiments, the RSPO2-translocation fusion polypeptide comprises SEQ ID NO:71. In some embodiments, the RSPO3-translocation fusion polypeptide comprises *PTPRK* and *RSPO3*. In some embodiments, the RSPO3-translocation fusion polypeptide comprises *PTPRK* exon 1 and *RSPO3* exon 2. In some embodiments, the RSPO3-translocation fusion polypeptide comprises *PTPRK* exon 7 and *RSPO3* exon 2. In some embodiments, the RSPO3-translocation fusion polypeptide comprises SEQ ID NO:72 and/or SEQ ID NO:73.

[0169] In a further aspect, an anti-wnt pathway antibody, in particular, an anti-R-spondin-translocation antibody, according to any of the above embodiments may incorporate any of the features, singly or in combination, as described in Sections below:

1. Antibody Affinity

[0170] In certain embodiments, an antibody provided herein has a dissociation constant (Kd) of ≤ 1μM. In one embodiment, Kd is measured by a radiolabeled antigen binding assay (RIA) performed with the Fab version of an antibody of interest and its antigen as described by the following assay. Solution binding affinity of Fabs for antigen is measured by equilibrating Fab with a minimal concentration of (^{125}I)-labeled antigen in the presence of a titration series of unlabeled antigen, then capturing bound antigen with an anti-Fab antibody-coated plate (*see, e.g.,* Chen *et al.*, *J. Mol. Biol.* 293:865-881(1999)). To establish conditions for the assay, MICROTITER® multi-well plates (Thermo Scientific) are coated overnight with 5 μg/ml of a capturing anti-Fab antibody (Cappel Labs) in 50 mM sodium carbonate (pH 9.6), and subsequently blocked with 2% (w/v) bovine serum albumin in PBS for two to five hours at room temperature (approximately 23°C). In a non-adsorbent plate (Nunc #269620), 100 pM or 26 pM [^{125}I]-antigen are mixed with serial dilutions of a Fab of interest (*e.g.,* consistent with assessment of the anti-VEGF antibody, Fab-12, in Presta *et al.*, *Cancer Res.* 57:4593-4599 (1997)). The Fab of interest is then incubated overnight; however, the incubation may continue for a longer period (*e.g.,* about 65 hours) to ensure that equilibrium is reached. Thereafter, the mixtures are transferred to the capture plate for incubation at room temperature (*e.g.,* for one hour). The solution is then removed and the plate washed eight times with 0.1% polysorbate 20 (TWEEN-20®) in PBS. When the plates have dried, 150 μl/well of scintillant (MICROSCINT-20™; Packard) is added, and the plates are counted on a TOPCOUNT™ gamma counter (Packard) for ten minutes. Concentrations of each Fab that give less than or equal to 20% of maximal binding are chosen for use in competitive binding assays.

[0171] According to another embodiment, Kd is measured using surface plasmon resonance assays using a BIACORE®-2000 or a BIACORE®-3000 (BIAcore, Inc., Piscataway, NJ) at 25°C with immobilized antigen CM5 chips at ~10 response units (RU). Briefly, carboxymethylated dextran biosensor chips (CM5, BIACORE, Inc.) are activated with *N*-ethyl-*N'*- (3-dimethylaminopropyl)-carbodiimide hydrochloride (EDC) and *N*-hydroxysuccinimide (NHS) according to the supplier's instructions. Antigen is diluted with 10 mM sodium acetate, pH 4.8, to 5 μg/ml (~0.2 μM) before injection at a flow rate of 5 μl/minute to achieve approximately 10 response units (RU) of coupled protein. Following the injection of antigen, 1 M ethanolamine is injected to block unreacted groups. For kinetics measurements, two-fold serial dilutions of Fab (0.78 nM to 500 nM) are injected in PBS with 0.05% polysorbate 20 (TWEEN-20™) surfactant (PBST) at 25°C at a flow rate of approximately 25 μl/min. Association rates (k_{on}) and dissociation rates (k_{off}) are calculated using a simple one-to-one Langmuir binding model (BIACORE® Evaluation Software version 3.2) by simultaneously fitting the association and dissociation sensorgrams. The equilibrium dissociation constant (Kd) is calculated as the

ratio k_{off}/k_{on}. *See, e.g.,* Chen *et al., J. Mol. Biol.* 293:865-881 (1999). If the on-rate exceeds $10^6 M^{-1}s^{-1}$ by the surface plasmon resonance assay above, then the on-rate can be determined by using a fluorescent quenching technique that measures the increase or decrease in fluorescence emission intensity (excitation = 295 nm; emission = 340 nm, 16 nm band-pass) at 25°C of a 20 nM anti-antigen antibody (Fab form) in PBS, pH 7.2, in the presence of increasing concentrations of antigen as measured in a spectrometer, such as a stop-flow equipped spectrophometer (Aviv Instruments) or a 8000-series SLM-AMINCO™ spectrophotometer (ThermoSpectronic) with a stirred cuvette.

2. Antibody Fragments

[0172] In certain embodiments, an antibody provided herein is an antibody fragment. Antibody fragments include, but are not limited to, Fab, Fab', Fab'-SH, $F(ab')_2$, Fv, and scFv fragments, and other fragments described below. For a review of certain antibody fragments, *see* Hudson *et al., Nat. Med.* 9:129-134 (2003). For a review of scFv fragments, *see, e.g.,* Pluckthün, in *The Pharmacology of Monoclonal Antibodies*, vol. 113, Rosenburg and Moore eds., (Springer-Verlag, New York), pp. 269-315 (1994); *see* also WO 93/16185; and U.S. Patent Nos. 5,571,894 and 5,587,458. For discussion of Fab and $F(ab')_2$ fragments comprising salvage receptor binding epitope residues and having increased *in vivo* half-life, *see* U.S. Patent No. 5,869,046.

[0173] Diabodies are antibody fragments with two antigen-binding sites that may be bivalent or bispecific. *See,* for example, EP 404,097; WO 1993/01161; Hudson *et al., Nat. Med.* 9:129-134 (2003); and Hollinger *et al., Proc. Natl. Acad. Sci. USA* 90: 6444-6448 (1993). Triabodies and tetrabodies are also described in Hudson *et al., Nat. Med.* 9:129-134 (2003).

[0174] Single-domain antibodies are antibody fragments comprising all or a portion of the heavy chain variable domain or all or a portion of the light chain variable domain of an antibody. In certain embodiments, a single-domain antibody is a human single-domain antibody (Domantis, Inc., Waltham, MA; *see, e.g.,* U.S. Patent No. 6,248,516 B1).

[0175] Antibody fragments can be made by various techniques, including but not limited to proteolytic digestion of an intact antibody as well as production by recombinant host cells (*e.g., E. coli* or phage), as described herein.

3. Chimeric and Humanized Antibodies

[0176] In certain embodiments, an antibody provided herein is a chimeric antibody. Certain chimeric antibodies are described, *e.g.,* in U.S. Patent No. 4,816,567; and Morrison *et al., Proc. Natl. Acad. Sci. USA*, 81:6851-6855 (1984)). In one example, a chimeric antibody comprises a non-human variable region (*e.g.,* a variable region derived from a mouse, rat, hamster, rabbit, or non-human primate, such as a monkey) and a human constant region. In a further example, a chimeric antibody is a "class switched" antibody in which the class or subclass has been changed from that of the parent antibody. Chimeric antibodies include antigen-binding fragments thereof.

[0177] In certain embodiments, a chimeric antibody is a humanized antibody. Typically, a non-human antibody is humanized to reduce immunogenicity to humans, while retaining the specificity and affinity of the parental non-human antibody. Generally, a humanized antibody comprises one or more variable domains in which HVRs, *e.g.,* CDRs, (or portions thereof) are derived from a non-human antibody, and FRs (or portions thereof) are derived from human antibody sequences. A humanized antibody optionally will also comprise at least a portion of a human constant region. In some embodiments, some FR residues in a humanized antibody are substituted with corresponding residues from a non-human antibody (*e.g.,* the antibody from which the HVR residues are derived), *e.g.,* to restore or improve antibody specificity or affinity.

[0178] Humanized antibodies and methods of making them are reviewed, *e.g.,* in Almagro and Fransson, *Front. Biosci.* 13:1619-1633 (2008), and are further described, *e.g.,* in Riechmann *et al., Nature* 332:323-329 (1988); Queen *et al., Proc. Nat'l Acad. Sci. USA* 86:10029-10033 (1989); US Patent Nos. 5, 821,337, 7,527,791, 6,982,321, and 7,087,409; Kashmiri *et al., Methods* 36:25-34 (2005) (describing SDR (a-CDR) grafting); Padlan, *Mol. Immunol.* 28:489-498 (1991) (describing "resurfacing"); Dall'Acqua *et al., Methods* 36:43-60 (2005) (describing "FR shuffling"); and Osbourn *et al., Methods* 36:61-68 (2005) and Klimka *et al., Br. J. Cancer,* 83:252-260 (2000) (describing the "guided selection" approach to FR shuffling).

[0179] Human framework regions that may be used for humanization include but are not limited to: framework regions selected using the "best-fit" method (*see, e.g.,* Sims *et al., J. Immunol.* 151:2296 (1993)); framework regions derived from the consensus sequence of human antibodies of a particular subgroup of light or heavy chain variable regions (*see, e.g.,* Carter *et al., Proc. Natl. Acad. Sci. USA,* 89:4285 (1992); and Presta *et al., J. Immunol.,* 151:2623 (1993)); human mature (somatically mutated) framework regions or human germline framework regions (*see, e.g.,* Almagro and Fransson, *Front. Biosci.* 13:1619-1633 (2008)); and framework regions derived from screening FR libraries (*see, e.g.,* Baca *et al., J. Biol. Chem.* 272:10678-10684 (1997) and Rosok *et al., J. Biol. Chem.* 271:22611-22618 (1996)).

4. Human Antibodies

[0180] In certain embodiments, an antibody provided herein is a human antibody. Human antibodies can be produced using various techniques known in the art. Human antibodies are described generally in van Dijk and van de Winkel, *Curr. Opin. Pharmacol.* 5: 368-74 (2001) and Lonberg, *Curr. Opin. Immunol.* 20:450-459 (2008).

[0181] Human antibodies may be prepared by administering an immunogen to a transgenic animal that has been modified to produce intact human antibodies or intact antibodies with human variable regions in response to antigenic challenge. Such animals typically contain all or a portion of the human immunoglobulin loci, which replace the endogenous immunoglobulin loci, or which are present extrachromosomally or integrated randomly into the animal's chromosomes. In such transgenic mice, the

endogenous immunoglobulin loci have generally been inactivated. For review of methods for obtaining human antibodies from transgenic animals, *see* Lonberg, Nat. Biotech. 23:1117-1125 (2005). *See also, e.g.,* U.S. Patent Nos. 6,075,181 and 6,150,584 describing XENOMOUSE™ technology; U.S. Patent No. 5,770,429 describing HuMab® technology; U.S. Patent No. 7,041,870 describing K-M MOUSE® technology, and U.S. Patent Application Publication No. US 2007/0061900, describing VelociMouse® technology). Human variable regions from intact antibodies generated by such animals may be further modified, *e.g.,* by combining with a different human constant region.

[0182] Human antibodies can also be made by hybridoma-based methods. Human myeloma and mouse-human heteromyeloma cell lines for the production of human monoclonal antibodies have been described. (*See, e.g.,* Kozbor *J. Immunol.*, 133: 3001 (1984); and Boerner *et al.*, J. Immunol., 147: 86 (1991).) Human antibodies generated via human B-cell hybridoma technology are also described in Li *et al.*, *Proc. Natl. Acad. Sci. USA*, 103:3557-3562 (2006). Additional methods include those described, for example, in U.S. Patent No. 7,189,826 (describing production of monoclonal human IgM antibodies from hybridoma cell lines) and Ni, *Xiandai Mianyixue*, 26(4):265-268 (2006) (describing human-human hybridomas). Human hybridoma technology (Trioma technology) is also described in Vollmers and Brandlein, *Histology and Histopathology*, 20(3):927-937 (2005) and Vollmers and Brandlein, *Methods and Findings in Experimental and Clin. Pharma.*, 27(3):185-91 (2005).

[0183] Human antibodies may also be generated by isolating Fv clone variable domain sequences selected from human-derived phage display libraries. Such variable domain sequences may then be combined with a desired human constant domain. Techniques for selecting human antibodies from antibody libraries are described below.

5. Library-Derived Antibodies

[0184] Antibodies of the invention may be isolated by screening combinatorial libraries for antibodies with the desired activity or activities. For example, a variety of methods are known in the art for generating phage display libraries and screening such libraries for antibodies possessing the desired binding characteristics. Such methods are reviewed, *e.g.,* in Hoogenboom *et al.,* in METHODS IN MOL. BIOL. 178:1-37 (O'Brien *et al.*, ed., Human Press, Totowa, NJ, 2001) and further described, *e.g.,* in the McCafferty *et al.*, Nature 348:552-554; Clackson *et al.*, *Nature* 352: 624-628 (1991); Marks *et al.*, *J. Mol. Biol.* 222: 581-597 (1992); Marks and Bradbury, in METHODS IN MOL. BIOL. 248:161-175 (Lo, ed., Human Press, Totowa, NJ, 2003); Sidhu *et al.*, *J. Mol. Biol.* 338(2): 299-310 (2004); Lee *et al.*, J. Mol. Biol. 340(5): 1073-1093 (2004); Fellouse, *Proc. Natl. Acad. Sci. USA* 101(34): 12467-12472 (2004); and Lee *et al.*, *J. Immunol. Methods* 284(1-2): 119-132(2004).

[0185] In certain phage display methods, repertoires of VH and VL genes are separately cloned by polymerase chain reaction (PCR) and recombined randomly in phage libraries, which can then be screened for antigen-binding phage as described in Winter *et al.*, *Ann. Rev. Immunol.*, 12: 433-455 (1994). Phage typically display antibody fragments, either as single-chain Fv (scFv) fragments or as Fab

fragments. Libraries from immunized sources provide high-affinity antibodies to the immunogen without the requirement of constructing hybridomas. Alternatively, the naive repertoire can be cloned (*e.g.,* from human) to provide a single source of antibodies to a wide range of non-self and also self antigens without any immunization as described by Griffiths *et al.*, *EMBO J*, 12: 725-734 (1993). Finally, naive libraries can also be made synthetically by cloning unrearranged V-gene segments from stem cells, and using PCR primers containing random sequence to encode the highly variable CDR3 regions and to accomplish rearrangement in vitro, as described by Hoogenboom and Winter, *J. Mol. Biol.*, 227: 381-388 (1992). Patent publications describing human antibody phage libraries include, for example: US Patent No. 5,750,373, and US Patent Publication Nos. 2005/0079574, 2005/0119455, 2005/0266000, 2007/0117126, 2007/0160598, 2007/0237764, 2007/0292936, and 2009/0002360.

[0186] Antibodies or antibody fragments isolated from human antibody libraries are considered human antibodies or human antibody fragments herein.

6. Multispecific Antibodies

[0187] In certain embodiments, an antibody provided herein is a multispecific antibody, *e.g.,* a bispecific antibody. Multispecific antibodies are monoclonal antibodies that have binding specificities for at least two different sites. In certain embodiments, one of the binding specificities is for wnt pathway polypeptide such as an R-spondin-translocation fusion polypeptide and the other is for any other antigen. In certain embodiments, bispecific antibodies may bind to two different epitopes of wnt pathway polypeptide such as an R-spondin-translocation fusion polypeptide. Bispecific antibodies may also be used to localize cytotoxic agents to cells which express wnt pathway polypeptide such as an R-spondin-translocation fusion polypeptide. Bispecific antibodies can be prepared as full length antibodies or antibody fragments.

[0188] Techniques for making multispecific antibodies include, but are not limited to, recombinant co-expression of two immunoglobulin heavy chain-light chain pairs having different specificities (*see* Milstein and Cuello, *Nature* 305: 537 (1983)), WO 93/08829, and Traunecker *et al.*, *EMBO J.* 10: 3655 (1991)), and "knob-in-hole" engineering (*see, e.g.,* U.S. Patent No. 5,731,168). Multi-specific antibodies may also be made by engineering electrostatic steering effects for making antibody Fc-heterodimeric molecules (WO 2009/089004A1); cross-linking two or more antibodies or fragments (*see, e.g.,* US Patent No. 4,676,980, and Brennan *et al.*, *Science*, 229: 81 (1985)); using leucine zippers to produce bi-specific antibodies (*see, e.g.,* Kostelny *et al.*, *J. Immunol.*, 148(5):1547-1553 (1992)); using "diabody" technology for making bispecific antibody fragments (*see, e.g.,* Hollinger *et al.*, *Proc. Natl. Acad. Sci. USA*, 90:6444-6448 (1993)); and using single-chain Fv (sFv) dimers (*see, e.g.,* Gruber *et al.*, *J. Immunol.*, 152:5368 (1994)); and preparing trispecific antibodies as described, *e.g.,* in Tutt *et al.*, *J. Immunol.* 147: 60 (1991).

[0189] Engineered antibodies with three or more functional antigen binding sites, including "Octopus antibodies," are also included herein (*see, e.g.,* US 2006/0025576).

[0190] The antibody or fragment herein also includes a "Dual Acting FAb" or "DAF" comprising an antigen binding site that binds to a wnt pathway polypeptide such as an R-spondin-translocation fusion polypeptide as well as another, different antigen (*see,* US 2008/0069820, for example).

7. Antibody Variants

a) Glycosylation variants

[0191] In certain embodiments, an antibody provided herein is altered to increase or decrease the extent to which the antibody is glycosylated. Addition or deletion of glycosylation sites to an antibody may be conveniently accomplished by altering the amino acid sequence such that one or more glycosylation sites is created or removed.

[0192] Where the antibody comprises an Fc region, the carbohydrate attached thereto may be altered. Native antibodies produced by mammalian cells typically comprise a branched, biantennary oligosaccharide that is generally attached by an N-linkage to Asn297 of the CH2 domain of the Fc region. *See, e.g.,* Wright *et al., TIBTECH* 15:26-32 (1997). The oligosaccharide may include various carbohydrates, *e.g.,* mannose, N-acetyl glucosamine (GlcNAc), galactose, and sialic acid, as well as a fucose attached to a GlcNAc in the "stem" of the biantennary oligosaccharide structure. In some embodiments, modifications of the oligosaccharide in an antibody of the invention may be made in order to create antibody variants with certain improved properties.

[0193] In one embodiment, antibody variants are provided having a carbohydrate structure that lacks fucose attached (directly or indirectly) to an Fc region. For example, the amount of fucose in such antibody may be from 1% to 80%, from 1% to 65%, from 5% to 65% or from 20% to 40%. The amount of fucose is determined by calculating the average amount of fucose within the sugar chain at Asn297, relative to the sum of all glycostructures attached to Asn 297 (*e.g.*, complex, hybrid and high mannose structures) as measured by MALDI-TOF mass spectrometry, as described in WO 2008/077546, for example. Asn297 refers to the asparagine residue located at about position 297 in the Fc region (Eu numbering of Fc region residues); however, Asn297 may also be located about ± 3 amino acids upstream or downstream of position 297, *i.e.*, between positions 294 and 300, due to minor sequence variations in antibodies. Such fucosylation variants may have improved ADCC function. *See, e.g.,* US Patent Publication Nos. US 2003/0157108 (Presta, L.); US 2004/0093621 (Kyowa Hakko Kogyo Co., Ltd). Examples of publications related to "defucosylated" or "fucose-deficient" antibody variants include: US 2003/0157108; WO 2000/61739; WO 2001/29246; US 2003/0115614; US 2002/0164328; US 2004/0093621; US 2004/0132140; US 2004/0110704; US 2004/0110282; US 2004/0109865; WO 2003/085119; WO 2003/084570; WO 2005/035586; WO 2005/035778; WO2005/053742; WO2002/031140; Okazaki *et al., J. Mol. Biol.* 336:1239-1249 (2004); Yamane-Ohnuki *et al., Biotech. Bioeng.* 87: 614 (2004). Examples of cell lines capable of producing defucosylated antibodies include Lec13 CHO cells deficient in protein fucosylation (Ripka *et al., Arch. Biochem. Biophys.* 249:533-545 (1986); US 2003/0157108, Presta, L; and WO 2004/056312, Adams *et al.*, especially at Example 11),

and knockout cell lines, such as alpha-1,6-fucosyltransferase gene, FUT8, knockout CHO cells (*see, e.g.,* Yamane-Ohnuki *et al., Biotech. Bioeng.* 87: 614 (2004); Kanda, Y. *et al., Biotechnol. Bioeng.*, 94(4):680-688 (2006); and WO2003/085107).

[0194] Antibodies variants are further provided with bisected oligosaccharides, *e.g.,* in which a biantennary oligosaccharide attached to the Fc region of the antibody is bisected by GlcNAc. Such antibody variants may have reduced fucosylation and/or improved ADCC function. Examples of such antibody variants are described, *e.g.,* in WO 2003/011878 (Jean-Mairet *et al.*); US Patent No. 6,602,684 (Umana *et al.*); and US 2005/0123546 (Umana *et al.*). Antibody variants with at least one galactose residue in the oligosaccharide attached to the Fc region are also provided. Such antibody variants may have improved CDC function. Such antibody variants are described, *e.g.,* in WO 1997/30087 (Patel *et al.*); WO 1998/58964 (Raju, S.); and WO 1999/22764 (Raju, S.).

b) Fc region variants

[0195] In certain embodiments, one or more amino acid modifications may be introduced into the Fc region of an antibody provided herein, thereby generating an Fc region variant. The Fc region variant may comprise a human Fc region sequence (*e.g.,* a human IgG1, IgG2, IgG3 or IgG4 Fc region) comprising an amino acid modification (*e.g.,* a substitution) at one or more amino acid positions.

[0196] In certain embodiments, the invention contemplates an antibody variant that possesses some but not all effector functions, which make it a desirable candidate for applications in which the half life of the antibody *in vivo* is important yet certain effector functions (such as complement and ADCC) are unnecessary or deleterious. *In vitro* and/or *in vivo* cytotoxicity assays can be conducted to confirm the reduction/depletion of CDC and/or ADCC activities. For example, Fc receptor (FcR) binding assays can be conducted to ensure that the antibody lacks FcγR binding (hence likely lacking ADCC activity), but retains FcRn binding ability. The primary cells for mediating ADCC, NK cells, express FcγRIII only, whereas monocytes express FcγRI, FcγRII and FcγRIII. FcR expression on hematopoietic cells is summarized in Table 3 on page 464 of Ravetch and Kinet, *Annu. Rev. Immunol.* 9:457-492 (1991). Non-limiting examples of *in vitro* assays to assess ADCC activity of a molecule of interest is described in U.S. Patent No. 5,500,362 (*see, e.g.,* Hellstrom, I. *et al., Proc. Nat'l Acad. Sci. USA* 83:7059-7063 (1986)) and Hellstrom, I *et al., Proc. Nat'l Acad. Sci. USA* 82:1499-1502 (1985); 5,821,337 (*see* Bruggemann, M. *et al., J. Exp. Med.* 166:1351-1361 (1987)). Alternatively, non-radioactive assays methods may be employed (*see,* for example, ACTI™ non-radioactive cytotoxicity assay for flow cytometry (CellTechnology, Inc. Mountain View, CA; and CytoTox 96® non-radioactive cytotoxicity assay (Promega, Madison, WI). Useful effector cells for such assays include peripheral blood mononuclear cells (PBMC) and Natural Killer (NK) cells. Alternatively, or additionally, ADCC activity of the molecule of interest may be assessed *in vivo, e.g.,* in a animal model such as that disclosed in Clynes *et al., Proc. Natl. Acad. Sci. USA* 95:652-656 (1998). C1q binding assays may also be carried out to confirm that the antibody is unable to bind C1q and hence lacks CDC activity. *See, e.g.,* C1q and C3c

binding ELISA in WO 2006/029879 and WO 2005/100402. To assess complement activation, a CDC assay may be performed (*see,* for example, Gazzano-Santoro *et al.*, *J. Immunol. Methods* 202:163 (1996); Cragg, M.S. *et al.*, *Blood* 101:1045-1052 (2003); and Cragg, M.S. and M.J. Glennie, *Blood* 103:2738-2743 (2004)). FcRn binding and *in vivo* clearance/half life determinations can also be performed using methods known in the art (*see, e.g.,* Petkova, S.B. *et al.*, *Int'l. Immunol.* 18(12):1759-1769 (2006)).

[0197] Antibodies with reduced effector function include those with substitution of one or more of Fc region residues 238, 265, 269, 270, 297, 327 and 329 (U.S. Patent No. 6,737,056). Such Fc mutants include Fc mutants with substitutions at two or more of amino acid positions 265, 269, 270, 297 and 327, including the so-called "DANA" Fc mutant with substitution of residues 265 and 297 to alanine (US Patent No. 7,332,581).

[0198] Certain antibody variants with improved or diminished binding to FcRs are described. (*See, e.g.,* U.S. Patent No. 6,737,056; WO 2004/056312, and Shields *et al., J. Biol. Chem.* 9(2): 6591-6604 (2001).) In certain embodiments, an antibody variant comprises an Fc region with one or more amino acid substitutions which improve ADCC, *e.g.,* substitutions at positions 298, 333, and/or 334 of the Fc region (EU numbering of residues). In some embodiments, alterations are made in the Fc region that result in altered (*i.e.*, either improved or diminished) C1q binding and/or Complement Dependent Cytotoxicity (CDC), *e.g.,* as described in US Patent No. 6,194,551, WO 99/51642, and Idusogie *et al., J. Immunol.* 164: 4178-4184 (2000).

[0199] Antibodies with increased half lives and improved binding to the neonatal Fc receptor (FcRn), which is responsible for the transfer of maternal IgGs to the fetus (Guyer *et al.*, *J. Immunol.* 117:587 (1976) and Kim *et al.*, *J. Immunol.* 24:249 (1994)), are described in US2005/0014934A1 (Hinton *et al.*). Those antibodies comprise an Fc region with one or more substitutions therein which improve binding of the Fc region to FcRn. Such Fc variants include those with substitutions at one or more of Fc region residues: 238, 256, 265, 272, 286, 303, 305, 307, 311, 312, 317, 340, 356, 360, 362, 376, 378, 380, 382, 413, 424 or 434, *e.g.,* substitution of Fc region residue 434 (US Patent No. 7,371,826). *See also* Duncan & Winter, *Nature* 322:738-40 (1988); U.S. Patent No. 5,648,260; U.S. Patent No. 5,624,821; and WO 94/29351 concerning other examples of Fc region variants.

c) Cysteine engineered antibody variants

[0200] In certain embodiments, it may be desirable to create cysteine engineered antibodies, *e.g.,* "thioMAbs," in which one or more residues of an antibody are substituted with cysteine residues. In particular embodiments, the substituted residues occur at accessible sites of the antibody. By substituting those residues with cysteine, reactive thiol groups are thereby positioned at accessible sites of the antibody and may be used to conjugate the antibody to other moieties, such as drug moieties or linker-drug moieties, to create an immunoconjugate, as described further herein. In certain embodiments, any one or more of the following residues may be substituted with cysteine: V205 (Kabat numbering) of the

light chain; A118 (EU numbering) of the heavy chain; and S400 (EU numbering) of the heavy chain Fc region. Cysteine engineered antibodies may be generated as described, *e.g.,* in U.S. Patent No. 7,521,541.

B. Immunoconjugates

[0201] Further provided herein are immunoconjugates comprising an anti-wnt pathway antibody such as an R-spondin-translocation fusion polypeptide herein conjugated to one or more cytotoxic agents, such as chemotherapeutic agents or drugs, growth inhibitory agents, toxins (*e.g.,* protein toxins, enzymatically active toxins of bacterial, fungal, plant, or animal origin, or fragments thereof), or radioactive isotopes.

[0202] In one embodiment, an immunoconjugate is an antibody-drug conjugate (ADC) in which an antibody is conjugated to one or more drugs, including but not limited to a maytansinoid (*see* U.S. Patent Nos. 5,208,020, 5,416,064 and European Patent EP 0 425 235 B1); an auristatin such as monomethylauristatin drug moieties DE and DF (MMAE and MMAF) (*see* U.S. Patent Nos. 5,635,483 and 5,780,588, and 7,498,298); a dolastatin; a calicheamicin or derivative thereof (*see* U.S. Patent Nos. 5,712,374, 5,714,586, 5,739,116, 5,767,285, 5,770,701, 5,770,710, 5,773,001, and 5,877,296; Hinman *et al.*, *Cancer Res.* 53:3336-3342 (1993); and Lode *et al.*, *Cancer Res.* 58:2925-2928 (1998)); an anthracycline such as daunomycin or doxorubicin (*see* Kratz *et al.*, *Current Med. Chem.* 13:477-523 (2006); Jeffrey *et al.*, *Bioorganic & Med. Chem. Letters* 16:358-362 (2006); Torgov *et al.*, *Bioconj. Chem.* 16:717-721 (2005); Nagy *et al.*, *Proc. Natl. Acad. Sci. USA* 97:829-834 (2000); Dubowchik *et al.*, *Bioorg. & Med. Chem. Letters* 12:1529-1532 (2002); King *et al.*, *J. Med. Chem.* 45:4336-4343 (2002); and U.S. Patent No. 6,630,579); methotrexate; vindesine; a taxane such as docetaxel, paclitaxel, larotaxel, tesetaxel, and ortataxel; a trichothecene; and CC1065.

[0203] In another embodiment, an immunoconjugate comprises an antibody as described herein conjugated to an enzymatically active toxin or fragment thereof, including but not limited to diphtheria A chain, nonbinding active fragments of diphtheria toxin, exotoxin A chain (from Pseudomonas aeruginosa), ricin A chain, abrin A chain, modeccin A chain, alpha-sarcin, Aleurites fordii proteins, dianthin proteins, Phytolaca americana proteins (PAPI, PAPII, and PAP-S), momordica charantia inhibitor, curcin, crotin, sapaonaria officinalis inhibitor, gelonin, mitogellin, restrictocin, phenomycin, enomycin, and the tricothecenes.

[0204] In another embodiment, an immunoconjugate comprises an antibody as described herein conjugated to a radioactive atom to form a radioconjugate. A variety of radioactive isotopes are available for the production of radioconjugates. Examples include At^{211}, I^{131}, I^{125}, Y^{90}, Re^{186}, Re^{188}, Sm^{153}, Bi^{212}, P^{32}, Pb^{212} and radioactive isotopes of Lu. When the radioconjugate is used for detection, it may comprise a radioactive atom for scintigraphic studies, for example Tc^{99} or I^{123}, or a spin label for nuclear magnetic resonance (NMR) imaging (also known as magnetic resonance imaging, MRI), such as iodine-123 again, iodine-131, indium-111, fluorine-19, carbon-13, nitrogen-15, oxygen-17, gadolinium, manganese or iron.

[0205] Conjugates of an antibody and cytotoxic agent may be made using a variety of bifunctional protein coupling agents such as N-succinimidyl-3-(2-pyridyldithio) propionate (SPDP), succinimidyl-4-(N-maleimidomethyl) cyclohexane-1-carboxylate (SMCC), iminothiolane (IT), bifunctional derivatives of imidoesters (such as dimethyl adipimidate HCl), active esters (such as disuccinimidyl suberate), aldehydes (such as glutaraldehyde), bis-azido compounds (such as bis (p-azidobenzoyl) hexanediamine), bis-diazonium derivatives (such as bis-(p-diazoniumbenzoyl)-ethylenediamine), diisocyanates (such as toluene 2,6-diisocyanate), and bis-active fluorine compounds (such as 1,5-difluoro-2,4-dinitrobenzene). For example, a ricin immunotoxin can be prepared as described in Vitetta *et al.*, *Science* 238:1098 (1987). Carbon-14-labeled 1-isothiocyanatobenzyl-3-methyldiethylene triaminepentaacetic acid (MX-DTPA) is an exemplary chelating agent for conjugation of radionucleotide to the antibody. *See* WO94/11026. The linker may be a "cleavable linker" facilitating release of a cytotoxic drug in the cell. For example, an acid-labile linker, peptidase-sensitive linker, photolabile linker, dimethyl linker or disulfide-containing linker (Chari *et al.*, *Cancer Res.* 52:127-131 (1992); U.S. Patent No. 5,208,020) may be used.

[0206] The immunuoconjugates or ADCs herein expressly contemplate, but are not limited to such conjugates prepared with cross-linker reagents including, but not limited to, BMPS, EMCS, GMBS, HBVS, LC-SMCC, MBS, MPBH, SBAP, SIA, SIAB, SMCC, SMPB, SMPH, sulfo-EMCS, sulfo-GMBS, sulfo-KMUS, sulfo-MBS, sulfo-SIAB, sulfo-SMCC, and sulfo-SMPB, and SVSB (succinimidyl-(4-vinylsulfone)benzoate) which are commercially available (*e.g.,* from Pierce Biotechnology, Inc., Rockford, IL., U.S.A).

C. Binding Polypeptides

[0207] Provided herein are wnt pathway binding polypeptide antagonists for use as a wnt pathway antagonist in any of the methods described herein. Wnt pathway binding polypeptide antagonists are polypeptides that bind, preferably specifically, to a wnt pathway polypeptide.

[0208] In some embodiments of any of the wnt pathway binding polypeptide antagonists, the wnt pathway binding polypeptide antagonist is a chimeric polypeptide. In some embodiments, the wnt pathway binding polypeptide antagonist comprises (a) a Frizzled domain component, and (b) a Fc domain. For example, any wnt pathway antagonists described in U.S. Patent No. 7,947,277, which is incorporated by reference in its entirety.

[0209] In some embodiments of any of the wnt pathway binding polypeptide antagonists, the wnt pathway binding polypeptide antagonist is a polypeptide that binds specifically to Dvl PDZ, wherein said polypeptide comprises a C-terminal region comprising a sequence with Gly at position -2, Trp or Tyr at position -1, Phe or Leu at position 0, and a hydrophobic or aromatic residue at position -3, wherein amino acid numbering is based on the C-terminal residue being in position 0. In some embodiments, position -6 is Trp. In some embodiments, position -1 is Trp. In some embodiments of any of the wnt pathway binding polypeptide antagonists, the wnt pathway binding polypeptide

antagonist is a polypeptide that binds specifically to Dvl PDZ at a binding affinity of IC50=1.5 uM or better. In some embodiments, the polypeptide inhibits Dvl PDZ interaction with its endogenous binding partner. In some embodiments, the polypeptide inhibits endogenous Dvl-mediated Wnt signaling. In some embodiments, a polypeptide comprising a C-terminus consisting of KWYGWL (SEQ ID NO: 80). In some embodiments, the polypeptide comprises the amino acid sequence X_1-X_2-W-X_3-D-X_4-P, and wherein X_1 is L or V, X_2 is L, X_3 is S or T, and X_4 is I, F or L. In some embodiments, the polypeptide comprises the amino acid sequence GEIVLWSDIPG (SEQ ID NO:81). In some embodiments, the polypeptide is any polypeptide described in U.S. Patent No. 7,977,064 and/or 7,695,928, which are incorporated by reference in their entirety.

[0210] In some embodiments of any of the wnt pathway binding polypeptide antagonists, the binding polypeptide binds WISP. In some embodiments, the WISP is WISP1, WISP2, and/or WISP3. In some embodiments, the polypeptide is any polypeptide described in U.S. Patent No. 6,387,657, 7,455,834, 7,732,567, 7,687,460, and/or 7,101,850 and/or U.S. Patent Application No. 2006/0292150, which are incorporated by reference in their entirety.

[0211] In some embodiments of any of the wnt pathway binding polypeptide antagonists, the binding polypeptide binds a S100-like cytokine polypeptide. In some embodiments, the S100-like cytokine polypeptide is a S100-A14 polypeptide. In some embodiments, the polypeptide is any polypeptide described in U.S. Patent No. 7,566,536 and/or 7,005,499, which are incorporated by reference in their entirety.

[0212] In some embodiments of any of the wnt pathway binding polypeptide antagonists, the wnt pathway binding polypeptide antagonist is a polypeptide that binds specifically to STRA6. In some embodiments, the polypeptide is any polypeptide described in U.S. Patent No. 7,173,115, 7,741,439, and/or 7,855,278, which are incorporated by reference in their entirety.

[0213] In some embodiments of any of the wnt pathway binding polypeptide antagonists, the binding polypeptide binds R-spondin polypeptide. In some embodiment, the R-spondin polypeptide is RSPO1 polypeptide. In some embodiment, the R-spondin polypeptide is RSPO2 polypeptide. In some embodiment, the R-spondin polypeptide is RSPO3 polypeptide. In some embodiment, the R-spondin polypeptide is RSPO4 polypeptide.

[0214] In some embodiments of any of the binding polypeptides, the wnt pathway binding polypeptide antagonists bind to an R-spondin-translocation fusion polypeptide. In some embodiments, the binding polypeptide specifically bind an R-spondin-translocation fusion polypeptide, but do not substantially bind wild-type R-spondin and/or a second gene of the translocation. In some embodiments, the R-spondin-translocation fusion polypeptide is RSPO1-translocation fusion polypeptide. In some embodiments, the R-spondin-translocation fusion polypeptide is RSPO2-translocation fusion polypeptide. In some embodiments, the R-spondin-translocation fusion polypeptide is RSPO3-

translocation fusion polypeptide. In some embodiments, the R-spondin-translocation fusion polypeptide is RSPO4-translocation fusion polypeptide. In some embodiments, the RSPO2-translocation fusion polypeptide comprises *EIF3E* and *RSPO2*. In some embodiments, the RSPO2 -translocation fusion polypeptide comprises *EIF3E* exon 1 and *RSPO2* exon 2. In some embodiments, the RSPO2-translocation fusion polypeptide comprises *EIF3E* exon 1 and *RSPO2* exon 3. In some embodiments, the RSPO2-translocation fusion polypeptide comprises SEQ ID NO:71. In some embodiments, the RSPO3-translocation fusion polypeptide comprises *PTPRK* and *RSPO3*. In some embodiments, the RSPO3-translocation fusion polypeptide comprises *PTPRK* exon 1 and *RSPO3* exon 2. In some embodiments, the RSPO3-translocation fusion polypeptide comprises *PTPRK* exon 7 and *RSPO3* exon 2. In some embodiments, the RSPO3-translocation fusion polypeptide comprises SEQ ID NO:72 and/or SEQ ID NO:73.

[0215] Binding polypeptides may be chemically synthesized using known polypeptide synthesis methodology or may be prepared and purified using recombinant technology. Binding polypeptides are usually at least about 5 amino acids in length, alternatively at least about 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, or 100 amino acids in length or more, wherein such binding polypeptides that are capable of binding, preferably specifically, to a target, wnt pathway polypeptide, as described herein. Binding polypeptides may be identified without undue experimentation using well known techniques. In this regard, it is noted that techniques for screening polypeptide libraries for binding polypeptides that are capable of specifically binding to a polypeptide target are well known in the art (*see, e.g.,* U.S. Patent Nos. 5,556,762, 5,750,373, 4,708,871, 4,833,092, 5,223,409, 5,403,484, 5,571,689, 5,663,143; PCT Publication Nos. WO 84/03506 and WO84/03564; Geysen *et al.*, *Proc. Natl. Acad. Sci. U.S.A.*, 81:3998-4002 (1984); Geysen *et al.*, *Proc. Natl. Acad. Sci. U.S.A.*, 82:178-182 (1985); Geysen *et al.*, in Synthetic Peptides as Antigens, 130-149 (1986); Geysen *et al.*, *J. Immunol. Meth.*, 102:259-274 (1987); Schoofs *et al.*, *J. Immunol.*, 140:611-616 (1988), Cwirla, S. E. *et al.,* (1990) *Proc. Natl. Acad. Sci. USA*, 87:6378; Lowman, H.B. *et al.,* (1991) *Biochemistry*, 30:10832; Clackson, T. *et al.,* (1991) *Nature*, 352: 624; Marks, J. D. *et al.,* (1991), *J. Mol. Biol.*, 222:581; Kang, A.S. *et al.,* (1991) *Proc. Natl. Acad. Sci. USA*, 88:8363, and Smith, G. P. (1991) *Current Opin. Biotechnol.*, 2:668).

[0216] In this regard, bacteriophage (phage) display is one well known technique which allows one to screen large polypeptide libraries to identify member(s) of those libraries which are capable of specifically binding to a target polypeptide, wnt pathway polypeptide. Phage display is a technique by which variant polypeptides are displayed as fusion proteins to the coat protein on the surface of bacteriophage particles (Scott, J.K. and Smith, G. P. (1990) *Science*, 249: 386). The utility of phage display lies in the fact that large libraries of selectively randomized protein variants (or randomly cloned

cDNAs) can be rapidly and efficiently sorted for those sequences that bind to a target molecule with high affinity. Display of peptide (Cwirla, S. E. *et al.,* (1990) *Proc. Natl. Acad. Sci. USA*, 87:6378) or protein (Lowman, H.B. *et al.,* (1991) *Biochemistry*, 30:10832; Clackson, T. *et al.,* (1991) *Nature*, 352: 624; Marks, J. D. *et al.,* (1991), *J. Mol. Biol.*, 222:581; Kang, A.S. *et al.,* (1991) *Proc. Natl. Acad. Sci. USA*, 88:8363) libraries on phage have been used for screening millions of polypeptides or oligopeptides for ones with specific binding properties (Smith, G. P. (1991) *Current Opin. Biotechnol.*, 2:668). Sorting phage libraries of random mutants requires a strategy for constructing and propagating a large number of variants, a procedure for affinity purification using the target receptor, and a means of evaluating the results of binding enrichments. U.S. Patent Nos. 5,223,409, 5,403,484, 5,571,689, and 5,663,143.

[0217] Although most phage display methods have used filamentous phage, lambdoid phage display systems (WO 95/34683; U.S. 5,627,024), T4 phage display systems (Ren *et al.*, *Gene*, 215: 439 (1998); Zhu *et al.*, *Cancer Research*, 58(15): 3209-3214 (1998); Jiang *et al.*, *Infection & Immunity*, 65(11): 4770-4777 (1997); Ren *et al.*, *Gene*, 195(2):303-311 (1997); Ren, *Protein Sci.*, 5: 1833 (1996); Efimov *et al.*, *Virus Genes*, 10: 173 (1995)) and T7 phage display systems (Smith and Scott, *Methods in Enzymology*, 217: 228-257 (1993); U.S. 5,766,905) are also known.

[0218] Additional improvements enhance the ability of display systems to screen peptide libraries for binding to selected target molecules and to display functional proteins with the potential of screening these proteins for desired properties. Combinatorial reaction devices for phage display reactions have been developed (WO 98/14277) and phage display libraries have been used to analyze and control bimolecular interactions (WO 98/20169; WO 98/20159) and properties of constrained helical peptides (WO 98/20036). WO 97/35196 describes a method of isolating an affinity ligand in which a phage display library is contacted with one solution in which the ligand will bind to a target molecule and a second solution in which the affinity ligand will not bind to the target molecule, to selectively isolate binding ligands. WO 97/46251 describes a method of biopanning a random phage display library with an affinity purified antibody and then isolating binding phage, followed by a micropanning process using microplate wells to isolate high affinity binding phage. The use of *Staphylococcus aureus* protein A as an affinity tag has also been reported (Li *et al.,* (1998) *Mol Biotech.*, 9:187). WO 97/47314 describes the use of substrate subtraction libraries to distinguish enzyme specificities using a combinatorial library which may be a phage display library. A method for selecting enzymes suitable for use in detergents using phage display is described in WO 97/09446. Additional methods of selecting specific binding proteins are described in U.S. Patent Nos. 5,498,538, 5,432,018, and WO 98/15833.

[0219] Methods of generating peptide libraries and screening these libraries are also disclosed in U.S. Patent Nos. 5,723,286, 5,432,018, 5,580,717, 5,427,908, 5,498,530, 5,770,434, 5,734,018, 5,698,426, 5,763,192, and 5,723,323.

D. Binding Small Molecules

[0220] Provided herein are wnt pathway small molecule antagonists for use as a wnt pathway antagonist in any of the methods described herein. In some embodiments, the wnt pathway antagonist is a canonical wnt pathway antagonist. In some embodiments, the wnt pathway antagonist is a non-canonical wnt pathway antagonist.

[0221] In some embodiments of any of the small molecules, the wnt pathway small molecule antagonist is an R-spondin small molecule antagonist (*e.g.*, RSPO1, 2, 3, and/or 4 small molecule antagonist). In some embodiment, the R-spondin small molecule antagonist is RSPO1-translocation small molecule antagonist. In some embodiment, the R-spondin small molecule antagonist is RSPO2-translocation small molecule antagonist. In some embodiment, the R-spondin small molecule antagonist is RSPO3-translocation antagonist. In some embodiment, the R-spondin small molecule antagonist is RSPO4-translocation small molecule antagonist.

[0222] In some embodiments of any of the small molecules, the small molecule binds to an R-spondin-translocation fusion polypeptide. In some embodiments, small molecule specifically binds an R-spondin-translocation fusion polypeptide, but do not substantially bind wild-type R-spondin and/or a second gene of the translocation. In some embodiments, the R-spondin-translocation fusion polypeptide is RSPO1-translocation fusion polypeptide. In some embodiments, the R-spondin-translocation fusion polypeptide is RSPO2-translocation fusion polypeptide. In some embodiments, the R-spondin-translocation fusion polypeptide is RSPO3-translocation fusion polypeptide. In some embodiments, the R-spondin-translocation fusion polypeptide is RSPO4-translocation fusion polypeptide. In some embodiments, the RSPO2-translocation fusion polypeptide comprises *EIF3E* and *RSPO2*. In some embodiments, the RSPO2 -translocation fusion polypeptide comprises *EIF3E* exon 1 and *RSPO2* exon 2. In some embodiments, the RSPO2-translocation fusion polypeptide comprises *EIF3E* exon 1 and *RSPO2* exon 3. In some embodiments, the RSPO2-translocation fusion polypeptide comprises SEQ ID NO:71. In some embodiments, the RSPO3-translocation fusion polypeptide comprises *PTPRK* and *RSPO3*. In some embodiments, the RSPO3-translocation fusion polypeptide comprises *PTPRK* exon 1 and *RSPO3* exon 2. In some embodiments, the RSPO3-translocation fusion polypeptide comprises *PTPRK* exon 7 and *RSPO3* exon 2. In some embodiments, the RSPO3-translocation fusion polypeptide comprises SEQ ID NO:72 and/or SEQ ID NO:73.

[0223] Small molecules are preferably organic molecules other than binding polypeptides or antibodies as defined herein that bind, preferably specifically, to wnt pathway polypeptide as described herein. Organic small molecules may be identified and chemically synthesized using known methodology (*see, e.g.,* PCT Publication Nos. WO00/00823 and WO00/39585). Organic small molecules are usually less than about 2000 Daltons in size, alternatively less than about 1500, 750, 500, 250 or 200 Daltons in size, wherein such organic small molecules that are capable of binding, preferably specifically, to a polypeptide as described herein may be identified without undue experimentation using well known

techniques. In this regard, it is noted that techniques for screening organic small molecule libraries for molecules that are capable of binding to a polypeptide target are well known in the art (*see, e.g.,* PCT Publication Nos. WO00/00823 and WO00/39585). Organic small molecules may be, for example, aldehydes, ketones, oximes, hydrazones, semicarbazones, carbazides, primary amines, secondary amines, tertiary amines, N-substituted hydrazines, hydrazides, alcohols, ethers, thiols, thioethers, disulfides, carboxylic acids, esters, amides, ureas, carbamates, carbonates, ketals, thioketals, acetals, thioacetals, aryl halides, aryl sulfonates, alkyl halides, alkyl sulfonates, aromatic compounds, heterocyclic compounds, anilines, alkenes, alkynes, diols, amino alcohols, oxazolidines, oxazolines, thiazolidines, thiazolines, enamines, sulfonamides, epoxides, aziridines, isocyanates, sulfonyl chlorides, diazo compounds, acid chlorides, or the like.

E. Antagonist Polynucleotides

[0224] Provided herein are wnt pathway polynucleotide antagonists for use as a wnt pathway antagonist in any of the methods described herein. The polynucleotide may be an antisense nucleic acid and/or a ribozyme. The antisense nucleic acids comprise a sequence complementary to at least a portion of an RNA transcript of a wnt pathway gene. However, absolute complementarity, although preferred, is not required. In some embodiments, the wnt pathway antagonist is a canonical wnt pathway antagonist. In some embodiments, the wnt pathway antagonist is a non-canonical wnt pathway antagonist. In some embodiments, wnt pathway polynucleotide is R-spondin. In some embodiments, the R-spondin is RSPO1. In some embodiments, the R-spondin is RSPO2. In some embodiments, the R-spondin is RSPO3. In some embodiments, the R-spondin is RSPO4. Examples of polynucleotide antagonists include those described in WO 2005/040418 such as TCCCATTTGCAAGGGTTGT (SEQ ID NO: 82) and/or AGCTGACTGTGATACCTGT(SEQ ID NO: 83).

[0225] In some embodiments of any of the polynucleotides, the polynucleotide binds to an R-spondin-translocation fusion polynucleotide. In some embodiments, polynucleotide specifically binds an R-spondin-translocation fusion polynucleotide, but do not substantially bind wild-type R-spondin and/or a second gene of the translocation. In some embodiments, the R-spondin-translocation fusion polynucleotide is RSPO1-translocation fusion polynucleotide. In some embodiments, the R-spondin-translocation fusion polynucleotide is RSPO2-translocation fusion polynucleotide. In some embodiments, the R-spondin-translocation fusion polynucleotide is RSPO3-translocation fusion polynucleotide. In some embodiments, the R-spondin-translocation fusion polynucleotide is RSPO4-translocation fusion polynucleotide. In some embodiments, the RSPO2-translocation fusion polynucleotide comprises *EIF3E* and *RSPO2*. In some embodiments, the RSPO2 -translocation fusion polynucleotide comprises *EIF3E* exon 1 and *RSPO2* exon 2. In some embodiments, the RSPO2-translocation fusion polynucleotide comprises *EIF3E* exon 1 and *RSPO2* exon 3. In some embodiments, the RSPO2-translocation fusion polynucleotide comprises SEQ ID NO:71. In some embodiments, the RSPO3-translocation fusion polynucleotide comprises *PTPRK* and *RSPO3*. In some embodiments, the

RSPO3-translocation fusion polynucleotide comprises *PTPRK* exon 1 and *RSPO3* exon 2. In some embodiments, the RSPO3-translocation fusion polynucleotide comprises *PTPRK* exon 7 and *RSPO3* exon 2. In some embodiments, the RSPO3-translocation fusion polynucleotide comprises SEQ ID NO:72 and/or SEQ ID NO:73.

[0226] A sequence "complementary to at least a portion of an RNA," referred to herein, means a sequence having sufficient complementarity to be able to hybridize with the RNA, forming a stable duplex; in the case of double stranded wnt pathway antisense nucleic acids, a single strand of the duplex DNA may thus be tested, or triplex formation may be assayed. The ability to hybridize will depend on both the degree of complementarity and the length of the antisense nucleic acid. Generally, the larger the hybridizing nucleic acid, the more base mismatches with an wnt pathway RNA it may contain and still form a stable duplex (or triplex as the case may be). One skilled in the art can ascertain a tolerable degree of mismatch by use of standard procedures to determine the melting point of the hybridized complex.

[0227] Polynucleotides that are complementary to the 5' end of the message, *e.g.,* the 5' untranslated sequence up to and including the AUG initiation codon, should work most efficiently at inhibiting translation. However, sequences complementary to the 3' untranslated sequences of mRNAs have been shown to be effective at inhibiting translation of mRNAs as well. *See generally*, Wagner, R., 1994, *Nature* 372:333-335. Thus, oligonucleotides complementary to either the 5'- or 3'-non-translated, non-coding regions of the wnt pathway gene, could be used in an antisense approach to inhibit translation of endogenous wnt pathway mRNA. Polynucleotides complementary to the 5' untranslated region of the mRNA should include the complement of the AUG start codon. Antisense polynucleotides complementary to mRNA coding regions are less efficient inhibitors of translation but could be used in accordance with the invention. Whether designed to hybridize to the 5'-, 3'- or coding region of wnt pathway mRNA, antisense nucleic acids should be at least six nucleotides in length, and are preferably oligonucleotides ranging from 6 to about 50 nucleotides in length. In specific aspects the oligonucleotide is at least 10 nucleotides, at least 17 nucleotides, at least 25 nucleotides or at least 50 nucleotides.

[0228] In one embodiment, the wnt pathway antisense nucleic acid of the invention is produced intracellularly by transcription from an exogenous sequence. For example, a vector or a portion thereof, is transcribed, producing an antisense nucleic acid (RNA) of the wnt pathway gene. Such a vector would contain a sequence encoding the wnt pathway antisense nucleic acid. Such a vector can remain episomal or become chromosomally integrated, as long as it can be transcribed to produce the desired antisense RNA. Such vectors can be constructed by recombinant DNA technology methods standard in the art. Vectors can be plasmid, viral, or others know in the art, used for replication and expression in vertebrate cells. Expression of the sequence encoding wnt pathway, or fragments thereof, can be by any promoter known in the art to act in vertebrate, preferably human cells. Such promoters can be inducible or constitutive. Such promoters include, but are not limited to, the SV40 early promoter region (Bernoist

and Chambon, *Nature* 29:304-310 (1981), the promoter contained in the 3' long terminal repeat of Rous sarcoma virus (Yamamoto *et al.*, *Cell* 22:787-797 (1980), the herpes thymidine promoter (Wagner *et al.*, *Proc. Natl. Acad. Sci. U.S.A.* 78:1441-1445 (1981), the regulatory sequences of the metallothionein gene (Brinster et al., *Nature* 296:39-42 (1982)), etc.

F. Antibody and Binding Polypeptide Variants

[0229] In certain embodiments, amino acid sequence variants of the antibodies and/or the binding polypeptides provided herein are contemplated. For example, it may be desirable to improve the binding affinity and/or other biological properties of the antibody and/or binding polypeptide. Amino acid sequence variants of an antibody and/or binding polypeptides may be prepared by introducing appropriate modifications into the nucleotide sequence encoding the antibody and/or binding polypeptide, or by peptide synthesis. Such modifications include, for example, deletions from, and/or insertions into and/or substitutions of residues within the amino acid sequences of the antibody and/or binding polypeptide. Any combination of deletion, insertion, and substitution can be made to arrive at the final construct, provided that the final construct possesses the desired characteristics, *e.g.,* target-binding.

[0230] In certain embodiments, antibody variants and/or binding polypeptide variants having one or more amino acid substitutions are provided. Sites of interest for substitutional mutagenesis include the HVRs and FRs. Conservative substitutions are shown in Table 1 under the heading of "conservative substitutions." More substantial changes are provided in Table 1 under the heading of "exemplary substitutions," and as further described below in reference to amino acid side chain classes. Amino acid substitutions may be introduced into an antibody and/or binding polypeptide of interest and the products screened for a desired activity, *e.g.,* retained/improved antigen binding, decreased immunogenicity, or improved ADCC or CDC.

TABLE 1

Original Residue	Exemplary Substitutions	Preferred Substitutions
Ala (A)	Val; Leu; Ile	Val
Arg (R)	Lys; Gln; Asn	Lys
Asn (N)	Gln; His; Asp, Lys; Arg	Gln
Asp (D)	Glu; Asn	Glu
Cys (C)	Ser; Ala	Ser
Gln (Q)	Asn; Glu	Asn
Glu (E)	Asp; Gln	Asp
Gly (G)	Ala	Ala
His (H)	Asn; Gln; Lys; Arg	Arg
Ile (I)	Leu; Val; Met; Ala; Phe; Norleucine	Leu

Original Residue	Exemplary Substitutions	Preferred Substitutions
Leu (L)	Norleucine; Ile; Val; Met; Ala; Phe	Ile
Lys (K)	Arg; Gln; Asn	Arg
Met (M)	Leu; Phe; Ile	Leu
Phe (F)	Trp; Leu; Val; Ile; Ala; Tyr	Tyr
Pro (P)	Ala	Ala
Ser (S)	Thr	Thr
Thr (T)	Val; Ser	Ser
Trp (W)	Tyr; Phe	Tyr
Tyr (Y)	Trp; Phe; Thr; Ser	Phe
Val (V)	Ile; Leu; Met; Phe; Ala; Norleucine	Leu

[0231] Amino acids may be grouped according to common side-chain properties:

(1) hydrophobic: Norleucine, Met, Ala, Val, Leu, Ile;

(2) neutral hydrophilic: Cys, Ser, Thr, Asn, Gln;

(3) acidic: Asp, Glu;

(4) basic: His, Lys, Arg;

(5) residues that influence chain orientation: Gly, Pro;

(6) aromatic: Trp, Tyr, Phe.

[0232] Non-conservative substitutions will entail exchanging a member of one of these classes for another class.

[0233] One type of substitutional variant involves substituting one or more hypervariable region residues of a parent antibody (*e.g.,* a humanized or human antibody). Generally, the resulting variant(s) selected for further study will have modifications (*e.g.,* improvements) in certain biological properties (*e.g.,* increased affinity, reduced immunogenicity) relative to the parent antibody and/or will have substantially retained certain biological properties of the parent antibody. An exemplary substitutional variant is an affinity matured antibody, which may be conveniently generated, *e.g.,* using phage display-based affinity maturation techniques such as those described herein. Briefly, one or more HVR residues are mutated and the variant antibodies displayed on phage and screened for a particular biological activity (*e.g.,* binding affinity).

[0234] Alterations (*e.g.,* substitutions) may be made in HVRs, *e.g.,* to improve antibody affinity. Such alterations may be made in HVR "hotspots," *i.e.*, residues encoded by codons that undergo mutation at high frequency during the somatic maturation process (*see, e.g.,* Chowdhury, *Methods Mol. Biol.* 207:179-196 (2008)), and/or SDRs (a-CDRs), with the resulting variant VH or VL being tested for binding affinity. Affinity maturation by constructing and reselecting from secondary libraries has been

described, *e.g.,* in Hoogenboom *et al.,* in METHODS IN MOL. BIOL. 178:1-37 (O'Brien *et al.*, ed., Human Press, Totowa, NJ, (2001).) In some embodiments of affinity maturation, diversity is introduced into the variable genes chosen for maturation by any of a variety of methods (*e.g.,* error-prone PCR, chain shuffling, or oligonucleotide-directed mutagenesis). A secondary library is then created. The library is then screened to identify any antibody variants with the desired affinity. Another method to introduce diversity involves HVR-directed approaches, in which several HVR residues (*e.g.,* 4-6 residues at a time) are randomized. HVR residues involved in antigen binding may be specifically identified, *e.g.,* using alanine scanning mutagenesis or modeling. CDR-H3 and CDR-L3 in particular are often targeted.

[0235] In certain embodiments, substitutions, insertions, or deletions may occur within one or more HVRs so long as such alterations do not substantially reduce the ability of the antibody to bind antigen. For example, conservative alterations (*e.g.,* conservative substitutions as provided herein) that do not substantially reduce binding affinity may be made in HVRs. Such alterations may be outside of HVR "hotspots" or SDRs. In certain embodiments of the variant VH and VL sequences provided above, each HVR either is unaltered, or contains no more than one, two or three amino acid substitutions.

[0236] A useful method for identification of residues or regions of the antibody and/or the binding polypeptide that may be targeted for mutagenesis is called "alanine scanning mutagenesis" as described by Cunningham and Wells (1989) *Science*, 244:1081-1085. In this method, a residue or group of target residues (*e.g.,* charged residues such as arg, asp, his, lys, and glu) are identified and replaced by a neutral or negatively charged amino acid (*e.g.,* alanine or polyalanine) to determine whether the interaction of the antibody with antigen is affected. Further substitutions may be introduced at the amino acid locations demonstrating functional sensitivity to the initial substitutions. Alternatively, or additionally, a crystal structure of an antigen-antibody complex to identify contact points between the antibody and antigen. Such contact residues and neighboring residues may be targeted or eliminated as candidates for substitution. Variants may be screened to determine whether they contain the desired properties.

[0237] Amino acid sequence insertions include amino- and/or carboxyl-terminal fusions ranging in length from one residue to polypeptides containing a hundred or more residues, as well as intrasequence insertions of single or multiple amino acid residues. Examples of terminal insertions include an antibody with an N-terminal methionyl residue. Other insertional variants of the antibody molecule include the fusion to the N- or C-terminus of the antibody to an enzyme (*e.g.,* for ADEPT) or a polypeptide which increases the serum half-life of the antibody.

G. Antibody and Binding Polypeptide Derivatives

[0238] In certain embodiments, an antibody and/or binding polypeptide provided herein may be further modified to contain additional nonproteinaceous moieties that are known in the art and readily available. The moieties suitable for derivatization of the antibody and/or binding polypeptide include but are not limited to water soluble polymers. Non-limiting examples of water soluble polymers include, but are not limited to, polyethylene glycol (PEG), copolymers of ethylene glycol/propylene glycol,

carboxymethylcellulose, dextran, polyvinyl alcohol, polyvinyl pyrrolidone, poly-1, 3-dioxolane, poly-1,3,6-trioxane, ethylene/maleic anhydride copolymer, polyaminoacids (either homopolymers or random copolymers), and dextran or poly(n-vinyl pyrrolidone)polyethylene glycol, propropylene glycol homopolymers, prolypropylene oxide/ethylene oxide co-polymers, polyoxyethylated polyols (*e.g.*, glycerol), polyvinyl alcohol, and mixtures thereof. Polyethylene glycol propionaldehyde may have advantages in manufacturing due to its stability in water. The polymer may be of any molecular weight, and may be branched or unbranched. The number of polymers attached to the antibody and/or binding polypeptide may vary, and if more than one polymer is attached, they can be the same or different molecules. In general, the number and/or type of polymers used for derivatization can be determined based on considerations including, but not limited to, the particular properties or functions of the antibody and/or binding polypeptide to be improved, whether the antibody derivative and/or binding polypeptide derivative will be used in a therapy under defined conditions, etc.

[0239] In another embodiment, conjugates of an antibody and/or binding polypeptide to nonproteinaceous moiety that may be selectively heated by exposure to radiation are provided. In one embodiment, the nonproteinaceous moiety is a carbon nanotube (Kam *et al.*, *Proc. Natl. Acad. Sci. USA* 102: 11600-11605 (2005)). The radiation may be of any wavelength, and includes, but is not limited to, wavelengths that do not harm ordinary cells, but which heat the nonproteinaceous moiety to a temperature at which cells proximal to the antibody and/or binding polypeptide-nonproteinaceous moiety are killed.

H. Recombinant Methods and Compositions

[0240] Antibodies and/or binding polypeptides may be produced using recombinant methods and compositions, *e.g.*, as described in U.S. Patent No. 4,816,567. In one embodiment, isolated nucleic acid encoding an anti- wnt pathway antibody. Such nucleic acid may encode an amino acid sequence comprising the VL and/or an amino acid sequence comprising the VH of the antibody (*e.g.*, the light and/or heavy chains of the antibody). In a further embodiment, one or more vectors (*e.g.*, expression vectors) comprising such nucleic acid encoding the antibody and/or binding polypeptide are provided. In a further embodiment, a host cell comprising such nucleic acid is provided. In one such embodiment, a host cell comprises (*e.g.*, has been transformed with): (1) a vector comprising a nucleic acid that encodes an amino acid sequence comprising the VL of the antibody and an amino acid sequence comprising the VH of the antibody, or (2) a first vector comprising a nucleic acid that encodes an amino acid sequence comprising the VL of the antibody and a second vector comprising a nucleic acid that encodes an amino acid sequence comprising the VH of the antibody. In one embodiment, the host cell is eukaryotic, *e.g.*, a Chinese Hamster Ovary (CHO) cell or lymphoid cell (*e.g.*, Y0, NS0, Sp20 cell). In one embodiment, a method of making an antibody such as an anti-wnt pathway antibody and/or binding polypeptide is provided, wherein the method comprises culturing a host cell comprising a nucleic acid encoding the antibody and/or binding polypeptide, as provided above, under conditions suitable for expression of the

antibody and/or binding polypeptide, and optionally recovering the antibody and/or polypeptide from the host cell (or host cell culture medium).

[0241] For recombinant production of an antibody such as an anti-wnt pathway antibody and/or a binding polypeptide, nucleic acid encoding the antibody and/or the binding polypeptide, *e.g.*, as described above, is isolated and inserted into one or more vectors for further cloning and/or expression in a host cell. Such nucleic acid may be readily isolated and sequenced using conventional procedures (*e.g.*, by using oligonucleotide probes that are capable of binding specifically to genes encoding the heavy and light chains of the antibody).

[0242] Suitable host cells for cloning or expression of vectors include prokaryotic or eukaryotic cells described herein. For example, antibodies may be produced in bacteria, in particular when glycosylation and Fc effector function are not needed. For expression of antibody fragments and polypeptides in bacteria, *see, e.g.*, U.S. Patent Nos. 5,648,237, 5,789,199, and 5,840,523. (*See* also Charlton, METHODS IN MOL. BIOL., *Vol. 248* (B.K.C. Lo, ed., Humana Press, Totowa, NJ, 2003), pp. 245-254, describing expression of antibody fragments in *E. coli*.) After expression, the antibody may be isolated from the bacterial cell paste in a soluble fraction and can be further purified.

[0243] In addition to prokaryotes, eukaryotic microbes such as filamentous fungi or yeast are suitable cloning or expression hosts for vectors, including fungi and yeast strains whose glycosylation pathways have been "humanized," resulting in the production of an antibody with a partially or fully human glycosylation pattern. *See* Gerngross, *Nat. Biotech.* 22:1409-1414 (2004), and Li *et al.*, *Nat. Biotech.* 24:210-215 (2006).

[0244] Suitable host cells for the expression of glycosylated antibody and/or glycosylated binding polypeptides are also derived from multicellular organisms (invertebrates and vertebrates). Examples of invertebrate cells include plant and insect cells. Numerous baculoviral strains have been identified which may be used in conjunction with insect cells, particularly for transfection of *Spodoptera frugiperda* cells.

[0245] Plant cell cultures can also be utilized as hosts. *See, e.g.*, US Patent Nos. 5,959,177, 6,040,498, 6,420,548, 7,125,978, and 6,417,429 (describing PLANTIBODIES™ technology for producing antibodies in transgenic plants).

[0246] Vertebrate cells may also be used as hosts. For example, mammalian cell lines that are adapted to grow in suspension may be useful. Other examples of useful mammalian host cell lines are monkey kidney CV1 line transformed by SV40 (COS-7); human embryonic kidney line (293 or 293 cells as described, *e.g.*, in Graham *et al.*, *J. Gen Virol.* 36:59 (1977)); baby hamster kidney cells (BHK); mouse sertoli cells (TM4 cells as described, *e.g.*, in Mather, *Biol. Reprod.* 23:243-251 (1980)); monkey kidney cells (CV1); African green monkey kidney cells (VERO-76); human cervical carcinoma cells (HELA); canine kidney cells (MDCK; buffalo rat liver cells (BRL 3A); human lung cells (W138); human liver cells (Hep G2); mouse mammary tumor (MMT 060562); TRI cells, as described, *e.g.*, in Mather *et al.*, *Annals N.Y. Acad. Sci.* 383:44-68 (1982); MRC 5 cells; and FS4 cells. Other useful mammalian host cell

lines include Chinese hamster ovary (CHO) cells, including DHFR- CHO cells (Urlaub *et al., Proc. Natl. Acad. Sci. USA* 77:4216 (1980)); and myeloma cell lines such as Y0, NS0 and Sp2/0. For a review of certain mammalian host cell lines suitable for antibody production and/or binding polypeptide production, *see, e.g.,* Yazaki and Wu, METHODS IN MOL. BIOL., *Vol. 248* (B.K.C. Lo, ed., Humana Press, Totowa, NJ), pp. 255-268 (2003).

[0247] While the description relates primarily to production of antibodies and/or binding polypeptides by culturing cells transformed or transfected with a vector containing antibody- and binding polypeptide-encoding nucleic acid. It is, of course, contemplated that alternative methods, which are well known in the art, may be employed to prepare antibodies and/or binding polypeptides. For instance, the appropriate amino acid sequence, or portions thereof, may be produced by direct peptide synthesis using solid-phase techniques [*see, e.g.,* Stewart *et al., Solid-Phase Peptide Synthesis*, W.H. Freeman Co., San Francisco, CA (1969); Merrifield, *J. Am. Chem. Soc.*, 85:2149-2154 (1963)]. *In vitro* protein synthesis may be performed using manual techniques or by automation. Automated synthesis may be accomplished, for instance, using an Applied Biosystems Peptide Synthesizer (Foster City, CA) using manufacturer's instructions. Various portions of the antibody and/or binding polypeptide may be chemically synthesized separately and combined using chemical or enzymatic methods to produce the desired antibody and/or binding polypeptide.

IV. Methods of Screening and/or Identifying Wnt Pathway Antagonists With Desired Function

[0248] Techniques for generating wnt pathway antagonists such as antibodies, binding polypeptides, and/or small molecules have been described above. Additional wnt pathway antagonists such as anti-wnt pathway antibodies, binding polypeptides, small molecules, and/or polynucleotides provided herein may be identified, screened for, or characterized for their physical/chemical properties and/or biological activities by various assays known in the art.

[0249] Provided herein are methods of screening for and/or identifying a wnt pathway antagonist which inhibits wnt pathway signaling, induces cancer cell cycle arrest, inhibits cancer cell proliferation, and/or promotes cancer cell death said method comprising: (a) contacting (i) a cancer cell, cancer tissue, and/or cancer sample, wherein the cancer cell, cancer tissue, and/or cancer comprises one or more biomarkers, and (ii) a reference cancer cell, reference cancer tissue, and/or reference cancer sample with a wnt pathway candidate antagonist, (b) determining the level of wnt pathway signaling, distribution of cell cycle stage, level of cell proliferation, and/or level of cancer cell death, whereby decreased level of wnt pathway signaling, a difference in distribution of cell cycle stage, decreased level of cell proliferation, and/or increased level of cancer cell death between the cancer cell, cancer tissue, and/or cancer sample, wherein the cancer cell, cancer tissue, and/or cancer comprises one or more biomarkers, and reference cancer cell, reference cancer tissue, and/or reference cancer sample identifies the wnt pathway candidate antagonist as an wnt pathway antagonist which inhibits wnt pathway signaling, induces cancer cell cycle

arrest, inhibits cancer cell proliferation, and/or promotes cancer cell cancer death. In some embodiments, the wnt pathway antagonist is an R-spondin antagonist.

[0250] Further provided herein are methods of screening for and/or identifying a wnt pathway antagonist which inhibits wnt pathway signaling, induces cancer cell cycle arrest, inhibits cancer cell proliferation, and/or promotes cancer cell death said method comprising: (a) contacting a cancer cell, cancer tissue, and/or cancer sample, wherein the cancer cell, cancer tissue, and/or cancer comprises one or more biomarkers with a wnt pathway candidate antagonist, (b) determining the level of wnt pathway signaling, distribution of cell cycle stage, level of cell proliferation, and/or level of cancer cell death to the cancer cell, cancer tissue, and/or cancer sample in the absence of the wnt pathway candidate antagonist, whereby decreased level of wnt pathway signaling, a difference in distribution of cell cycle stage, decreased level of cell proliferation, and/or increased level of cancer cell death between the cancer cell, cancer tissue, and/or cancer sample in the presence of the wnt pathway candidate antagonist and the cancer cell, cancer tissue, and/or cancer sample in the absence of the wnt pathway candidate antagonist identifies the wnt pathway candidate antagonist as an wnt pathway antagonist which inhibits wnt pathway signaling, induces cancer cell cycle arrest, inhibits cancer cell proliferation, and/or promotes cancer cell cancer death. In some embodiments, the wnt pathway antagonist is an R-spondin antagonist.

[0251] In some embodiments of any of the methods, the one or more biomarkers is a translocation (*e.g.*, rearrangement and/or fusion) of one or more genes listed in Table 9. In some embodiments of any of the methods, the translocation (*e.g.*, rearrangement and/or fusion) is an R-spondin translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the R-spondin translocation (*e.g.*, rearrangement and/or fusion) is a RSPO1 translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the R-spondin translocation (*e.g.*, rearrangement and/or fusion) is a RSPO2 translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) comprises *EIF3E* and *RSPO2*. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) comprises *EIF3E* exon 1 and *RSPO2* exon 2. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) comprises *EIF3E* exon 1 and *RSPO2* exon 3. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) comprises SEQ ID NO:71 In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) is detectable by primers which include SEQ ID NO:12, 41, and/or 42. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) is driven by the *EIF3E* promoter. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) is driven by the *RSPO2* promoter. In some embodiments, the R-spondin translocation (*e.g.*, rearrangement and/or fusion) is a RSPO3 translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) comprises *PTPRK* and *RSPO3*. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) comprises *PTPRK* exon 1 and *RSPO3* exon 2. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) comprises *PTPRK* exon 7 and *RSPO3* exon 2.

In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) comprises SEQ ID NO:72 and/or SEQ ID NO:73. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) is detectable by primers which include SEQ ID NO:13, 14, 43, and/or 44. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) is driven by the *PTPRK* promoter. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) is driven by the *RSPO3* promoter. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) comprises the PTPRK secretion signal sequence (and/or does not comprise the RSPO3 secretion signal sequence). In some embodiments, the R-spondin translocation (*e.g.*, rearrangement and/or fusion) is a RSPO4 translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the R-spondin translocation (*e.g.*, rearrangement and/or fusion) results in elevated expression levels of R-spondin (*e.g.*, compared to a reference without the R-spondin translocation. In some embodiments, the one or more biomarkers is an R-spondin translocation (*e.g.*, rearrangement and/or fusion) and *KRAS* and/or *BRAF*. In some embodiments, the presence of one or more biomarkers is presence of an R-spondin translocation (*e.g.*, rearrangement and/or fusion) and a variation (*e.g.*, polymorphism or mutation) *KRAS* and/or *BRAF*. In some embodiments, the presence of one or more biomarkers is presence of an R-spondin translocation (*e.g.*, rearrangement and/or fusion) and the absence of one or more biomarkers is absence of a variation (*e.g.*, polymorphism or mutation) *CTNNB1* and/or *APC*.

[0252] Methods of determining the level of wnt pathway signaling are known in the art and are described in the Examples herein. In some embodiments, the levels of wnt pathway signaling are determined using a luciferase reporter assay as described in the Examples. In some embodiments, the wnt pathway antagonist inhibits wnt pathway signaling by reducing the level of wnt pathway signaling by about any of 10, 20, 30, 40, 50, 60, 70, 80, 90, or 100%.

[0253] The growth inhibitory effects of a wnt pathway antagonist described herein may be assessed by methods known in the art, *e.g.*, using cells which express wnt pathway either endogenously or following transfection with the respective gene(s). For example, appropriate tumor cell lines, and wnt pathway polypeptide-transfected cells may be treated with a wnt pathway antagonist described herein at various concentrations for a few days (*e.g.*, 2-7) days and stained with crystal violet or MTT or analyzed by some other colorimetric assay. Another method of measuring proliferation would be by comparing ^{3}H-thymidine uptake by the cells treated in the presence or absence an antibody, binding polypeptide, small molecule, and/or polynucleotides of the invention. After treatment, the cells are harvested and the amount of radioactivity incorporated into the DNA quantitated in a scintillation counter. Appropriate positive controls include treatment of a selected cell line with a growth inhibitory antibody known to inhibit growth of that cell line. Growth inhibition of tumor cells in vivo can be determined in various ways known in the art.

[0254] Methods of determining the distribution of cell cycle stage, level of cell proliferation, and/or level of cell death are known in the art. In some embodiments, cancer cell cycle arrest is arrest in G1.

[0255] In some embodiments, the wnt pathway antagonist will inhibit cancer cell proliferation of the cancer cell, cancer tissue, or cancer sample in vitro or in vivo by about 25-100% compared to the untreated cancer cell, cancer tissue, or cancer sample, more preferably, by about 30-100%, and even more preferably by about 50-100% or about 70-100%. For example, growth inhibition can be measured at a wnt pathway antagonist concentration of about 0.5 to about 30 μg/ml or about 0.5 nM to about 200 nM in cell culture, where the growth inhibition is determined 1-10 days after exposure of the tumor cells to the wnt pathway candidate antagonist. The wnt pathway antagonist is growth inhibitory in vivo if administration of the wnt pathway candidate antagonist at about 1 μg/kg to about 100 mg/kg body weight results in reduction in tumor size or reduction of tumor cell proliferation within about 5 days to 3 months from the first administration of the wnt pathway candidate antagonist, preferably within about 5 to 30 days.

[0256] To select for a wnt pathway antagonists which induces cancer cell death, loss of membrane integrity as indicated by, *e.g.,* propidium iodide (PI), trypan blue or 7AAD uptake may be assessed relative to a reference. A PI uptake assay can be performed in the absence of complement and immune effector cells. wnt pathway-expressing tumor cells are incubated with medium alone or medium containing the appropriate a wnt pathway antagonist. The cells are incubated for a 3-day time period. Following each treatment, cells are washed and aliquoted into 35 mm strainer-capped 12 x 75 tubes (1 ml per tube, 3 tubes per treatment group) for removal of cell clumps. Tubes then receive PI (10 μg/ml). Samples may be analyzed using a FACSCAN® flow cytometer and FACSCONVERT® CellQuest software (Becton Dickinson). Those wnt pathway antagonists that induce statistically significant levels of cell death as determined by PI uptake may be selected as cell death-inducing antibodies, binding polypeptides, small molecules, and/or polynucleotides.

[0257] To screen for wnt pathway antagonists which bind to an epitope on or interact with a polypeptide bound by an antibody of interest, a routine cross-blocking assay such as that described in Antibodies, A Laboratory Manual, Cold Spring Harbor Laboratory, Ed Harlow and David Lane (1988), can be performed. This assay can be used to determine if a candidate wnt pathway antagonist binds the same site or epitope as a known antibody. Alternatively, or additionally, epitope mapping can be performed by methods known in the art. For example, the antibody and/or binding polypeptide sequence can be mutagenized such as by alanine scanning, to identify contact residues. The mutant antibody is initially tested for binding with polyclonal antibody and/or binding polypeptide to ensure proper folding. In a different method, peptides corresponding to different regions of a polypeptide can be used in competition assays with the candidate antibodies and/or polypeptides or with a candidate antibody and/or binding polypeptide and an antibody with a characterized or known epitope.

[0258] In some embodiments of any of the methods of screening and/or identifying, the wnt pathway candidate antagonist is an antibody, binding polypeptide, small molecule, or polynucleotide. In some

embodiments, the wnt pathway candidate antagonist is an antibody. In some embodiments, the wnt pathway antagonist (*e.g.*, R-spondin-translocation antagonist) antagonist is a small molecule.

[0259] In one aspect, a wnt pathway antagonist is tested for its antigen binding activity, *e.g.,* by known methods such as ELISA, Western blot, etc.

V. Pharmaceutical Formulations

[0260] Pharmaceutical formulations of a wnt pathway antagonist as described herein are prepared by mixing such antibody having the desired degree of purity with one or more optional pharmaceutically acceptable carriers (REMINGTON'S PHARMA. SCI. 16th edition, Osol, A. Ed. (1980)), in the form of lyophilized formulations or aqueous solutions. In some embodiments, the wnt pathway antagonist is a small molecule, an antibody, binding polypeptide, and/or polynucleotide. Pharmaceutically acceptable carriers are generally nontoxic to recipients at the dosages and concentrations employed, and include, but are not limited to: buffers such as phosphate, citrate, and other organic acids; antioxidants including ascorbic acid and methionine; preservatives (such as octadecyldimethylbenzyl ammonium chloride; hexamethonium chloride; benzalkonium chloride; benzethonium chloride; phenol, butyl or benzyl alcohol; alkyl parabens such as methyl or propyl paraben; catechol; resorcinol; cyclohexanol; 3-pentanol; and m-cresol); low molecular weight (less than about 10 residues) polypeptides; proteins, such as serum albumin, gelatin, or immunoglobulins; hydrophilic polymers such as polyvinylpyrrolidone; amino acids such as glycine, glutamine, asparagine, histidine, arginine, or lysine; monosaccharides, disaccharides, and other carbohydrates including glucose, mannose, or dextrins; chelating agents such as EDTA; sugars such as sucrose, mannitol, trehalose or sorbitol; salt-forming counter-ions such as sodium; metal complexes (*e.g.,* Zn-protein complexes); and/or non-ionic surfactants such as polyethylene glycol (PEG). Exemplary pharmaceutically acceptable carriers herein further include interstitial drug dispersion agents such as soluble neutral-active hyaluronidase glycoproteins (sHASEGP), for example, human soluble PH-20 hyaluronidase glycoproteins, such as rHuPH20 (HYLENEX®, Baxter International, Inc.). Certain exemplary sHASEGPs and methods of use, including rHuPH20, are described in US Patent Publication Nos. 2005/0260186 and 2006/0104968. In one aspect, a sHASEGP is combined with one or more additional glycosaminoglycanases such as chondroitinases.

[0261] Exemplary lyophilized formulations are described in US Patent No. 6,267,958. Aqueous antibody formulations include those described in US Patent No. 6,171,586 and WO 2006/044908, the latter formulations including a histidine-acetate buffer.

[0262] The formulation herein may also contain more than one active ingredients as necessary for the particular indication being treated, preferably those with complementary activities that do not adversely affect each other. Such active ingredients are suitably present in combination in amounts that are effective for the purpose intended.

[0263] Active ingredients may be entrapped in microcapsules prepared, for example, by coacervation techniques or by interfacial polymerization, for example, hydroxymethylcellulose or gelatin-

microcapsules and poly-(methylmethacylate) microcapsules, respectively, in colloidal drug delivery systems (for example, liposomes, albumin microspheres, microemulsions, nano-particles and nanocapsules) or in macroemulsions. Such techniques are disclosed in REMINGTON'S PHARMA. SCI. 16th edition, Osol, A. Ed. (1980).

[0264] Sustained-release preparations may be prepared. Suitable examples of sustained-release preparations include semipermeable matrices of solid hydrophobic polymers containing the wnt pathway antagonist, which matrices are in the form of shaped articles, *e.g.,* films, or microcapsules.

[0265] The formulations to be used for *in vivo* administration are generally sterile. Sterility may be readily accomplished, *e.g.,* by filtration through sterile filtration membranes.

VI. Articles of Manufacture

[0266] In another aspect of the invention, an article of manufacture containing materials useful for the treatment, prevention and/or diagnosis of the disorders described above is provided. The article of manufacture comprises a container and a label or package insert on or associated with the container. Suitable containers include, for example, bottles, vials, syringes, IV solution bags, etc. The containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is by itself or combined with another composition effective for treating, preventing and/or diagnosing the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). At least one active agent in the composition is a wnt pathway antagonist (*e.g.*, R-spondin antagonist, *e.g.*, R-spondin-translocation antagonist) described herein. The label or package insert indicates that the composition is used for treating the condition of choice. Moreover, the article of manufacture may comprise (a) a first container with a composition contained therein, wherein the composition comprises a wnt pathway antagonist (*e.g.*, R-spondin antagonist, *e.g.*, R-spondin-translocation antagonist); and (b) a second container with a composition contained therein, wherein the composition comprises a further cytotoxic or otherwise therapeutic agent.

[0267] In some embodiments, the article of manufacture comprises a container, a label on said container, and a composition contained within said container; wherein the composition includes one or more reagents (*e.g.,* primary antibodies that bind to one or more biomarkers or probes and/or primers to one or more of the biomarkers described herein), the label on the container indicating that the composition can be used to evaluate the presence of one or more biomarkers in a sample, and instructions for using the reagents for evaluating the presence of one or more biomarkers in a sample. The article of manufacture can further comprise a set of instructions and materials for preparing the sample and utilizing the reagents. In some embodiments, the article of manufacture may include reagents such as both a primary and secondary antibody, wherein the secondary antibody is conjugated to a label, *e.g.,* an enzymatic label. In some embodiments, the article of manufacture one or more probes and/or primers to one or more of the biomarkers described herein.

[0268] In some embodiments of any of the articles of manufacture, the one or more biomarkers comprises a translocation (*e.g.*, rearrangement and/or fusion) of one or more genes listed in Table 9. In some embodiments of any of the articles of manufacture, the translocation (*e.g.*, rearrangement and/or fusion) is an R-spondin translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the R-spondin translocation (*e.g.*, rearrangement and/or fusion) is a RSPO1 translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the R-spondin translocation (*e.g.*, rearrangement and/or fusion) is a RSPO2 translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) comprises *EIF3E* and *RSPO2*. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) comprises *EIF3E* exon 1 and *RSPO2* exon 2. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) comprises *EIF3E* exon 1 and *RSPO2* exon 3. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) comprises SEQ ID NO:71. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) is detectable by primers which include SEQ ID NO:12, 41, and/or 42. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) is driven by the *EIF3E* promoter. In some embodiments, the RSPO2 translocation (*e.g.*, rearrangement and/or fusion) is driven by the *RSPO2* promoter. In some embodiments, the R-spondin translocation (*e.g.*, rearrangement and/or fusion) is a RSPO3 translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) comprises *PTPRK* and *RSPO3*. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) comprises *PTPRK* exon 1 and *RSPO3* exon 2. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) comprises *PTPRK* exon 7 and *RSPO3* exon 2. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) comprises SEQ ID NO:72 and/or SEQ ID NO:73. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) is detectable by primers which include SEQ ID NO:13, 14, 43, and/or 44. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) is driven by the *PTPRK* promoter. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) is driven by the *RSPO3* promoter. In some embodiments, the RSPO3 translocation (*e.g.*, rearrangement and/or fusion) comprises the PTPRK secretion signal sequence (and/or does not comprise the RSPO3 secretion signal sequence). In some embodiments, the R-spondin translocation (*e.g.*, rearrangement and/or fusion) is a RSPO4 translocation (*e.g.*, rearrangement and/or fusion). In some embodiments, the R-spondin translocation (*e.g.*, rearrangement and/or fusion) results in elevated expression levels of R-spondin (*e.g.*, compared to a reference without the R-spondin translocation. In some embodiments, the one or more biomarkers is an R-spondin translocation (*e.g.*, rearrangement and/or fusion) and *KRAS* and/or *BRAF*. In some embodiments, the presence of one or more biomarkers is presence of an R-spondin translocation (*e.g.*, rearrangement and/or fusion) and a variation (*e.g.*, polymorphism or mutation) *KRAS* and/or *BRAF*. In some embodiments, the presence of one or more biomarkers is presence of an R-spondin translocation (*e.g.*, rearrangement and/or fusion) and the absence

of one or more biomarkers is absence of a variation (*e.g.*, polymorphism or mutation) *CTNNB1* and/or *APC*.

[0269] In some embodiments of any of the articles of manufacture, the articles of manufacture comprise primers. In some embodiments, the primers are any of SEQ ID NO:12, 13, 14, 41, 42, 43, and/or 44.

[0270] In some embodiments of any of the article of manufacture, the wnt pathway antagonist (*e.g.*, R-spondin-translocation antagonist) is an antibody, binding polypeptide, small molecule, or polynucleotide. In some embodiments, the wnt pathway antagonist (*e.g.*, R-spondin-translocation antagonist) is a small molecule. In some embodiments, the wnt pathway antagonist (*e.g.*, R-spondin-translocation antagonist) is an antibody. In some embodiments, the antibody is a monoclonal antibody. In some embodiments, the antibody is a human, humanized, or chimeric antibody. In some embodiments, the antibody is an antibody fragment and the antibody fragment binds wnt pathway polypeptide (*e.g.*, R-spondin-translocation fusion polypeptide).

[0271] The article of manufacture in this embodiment of the invention may further comprise a package insert indicating that the compositions can be used to treat a particular condition. Alternatively, or additionally, the article of manufacture may further comprise a second (or third) container comprising a pharmaceutically-acceptable buffer, such as bacteriostatic water for injection (BWFI), phosphate-buffered saline, Ringer's solution and dextrose solution. It may further include other materials desirable from a commercial and user standpoint, including other buffers, diluents, filters, needles, and syringes.

[0272] Other optional components in the article of manufacture include one or more buffers (*e.g.*, block buffer, wash buffer, substrate buffer, etc), other reagents such as substrate (*e.g.*, chromogen) which is chemically altered by an enzymatic label, epitope retrieval solution, control samples (positive and/or negative controls), control slide(s) etc.

[0273] It is understood that any of the above articles of manufacture may include an immunoconjugate described herein in place of or in addition to a wnt pathway antagonist.

EXAMPLES

[0274] The following are examples of methods and compositions of the invention. It is understood that various other embodiments may be practiced, given the general description provided above.

Materials and Methods for Examples

Samples, DNA and RNA preps and MSI testing

[0275] Patient-matched fresh frozen primary colon tumors and normal tissue samples were obtained from commercial sources subjected to genomic analysis described below. All tumor and normal tissue were subject to pathology review. From a set of 90 samples 74 tumor pairs were identified for further analysis. Tumor DNA and RNA were extracted using Qiagen AllPrep DNA/RNA kit (Qiagen, CA). Tumor samples were assessed for microsatellite instability using an MSI detection kit (Promega, WI).

Exome capture and sequencing

[0276] Seventy two tumor samples and matched normal tissues were analyzed by exome sequencing. Exome capture was performed using SeqCap EZ human exome library v2.0 (Nimblegen, WI) consisting of 2.1 million empirically optimized long oligonucleotides that target ~30,000 coding genes (~300,000 exons, total size 36.5 Mb). The library was capable of capturing a total of 44.1 Mb of the genome, including genes and exons represented in RefSeq (Jan 2010), CCDS (Sept 2009) and miRBase (v.14, Sept 2009). Exome capture libraries generated were sequenced on HiSeq 2000 (Illumina, CA). One lane of 2x75 bp paired-end data was collected for each sample.

RNA-seq

[0277] RNA from 68 colon tumor and matched normal sample pairs was used to generate RNA-seq libraries using TruSeq RNA Sample Preparation kit (Illumina, CA). RNA-seq libraries were multiplex (two per lane) and sequenced on HiSeq 2000 as per manufacturer's recommendation (Illumina, CA). ~30 million 2 x 75bp paired-end sequencing reads per sample were generated.

Sequence data processing

[0278] All short read data was evaluated for quality control using the Bioconductor ShortRead package. Morgan, M. *et al., Bioinformatics* **25**, 2607-2608 (2009). To confirm that all samples were identified correctly, all exome and RNA-seq data variants that overlapped with the Illuman 2.5 M array data were compared and checked for consistency. An all by all germline variant comparison was also done between all samples to check that all pairs were correctly matched between the tumor and normal and correspondingly did not match with any other patient pair above a cutoff of 90%.

Variant calling

[0279] Sequencing reads were mapped to UCSC human genome (GRCh37/hg19) using BWA software set to default parameters. Li, H. & Durbin, R. *Bioinformatics* **25**, 1754-1760 (2009). Local realignment, duplicate marking and raw variant calling were performed as described previously. DePristo, M. A. *et al., Nat. Genet.* **43**, 491-498 (2011). Known germline variations represented in dbSNP Build 131 (Sherry, S. T. *et al., Nucleic Acids Res* **29**, 308-311 (2001)), but not represented in COSMIC (Forbes, S. A. *et al., Nucleic Acids Res.* **38**, D652-657 (2010)), were additionally filtered out. In addition variants that were present in both the tumor and normal samples were removed as germline variations. Remaining variations present in the tumor sample, but absent in the matched normal were predicted to be somatic. Predicted somatic variations were additionally filtered to include only positions with a minimum of 10x coverage in both the tumor and matched normal as well as an observed variant allele frequency of <3% in the matched normal and a significant difference in variant allele counts using Fisher's exact test. To evaluate the performance of this algorithm, 807 protein-altering variants were randomly selected and validated them using Sequenom (San Diego, CA) nucleic acid technology as described previously. Kan, Z. *et al., Nature* **466**, 869-873 (2010). Of these, 93% (753) validated as cancer specific with the invalidated variants being equally split between not being seen in the tumor and also being seen in the

adjacent normal (germline). Indels were called using the GATK Indel Genotyper Version 2 which reads both the tumor and normal BAM file for a given pair. DePristo, M. A. *et al., Nat. Genet.* **43**, 491-498 (2011).

[0280] In order to identify variants grossly violating a binomial assumption, or variant calls affected by a specific mapper, Sequenom validated variants were additionally included using the following algorithm. Reads were mapped to UCSC human genome (GRCh37/hg19) using GSNAP. Wu, T. D. & Nacu, S. *Bioinformatics* **26**, 873-881 (2010). Variants seen at least twice at a given position and greater than 10% allele frequency were selected. These variants were additionally filtered for significant biases in strand and position using Fisher's exact test. In addition variants that did not have adequate coverage in the adjacent normal as determined as at least a 1% chance of being missed using a beta-binomial distribution at a normal allele frequency of 12.5% were excluded. All novel protein-altering variants included in the second algorithm were validated by Sequenom, which resulted in a total of 515 additional variants. The effect of all non-synonymous somatic mutations on gene function was predicted using SIFT (Ng, P. C. & Henikoff, S. *Genome Res* **12**, 436-446 (2002)) and PolyPhen (Ramensky, V., Bork, P. & Sunyaev, S. *Nucleic Acids Res* **30**, 3894-3900 (2002)). All variants were annotated using Ensembl (release 59, www.ensembl.org).

Validation of somatic mutations and indels

[0281] Single base pair extension followed by nucleic acid mass spectrometry (Sequenom, CA) was used as described previously to validate the predicted somatic mutations. Tumor and matched normal DNA was whole genome amplified and using the REPLI-g Whole Genome Amplification Midi Kit (Qiagen, CA) and cleaned up as per manufacturer's recommendations and used. Variants found as expected in the tumor but absent in the normal were designated somatic. Those that were present in both tumor and normal were classified as germline. Variants that could not be validated in tumor or normal were designated as failed. For indel validation, primers for PCR were designed that will generate an amplicon of ~300 bp that contained the indel region. The region was PCR amplified in both tumor and matched normal sample using Phusion (NEB, MA) as per manufacturer's instructions. The PCR fragments were then purified on a gel an isolated the relevant bands and Sanger sequenced them. The sequencing trace files were analyzed using Mutation Surveyor (SoftGenetics, PA). Indels that were present in the tumor and absent in the normal were designated somatic and are reported in Table 3.

Mutational significance

[0282] Mutational significance of genes was evaluated using a previously described method. Briefly this method can identify genes that have statistically significant more protein-altering mutations than what would be expected based on a calculated background mutation rate. The background mutation rate was calculated for six different nucleotide mutation categories (A,C,G,T,CG1,CG2) in which there was sufficient coverage (≥10x) in both the tumor and matched normal sample. A nonsynonymous to synonymous ratio, r_i, was calculated using a simulation of mutating all protein coding nucleotides and

seeing if the resulting change would result in a synonymous or nonsynonymous change. The background mutation rate, f_i, was determined by multiplying the number of synonymous somatic variants by r_i and normalizing by the total number of protein-coding nucleotides. The number of expected mutations for a given gene was determined as the number of protein-coding bases multiplied by f_i and integrated across all mutation categories. A p-value was calculated using a Poisson probability function given the expected and observed number of mutations for each gene. P values were corrected for multiple testing using the Benjamini Hochberg method and the resulting q-values were converted to q-scores by taking the negative log10 of the q-values. Given that different mutation rates existed for the MSI and MSS samples, qscores were calculated separately for each with the two hypermutated samples being removed completely. In order to not underestimate the background mutation rates, the seven samples with less than 50% tumor content were excluded from the analysis. Pathway mutational significance was also calculated as previously described, with the exception that the BioCara Pathway database used used which was downloaded as part of MSigDB (Subramanian A. *et al.*, *Proc. of the Natl Acad. Of Sci. USA* **102**, 15545-15550 (2005)).

Whole genome sequencing and analysis

[0283] Paired-end DNA-Seq reads were aligned to GRCh37 using BWA. Further processing of the alignments to obtain mutation calls was similar to the exome sequencing analysis using the GATK pipeline. Copy-number was calculated by computing the number of reads in 10 kb non-overlapping bins and taking the ratio tumor/normal of these counts. Chromosomal breakpoints were predicted using breakdancer. Chen, K. *et al., Nat. Methods* **6**, 677-681 (2009). Genome plots were created using Circos (Krzywinski, M. *et al.*, *Genome Res.* **19**, 1639-1459 (2009)).

RNA-seq data analysis

[0284] RNA-Seq reads were aligned to the human genome version GRCh37 using GSNAP (Wu, T.D. &Nacu, S. *Bioinformatics* **26**, 873-881 (2010). Expression counts per gene were obtained by counting the number of reads aligning concordant and uniquely to each gene locus as defined by CCDS. The gene counts were then normalized for library size and subsequently variance stabilized using the DESeq Bioconductor software package. Anders, S. & Huber, W. *Genome Biology* **11**, R106 (2010). Differential gene expression was computed by pairwise t-tests on the variance stabilized counts followed by correction for multiple testing using the Benjamini & Hochberg method.

SNP array data generation and analysis

[0285] Illumina HumanOmni2.5_4v1 arrays were used to assay 74 colon tumors and matched normals for genotype, DNA copy and LOH at ~2.5 million SNP positions. These samples all passed our quality control metrics for sample identity and data quality (*see* below). A subset of 2295239 high-quality SNPs was selected for all analyses.

[0286] After making modifications to permit use with Illumina array data, the PICNIC (Greenman, C. D. *et al., Biostatistics* **11**, 164-175 (2010)) algorithm was applied to estimate total copy number

and allele-specific copy number / LOH. Modification included replacement of the segment initialization component with the CBS algorithm (Venkatraman, E. S. & Olshen, A. B. *Bioinformatics* **23**, 657-663 (2007)), and adjustment of the prior distribution for background raw copy number signal (abjusted mean of 0.7393 and a standard deviation of 0.05). For the preprocessing required by PICNIC's hidden Markov model (HMM), a Bayesiaan model to estimate cluster centroids for each SNP. For SNP *k* and genotype *g*, observed data in normal sample were modeled as following a bivariate Gaussian distribution. Cluster centers for the three diploid genotypes were modeled jointly by a 6-dimensional Gaussian distribution with mean treated as a hyperparameter and set empirically based on a training set of 156 normal samples. Cluster center and within-genotype covariance matrices were modeled as inverse Wishart with scale matrix hyperparameters also set empirically and with degrees of freedom manually tuned to provide satisfactory results for a wide range of probe behavior and minor allele frequencies. Finally, signal for SNP *k* (for the A and B alleles separately) was transformed with a non-linear function:

$y = \alpha_k x^{\gamma_k} + \beta_k$ with parameters selected based on the posterior distributions computed above.

[0287] Sample identity was verified using genotype concordance between all samples. Pairs of tumors from the same patient were expected to have > 90% concordance and all other pairs were expected to have < 80% concordance. Samples failing those criteria were excluded from all analyses. Following modified PICNIC, the quality of the overall HMM fit was assessed by measuring the root mean squared error (RMSE) between the raw and HMM-fitted value for each SNP. Samples with and RMSE >1.5 were excluded from all analyses. Finally to account for two commonly observed artifacts, fitted copy number values were set to "NA" for singletons with fitted copy number 0 or when the observed and fitted means differed by more tha 2 for regions of inferred copy gain.

Recurrent DNA copy number gain and loss

[0288] Genomic regions with recurrent DNA copy gain and loss were identified using GISTIC, version 2.0. Mermel, C. H. *et al., Genome Biology* **12**, R41 (2011). Segmented integer total copy number values obtained from PICNIC, *c*, were converted to $\log_2$ ratio values, *y*, as $y = \log_2(c + 0.1) - 1$. Cutoffs of +/- 0.2 were used to categorize $\log_2$ ratio values as gain or loss, respectively. A minimum segment length of 20 SNPs and a $\log_2$ ratio "cap" value of 3 were used.

Fusion detection and validation

[0289] Putative fusions were identified using a computational pipeline developed called GSTRUCT-fusions. The pipeline was based on a generate-and-test strategy that is fundamentally similar to methodology reported previously for finding readthrough fusions. Nacu, S. *et al., BMC Med Genomics* **4**, 11 (2011). Paired-end reads were aligned using our alignment program GSNAP. Nacu, S. *et al., BMC Med Genomics* **4**, 11 (2011). GSNAP has the ability to detect splices representing translocations, inversions, and other distant fusions within a single read end.

[0290] These distant splices provided one set of candidate fusions for the subsequent testing stage. The other set of candidate fusions derived from unpaired unique alignments, where each end of the paired-end read aligned uniquely to a different chromosome, and also from paired, but discordant unique alignments, where each end aligned uniquely to the same chromosome, but with an apparent genomic distance that exceeded 200,000 bp or with genomic orientations that suggested an inversion or scrambling event.

[0291] Candidate fusions were then filtered against known transcripts from RefSeq, aligned to the genome using GMAP. Wu, T. D. & Watanabe, C. K. *Bioinformatics* **21**, 1859-1875 (2005). Both fragments flanking a distant splice, or both ends of an unpaired or discordant paired-end alignment, were required to map to known exon regions. This filtering step eliminated approximately 90% of the candidates. Candidate inversions and deletions were further eliminated that suggested rearrangements of the same gene, as well as apparent readthrough fusion events involving adjacent genes in the genome, which our previous research indicated were likely to have a transcriptional rather than genomic origin.

[0292] For the remaining candidate fusion events, artificial exon-exon junctions consisting of the exons distal to the supported donor exon and the exons proximal to the supported acceptor exon were constructed. The exons included in the proximal and distal computations were limited so that the cumulative length along each gene was within an estimated maximum insert length of 200 bp. As a control, all exon-exon junctions consisting of combinations of exons within the same gene were constructed for all genes contributing to a candidate fusion event.

[0293] In the testing stage of our pipeline, we constructed a genomic index from the artificial exon-exon junctions and controls using the GMAP_BUILD program included as part of the GMAP and GSNAP package. This genomic index and the GSNAP program with splice detection turned off were used to re-align the original read ends that were not concordant to the genome. Reads were extracted that aligned to an intergenic junction corresponding to a candidate fusion, but not to a control intragenic junction.

[0294] The results of the re-alignment were filtered to require that each candidate fusion have at least one read with an overhang of 20 bp. Each candidate fusion was also required to have at least 10 supporting reads. For each remaining candidate fusion, the two component genes were aligned against each other using GMAP and eliminated the fusion if the alignment had any region containing 60 matches in a window of 75 bp. The exon-exon junction were also aligned against each of the component genes using GMAP and eliminated the fusion if the alignment had coverage greater than 90% of the junction and identity greater than 95%.

[0295] Validation of gene fusions was done using reverse transcription (RT)-PCR approach using both colon tumor and matched normal samples. 500 ng of total RNA was reverse transcribed to cDNA with a High Capacity cDNA Reverse Transcription kit (Life Technologies, CA) following manufacturer's instructions. 50 ng of cDNA was amplified in a 25 µl reaction containing 400 pM of each primer, 300

μM of each deoxynucleoside triphosphates and 2.5 units of LongAmp Taq DNA polymerase (New England Biolabs, MA). PCR was performed with an initial denaturation at 95°C for 3 minutes followed by 35 cycles of 95°C for 10 seconds, 56°C for 1 minute and 68°C for 30 seconds and a final extension step at 68°C for 10 minutes. 3 μl of PCR product was run on 1.2% agarose gel to identify samples containing gene fusion. Specific PCR products were purified with either a QIAquick PCR Purification kit or Gel Extraction kit (Qiagen, CA). The purified DNA was either sequenced directly with PCR primers specific to each fusion or cloned into TOPO cloning vector pCR2.1 (Life Technologies, CA) prior to Sanger sequencing. The clones were sequenced using Sanger sequencing on a ABI3730xl (Life Technologies, CA) as per manufacturer instructions. The Sanger sequencing trace files were analyzed using Sequencher (Gene Cordes Corp., MI).

RSPO fusion activity testing

[0296] Eukaryotic expression plasmid pRK5E driving the expression of c-terminal FLAG tag EIF3E, PTPKR (amino acids 1-387), RSPO2, RSPO3, EIF3E(e1)-RSPO2(e2), PTPRK(e1)-RSPO3(e2), PTPRK(e7)-RSPO3(e2) was generated using standard PCR and cloning strategies.

Cells, conditioned media, immunoprecipitation and Western blot

[0297] HEK 293T, human embryonic kidney cells, were maintained in DMEM supplemented with 10% FBS. For expression analysis and condition media generation 3 x 10^5 HEK29T cells were plated in 6-well plates in 1.5 ml DMEM containing 10%FBS. Cells were transfected with 1 μg of DNA using Figure 6 (Roche) according to the manufacturer's instructions. Media was conditioned for 48 hours, collected, centrifuged, and used to stimulate the luciferase reporter assay (final concentration 0.1- 0.4X). For expression analysis, media was collected, centrifuged to remove debris and used for immunoprecipitation.

Luciferase reporter assays

[0298] HEK 293T cells were plated at a density of 50,000 cells/ml in 90 μl of media containing 2.5% FBS per well of a 96-well plate. After 24 hours, cells were transfected using Figure 6 according to manufacturer's instructions (Roche, CA) with the following DNA per well: 0.04 μg TOPbrite Firefly reporter (*Nature Chem. Biol.* 5, 217 - 219 (2009)), 0.02 μg pRL SV40-Renilla (Promega, WI) and 0.01 μg of the appropriate R-spondin or control constructs. Cells were stimulated with 25 μl of either fresh or conditioned media containing 10% FBS with or without rmWnt3a (20-100 ng/ml (final), R&D Systems, MN). Following 24 hours stimulation, 50 μl of media was removed and replaced with Dual-Glo luciferase detection reagents (Promega, WI) according to manufacturer's instructions. An Envision Luminometer (Perkin-Elmer, MA) was used to detect luminescence. To control for transfection efficiency, Firefly luciferase levels were normalized to Renilla luciferase levels to generate the measure of relative luciferase units (RLU). Experimental data was presented as mean ± SD from three independent wells.

Immunoprecipitation and Western blot

[0299] To confirm that the RSPO wild type and RSPO fusion proteins were secreted, FLAG tagged proteins were immunoprecipitated from the media using anti-FLAG-M2 antibody coupled beads (Sigma, MO), boiled in SDS-PAGE loading buffer, resolved on a 4-20% SDS-PAGE (Invitrogen, Carlsbad, CA) and transferred onto a nitrocellulose membrane. RSPO and other FLAG tagged proteins expressed in cells were detected from cell lysates using western blot as described before (Bijay p85 paper). Briefly, immunoprecipitated proteins and proteins from cell lysates were detected by Western blot using FLAG-HRP-conjugated antibody and chemiluminescences Super signal West Dura chemiluminescence detection substrate (Thermo Fisher Scientific, IL).

Example 1-CRC Mutation Profile

[0300] Identifying and understanding changes in cancer genomes is essential for the development of targeted therapeutics. In these examples, a systematically analysis of over 70 pairs of primary human colon cancers was undertaken by applying next generation sequencing to characterize their exomes, transcirptomes and copy number alterations. 36,303 protein altering somatic changes were identified that include several new recurrent mutations in Wnt pathway genes like *TCF12* and *TCF7L2*, chromatin remodeling proteins such as *TET2* and *TET3* and receptor tyrosine kinases including *ERBB3*. The analysis for significant cancer genes identified 18 candidates, including cell cycle checkpoint kinase ATM. The copy number and RNA-seq data analysis identified amplifications and corresponding overexpression of *IGF2* in a subset of colon tumors. Further, using RNA-seq data multiple fusion transcripts were identified including recurrent gene fusions of the R-spondin genes *RSPO2* and *RSPO3*, occurring in 10% of the samples. The RSPO fusion proteins were demonstrated to be biologically active and potentiate Wnt signaling. The *RSPO* fusions aremutually exclusive with *APC* mutations indicating that they likely play a role in activating Wnt signaling and tumorigenesis. The R-spondin gene fusions and several other gene mutations identified in these examples provide new opportunities for therapeutic intervention in colon cancer.

[0301] 74 primary colon tumors and their matched adjacent normal samples were characterized. Whole-exome sequencing for 72 (15 MSI and 57 MSS) of the 74 colon tumor and adjacent normal sample pairs to assess the mutational spectra was performed. These 74 tumor/normal pairs were also analyzed on Illumina 2.5M array to assess chromosomal copy number changes. RNA-seq data for 68 tumor/normal pairs was also obtained. Finally, the genome of an MSI and MSS tumor/normal pair at 30x coverage from this set of samples was sequenced and analyzed.

Table 2 - Somatic mutations

GeneName	Mutation	Ref	Position_cDNA	Var	GeneName	Mutation	Ref	Position_cDNA	Var	GeneName	Mutation	Ref	Position_cDNA	Var
A1BG	A137T	C	471	T	ACSM1	R133Q	C	466	T	AGL	R1098C	C	3767	T	ANKHD1	R1224W	C	3794	T
A1BG	R345H	C	1096	T	ACSM2A	D431N	G	1405	A	AGMAT	L195P	A	727	G	ANKHD1	S2352L	C	7179	T
A1BG	P487H	G	1522	T	ACSM2A	T249S	A	859	T	AGPAT2	R121W	G	427	A	ANKHD1	G62S	G	308	A
A1BG	E339D	C	1079	A	ACSM2A	T491M	C	1586	T	AGPAT2	R90C	G	334	A	ANKHD1	Y1156*	T	3592	G
A1BG	D187Y	C	621	A	ACSM2A	D396Y	G	1300	T	AGPAT6	R223*	C	1606	T	ANKHD1	S1996N	G	6111	A
A1CF	A391V	G	1217	A	ACSM2B	P416A	G	1399	C	AGPAT6	I31T	T	1031	C	ANKHD1	P1091Q	C	3396	A
A1CF	N287S	T	905	C	ACSM3	V123I	G	554	A	AGPAT6	A411V	C	2171	T	ANKHD1	R1871H	G	5736	A
A2M	R945Q	C	3142	T	ACSM4	R99Q	G	313	A	AGPHD1	A267T	G	912	A	ANKHD1	P2202L	C	6729	T
A2M	S1026N	C	3385	T	ACSM4	D331Y	G	1008	T	AGPS	D180V	A	685	T	ANKHD1	D1301G	A	4026	G
A2M	A1151P	C	3759	G	ACSM4	E530D	G	1607	T	AGPS	K143T	A	574	C	ANKHD1	-	T	0	A
A2M	G852R	C	2862	T	ACSM4	K531T	A	1609	C	AGPS	A276V	C	973	T	ANKIB1	E504K	G	1886	A
A2M	A88S	C	570	A	ACSM5	D449V	A	1493	T	AGR2	P126H	G	419	T	ANKIB1	P291S	C	1247	T
A2M	T1209A	T	3933	C	ACSM5	A226P	G	823	C	AGR3	E89*	C	336	A	ANKIB1	A714V	C	2517	T
A2M	R1297H	C	4198	T	ACSM5	Q148R	A	590	G	AGRN	S330R	C	1040	A	ANKIB1	A735V	C	2580	T
A2M	K664N	C	2300	A	ACSS1	R537*	G	1689	A	AGRN	-	G	0	A	ANKK1	R43C	C	221	T
A2M	H358Q	G	1382	T	ACSS1	L497P	A	1570	G	AGRN	R1308C	C	3972	T	ANKK1	L606M	C	1910	A
A2M	A90T	C	576	T	ACSS1	A315P	C	1023	G	AGRN	A1506V	C	4567	T	ANKK1	N200S	A	693	G
A2M	R598C	G	2100	A	ACSS3	K606R	A	1908	G	AGRN	R339H	G	1066	A	ANKLE1	R415W	C	1519	T
A2ML1	S840Y	C	2550	A	ACSS3	P26L	C	168	T	AGRN	C540R	T	1668	C	ANKLE2	R659*	G	2042	A
A2ML1	V924E	T	2802	A	ACSS3	L294R	T	972	G	AGT	E423A	T	1483	G	ANKLE2	I253S	A	825	C
A2ML1	W737L	G	2241	T	ACTA1	R314H	C	1044	T	AGT	D156H	C	681	G	ANKMY1	V541M	C	1760	T
A2ML1	T523A	A	1598	G	ACTA2	R97H	C	356	T	AGTPBP1	R314W	G	940	A	ANKMY1	R20H	C	198	T
A2ML1	L1202F	G	3637	T	ACTA2	E109D	C	393	A	AGTPBP1	R597I	C	1790	A	ANKMY1	D514Y	C	1679	A
A2ML1	F355V	T	1094	G	ACTB	V139A	A	608	G	AGTR1	R137C	C	800	T	ANKMY2	E440D	C	1564	A
A4GALT	P305L	G	1404	A	ACTB	V287M	C	1051	T	AGTRAP	H153R	A	517	G	ANKRD1	N83H	T	496	G
A4GALT	R147W	G	929	A	ACTBL2	V371I	C	1213	T	AGXT	I46F	A	523	T	ANKRD10	T37A	T	244	C
A4GALT	A335D	G	1494	T	ACTBL2	R40*	G	220	A	AGXT	A294V	C	1268	T	ANKRD10	E332D	C	1131	A
A4GALT	F186C	A	1047	C	ACTL6A	L157F	G	684	T	AGXT2	L342V	G	1225	C	ANKRD11	A1840V	G	5980	A
AAAS	L18I	G	215	T	ACTL6B	H248Y	G	849	A	AGXT2	T79M	G	437	A	ANKRD11	R440*	G	1779	A
AAAS	R230*	G	851	A	ACTL6B	R338C	G	1119	A	AGXT2	-	T	0	C	ANKRD11	A1288T	C	4323	T
AACS	S84*	C	457	A	ACTL6B	K86N	C	365	A	AGXT2	F108L	A	525	C	ANKRD11	E2522K	C	8025	T
AACS	G592R	G	1980	A	ACTL7A	A349T	G	1102	A	AGXT2L1	R468K	C	1558	T	ANKRD11	S1698N	C	5554	T
AADAC	L173F	C	643	T	ACTL7B	A410G	G	1294	C	AGXT2L1	V236A	A	862	G	ANKRD12	R1308*	C	4162	T

AADAC	L344I	C	1156	A	ACTL7B	D247N	C	804	T	AGXT2L2	R195H	C	819	T	ANKRD12	R1791H	G	5612	A
AADACL2	H111R	A	452	G	ACTL8	A168T	G	718	A	AHCTF1	N216T	T	647	G	ANKRD12	A1210V	C	3869	T
AADACL2	F15C	T	164	G	ACTL8	V292A	T	1091	C	AHCTF1	T1947A	T	5839	C	ANKRD12	L306S	T	1157	C
AADACL2	L302I	C	1024	A	ACTL9	F350L	G	1171	T	AHCTF1	R619C	G	1855	A	ANKRD13A	R174H	G	780	A
AADACL3	D172Y	G	719	T	ACTL9	S89L	G	387	A	AHCTF1	L709I	G	2125	T	ANKRD13B	T57M	C	324	T
AADACL3	R95H	G	489	A	ACTL9	R190C	G	689	A	AHCYL2	A488V	C	1517	T	ANKRD13B	G302S	G	1058	A
AADACL3	R338S	A	1219	C	ACTL9	R171H	C	633	T	AHDC1	A709V	G	2749	A	ANKRD13B	R606W	C	1970	T
AADACL4	V79M	G	235	A	ACTL9	R400W	G	1319	A	AHDC1	H1455R	T	4987	C	ANKRD13C	T452M	G	1669	A
AADAT	K282N	T	963	G	ACTN1	N473S	T	1601	C	AHDC1	Y1002C	T	3628	C	ANKRD13C	Q202L	T	919	A
AADAT	M306V	T	1033	C	ACTN1	K198T	T	776	G	AHDC1	R743L	C	2851	A	ANKRD13D	A223V	C	1582	T
AADAT	F52C	A	272	C	ACTN2	E520A	A	1725	C	AHI1	C952*	A	3155	T	ANKRD13D	D431N	G	2205	A
AAK1	L665I	G	2370	T	ACTN2	A882T	G	2810	A	AHNAK	G1840W	C	5818	A	ANKRD13D	A389T	G	2079	A
AAK1	R141H	C	799	T	ACTN2	L104W	T	477	G	AHNAK	L4394S	A	13481	G	ANKRD13D	R278H	G	1747	A
AAK1	A592V	G	2152	A	ACTN2	A257V	C	936	T	AHNAK	M1857V	T	5869	C	ANKRD13D	-	G	0	T
AAMP	S20R	T	150	G	ACTN2	R506I	G	1683	T	AHNAK	G90W	C	568	A	ANKRD16	P74H	G	765	T
AARS	I382N	A	1252	T	ACTN3	Q450H	G	1466	C	AHNAK	L2241P	A	7022	G	ANKRD17	L1237M	G	3826	T
AARS	R206W	G	723	A	ACTN4	R339W	C	1091	T	AHNAK	E3455K	C	10663	T	ANKRD17	K1505N	T	4632	G
AARS	A671S	C	2118	A	ACTR1B	R199H	C	813	T	AHNAK	K730N	T	2490	G	ANKRD17	S792N	C	2492	T
AARS2	R480W	G	1441	A	ACTR1B	F57L	G	388	T	AHNAK	K1652T	T	5255	G	ANKRD18A	A108V	G	698	A
AARS2	A933S	C	2800	A	ACTR2	Y330H	T	1061	C	AHNAK	P4127A	G	12679	C	ANKRD18A	A759V	G	2651	A
AARS2	T530A	T	1591	C	ACTR3B	G356R	G	1200	A	AHNAK	F5768L	G	17604	T	ANKRD18A	T85A	T	628	C
AARS2	-	C	0	A	ACTR3B	V377M	G	1263	A	AHNAK	K5022T	T	15365	G	ANKRD18A	N723D	T	2542	C
AARSD1	N333K	A	1217	T	ACTR3C	E102K	C	315	T	AHNAK	F4073C	A	12518	C	ANKRD18B	R556H	G	1763	A
AASDHPPT	K151*	A	604	T	ACTR5	R450Q	G	1386	A	AHNAK	V4051A	A	12452	G	ANKRD18B	E452*	G	1450	T
AASS	R267C	G	895	A	ACTR5	R518W	C	1589	T	AHNAK	I3214S	A	9941	C	ANKRD2	R127W	C	646	T
AASS	M689I	C	2163	A	ACTR5	S389N	G	1203	A	AHNAK	A3200V	G	9899	A	ANKRD2	-	A	0	G
AASS	E425*	C	1369	A	ACTR5	R12H	G	72	A	AHNAK	K2141E	T	6721	C	ANKRD24	H451Y	C	1351	T
AASS	G361R	C	1177	T	ACTR6	R332L	G	1760	T	AHNAK	E1443*	C	4627	A	ANKRD24	V1061M	G	3181	A
AASS	L133R	A	494	C	ACTR8	A4G	G	112	C	AHNAK2	G2891S	C	8791	T	ANKRD24	S316G	A	946	G
AASS	G158R	C	568	T	ACTRT1	G302R	C	1096	T	AHNAK2	N5651S	T	17072	C	ANKRD24	T723M	C	2168	T
AATF	G148D	G	694	A	ACTRT1	V38I	C	304	T	AHNAK2	V1186A	A	3677	G	ANKRD24	-	G	0	T
AATK	H747R	T	2265	C	ACTRT2	Y56C	A	372	G	AHNAK2	V4034M	C	12220	T	ANKRD24	L1222I	C	3664	A
AATK	Q362P	T	1110	G	ACVR1B	R444*	C	1372	T	AHNAK2	M3891T	A	11792	G	ANKRD26	R802*	G	2576	A
AATK	Y372F	T	1140	A	ACVR1C	R234C	G	1061	A	AHNAK2	S2207T	A	6739	T	ANKRD26	Q336R	T	1179	C
AATK	R485H	C	1479	T	ACVR2A	I488V	A	2098	G	AHNAK2	A3792T	C	11494	T	ANKRD26	M407V	T	1391	C
AATK	D464N	C	1415	T	ACVR2B	E50K	G	620	A	AHNAK2	D4773G	T	14438	C	ANKRD26	A908T	C	2894	T
ABAT	A226V	C	865	T	ACVR2B	K434N	G	1774	T	AHNAK2	P3227S	G	9799	A	ANKRD26	K910Q	T	2900	G
ABCA1	R230H	C	1084	T	ACVR2B	V290A	T	1341	C	AHNAK2	E5680G	T	17159	C	ANKRD26	V532G	A	1767	C
ABCA1	S824L	G	2866	A	ACVR2B	E286K	G	1328	A	AHNAK2	G3250D	C	9869	T	ANKRD26	F5C	A	186	C

ABCA1	R1839H	C	5911	T	ACY3	R159W	G	646	A	AHNAK2	S4966Y	G	15017	T	ANKRD27	C88R	A	418	G
ABCA1	S689I	C	2461	A	ADAD1	R508Q	G	1708	A	AHNAK2	F4963C	A	15008	C	ANKRD27	-	C	0	T
ABCA1	Y1126C	T	3772	C	ADAD1	T424A	A	1455	G	AHNAK2	L3729V	A	11305	C	ANKRD28	R401H	C	1202	T
ABCA1	L932M	G	3189	T	ADAD1	Y139C	A	601	G	AHNAK2	G2494R	C	7600	T	ANKRD28	R401C	G	1201	A
ABCA1	A1010V	G	3424	A	ADAD1	S11L	C	217	T	AHR	V660M	G	2621	A	ANKRD28	R208C	G	622	A
ABCA1	R2030Q	C	6484	T	ADAD1	S346Y	C	1222	A	AHR	M348V	A	1685	G	ANKRD28	I681S	A	2042	C
ABCA10	E1168K	C	4381	T	ADAD1	K365N	A	1280	C	AHRR	R72H	G	259	A	ANKRD28	R208C	G	622	A
ABCA10	E399*	C	2074	A	ADAD2	A48V	C	236	T	AHSG	V128A	T	459	C	ANKRD28	R171*	G	511	A
ABCA10	E1443*	C	5206	A	ADAD2	S62L	C	278	T	AHSP	R71W	C	314	T	ANKRD30A	T306M	C	1016	T
ABCA10	T583I	G	2627	A	ADAD2	G595W	G	1876	T	AHSP	D9Y	G	128	T	ANKRD30A	K468E	A	1501	G
ABCA11P	R341I	C	1071	A	ADAM10	G500E	C	1943	T	AICDA	R128W	G	461	A	ANKRD30A	N454H	A	1459	C
ABCA11P	G607D	C	1869	T	ADAM10	K714N	T	2586	G	AIFM2	G231D	C	710	T	ANKRD30A	H1402N	C	4303	A
ABCA11P	I762L	T	2333	G	ADAM11	R311W	C	931	T	AIFM3	V337I	G	1249	A	ANKRD31	N1060T	T	3371	G
ABCA11P	K621I	T	1911	A	ADAM11	R284C	C	850	T	AIFM3	T226M	C	917	T	ANKRD31	E490D	C	1662	A
ABCA11P	E570D	C	1759	A	ADAM12	Y310H	A	1238	G	AIM1	R1527*	C	5066	T	ANKRD31	G1211D	C	3824	T
ABCA12	V1753A	A	5478	G	ADAM12	H871R	T	2922	C	AIM1	R1587*	C	5246	T	ANKRD32	P443H	C	1747	A
ABCA12	S119N	C	576	T	ADAM12	R449C	G	1655	A	AIM1	Y925C	A	3261	G	ANKRD32	L335S	T	1423	C
ABCA12	I736S	A	2427	C	ADAM12	D399G	T	1506	C	AIM1	A73S	G	704	T	ANKRD32	E268*	G	1221	T
ABCA12	V1305G	A	4134	C	ADAM17	E406*	C	1399	A	AIM1L	D336G	T	1006	C	ANKRD32	E319*	G	1374	T
ABCA12	T1982I	G	6165	A	ADAM17	R725H	C	2357	T	AIM1L	E524K	C	1569	T	ANKRD32	T334A	A	1419	G
ABCA12	R1299Q	C	4116	T	ADAM18	K44N	G	174	T	AIM2	E147*	C	728	A	ANKRD33B	A431V	C	1377	T
ABCA12	A2568V	G	7923	A	ADAM18	R543W	C	1669	T	AIMP1	R73*	C	258	T	ANKRD33B	A168V	C	588	T
ABCA12	K508N	T	1744	A	ADAM18	K409T	A	1268	C	AIMP2	T314M	C	1060	T	ANKRD33B	R425Q	G	1359	A
ABCA12	A2405S	C	7433	A	ADAM19	E179K	C	599	T	AIMP2	R65C	C	312	T	ANKRD34A	T420M	C	2552	T
ABCA12	A835V	G	2724	A	ADAM19	S851P	A	2615	G	AIP	R323W	C	1092	T	ANKRD34A	T79M	C	1529	T
ABCA12	E1679G	T	5256	C	ADAM19	G136*	C	470	A	AIP	Y261H	T	906	C	ANKRD34B	R362I	C	1758	A
ABCA12	R248I	C	963	A	ADAM2	K441E	T	1396	C	AIPL1	V269M	C	866	T	ANKRD34B	R24H	C	744	T
ABCA13	R3162Q	G	9509	A	ADAM21P1	A676T	G	2026	A	AJAP1	A218T	G	1346	A	ANKRD34C	E45K	G	133	A
ABCA13	R4217C	C	1267 3	T	ADAM21P1	F448Y	T	1343	A	AJAP1	N387T	A	1854	C	ANKRD34C	K367N	A	1101	C
ABCA13	V5028A	T	1510 7	C	ADAM22	M212V	A	634	G	AK1	K147E	T	535	C	ANKRD35	A512D	C	1622	A
ABCA13	V3662I	G	1100 8	A	ADAM23	G413*	G	1565	T	AK2	D112N	C	498	T	ANKRD36	C17*	C	239	A
ABCA13	R3489W	C	1048 9	T	ADAM23	I794M	A	2710	G	AK5	G146D	G	700	A	ANKRD36	K978N	A	3122	C
ABCA13	D4133A	A	1242 2	C	ADAM23	R292C	C	1202	T	AK5	-	G	0	T	ANKRD36B	T689M	G	2245	A
ABCA13	E117D	G	375	T	ADAM23	W441*	G	1651	A	AK5	R13M	G	301	T	ANKRD36B	E239*	C	894	A
ABCA13	K1214T	A	3665	C	ADAM29	E146*	G	1025	T	AK7	R640C	C	1962	T	ANKRD40	D99E	A	567	T
ABCA13	K1671N	G	5037	T	ADAM29	Q731H	G	2782	T	AK7	R681I	G	2086	T	ANKRD42	R558C	C	1672	T

ABCA13	K3471N	G	10437	T	ADAM29	C446Y	G	1926	A	AKAP1	L53W	T	158	G	ANKRD42	L617P	T	1850	C
ABCA13	R3497Q	G	10514	A	ADAM29	V69A	T	795	C	AKAP11	S589P	T	1940	C	ANKRD43	D377N	G	1410	A
ABCA13	A4123T	G	12391	A	ADAM29	K537N	A	2200	C	AKAP11	R1608G	A	4997	G	ANKRD44	P562S	G	1684	A
ABCA13	K4706N	G	14142	T	ADAM30	V481I	C	1600	T	AKAP11	K629Q	A	2060	C	ANKRD44	A837V	G	2510	A
ABCA13	H5017R	A	15074	G	ADAM30	F167V	A	658	C	AKAP11	C837G	T	2684	G	ANKRD45	V64I	C	204	T
ABCA13	Q1918H	G	5778	T	ADAM32	P452L	C	1600	T	AKAP11	K1227T	A	3855	C	ANKRD46	R126*	G	555	A
ABCA2	R2103S	G	6357	T	ADAM32	D332A	A	1240	C	AKAP12	E147K	G	679	A	ANKRD49	S43G	A	266	G
ABCA2	P1895L	G	5734	A	ADAM32	R511I	G	1777	T	AKAP12	S850P	T	2788	C	ANKRD5	R186C	C	957	T
ABCA2	T1656M	G	5017	A	ADAM32	W710C	G	2375	T	AKAP12	L243P	T	968	C	ANKRD5	E94*	G	681	T
ABCA3	R1355Q	C	4590	T	ADAM9	-	G	0	A	AKAP12	E164K	G	730	A	ANKRD5	S248L	C	1144	T
ABCA3	R1236C	G	4232	A	ADAM9	R474*	C	1498	T	AKAP12	R814Q	G	2681	A	ANKRD50	R324C	G	2008	A
ABCA3	R1039H	C	3642	T	ADAM9	T593M	C	1856	T	AKAP12	K1734E	A	5440	G	ANKRD50	C36Y	C	1145	T
ABCA3	G887C	C	3185	A	ADAM9	R725I	G	2252	T	AKAP12	R671H	G	2252	A	ANKRD50	R362*	G	2122	A
ABCA3	R170C	G	1034	A	ADAMTS1	R551I	C	2107	A	AKAP13	M1278I	G	4004	A	ANKRD50	K32E	T	1132	C
ABCA3	S975*	G	3450	T	ADAMTS1	R52C	G	609	A	AKAP13	Y33N	T	267	A	ANKRD50	Q1230R	T	4727	C
ABCA4	V1828M	C	5569	T	ADAMTS1	K771N	T	2768	G	AKAP13	K2759N	A	8447	C	ANKRD50	F224L	G	1710	T
ABCA4	G1803S	C	5494	T	ADAMTS1	S94G	T	735	C	AKAP13	R2015H	G	6214	A	ANKRD52	A297V	G	980	A
ABCA4	R511H	C	1619	T	ADAMTS1	R258H	C	1228	T	AKAP13	S2198R	A	6762	C	ANKRD52	R103Q	C	398	T
ABCA4	E684D	C	2139	A	ADAMTS1	L355I	G	1518	T	AKAP13	E2431*	G	7461	T	ANKRD52	A868T	C	2692	T
ABCA4	R1307S	T	4008	G	ADAMTS1	R190W	G	1023	A	AKAP3	S356L	G	1296	A	ANKRD52	R389C	G	1255	A
ABCA4	R1055Q	C	3251	T	ADAMTS10	P176S	G	793	A	AKAP3	I598F	T	2021	A	ANKRD54	R197*	G	782	A
ABCA4	L33S	A	185	G	ADAMTS10	C1002Y	C	3272	T	AKAP3	S571Y	G	1941	T	ANKRD54	H69R	T	399	C
ABCA5	K1432N	C	4442	A	ADAMTS10	A55T	C	430	T	AKAP3	K433N	T	1528	G	ANKRD54	P12Q	G	228	T
ABCA5	D379Y	C	1281	A	ADAMTS10	S570Y	G	1976	T	AKAP3	F354L	A	1289	G	ANKRD55	R48W	G	294	A
ABCA6	G499D	C	1671	T	ADAMTS10	R768H	C	2570	T	AKAP4	G718V	C	2277	A	ANKRD55	T144M	G	583	A
ABCA6	A398S	C	1367	A	ADAMTS12	V465I	C	1729	T	AKAP4	L348I	G	1166	T	ANKRD55	P591S	G	1923	A
ABCA6	V560I	C	1853	T	ADAMTS12	R604W	G	2146	A	AKAP4	R176H	C	651	T	ANKRD56	E789*	C	2365	A
ABCA6	R1419I	C	4431	A	ADAMTS12	V593I	C	2113	T	AKAP6	G1260R	G	3904	C	ANKRD57	G260C	G	934	T
ABCA6	E799K	C	2570	T	ADAMTS12	R1398Q	C	4529	T	AKAP6	M2011I	G	6159	T	ANKRD6	D293Y	G	1218	T
ABCA6	K485E	T	1628	C	ADAMTS12	H402Y	G	1540	A	AKAP6	L1473I	C	4543	A	ANKRD6	E330*	G	1329	T
ABCA6	E476*	C	1601	A	ADAMTS12	E566D	C	2034	A	AKAP6	S955P	T	2989	C	ANKRD6	-	T	0	C
ABCA7	L1696V	T	5317	G	ADAMTS12	R604W	G	2146	A	AKAP6	R270Q	G	935	A	ANKRD7	R66I	G	365	T
ABCA7	A589V	C	1997	T	ADAMTS12	Q325H	C	1311	A	AKAP6	K436T	A	1433	C	ANKRD7	N2T	A	173	C
ABCA7	V1536I	G	4837	A	ADAMTS12	E302K	C	1240	T	AKAP6	V614I	G	1966	A	ANKRD7	Q63H	A	357	C
ABCA7	V541M	G	1852	A	ADAMTS12	A23T	C	403	T	AKAP6	D1731N	G	5317	A	ANKRD9	R66H	C	794	T
ABCA7	R770Q	G	2540	A	ADAMTS13	G316D	G	1391	A	AKAP6	R2105I	G	6440	T	ANKRD9	Q268H	C	1401	A

ABCA7	R2002W	C	6235	T	ADAMTS13	D921G	A	3206	G	AKAP7	A178T	G	532	A	ANKRD9	E142K	C	1021	T
ABCA7	R1754Q	G	5492	A	ADAMTS13	Y957H	T	3313	C	AKAP7	P319L	C	956	T	ANKS1A	Q1112K	C	3472	A
ABCA7	S162*	C	716	A	ADAMTS13	A1145T	G	3877	A	AKAP7	N10H	A	28	C	ANKS1A	L1131H	T	3530	A
ABCA7	Y750C	A	2480	G	ADAMTS13	S1233Y	C	4142	A	AKAP7	K15N	G	45	T	ANKS1A	-	G	0	A
ABCA7	R1976H	G	6158	A	ADAMTS14	V682I	G	2044	A	AKAP8	R242Q	C	786	T	ANKS1A	A1073V	C	3356	T
ABCA7	P723S	C	2398	T	ADAMTS14	C877W	C	2631	G	AKAP8	R447Q	C	1401	T	ANKS1A	R884H	G	2789	A
ABCA7	G1786*	G	5587	T	ADAMTS14	A956T	G	2866	A	AKAP8	R206C	G	677	A	ANKS1B	D301N	C	901	T
ABCA7	K1732N	G	5427	T	ADAMTS14	G721R	G	2161	A	AKAP8	R383H	C	1209	T	ANKS1B	G172R	C	514	T
ABCA8	S348T	A	1221	T	ADAMTS14	R879C	C	2635	T	AKAP8L	D89N	C	364	T	ANKS1B	P116Q	G	347	T
ABCA8	-	C	0	T	ADAMTS14	D297N	G	889	A	AKAP8L	D338N	C	1111	T	ANKS1B	K1151R	T	3452	C
ABCA8	V334M	C	1179	T	ADAMTS14	G765S	G	2293	A	AKAP9	R3310W	C	10161	T	ANKS1B	Y745H	A	2233	G
ABCA8	A1132T	C	3573	T	ADAMTS14	G1206W	G	3616	T	AKAP9	R3758C	C	11505	T	ANKS1B	K663R	T	1988	C
ABCA8	V1034D	A	3280	T	ADAMTS14	L174F	G	522	C	AKAP9	I2828N	T	8716	A	ANKS1B	L263F	C	789	A
ABCA8	R1088C	G	3441	A	ADAMTS14	D297N	G	889	A	AKAP9	A2986T	G	9189	A	ANKS4B	N75S	A	267	G
ABCA8	P1208S	G	3801	A	ADAMTS15	R507I	G	1520	T	AKAP9	P1381L	C	4375	T	ANKS4B	A398D	C	1236	A
ABCA8	E1118K	C	3531	T	ADAMTS15	C555Y	G	1664	A	AKAP9	T2701N	C	8335	A	ANKS6	A872V	G	2636	A
ABCA8	K620T	T	2038	G	ADAMTS15	A765V	C	2294	T	AKAP9	E136G	A	640	G	ANKS6	G236V	C	728	A
ABCA9	L416F	C	1391	G	ADAMTS15	A870T	G	2608	A	AKAP9	T211A	A	864	G	ANKS6	F615C	A	1865	C
ABCA9	A1567T	C	4842	T	ADAMTS15	I54T	T	161	C	AKAP9	E1921D	G	5996	T	ANKS6	R541Q	C	1643	T
ABCA9	R655Q	C	2107	T	ADAMTS15	D189N	G	565	A	AKAP9	G3627E	G	11113	A	ANKS6	R412*	G	1255	A
ABCA9	F563L	A	1832	T	ADAMTS15	D372A	A	1115	C	AKAP9	V1101A	T	3535	C	ANKZF1	R146Q	G	611	A
ABCB1	E256*	C	1184	A	ADAMTS16	G993R	G	3115	A	AKAP9	S2485Y	C	7687	A	ANKZF1	R303Q	G	1082	A
ABCB1	I1266V	T	4214	C	ADAMTS16	V1011E	T	3170	A	AKD1	R48H	C	220	T	ANKZF1	R164Q	G	665	A
ABCB1	F759L	A	2693	G	ADAMTS16	K130N	G	528	T	AKD1	N139I	T	415	A	ANKZF1	R320Q	G	1133	A
ABCB1	K1076N	C	3646	A	ADAMTS16	L344I	C	1168	A	AKIRIN1	R143C	C	563	T	ANLN	R16*	C	267	T
ABCB1	E614*	C	2258	A	ADAMTS16	R44H	G	269	A	AKIRIN2	K86T	T	782	G	ANLN	R1040C	C	3339	T
ABCB1	F335L	G	1423	T	ADAMTS16	A947S	G	2977	T	AKNA	D278Y	C	994	A	ANO1	R246W	C	785	T
ABCB1	R286I	C	1275	A	ADAMTS17	L748M	G	2348	T	AKNA	R1198W	G	3754	A	ANO10	A572V	G	1886	A
ABCB1	R262I	C	1203	A	ADAMTS17	P466L	G	1503	A	AKNA	E611A	T	1994	G	ANO10	M373V	T	1288	C
ABCB10	R267H	C	843	T	ADAMTS17	G895D	C	2790	T	AKNA	D552G	T	1817	C	ANO2	T710I	G	2201	A
ABCB11	R616C	G	1971	A	ADAMTS17	R1075H	C	3330	T	AKNA	R1156*	G	3628	A	ANO2	R704*	G	2182	A
ABCB11	F1200C	A	3724	C	ADAMTS17	T900M	G	2805	A	AKNA	L231M	G	853	T	ANO2	S994Y	G	3053	T
ABCB4	A578V	G	1845	A	ADAMTS18	R902Q	C	3124	T	AKNA	S375I	C	1286	A	ANO2	R570H	C	1781	T
ABCB4	G687E	C	2172	T	ADAMTS18	E678D	C	2453	A	AKNA	P1046T	G	3298	T	ANO2	N247S	T	812	C
ABCB4	L158V	G	584	C	ADAMTS18	G891E	C	3091	T	AKNA	A1331V	G	4154	A	ANO2	N161I	T	554	A
ABCB4	M918L	T	2864	A	ADAMTS18	G429D	C	1705	T	AKNAD1	S780P	A	2607	G	ANO2	D657N	C	2041	T
ABCB4	K191N	C	685	A	ADAMTS18	N905H	T	3132	G	AKNAD1	E478D	C	1703	A	ANO2	N402T	T	1277	G
ABCB4	R159*	G	587	A	ADAMTS18	V896I	C	3105	T	AKR1B1	A35T	C	183	T	ANO2	F198S	A	665	G
ABCB4	G90E	C	381	T	ADAMTS18	F750L	A	2669	C	AKR1B1	F116S	A	427	G	ANO2	G357V	C	1142	A

ABCB5	R140Q	G	856	A	ADAMTS18	R651W	G	2370	A	AKR1B1	W21*	C	143	T	ANO3	V2G	T	857	G
ABCB5	R1027C	C	3516	T	ADAMTS18	I540V	T	2037	C	AKR1B10	G119V	G	676	T	ANO3	R727Q	G	3032	A
ABCB5	E1083*	G	3684	T	ADAMTS18	F485S	A	1873	G	AKR1C3	D300Y	G	1550	T	ANO4	R408M	G	1434	T
ABCB5	V472A	T	1852	C	ADAMTS18	S473*	G	1837	T	AKR1C4	V228A	T	936	C	ANO4	S385G	A	1364	G
ABCB5	H730R	A	2626	G	ADAMTS18	S367R	A	1520	C	AKR1C4	F89L	C	520	A	ANO4	R798H	G	2604	A
ABCB5	V1210I	G	4065	A	ADAMTS18	E111*	C	750	A	AKR1C4	V150I	G	701	A	ANO4	S6P	T	227	C
ABCB6	K569T	T	2023	G	ADAMTS19	E624*	G	2015	T	AKR1C4	S162P	T	737	C	ANO4	R104I	G	522	T
ABCB8	R547W	C	1705	T	ADAMTS19	R969*	C	3050	T	AKR1D1	A153V	C	500	T	ANO4	F752C	T	2466	G
ABCB8	R55C	C	229	T	ADAMTS19	A1028S	G	3227	T	AKR1D1	H93R	A	320	G	ANO4	R884*	C	2861	T
ABCB9	L30M	G	666	T	ADAMTS19	T238A	A	857	G	AKR1E2	-	G	0	T	ANO4	F896C	T	2898	G
ABCB9	V230A	A	1267	G	ADAMTS19	M426I	G	1423	T	AKR7A2	G95V	C	306	A	ANO4	D912Y	G	2945	T
ABCB9	Y412C	T	1813	C	ADAMTS19	K438N	A	1459	C	AKT2	-	C	0	T	ANO5	F568V	T	2019	G
ABCC1	D787G	A	2535	G	ADAMTS19	-	G	0	A	AKT3	-	C	0	T	ANO5	G347D	G	1357	A
ABCC1	R1158C	C	3647	T	ADAMTS19	R656Q	G	2112	A	AKT3	F207L	A	822	C	ANO5	L113I	C	654	A
ABCC1	G1519D	G	4731	A	ADAMTS2	R941H	C	2878	T	ALAD	L336P	A	1106	G	ANO5	R127I	G	697	T
ABCC10	L187P	T	775	C	ADAMTS2	D617N	C	1905	T	ALAS1	D205A	A	889	C	ANO5	N567H	A	2016	C
ABCC10	T296I	C	1102	T	ADAMTS2	A1005T	C	3069	T	ALAS2	R368Q	C	1241	T	ANO5	Q679P	A	2353	C
ABCC10	T539M	C	1831	T	ADAMTS2	R691H	C	2128	T	ALAS2	R411C	G	1369	A	ANO6	Q413R	A	1573	G
ABCC11	A597T	C	1888	T	ADAMTS2	A1020E	G	3115	T	ALB	S294L	C	954	T	ANO6	R712C	C	2469	T
ABCC11	R428Q	C	1382	T	ADAMTS2	R368Q	C	1159	T	ALB	F173V	T	590	G	ANO6	R253C	C	1092	T
ABCC11	A556V	G	1766	A	ADAMTS2	L849M	G	2601	T	ALB	P523S	C	1640	T	ANO7	R149C	C	548	T
ABCC11	K678N	C	2133	A	ADAMTS2	E428K	C	1338	T	ALCAM	A69T	G	705	A	ANO7	A130T	G	491	A
ABCC11	T256A	T	865	C	ADAMTS20	R63Q	C	188	T	ALCAM	H330N	C	1488	A	ANO7	A183T	G	650	A
ABCC12	D634N	C	2246	T	ADAMTS20	R807I	C	2420	A	ALCAM	V184L	G	1050	T	ANO7	R578H	G	1836	A
ABCC12	-	C	0	T	ADAMTS20	K1625N	C	4875	A	ALCAM	Y470C	A	1909	G	ANO7	G763D	G	2391	A
ABCC12	V867I	C	2945	T	ADAMTS20	P1274L	G	3821	A	ALDH16A1	E755K	G	2379	A	ANO7	S65I	G	297	T
ABCC12	R1273H	C	4164	T	ADAMTS20	I1718S	A	5153	C	ALDH16A1	A581V	C	1858	T	ANO7	G269D	G	909	A
ABCC12	D1301Y	C	4247	A	ADAMTS20	N1542D	T	4624	C	ALDH16A1	A581V	C	1858	T	ANO7	A204V	C	714	T
ABCC12	E1252*	C	4100	A	ADAMTS20	S237*	G	710	T	ALDH16A1	A782G	C	2461	G	ANO7	A538T	G	1715	A
ABCC12	-	C	0	A	ADAMTS20	R1000C	G	2998	A	ALDH16A1	R329W	C	1101	T	ANO7	R451H	G	1455	A
ABCC12	E928D	C	3130	A	ADAMTS20	S1346P	A	4036	G	ALDH18A1	R55H	C	302	T	ANO7	A431T	G	1394	A
ABCC12	A844T	C	2876	T	ADAMTS20	N1781H	T	5341	G	ALDH18A1	R456C	G	1504	A	ANO7	D874G	A	2724	G
ABCC12	E565*	C	2039	A	ADAMTS20	E1617D	C	4851	A	ALDH18A1	A80T	C	376	T	ANO7	R336H	G	1110	A
ABCC12	V249A	A	1092	G	ADAMTS20	R598H	C	1793	T	ALDH18A1	R64H	C	329	T	ANO8	R1036Q	C	3266	T
ABCC2	S978L	C	3046	T	ADAMTS20	-	C	0	T	ALDH18A1	R514Q	C	1679	T	ANO8	L474P	A	1580	G
ABCC2	D1396N	G	4299	A	ADAMTS3	D223A	T	705	G	ALDH1A1	Y90*	G	325	T	ANO8	R140C	G	577	A
ABCC2	A1450V	C	4462	T	ADAMTS3	A531P	C	1628	G	ALDH1A1	-	C	0	A	ANO8	R711Q	C	2291	T
ABCC2	R260W	C	891	T	ADAMTS3	G226D	C	714	T	ALDH1A2	V509M	C	2293	T	ANO9	-	C	0	T
ABCC2	F5L	C	128	A	ADAMTS3	K756N	C	2305	A	ALDH1A2	E416D	C	2016	A	ANO9	R42C	G	209	A

ABCC3	L351P	T	1132	C	ADAMTS3	F180L	G	577	T	ALDH1A2	I295T	A	1652	G	ANP32A	L228F	G	799	A
ABCC3	P652L	C	2035	T	ADAMTS4	V152M	C	883	T	ALDH1A3	A194T	G	1112	A	ANP32C	L11P	A	32	G
ABCC4	A1203V	G	3723	A	ADAMTS4	R760C	G	2707	A	ALDH1B1	R18C	C	205	T	ANPEP	R218Q	C	967	T
ABCC4	T988M	G	3078	A	ADAMTS4	A52T	C	583	T	ALDH1B1	N333I	A	1151	T	ANPEP	V109I	C	639	T
ABCC4	G34D	C	216	T	ADAMTS4	E769D	C	2736	A	ALDH1B1	T283I	C	1001	T	ANTXR1	R551S	G	1975	T
ABCC5	R1267Q	C	4041	T	ADAMTS5	P919H	G	2878	T	ALDH1L1	T451I	G	1570	A	ANTXR1	A173V	C	840	T
ABCC5	Q190H	C	811	A	ADAMTS5	L667V	G	2121	C	ALDH1L1	W546G	A	1854	C	ANTXR1	A192V	C	897	T
ABCC5	T1055M	G	3405	A	ADAMTS5	R257W	G	891	A	ALDH1L1	A514V	G	1759	A	ANTXR1	Y176*	C	850	A
ABCC8	R1394C	G	4306	A	ADAMTS5	R170C	G	630	A	ALDH1L1	A276V	G	1045	A	ANTXR2	R484Q	C	1977	T
ABCC8	A1303T	C	4033	T	ADAMTS5	T746I	G	2359	A	ALDH1L2	V720L	C	2180	A	ANTXR2	K161T	T	1245	G
ABCC8	A1185V	G	3680	A	ADAMTS5	Y784C	T	2473	C	ALDH1L2	R714Q	C	2163	T	ANUBL1	E387*	C	1411	A
ABCC8	-	A	0	G	ADAMTS5	T607A	T	1941	C	ALDH1L2	D491Y	C	1493	A	ANXA1	R72Q	G	397	A
ABCC8	E1400K	C	4324	T	ADAMTS5	I547N	A	1762	T	ALDH2	V57I	G	610	A	ANXA1	-	A	0	G
ABCC8	-	C	0	T	ADAMTS5	P205L	G	736	A	ALDH2	A120V	C	800	T	ANXA10	R128*	C	568	T
ABCC9	S562R	T	1704	G	ADAMTS6	N838D	T	3369	C	ALDH3A1	F388L	G	1164	T	ANXA10	M83V	A	433	G
ABCC9	V19A	A	76	G	ADAMTS6	Q1039R	T	3973	C	ALDH3A2	L49P	T	367	C	ANXA11	-	A	0	G
ABCC9	R1154W	G	3480	A	ADAMTS7	G115S	C	554	T	ALDH3A2	R311H	G	1153	A	ANXA13	A133T	C	470	T
ABCC9	F858L	G	2594	T	ADAMTS7	A722T	C	2375	T	ALDH3A2	G408R	G	1443	C	ANXA3	K101T	A	681	C
ABCC9	K506Q	T	1536	G	ADAMTS7	A636V	G	2118	A	ALDH3B2	E97D	C	730	A	ANXA4	-	G	0	T
ABCD1	R259W	C	1174	T	ADAMTS7	C1671Y	C	5223	T	ALDH4A1	S100N	C	557	T	ANXA6	A98V	G	445	A
ABCD1	R401W	C	1600	T	ADAMTS7	R1669C	G	5216	A	ALDH4A1	W361*	C	1341	T	ANXA6	G88C	C	414	A
ABCD2	T211M	G	1058	A	ADAMTS7	D869A	T	2817	G	ALDH4A1	F40S	A	377	G	ANXA7	I223S	A	725	C
ABCD2	N394H	T	1606	G	ADAMTS8	R651H	C	1952	T	ALDH5A1	V505I	G	1541	A	ANXA9	A23T	G	543	A
ABCD2	M216T	A	1073	G	ADAMTS9	R177Q	C	873	T	ALDH6A1	F185L	G	654	T	AOAH	W512*	C	1837	T
ABCD3	M157V	A	571	G	ADAMTS9	E186D	T	901	G	ALDH8A1	E48K	C	195	T	AOC3	G508R	G	1682	A
ABCD3	R544*	C	1732	T	ADAMTS9	E1931D	C	6136	A	ALDH8A1	R69C	G	258	A	AOC3	V539I	G	1775	A
ABCD3	F166L	C	600	A	ADAMTS9	S501Y	G	1845	T	ALDH9A1	R357Q	C	1375	T	AOC3	N375D	A	1283	G
ABCD4	-	T	0	G	ADAMTS9	R1816Q	C	5790	T	ALDH9A1	T209A	T	930	C	AOX1	D862N	G	2825	A
ABCF3	R618*	C	2037	T	ADAMTS9	M1264I	C	4135	T	ALDOB	L128F	G	507	A	AOX1	R433*	C	1538	T
ABCF3	T272I	C	1000	T	ADAMTS9	P1601L	G	5145	A	ALDOB	V104M	C	435	T	AOX1	K1237E	A	3950	G
ABCG1	H634R	A	2049	G	ADAMTSL1	G1000R	G	3125	A	ALDOB	A168T	C	627	T	AOX1	R290K	G	1110	A
ABCG1	R821W	C	2609	T	ADAMTSL2	R88H	G	695	A	ALDOC	A297V	G	1036	A	AOX1	A507V	C	1761	T
ABCG1	S672L	C	2163	T	ADAMTSL3	R231W	C	915	T	ALG1	L193P	T	609	C	AOX1	D555Y	G	1904	T
ABCG2	S88L	G	809	A	ADAMTSL3	V979M	G	3159	A	ALG1	A10T	G	59	A	AOX1	A664V	C	2232	T
ABCG2	N288T	T	1409	G	ADAMTSL3	Q23P	A	292	C	ALG12	A179T	C	809	T	AP1AR	S174A	T	875	G
ABCG4	A334T	G	1336	A	ADAMTSL3	-	G	0	A	ALG13	S52G	A	166	G	AP1B1	T849I	G	2730	A
ABCG4	P483L	C	1784	T	ADAMTSL3	R632*	C	2118	T	ALG1L	R3Q	C	172	T	AP1B1	N904S	T	2895	C
ABCG4	-	T	2275	C	ADAMTSL3	A1117V	C	3574	T	ALG2	S207N	C	682	T	AP1B1	S798G	T	2576	C
ABCG4	C597Y	G	2126	A	ADAMTSL3	H1400N	C	4422	A	ALG3	R260C	G	809	A	AP1B1	V326M	C	1160	T

ABCG4	T513A	A	1873	G	ADAMTSL4	R542W	C	1860	T	ALG3	T135A	T	434	C	AP1B1	G638C	C	2096	A
ABCG5	P431L	G	1432	A	ADAMTSL4	R478C	C	1668	T	ALG6	R503I	G	1813	T	AP1B1	R114C	G	524	A
ABCG5	V233I	C	837	T	ADAMTSL5	L250F	G	748	A	ALG8	-	C	0	A	AP1G1	I531S	A	1592	C
ABCG8	I544M	T	1722	G	ADAP1	G316D	C	947	T	ALG8	V110I	C	393	T	AP1G1	D530N	C	1588	T
ABHD1	G11D	G	146	A	ADAP1	A122D	G	365	T	ALG9	A105V	G	314	A	AP1G2	K109N	C	1083	A
ABHD10	K195R	A	611	G	ADAR	F787L	G	2361	T	ALG9	E692*	C	2074	A	AP1G2	A522V	G	2321	A
ABHD10	L290I	C	895	A	ADAR	N900I	T	2699	A	ALK	R401*	G	2108	A	AP1G2	G286R	C	1612	T
ABHD12	V289M	C	1145	T	ADAR	R1069W	G	3205	A	ALK	A585T	C	2660	T	AP1G2	S78F	G	989	A
ABHD12B	L276P	T	842	C	ADARB1	S583L	C	1763	T	ALK	D769G	T	3213	C	AP1G2	D43N	C	883	T
ABHD12B	K92N	G	291	T	ADARB1	S639G	A	1930	G	ALK	R551Q	C	2559	T	AP1M2	R19C	G	102	A
ABHD12B	K280T	A	854	C	ADARB1	R244H	G	746	A	ALK	R291H	C	1779	T	AP1M2	V110I	C	375	T
ABHD12B	E302D	G	921	T	ADARB2	T447M	G	1666	A	ALK	R188C	G	1469	A	AP2A1	G335D	G	1215	A
ABHD13	E317*	G	1250	T	ADARB2	A332T	C	1320	T	ALK	R179H	C	1443	T	AP2A1	K6N	G	229	T
ABHD14A	Q116R	A	347	G	ADARB2	L595I	G	2109	T	ALK	R200S	T	1507	A	AP2A1	K61E	A	392	G
ABHD15	R315*	G	1001	A	ADARB2	A303T	C	1233	T	ALK	F58L	G	1081	T	AP2A1	N509D	A	1736	G
ABHD2	R156W	C	962	T	ADAT1	A473V	G	1564	A	ALK	R551*	G	2558	A	AP2A1	V373I	G	1328	A
ABHD2	R409C	C	1721	T	ADAT3	D271N	G	1039	A	ALKBH2	E25*	C	466	A	AP2A1	A489T	G	1676	A
ABHD2	D423N	G	1763	A	ADAT3	A183V	C	776	T	ALKBH3	P260S	C	1221	T	AP2A1	F864L	C	2803	A
ABHD2	R254W	C	1256	T	ADAT3	R261C	C	1009	T	ALKBH3	N168T	A	946	C	AP2A1	R959C	C	3086	T
ABHD3	G374D	C	1261	T	ADC	A380V	C	1457	T	ALKBH4	A248T	C	782	T	AP2A2	T189A	A	746	G
ABHD3	L69I	G	345	T	ADCK1	D403Y	G	1306	T	ALKBH5	R327C	C	1670	T	AP2A2	A800V	C	2580	T
ABHD4	R305W	C	983	T	ADCK2	P34S	C	278	T	ALKBH7	P161L	C	870	T	AP2A2	R633Q	G	2079	A
ABHD4	R278*	C	902	T	ADCK4	A256V	G	1069	A	ALKBH8	Q305*	G	1048	A	AP2S1	-	C	0	A
ABHD5	D243N	G	850	A	ADCK4	A86T	C	558	T	ALKBH8	S317R	T	1084	G	AP3B1	R104Q	C	436	T
ABHD5	E128D	G	507	T	ADCK4	R518H	C	1855	T	ALKBH8	E144*	C	565	A	AP3B1	A884T	C	2775	T
ABHD5	I322M	T	1089	G	ADCK5	L389R	T	1220	G	ALLC	R194*	C	687	T	AP3B1	E275K	C	948	T
ABHD8	F197L	G	831	T	ADCK5	P474Q	C	1475	A	ALLC	M156I	G	575	T	AP3B1	T835I	G	2629	A
ABI1	R138W	G	579	A	ADCK5	R449C	C	1399	T	ALMS1	-	T	0	C	AP3B2	G710S	C	2305	T
ABI2	F500L	T	1796	G	ADCY1	R345C	C	1055	T	ALMS1	L313S	T	1049	C	AP3B2	A579V	G	1913	A
ABI2	R237I	G	1006	T	ADCY1	N1004S	A	3033	G	ALMS1	D3857G	A	11681	G	AP3B2	E924K	C	2947	T
ABI3	G144D	G	929	A	ADCY1	S711L	C	2154	T	ALMS1	A3390V	C	10280	T	AP3B2	G271S	C	988	T
ABI3BP	Y438C	T	1423	C	ADCY1	A991T	G	2993	A	ALMS1	S290R	A	979	C	AP3B2	L809F	G	2602	A
ABI3BP	P556L	G	1777	A	ADCY1	G359S	G	1097	A	ALMS1	N359H	A	1186	C	AP3D1	S471R	T	1634	G
ABI3BP	T1319P	T	4065	G	ADCY1	D997N	G	3011	A	ALMS1	S513P	T	1648	C	AP3D1	E863A	T	2811	G
ABI3BP	-	C	0	A	ADCY1	R346C	C	1058	T	ALMS1	K1121N	A	3474	C	AP3D1	E209K	C	848	T
ABI3BP	E1712K	C	5244	T	ADCY10	F336L	G	1193	T	ALMS1	L1423V	T	4378	G	AP3M1	R263H	C	797	T
ABI3BP	K1700T	T	5209	G	ADCY10	H1515Y	G	4728	A	ALMS1	E2022D	G	6177	T	AP3M2	S287F	C	1092	T
ABI3BP	P1349S	G	4155	A	ADCY10	P438L	G	1498	A	ALOX12	T405A	A	1266	G	AP3S2	V124A	A	764	G
ABL1	A941V	C	3196	T	ADCY10	E739*	C	2400	A	ALOX12	R599C	C	1848	T	AP4B1	A76D	G	432	T

ABL1	G409W	G	1599	T	ADCY10	S607Y	G	2005	T	ALOX12B	K241T	T	984	G	AP4B1	A660V	G	2184	A
ABL1	F91V	T	645	G	ADCY2	M848T	T	2632	C	ALOX15	R500*	G	1510	A	AP4B1	T733A	T	2402	C
ABL2	R580Q	C	1943	T	ADCY2	K937R	A	2899	G	ALOX15	R466W	G	1408	A	AP4E1	L90P	T	299	C
ABL2	V468I	C	1606	T	ADCY2	S100T	T	387	A	ALOX15	V100M	C	310	T	AP4E1	E164K	G	520	A
ABL2	G24D	C	275	T	ADCY2	R480H	G	1528	A	ALOX15	E398D	T	1206	G	AP4E1	S987R	A	2989	C
ABLIM1	R754*	G	2260	A	ADCY2	M767I	G	2390	T	ALOX15	P299S	G	907	A	AP4M1	N139S	A	574	G
ABLIM2	A110V	G	349	A	ADCY2	P894L	C	2770	T	ALOX15B	A239T	G	828	A	AP4M1	G39R	G	273	A
ABLIM3	I260V	A	1017	G	ADCY2	V118F	G	441	T	ALOX15B	Y149C	A	559	G	AP4M1	K191N	G	731	T
ABP1	A9T	G	85	A	ADCY2	-	G	0	T	ALOX15B	Y256C	A	880	G	AP4S1	E75D	G	433	T
ABP1	N660S	A	2039	G	ADCY2	F612V	T	1923	G	ALOX15B	A236T	G	819	A	AP4S1	L138I	C	794	A
ABP1	C181Y	G	602	A	ADCY2	L665P	T	2083	C	ALOX15B	L289V	T	978	G	APAF1	E925*	G	3350	T
ABR	E405K	C	1323	T	ADCY2	T687A	A	2148	G	ALOX5	V51M	G	204	A	APAF1	D825A	A	3051	C
ABT1	A178T	G	563	A	ADCY3	Q150H	C	1302	A	ALOX5	L267M	C	852	A	APAF1	L140F	C	995	T
ABT1	R170H	G	540	A	ADCY3	P131L	G	1244	A	ALOX5	E135*	G	456	T	APAF1	E777*	G	2906	T
ABT1	V121M	G	392	A	ADCY3	A160T	C	1330	T	ALOX5	E274D	G	875	T	APBA1	A427V	G	1503	A
ABT1	R244H	G	762	A	ADCY3	E947V	T	3692	A	ALOX5	R652H	G	2008	A	APBA1	R492M	C	1698	A
ABT1	R164C	C	521	T	ADCY4	Q853R	T	2672	C	ALOX5AP	F92C	T	373	G	APBA1	E373K	C	1340	T
ABT1	R150H	G	480	A	ADCY4	A68V	G	317	A	ALOXE3	E804*	C	2441	A	APBA1	K498I	T	1716	A
ABT1	R204H	G	642	A	ADCY4	P28L	G	197	A	ALOXE3	G713S	C	2168	T	APBA1	D474G	T	1644	C
ABTB1	R465W	C	1479	T	ADCY4	A42T	C	238	T	ALOXE3	S237A	A	740	C	APBA1	A296T	C	1109	T
ABTB1	V117M	G	435	A	ADCY4	T802I	G	2519	A	ALOXE3	R367*	G	1130	A	APBA1	E624K	C	2093	T
ABTB1	G383V	G	1234	T	ADCY5	R346C	G	2249	A	ALOXE3	R212H	C	666	T	APBA2	V174D	T	715	A
ABTB2	R829H	C	2716	T	ADCY5	Q422*	G	2477	A	ALPI	T293M	C	955	T	APBA2	R102H	G	499	A
ABTB2	S429P	A	1515	G	ADCY5	A363V	G	2301	A	ALPI	A460V	C	1456	T	APBA3	T178M	G	710	A
ABTB2	L582M	G	1974	T	ADCY5	R1117W	G	4562	A	ALPK1	V296M	G	1165	A	APBA3	R358W	G	1249	A
ABTB2	R313G	T	1167	C	ADCY5	P222L	G	1878	A	ALPK1	A86T	G	535	A	APBB1	E567K	C	1799	T
ABTB2	K691T	T	2302	G	ADCY5	A1054T	C	4373	T	ALPK1	I1124M	A	3651	G	APBB1	P64S	G	290	A
ACAA1	S124L	G	544	A	ADCY5	A482V	G	2658	A	ALPK1	K1125E	A	3652	G	APBB1	G136D	C	507	T
ACAA1	M1I	C	176	T	ADCY6	R739W	G	2875	A	ALPK1	A144S	G	709	T	APBB1IP	H183R	A	1003	G
ACACA	R1017Q	C	3532	T	ADCY7	V927M	G	3068	A	ALPK2	A1737V	G	5424	A	APBB1IP	A487V	C	1915	T
ACACA	I1909N	A	6208	T	ADCY7	R388H	G	1452	A	ALPK2	S821Y	G	2676	T	APBB1IP	P270S	C	1263	T
ACACA	M1270V	T	4290	C	ADCY7	G435R	G	1592	A	ALPK2	A1294E	G	4095	T	APBB2	S424Y	G	1815	T
ACACA	R1768H	C	5785	T	ADCY7	R495Q	G	1773	A	ALPK2	A702V	G	2319	A	APBB2	R740*	G	2762	A
ACACA	V1114A	A	3823	G	ADCY8	R179C	G	791	A	ALPK2	E1312*	C	4148	A	APBB3	T73M	G	233	A
ACACA	G263V	C	1270	A	ADCY8	L216M	G	902	T	ALPK2	A994D	G	3195	T	APBB3	I76L	T	241	G
ACACB	R1511H	G	4532	A	ADCY8	T555A	T	1919	C	ALPK2	N545K	A	1849	C	APC	R876*	C	3006	T
ACACB	S712L	C	2135	T	ADCY8	Q303E	G	1163	C	ALPK3	S698N	G	2260	A	APC	H1009R	A	3406	G
ACACB	R724*	C	2170	T	ADCY8	P474L	G	1677	A	ALPK3	A1436V	C	4474	T	APC	R1450*	C	4728	T
ACACB	G2005D	G	6014	A	ADCY8	A314V	G	1197	A	ALPK3	R642Q	G	2092	A	APC	R1114*	C	3720	T

ACACB	R2384C	C	7150	T	ADCY8	A992V	G	3231	A	ALPK3	R1254C	C	3927	T	APC	Q1529*	C	4965	T
ACACB	A600T	G	1798	A	ADCY8	N854K	G	2818	T	ALPK3	E1461D	G	4550	T	APC	S1861Y	C	5962	A
ACACB	R1389C	C	4165	T	ADCY8	S705Y	G	2370	T	ALPL	R30*	C	338	T	APC	R653M	G	2338	T
ACACB	V241M	G	721	A	ADCY8	G422A	C	1521	G	ALPP	A198T	G	861	A	APC	R876Q	G	3007	A
ACACB	P580H	C	1739	A	ADCY8	T1218A	T	3908	C	ALPPL2	S99T	T	347	A	APC	R2816Q	G	8827	A
ACACB	G1816D	G	5447	A	ADCY9	Y1184H	A	4089	G	ALPPL2	A97S	G	341	T	APC	R653K	G	2338	A
ACAD10	D299Y	G	1072	T	ADCY9	L833M	G	3036	T	ALS2	S492F	G	1848	A	APC	Q1378*	C	4512	T
ACAD10	P755L	C	2441	T	ADCY9	V558M	C	2211	T	ALS2	R350W	G	1421	A	APC	R232*	C	1074	T
ACAD10	G632V	G	2072	T	ADCY9	-	A	0	G	ALS2	P258Q	G	1146	T	APC	Q238*	C	1092	T
ACAD10	H1088R	A	3440	G	ADCY9	V1215I	C	4182	T	ALS2	F792V	A	2747	C	APC	R564*	C	2070	T
ACAD11	K207Q	T	1591	G	ADCYAP1	E45K	G	252	A	ALS2	E347*	C	1412	A	APC	N1290K	T	4250	A
ACAD11	E215*	C	1615	A	ADCYAP1	R172Q	G	634	A	ALS2CL	A257T	C	853	T	APC	R876*	C	3006	T
ACAD8	R389W	C	1253	T	ADCYAP1R1	G341R	G	1047	A	ALS2CL	R134W	G	484	A	APC	E1521*	G	4941	T
ACAD8	G275R	G	911	A	ADCYAP1R1	E97*	G	315	T	ALS2CL	R607W	G	1903	A	APC	E1408*	G	4602	T
ACAD9	F70L	C	291	A	ADCYAP1R1	R288I	G	889	T	ALS2CL	F406L	G	1302	T	APC	Q215*	C	1023	T
ACADL	E260*	C	1006	A	ADCYAP1R1	H182L	A	571	T	ALS2CR11	R135C	G	448	A	APC	R1386*	A	4536	T
ACADL	R50*	G	376	A	ADD2	R432G	G	1739	C	ALS2CR11	K951I	T	2897	A	APC	E1306*	G	4296	T
ACADL	S210G	T	856	C	ADD2	T675M	G	2469	A	ALS2CR11	K951*	T	2896	A	APC	G1312*	G	4314	T
ACADL	R51I	C	380	A	ADD3	R434H	G	1668	A	ALS2CR11	S1427A	A	4324	C	APC	R232*	C	1074	T
ACADL	D211N	C	859	T	ADD3	F689V	T	2432	G	ALS2CR11	S1210Y	G	3674	T	APC	R283*	C	1227	T
ACADM	K289E	A	944	G	ADD3	E30A	A	456	C	ALS2CR11	S659Y	G	2021	T	APC	R876*	C	3006	T
ACADM	I283N	T	927	A	ADH1A	K19N	C	171	A	ALS2CR12	R30C	G	135	A	APC	Q1367*	C	4479	T
ACADS	R247C	C	857	T	ADH1C	A157V	G	822	A	ALS2CR12	E387*	C	1206	A	APC	E1379*	G	4515	T
ACADS	S252R	C	874	A	ADH1C	A222V	G	1017	A	ALS2CR12	N373K	A	1166	C	APC	S117*	C	730	A
ACADSB	A340T	G	1032	A	ADH4	F343I	A	1193	T	ALS2CR12	K259N	T	824	G	APC	S1201*	C	3982	A
ACADSB	E266K	G	810	A	ADH4	L291I	G	1037	T	ALS2CR8	P256L	C	1088	T	APC	S1355Y	C	4444	A
ACADSB	E318D	A	968	C	ADH4	V278G	A	999	C	ALX1	P276S	C	832	T	APC	S1400L	C	4579	T
ACADVL	N203D	A	642	G	ADHFE1	S117*	C	381	A	ALX1	A95S	G	289	T	APC	T1705A	A	5493	G
ACAN	R2232H	G	7069	A	ADHFE1	R307M	G	951	T	ALX1	R312*	C	940	T	APC	R1920*	C	6138	T
ACAN	G2365W	G	7467	T	ADHFE1	A2T	G	35	A	ALX1	R312Q	G	941	A	APC	M2047V	A	6519	G
ACAN	A248T	G	1116	A	ADHFE1	S213L	C	669	T	ALX4	M364T	A	1098	G	APC	S2307L	C	7300	T
ACAN	D1964G	A	6265	G	ADIPOQ	E89K	G	333	A	ALX4	R244Q	C	738	T	APC	R1450*	C	4728	T
ACAN	R95W	C	657	T	ADIPOQ	D59Y	G	243	T	ALX4	A64T	C	197	T	APC	R302*	C	1284	T
ACAN	E438D	G	1688	T	ADK	G108V	G	373	T	AMAC1L1	R90C	C	389	T	APC	Q1338*	C	4392	T
ACAN	F361L	C	1457	A	ADM	-	G	0	A	AMAC1L2	T184I	C	724	T	APC	R564*	C	2070	T
ACAN	L758R	T	2647	G	ADM	M9L	A	180	C	AMAC1L3	H214R	A	762	G	APC	Q1378*	C	4512	T

ACAP1	E505D	G	1721	T	ADNP	K266N	T	1118	G	AMBN	L21M	C	164	A	APC	R499*	C	1875	T
ACAP1	R535H	G	1810	A	ADNP	A529T	C	1905	T	AMBN	S73Y	C	321	A	APC2	Y1795C	A	5592	G
ACAP1	K185T	A	760	C	ADNP	P993L	G	3298	A	AMBN	E264*	G	893	T	APC2	L96M	C	494	A
ACAP2	R349H	C	1277	T	ADNP	I247V	T	1059	C	AMBP	W114L	C	604	A	APC2	V1684M	G	5258	A
ACAP2	N111D	T	562	C	ADNP2	H233D	C	1152	G	AMBP	R349C	G	1308	A	APCDD1	R564H	G	1691	A
ACAP2	N92H	T	505	G	ADORA1	S50L	C	560	T	AMBP	K88T	T	526	G	APCDD1	R354H	G	1061	A
ACAP3	T744M	G	2434	A	ADORA1	P73S	C	628	T	AMBRA1	R755H	C	2624	T	APCDD1	V417L	G	1249	T
ACAP3	A683V	G	2251	A	ADORA2A	M211T	T	1082	C	AMBRA1	W1236*	C	4068	T	APCDD1	R176W	C	526	T
ACAP3	H451Q	G	1556	T	ADPGK	L176I	G	620	T	AMDHD1	R141Q	G	528	A	APCDD1L	A3S	C	238	A
ACAP3	V103M	C	510	T	ADPRHL2	A17S	G	79	T	AMDHD1	V172M	G	620	A	APCDD1L	A49V	G	377	A
ACAP3	R677C	G	2232	A	ADRA1A	K372N	C	1552	A	AMDHD1	V58F	G	278	T	APCDD1L	R180W	G	769	A
ACAP3	G422S	C	1467	T	ADRA1B	L283R	T	971	G	AMDHD1	A107T	G	425	A	APCDD1L	V145I	C	664	T
ACAT1	R258C	C	848	T	ADRA1D	A324T	C	1087	T	AMDHD2	A218V	C	686	T	APCDD1L	T340M	G	1250	A
ACAT1	G341R	G	1097	A	ADRA2B	A140T	C	418	T	AMFR	R596H	C	1996	T	APCDD1L	F462L	G	1617	T
ACAT2	I106M	A	2078	G	ADRA2B	V142I	C	424	T	AMFR	R352Q	C	1264	T	APCS	E155G	A	561	G
ACBD3	R223*	G	722	A	ADRA2B	E86K	C	256	T	AMHR2	R463H	G	1466	A	APEH	L650H	T	1984	A
ACBD3	E233Q	C	752	G	ADRA2C	L109V	T	363	G	AMHR2	A366T	G	1174	A	APEH	F356L	C	1103	A
ACBD4	-	A	0	G	ADRA2C	A144V	C	469	T	AMIGO3	D477N	C	1659	T	APEX1	A273T	G	1083	A
ACBD4	E83D	G	718	T	ADRB1	R165H	G	580	A	AMIGO3	R15H	C	274	T	APH1B	K69T	A	276	C
ACBD5	E320K	C	1023	T	ADRB2	S396G	A	1425	G	AMIGO3	V454I	C	1590	T	API5	A120V	C	532	T
ACCN1	R30H	C	89	T	ADRB2	N398S	A	1432	G	AMIGO3	Q316H	C	1178	A	APIP	A121D	G	362	T
ACCN1	R198H	C	1466	T	ADRB3	R155W	G	660	A	AMIGO3	L50V	G	378	C	APITD1	S43N	G	544	A
ACCN1	F460V	A	2251	C	ADRB3	A107T	C	516	T	AMMECR1	R173C	G	685	A	APLF	R41I	G	293	T
ACCN2	R190C	C	797	T	ADRBK1	-	G	0	T	AMMECR1L	R229H	C	947	T	APLF	S164Y	C	662	A
ACCN2	T316M	C	1176	T	ADRBK1	F452L	T	1620	C	AMMECR1L	-	C	0	A	APLF	D334N	G	1171	A
ACCN2	C367W	C	1330	G	ADRBK1	R173W	C	783	T	AMN1	M19V	T	221	C	APLP1	V380I	G	1276	A
ACCN3	T201A	A	601	G	ADRBK2	R578H	G	1925	A	AMOT	R471C	G	1411	A	APLP1	M329V	A	1123	G
ACCN3	L359P	T	1076	C	ADRBK2	D500E	T	1692	G	AMOT	S175G	T	523	C	APLP1	C181*	C	681	A
ACCN3	L299I	C	895	A	ADRM1	A256V	C	843	T	AMOT	R446Q	C	1337	T	APLP2	A253V	C	915	T
ACCN4	M555R	T	1678	G	ADSL	T368M	C	1132	T	AMOT	Q180*	G	538	A	APLP2	R494Q	G	1638	A
ACCN4	R325H	G	988	A	ADSL	P24L	C	100	T	AMOT	R99*	G	295	A	APOA1	V10M	C	394	T
ACCN4	V643G	T	1942	G	ADSS	R430*	G	1605	A	AMOT	Y599S	T	1796	G	APOA2	A5T	C	71	T
ACCN4	G40R	G	132	C	ADSSL1	E437D	G	1313	T	AMOTL1	P418Q	C	1423	A	APOA4	Q152*	G	569	A
ACCN5	P294H	G	928	T	AEBP1	P349T	C	1350	A	AMOTL1	P376S	C	1296	T	APOA4	A183T	C	662	T
ACCN5	G247V	C	787	A	AEBP1	A923T	G	3072	A	AMOTL1	-	T	0	C	APOA4	E344K	C	1145	T
ACCS	R370H	G	1253	A	AEBP1	P322L	C	1270	T	AMOTL1	R569Q	G	1876	A	APOA5	R204H	C	646	T
ACCS	V293M	G	1021	A	AEBP1	K140N	G	725	T	AMOTL2	G256A	C	946	G	APOA5	A195T	C	618	T
ACD	L52I	G	419	T	AEBP1	D559Y	G	1980	T	AMPD1	D732N	C	2242	T	APOB	S3036Y	G	9235	T

ACE	A1252V	C	3779	T	AEBP1	K753N	G	2564	T	AMPD1	V159A	A	524	G	APOB	K859N	C	2705	A
ACE	E788G	A	2387	G	AEBP1	T866I	C	2902	T	AMPD1	D322Y	C	1012	A	APOB	R50W	G	276	A
ACE2	P284S	G	953	A	AES	L25R	A	113	C	AMPD2	V222A	T	1025	C	APOB	R1513Q	C	4666	T
ACE2	S47C	G	243	C	AFAP1	S124P	A	643	G	AMPD2	R457W	C	1729	T	APOB	P4200S	G	1272 6	A
ACER1	R258Q	C	851	T	AFAP1	K163N	C	762	A	AMPD2	R546H	G	1997	A	APOB	V2997M	C	9117	T
ACER1	I173S	A	596	C	AFAP1	P572T	G	1987	T	AMPD2	E550G	A	2009	G	APOB	A913V	G	2866	A
ACHE	P81L	G	381	A	AFAP1	A158T	C	745	T	AMPD3	R171Q	G	857	A	APOB	R1513Q	C	4666	T
ACIN1	R1034C	G	3428	A	AFAP1	R361H	C	1355	T	AMPD3	R91W	C	616	T	APOB	N2035S	T	6232	C
ACIN1	L111*	A	660	T	AFAP1L1	R285H	G	952	A	AMPD3	L724M	C	2515	A	APOB	-	C	0	A
ACLY	V785I	C	2358	T	AFAP1L1	V711M	G	2229	A	AMPH	F183L	A	763	G	APOB	G724C	C	2298	A
ACLY	A657V	G	1975	A	AFAP1L1	R170S	G	608	T	AMPH	L255F	G	979	A	APOB	S2980F	G	9067	A
ACMSD	G24R	G	206	A	AFAP1L1	R436H	G	1405	A	AMY2B	T463A	A	2003	G	APOB	K1661R	T	5110	C
ACMSD	A162V	C	621	T	AFAP1L2	L199P	A	596	G	ANAPC1	-	A	0	G	APOB	G1181C	C	3669	A
ACMSD	A162V	C	621	T	AFAP1L2	P669H	G	2006	T	ANAPC1	M347T	A	1813	G	APOB	W397*	C	1319	T
ACN9	K28T	A	1217	C	AFAP1L2	D176G	T	527	C	ANAPC1	K543T	T	2401	G	APOB	G3716C	C	1127 4	A
ACO1	V768I	G	2440	A	AFAP1L2	A37V	G	110	A	ANAPC2	R323C	G	972	A	APOB	Q1789P	T	5494	G
ACO1	W782R	T	2482	A	AFF1	A696T	G	2352	A	ANAPC5	N91H	T	393	G	APOB	-	T	0	C
ACO2	A106V	C	334	T	AFF1	T898I	C	2959	T	ANAPC7	R424*	G	1271	A	APOB	A4481V	G	1357 0	A
ACO2	G240S	G	735	A	AFF2	R927C	C	3258	T	ANAPC7	L274M	A	821	T	APOB	L4299I	G	1302 3	T
ACO2	V668I	G	2019	A	AFF2	A248V	C	1222	T	ANGEL1	A669T	C	2118	T	APOB	S3036Y	G	9235	T
ACO2	E314K	G	957	A	AFF2	Q14R	A	520	G	ANGEL1	R585H	C	1867	T	APOB	H2067N	G	6327	T
ACOT1	T202M	C	913	T	AFF2	P239L	C	1195	T	ANGEL1	E639D	C	2030	A	APOBEC1	D75N	C	244	T
ACOT11	R314H	G	1023	A	AFF2	S715*	C	2623	A	ANGEL2	V306I	C	1071	T	APOBEC2	D26N	G	120	A
ACOT11	A319V	C	1038	T	AFF2	P252S	C	1233	T	ANGEL2	H448R	T	1498	C	APOBEC3B	L404I	C	1265	A
ACOT11	R184H	G	633	A	AFF2	R926H	G	3256	A	ANGPT1	R494Q	C	1978	T	APOBEC3B	I118T	T	408	C
ACOT11	G202C	G	686	T	AFF3	R59I	C	320	A	ANGPT2	E212D	C	1111	A	APOBEC3C	R67C	C	239	T
ACOT12	E119*	C	384	A	AFF4	R831Q	C	2872	T	ANGPT2	S40F	G	594	A	APOBEC3C	R66H	G	237	A
ACOT12	K114T	T	370	G	AFF4	R17Q	C	430	T	ANGPT4	Q190*	G	671	A	APOBEC3C	A131V	C	432	T
ACOT7	A277T	C	976	T	AFF4	K747T	T	2620	G	ANGPT4	N158S	T	576	C	APOBEC3D	F267S	T	1207	C
ACOT8	R86W	G	347	A	AFF4	R560K	C	2059	T	ANGPT4	P50S	G	251	A	APOBEC3F	R121H	G	719	A
ACOX1	E311V	T	1222	A	AFG3L2	R711I	C	2302	A	ANGPTL1	A256T	C	1214	T	APOBEC3G	Y340H	T	1375	C
ACOX3	D507N	C	1597	T	AFG3L2	R783Q	C	2518	T	ANGPTL1	N127S	T	828	C	APOBEC3H	E152D	G	532	T
ACOX3	E283K	C	925	T	AFG3L2	E734*	C	2370	A	ANGPTL1	M427R	A	1728	C	APOBEC4	S74Y	G	493	T
ACOX3	V567L	C	1777	A	AFG3L2	R283Q	C	1018	T	ANGPTL1	K377T	T	1578	G	APOBEC4	R36*	G	378	A
ACOX3	R334H	C	1079	T	AFM	T281M	C	935	T	ANGPTL1	K47N	C	589	A	APOE	R56C	C	332	T
ACOX3	R328H	C	1061	T	AFMID	E250K	G	757	A	ANGPTL2	R124H	C	989	T	APOE	S147N	G	606	A

ACOXL	E107K	G	543	A	AFP	R337I	G	1026	T	ANGPTL2	E37*	C	727	A	APOE	R258H	G	939	A
ACOXL	D474N	G	1644	A	AFP	Y60D	T	194	G	ANGPTL4	R136Q	G	602	A	APOF	P319T	G	1033	T
ACOXL	V160I	G	702	A	AFP	L179I	C	551	A	ANGPTL4	R336H	G	1202	A	APOH	S3Y	G	67	T
ACOXL	Y86S	A	481	C	AFP	T210A	A	644	G	ANGPTL4	R136Q	G	602	A	APOL1	E108G	A	590	G
ACP1	Q106*	C	412	T	AFP	A317V	C	966	T	ANGPTL5	K95R	T	882	C	APOL1	R319H	G	1223	A
ACP2	R161C	G	598	A	AFTPH	K333T	A	1312	C	ANGPTL6	R376L	C	1366	A	APOL4	A142T	C	649	T
ACP2	R86C	G	373	A	AFTPH	R54H	G	475	A	ANGPTL6	V334M	C	1239	T	APOL4	L326P	A	1202	G
ACP2	F323L	G	1086	T	AFTPH	R736Q	G	2521	A	ANGPTL6	E225D	C	914	A	APOL4	E101*	C	526	A
ACP6	R162H	C	933	T	AGAP1	A404T	G	1706	A	ANGPTL7	A262T	G	1023	A	APOL5	M256V	A	766	G
ACPL2	G343R	G	1164	A	AGAP1	M697T	T	2586	C	ANK1	S1653Y	G	5042	T	APOL5	G216R	G	646	A
ACPP	P349T	C	1095	A	AGAP1	A460V	C	1875	T	ANK1	E68*	C	286	A	APOO	R113I	C	570	A
ACPP	K91Q	A	321	C	AGAP1	G754S	G	2756	A	ANK1	R1001H	C	3086	T	APOO	-	T	0	C
ACPP	R105Q	G	364	A	AGAP1	D753N	G	2753	A	ANK1	Q43*	G	211	A	APP	G68D	C	237	T
ACPT	V230I	G	688	A	AGAP2	-	C	0	A	ANK1	V575M	C	1807	T	APP	R359Q	C	1110	T
ACRBP	H108Y	G	370	A	AGAP2	K443N	C	1329	A	ANK1	S1921C	G	5846	C	APP	R469H	C	1440	T
ACRC	R664C	C	2104	T	AGAP3	R513C	C	1537	T	ANK1	D184N	C	634	T	APPBP2	E569D	T	1995	G
ACRC	K308N	G	1038	T	AGAP3	G271R	G	811	A	ANK1	-	C	0	T	APPL1	S496Y	C	1634	A
ACRC	S186L	C	671	T	AGAP3	S305L	C	914	T	ANK1	F1802C	A	5489	C	APPL1	R505Q	G	1661	A
ACRV1	R257Q	C	1037	T	AGAP3	R481H	G	1442	A	ANK1	E1232*	C	3778	A	APPL1	P264H	C	938	A
ACRV1	S260Y	G	1046	T	AGAP3	P343T	C	1027	A	ANK1	R281L	C	926	A	APPL2	-	A	0	G
ACRV1	R257Q	C	1037	T	AGAP3	V311M	G	931	A	ANK1	R39*	G	397	A	APPL2	I83T	A	466	G
ACSBG1	Y138N	A	474	T	AGAP3	A661T	G	1981	A	ANK2	R506H	G	1570	A	APPL2	E614*	C	2058	A
ACSBG1	R565H	C	1756	T	AGAP3	N491H	A	1471	C	ANK2	D3948N	G	11895	A	APPL2	K613T	T	2056	G
ACSBG1	K447N	C	1403	A	AGAP6	H132R	A	793	G	ANK2	R2052*	C	6207	T	APPL2	T561N	G	1900	T
ACSBG1	R437C	G	1371	A	AGAP6	R137C	C	807	T	ANK2	G1783C	G	5400	T	APRT	D35G	T	139	C
ACSBG1	L141R	A	484	C	AGBL2	G635R	C	2003	T	ANK2	S3428T	T	10335	A	APTX	R56G	G	166	C
ACSBG2	E79K	G	477	A	AGBL2	K810T	T	2529	G	ANK2	T675A	A	2076	G	APTX	E348K	C	1042	T
ACSBG2	L386F	C	1398	T	AGBL3	D139N	G	668	A	ANK2	A1809V	C	5479	T	AQP10	G138D	G	453	A
ACSBG2	I283M	C	1091	G	AGBL3	R441Q	G	1575	A	ANK2	F3103S	T	9361	C	AQP10	P101T	C	341	A
ACSBG2	A225T	G	915	A	AGBL3	R906M	G	2970	T	ANK2	T3222A	A	9717	G	AQP10	P150T	C	488	A
ACSF2	L27P	T	123	C	AGBL3	T972A	A	3167	G	ANK2	F3258C	T	9826	G	AQP12B	A38T	C	175	T
ACSF2	Q166*	C	539	T	AGBL3	F29C	T	339	G	ANK2	T1863M	C	5641	T	AQP2	H177N	C	619	A
ACSF2	A357T	G	1112	A	AGBL3	R319W	C	1208	T	ANK3	S1894Y	G	5873	T	AQP3	F220V	A	739	C
ACSF2	R631*	C	1934	T	AGBL3	D458E	T	1627	G	ANK3	R805C	G	2605	A	AQP4	A192T	C	670	T
ACSF3	A131V	C	769	T	AGBL4	S282F	G	962	A	ANK3	E864K	C	2782	T	AQP5	G191D	G	1094	A
ACSF3	R388H	G	1540	A	AGBL4	A353T	C	1174	T	ANK3	A2382V	G	7337	A	AQP6	F39L	C	454	A
ACSL1	R237*	G	1035	A	AGBL4	I160S	A	596	C	ANK3	I16N	A	239	T	AQP8	A143T	G	552	A
ACSL1	E131G	T	718	C	AGBL4	N84T	T	368	G	ANK3	E4317D	C	13143	A	AQP8	R213H	G	763	A
ACSL1	-	T	0	C	AGBL5	A240T	G	877	A	ANK3	K4305T	T	13106	G	AQP8	T254A	A	885	G

ACSL1	F617C	A	2176	C	AGBL5	R699Q	G	2255	A	ANK3	R2596C	G	7978	A	AQP9	E287D	G	1124	T
ACSL3	K720R	A	2690	G	AGBL5	M764L	A	2449	C	ANK3	S1806L	G	5609	A	AQP9	T26P	A	339	C
ACSL3	S226Y	C	1208	A	AGBL5	S425N	G	1433	A	ANKAR	L958I	C	2872	A	AQR	V15A	A	186	G
ACSL4	R133H	C	795	T	AGBL5	V695I	G	2242	A	ANKDD1A	E16D	G	77	T	AQR	R1288H	C	4005	T
ACSL4	Y394C	T	1578	C	AGGF1	R688Q	G	2445	A	ANKDD1A	L310I	C	957	A	AQR	R905I	C	2856	A
ACSL4	R45I	C	531	A	AGGF1	K583N	G	2131	T	ANKFN1	R260H	G	814	A	AQR	A668V	G	2145	A
ACSL5	-	G	0	T	AGGF1	E616*	G	2228	T	ANKFN1	S649Y	C	1981	A	AR	S244L	C	1255	T
ACSL6	V505I	C	1622	T	AGGF1	K646N	A	2320	C	ANKFY1	R747H	C	2278	T	AR	V478A	T	1957	C
ACSL6	I611L	T	1940	G	AGK	R9Q	G	286	A	ANKFY1	A259T	C	813	T	AR	Q75L	A	748	T
ACSL6	N181K	A	652	T	AGK	R351*	C	1311	T	ANKFY1	V162L	C	522	A	ARAF	V525L	G	1705	T
ACSL6	D400N	C	1307	T	AGL	L1060I	C	3653	A	ANKH	G429S	C	1616	T	ARAP1	R76H	C	430	T
ACSM1	D435Y	C	1371	A	AGL	V211I	G	1106	A	ANKH	S123L	G	699	A	ARAP1	L608M	G	2025	T
ARAP2	K1496N	C	4978	A	ATAD2	L938I	G	2920	T	BAIAP2L2	V93M	C	422	T	BTBD17	D440N	C	1318	T
ARAP2	Y139H	A	905	G	ATAD2	E909*	C	2833	A	BAIAP3	A1185V	C	3564	T	BTBD18	G624E	C	2160	T
ARAP3	D1420V	T	4325	A	ATAD2	R792Q	C	2483	T	BAMBI	G108W	G	878	T	BTBD18	C478*	A	1723	T
ARAP3	P4H	G	77	T	ATAD2B	M497T	A	1834	G	BANK1	R730M	G	2463	T	BTBD2	A252T	C	754	T
ARAP3	E1312*	C	4000	A	ATAD3A	K313N	G	1033	T	BANK1	R515*	C	1817	T	BTBD3	L218H	T	653	A
ARAP3	R308H	C	989	T	ATAD3A	D378N	G	1226	A	BANK1	E46K	G	410	A	BTBD3	R473Q	G	1418	A
ARAP3	R37Q	C	176	T	ATAD3B	R342W	C	1140	T	BANP	V229A	T	838	C	BTBD7	T667M	G	2326	A
ARC	Q243H	C	930	A	ATAD3B	-	G	0	T	BAP1	G128*	C	854	A	BTBD7	T667M	G	2326	A
ARC	V68I	C	403	T	ATAD5	-	T	0	C	BARD1	-	C	0	T	BTBD7	F973C	A	3244	C
ARCN1	R476Q	G	1592	A	ATAD5	K1453Q	A	4735	C	BARD1	H324N	G	1105	T	BTBD8	R216C	C	882	T
ARF1	R19C	C	198	T	ATAD5	R1448H	G	4721	A	BARHL1	D169G	A	698	G	BTBD9	R257*	G	921	A
ARF4	W78G	A	500	C	ATAD5	K425T	A	1652	C	BARHL1	D10N	G	220	A	BTBD9	C162R	A	636	G
ARFGAP1	A158T	G	593	A	ATCAY	A148T	G	872	A	BARHL2	A238T	C	754	T	BTBD9	D201Y	C	753	A
ARFGAP1	P153Q	C	579	A	ATCAY	V13M	G	467	A	BARHL2	E187K	C	601	T	BTBD9	D37N	C	261	T
ARFGAP3	G308*	C	1142	A	ATE1	R56Q	C	254	T	BARX1	R124H	C	545	T	BTD	P135L	C	492	T
ARFGEF1	S1593P	A	5167	G	ATF1	D70Y	G	486	T	BASP1	E34G	A	361	G	BTD	A103T	G	395	A
ARFGEF1	M725I	C	2565	T	ATF3	R156Q	G	600	A	BASP1	E50*	G	408	T	BTD	R211C	C	719	T
ARFGEF1	S495L	G	1874	A	ATF5	R70Q	G	776	A	BAT2L1	A441V	C	1377	T	BTD	F18Y	T	141	A
ARFGEF1	Q1490R	T	4859	C	ATF6	H488Y	C	1529	T	BAT2L1	D1005N	G	3068	A	BTG3	R17*	G	203	A
ARFGEF1	R1253*	G	4147	A	ATF6	E346G	A	1104	G	BAT2L1	V1673I	G	5072	A	BTG3	K90N	C	424	A
ARFGEF1	N584H	T	2140	G	ATF6	G18E	G	120	A	BAT2L1	R1067W	C	3254	T	BTG3	F65C	A	348	C
ARFGEF2	R1348Q	G	4043	A	ATF6	R317*	C	1016	T	BAT2L2	F2032S	T	6361	C	BTK	R288Q	C	1027	T
ARFGEF2	E73K	G	217	A	ATF6B	A623V	G	1901	A	BAT2L2	R2825Q	G	8740	A	BTN1A1	A302T	G	970	A
ARFGEF2	R1109C	C	3325	T	ATF6B	P170L	G	542	A	BAT2L2	S880P	T	2904	C	BTN1A1	A103T	G	373	A
ARFGEF2	S1213T	T	3637	A	ATF6B	S8N	C	56	T	BAT2L2	E364K	G	1356	A	BTN1A1	A395V	C	1250	T
ARFGEF2	P27H	C	80	A	ATF7	E377*	C	1287	A	BATF	S24F	C	313	T	BTN2A1	A136T	G	618	A
ARFGEF2	T1597M	C	4790	T	ATF7	P410L	G	1387	A	BATF2	R33*	G	228	A	BTN2A1	L427P	T	1492	C

ARFGEF2	S1266P	T	3796	C	ATF7IP	R696K	G	2240	A	BAX	L113P	T	338	C	BTN2A1	Q295K	C	1095	A
ARFGEF2	K1727R	A	5180	G	ATF7IP	P159A	C	628	G	BAX	L125M	C	373	A	BTN2A2	R143C	C	538	T
ARFGEF2	S218F	C	653	T	ATF7IP	P159A	C	628	G	BAZ1A	S1119Y	G	3684	T	BTN2A2	K294N	G	993	T
ARFIP2	F182L	A	683	C	ATF7IP	G46D	G	290	A	BAZ1A	W530*	C	1918	T	BTN3A3	E366G	A	1340	G
ARG1	C53Y	G	216	A	ATF7IP	R1098*	C	3445	T	BAZ1A	R1511H	C	4860	T	BTNL3	A283S	G	1031	T
ARG1	R79M	G	294	T	ATF7IP2	A361S	G	1302	T	BAZ1A	K575N	T	2053	G	BTNL9	A112S	G	565	T
ARGFX	S84Y	C	261	A	ATF7IP2	G510C	G	1749	T	BAZ1A	K940T	T	3147	G	BTNL9	S470P	T	1639	C
ARGFX	N106T	A	327	C	ATG10	R139*	C	709	T	BAZ1B	R199Q	C	935	T	BTRC	A47T	G	257	A
ARHGAP10	V348I	G	1281	A	ATG10	E5*	G	307	T	BAZ1B	V1167M	C	3838	T	BTRC	R560*	C	1796	T
ARHGAP10	V406I	G	1455	A	ATG12	L166V	G	613	C	BAZ1B	R1452M	C	4694	A	BUB1	T461A	T	1500	C
ARHGAP10	F538L	T	1851	C	ATG16L1	K41I	A	236	T	BAZ1B	R1238H	C	4052	T	BUB1	D937G	T	2929	C
ARHGAP10	P677T	C	2268	A	ATG16L1	R303C	C	1021	T	BAZ2A	Q719*	G	2349	A	BUB1	K566N	C	1817	A
ARHGAP10	P281L	C	1081	T	ATG16L1	A599V	C	1910	T	BAZ2A	R1492M	C	4669	A	BUB1	R244C	G	849	A
ARHGAP10	V348I	G	1281	A	ATG16L1	G547V	G	1754	T	BAZ2A	P122T	G	558	T	BUB1B	L165R	T	706	G
ARHGAP10	F558L	T	1913	G	ATG16L1	R439Q	G	1430	A	BAZ2A	R1793W	G	5571	A	BUB1B	E469*	G	1617	T
ARHGAP10	E180K	G	777	A	ATG16L1	T462A	A	1498	G	BAZ2B	R1938*	G	6308	A	BUB3	L30M	C	297	A
ARHGAP10	R400I	G	1438	T	ATG16L1	K507N	G	1635	T	BAZ2B	S604Y	G	2307	T	BUB3	C62G	T	393	G
ARHGAP11A	R839H	G	3238	A	ATG2A	R574C	G	1835	A	BAZ2B	R210*	G	1124	A	BUD13	H157R	T	494	C
ARHGAP11A	N978I	A	3655	T	ATG2A	P656S	G	2081	A	BAZ2B	A293S	C	1373	A	BUD13	P327L	G	1004	A
ARHGAP11A	M614I	G	2564	A	ATG2A	P1552L	G	4770	A	BAZ2B	G764W	C	2786	A	BUD13	E608*	C	1846	A
ARHGAP11A	K152N	G	1178	T	ATG2A	R400H	C	1314	T	BAZ2B	R1384C	G	4646	A	BVES	L261I	G	938	T
ARHGAP12	E792*	C	2609	A	ATG2A	E1349*	C	4160	A	BAZ2B	T577A	T	2225	C	BZRAP1	E1269K	C	4676	T
ARHGAP12	S516P	A	1781	G	ATG2B	A1715V	G	6038	A	BAZ2B	S247R	A	1237	C	BZRAP1	W1555R	A	5534	G
ARHGAP12	G279V	C	1071	A	ATG2B	R1651*	G	5845	A	BBOX1	A100V	C	667	T	BZRAP1	R561Q	C	2553	T
ARHGAP12	K484N	C	1687	A	ATG2B	K1374T	T	5015	G	BBS1	R490W	C	1530	T	BZRAP1	-	T	0	C
ARHGAP12	R208I	C	858	A	ATG4B	D275N	G	823	A	BBS10	N543S	T	1697	C	BZW2	-	G	0	T
ARHGAP15	V408F	G	1389	T	ATG4B	R492*	C	1474	T	BBS12	R368C	C	1295	T	C10orf10	R4W	G	228	A
ARHGAP15	R27I	G	247	T	ATG4C	R192Q	G	782	A	BBS12	F544L	T	1825	G	C10orf103	G22E	G	65	A
ARHGAP15	D48N	G	309	A	ATG4D	R102H	G	479	A	BBS12	D687G	A	2253	G	C10orf105	P95L	G	284	A
ARHGAP15	R200I	G	766	T	ATG4D	R339Q	G	1190	A	BBS2	R315W	G	1364	A	C10orf107	E142*	G	729	T
ARHGAP15	E335*	G	1170	T	ATG5	E179*	C	859	A	BBS2	G375D	C	1545	T	C10orf107	F11V	T	336	G
ARHGAP17	D471V	T	1505	A	ATG7	K667N	G	2026	T	BBS4	A504V	C	1552	T	C10orf113	A5T	C	33	T
ARHGAP19	K259E	T	804	C	ATG9A	E541*	C	1833	A	BBS4	N375H	A	1164	C	C10orf114	D122G	T	813	C
ARHGAP20	A1077V	G	3515	A	ATG9A	R758H	C	2485	T	BBS5	N112H	A	408	C	C10orf118	E882*	C	2911	A
ARHGAP20	Y665C	T	2279	C	ATG9A	V87M	C	471	T	BBS5	N379S	A	1210	G	C10orf118	E88D	T	531	G
ARHGAP20	-	C	0	A	ATIC	R172H	G	841	A	BBS7	I649V	T	2129	C	C10orf118	R685C	G	2320	A

ARHGAP20	-	T	0	C	ATIC	G439R	G	1641	A	BBS7	Y558*	G	1858	T	C10orf118	Y202*	A	873	C
ARHGAP20	K816R	T	2732	C	ATIC	C241Y	G	1048	A	BBS9	I451L	A	1872	T	C10orf119	M285I	C	1025	A
ARHGAP20	G1069*	C	3490	A	ATIC	L131V	T	717	G	BBS9	R173I	G	1039	T	C10orf119	F229V	A	855	C
ARHGAP20	D987Y	C	3244	A	ATIC	T182M	C	871	T	BBX	E879K	G	2922	A	C10orf119	A210V	G	799	A
ARHGAP20	Y806H	A	2701	G	ATIC	G62R	G	510	A	BBX	F409S	T	1513	C	C10orf12	R207C	C	726	T
ARHGAP21	E1812K	C	5921	T	ATIC	V153M	G	783	A	BBX	G590*	G	2055	T	C10orf12	N971I	A	3019	T
ARHGAP21	V1815I	C	5930	T	ATIC	E336*	G	1332	T	BCAN	T430M	C	1625	T	C10orf12	-	A	3851	T
ARHGAP21	L311F	T	1420	A	ATIC	S475L	C	1750	T	BCAN	G51S	G	487	A	C10orf12	V1039I	G	3222	A
ARHGAP21	R1768W	G	5789	A	ATL1	R55Q	G	405	A	BCAN	R599W	C	2131	T	C10orf12	D199E	C	704	G
ARHGAP21	V1147I	C	3926	T	ATL1	G122*	G	605	T	BCAN	T714A	A	2476	G	C10orf12	E487K	G	1566	A
ARHGAP21	K641T	T	2409	G	ATL2	K417Q	T	1251	G	BCAP29	K96*	A	337	T	C10orf122	R76W	G	381	A
ARHGAP21	S637*	G	2397	T	ATL3	K357T	T	1070	G	BCAP29	L64I	C	241	A	C10orf122	R160I	C	634	A
ARHGAP22	R610H	C	1985	T	ATM	R13H	G	423	A	BCAP29	R119C	C	406	T	C10orf128	Q145H	T	435	G
ARHGAP22	R449Q	C	1502	T	ATM	F1445C	T	4719	G	BCAR1	R612W	G	1834	A	C10orf129	S217R	A	774	C
ARHGAP22	A367T	C	1255	T	ATM	Y2124C	A	6756	G	BCAR1	V557I	C	1669	T	C10orf137	A871T	G	2843	A
ARHGAP23	A1010T	G	3028	A	ATM	Y2404D	T	7595	G	BCAR1	G322C	C	964	A	C10orf137	-	G	0	T
ARHGAP24	S369N	G	1572	A	ATM	T915A	A	3128	G	BCAR1	H349R	T	1046	C	C10orf137	V143M	G	659	A
ARHGAP25	A265V	C	1159	T	ATM	R2763*	C	8672	T	BCAR3	R80W	G	481	A	C10orf137	E29K	G	317	A
ARHGAP25	R378*	C	1497	T	ATM	R248L	G	1128	T	BCAR3	R800I	C	2642	A	C10orf137	E46*	G	368	T
ARHGAP25	M139T	T	781	C	ATM	C977Y	G	3315	A	BCAS1	T153A	T	795	C	C10orf137	R306W	C	1148	T
ARHGAP26	A383T	G	1525	A	ATM	R1466Q	G	4782	A	BCAS1	A73V	G	556	A	C10orf140	E444G	T	3584	C
ARHGAP26	L145S	T	812	C	ATM	K24T	A	456	C	BCAS1	F565L	G	2033	T	C10orf140	G429E	C	3539	T
ARHGAP26	R501W	C	1879	T	ATM	-	T	0	C	BCAS3	D794E	T	2382	A	C10orf140	F173V	A	2770	C
ARHGAP26	A512P	G	1912	C	ATM	Q2297*	C	7274	T	BCAS3	P521L	C	1562	T	C10orf18	G1024D	G	3696	A
ARHGAP27	A646V	G	1937	A	ATM	N2875S	A	9009	G	BCAS4	L136F	C	506	T	C10orf18	R1579I	G	5361	T
ARHGAP27	M864V	T	2590	C	ATM	V734A	T	2586	C	BCAT1	G14R	C	482	T	C10orf18	R2278C	C	7457	T
ARHGAP28	A502V	C	1505	T	ATM	G449V	G	1731	T	BCAT1	I141T	A	864	G	C10orf27	A8D	G	413	T
ARHGAP28	L385R	T	1154	G	ATM	I352N	T	1440	A	BCAT1	K107T	T	762	G	C10orf28	G120E	G	484	A
ARHGAP28	R143*	C	427	T	ATM	R805*	C	2798	T	BCCIP	V162A	T	497	C	C10orf28	S54R	A	285	C
ARHGAP29	A1150T	C	3631	T	ATM	R1730*	C	5573	T	BCCIP	R151C	C	463	T	C10orf28	D154N	G	585	A
ARHGAP29	A959V	G	3059	A	ATM	L1826V	T	5861	G	BCDIN3D	S77P	A	234	G	C10orf28	E654*	G	2085	T
ARHGAP29	V1202M	C	3787	T	ATM	G2083*	G	6632	T	BCHE	-	A	0	G	C10orf35	R59Q	G	176	A
ARHGAP29	R13C	G	220	A	ATM	Q1537L	A	4995	T	BCHE	K208T	T	790	G	C10orf46	F252C	A	1239	C
ARHGAP29	L598I	G	1975	T	ATMIN	Q385R	A	1172	G	BCHE	S100I	C	466	A	C10orf53	G137C	G	421	T
ARHGAP29	E476*	C	1609	A	ATMIN	N750H	A	2266	C	BCKDHA	R178H	G	533	A	C10orf54	H126R	T	436	C
ARHGAP29	E387*	C	1342	A	ATN1	D104N	G	547	A	BCKDHA	A224T	G	670	A	C10orf55	S38L	G	454	A
ARHGAP30	R304H	C	1257	T	ATN1	R884H	G	2888	A	BCKDHA	R102Q	G	305	A	C10orf62	A149V	C	617	T
ARHGAP30	R445H	C	1680	T	ATN1	Q498H	G	1731	T	BCKDHA	Y348C	A	1043	G	C10orf62	R139W	C	586	T
ARHGAP31	S688L	C	2595	T	ATOH7	E146D	C	859	A	BCKDHB	R111*	C	378	T	C10orf67	I45K	A	134	T

ARHGAP31	S17N	G	582	A	ATOH8	P137H	C	706	A	BCKDHB	A5T	G	60	A	C10orf68	L61I	C	654	A
ARHGAP31	P673S	C	2549	T	ATP10A	D975N	C	3029	T	BCKDK	A358T	G	1695	A	C10orf68	K12T	A	508	C
ARHGAP31	S526Y	C	2109	A	ATP10A	E221K	C	767	T	BCL11A	R826*	G	2704	A	C10orf71	P1394L	C	4469	T
ARHGAP31	F861V	T	3113	G	ATP10A	A804V	G	2517	A	BCL11A	A532V	G	1823	A	C10orf71	A426V	C	1565	T
ARHGAP31	R1231M	G	4224	T	ATP10A	F572L	G	1822	T	BCL11A	P353S	G	1285	A	C10orf72	R208W	G	646	A
ARHGAP32	A1375T	C	4123	T	ATP10A	Y390C	T	1275	C	BCL11A	F17L	G	279	T	C10orf72	R100C	G	322	A
ARHGAP32	A412V	G	1235	A	ATP10A	A1042V	G	3231	A	BCL11B	R472H	C	1425	T	C10orf76	G577D	C	1850	T
ARHGAP32	F370L	A	1108	G	ATP10A	A1284T	C	3956	T	BCL11B	D857N	C	2579	T	C10orf76	G245R	C	853	T
ARHGAP32	V563I	C	1687	T	ATP10A	A1401V	G	4308	A	BCL11B	E535D	C	1615	G	C10orf78	S280G	A	838	G
ARHGAP32	Q141H	C	423	A	ATP10A	-	C	0	G	BCL11B	G83S	C	257	T	C10orf79	R1314*	G	4056	A
ARHGAP32	P1351T	G	4051	T	ATP10A	A1211T	C	3737	T	BCL11B	S468N	C	1413	T	C10orf79	Q790*	G	2484	A
ARHGAP32	P1348S	G	4042	A	ATP10A	F1300S	A	4005	G	BCL11B	S358A	A	1082	C	C10orf79	S296L	G	1003	A
ARHGAP33	R933C	C	2882	T	ATP10A	E696D	C	2194	A	BCL11B	P268T	G	812	T	C10orf79	S1002F	G	3121	A
ARHGAP36	R170W	C	853	T	ATP10A	R968H	C	3009	T	BCL11B	G415D	C	1254	T	C10orf79	G107C	C	435	A
ARHGAP36	P21H	C	407	A	ATP10A	D1271E	G	3919	T	BCL2A1	A123V	G	695	A	C10orf79	F341V	A	1137	C
ARHGAP39	G774C	C	2405	A	ATP10A	-	C	0	A	BCL2A1	E47*	C	466	A	C10orf81	P271H	C	1374	A
ARHGAP39	R737W	G	2294	A	ATP10A	R977K	C	3036	T	BCL2L10	W163C	C	538	A	C10orf81	R213Q	G	1200	A
ARHGAP39	D326N	C	1061	T	ATP10A	F954L	G	2968	T	BCL2L10	L188M	G	611	T	C10orf90	R619C	G	1976	A
ARHGAP39	R94W	G	365	A	ATP10A	R850C	G	2654	A	BCL2L11	P21L	C	335	T	C10orf90	A84T	C	371	T
ARHGAP39	V59I	C	260	T	ATP10A	R793W	G	2483	A	BCL2L14	G261R	G	987	A	C10orf90	A84T	C	371	T
ARHGAP39	R933C	G	2882	A	ATP10A	R590Q	C	1875	T	BCL3	C115Y	G	588	A	C10orf92	T2432I	G	7634	A
ARHGAP39	P1055S	G	3248	A	ATP10A	V230M	C	794	T	BCL3	R264C	C	1034	T	C10orf92	A201T	C	940	T
ARHGAP39	G446R	C	1421	T	ATP10B	R1363*	G	4934	A	BCL6	R594Q	C	2148	T	C10orf92	F2479L	G	7776	T
ARHGAP4	E209A	T	684	G	ATP10B	Q1146H	C	4285	A	BCL6	A410T	C	1595	T	C10orf92	A2243T	C	7066	T
ARHGAP40	V219M	G	655	A	ATP10B	P1388H	G	5010	T	BCL6	D338G	T	1380	C	C10orf92	A1936V	G	6146	A
ARHGAP40	E456K	G	1366	A	ATP10B	M371T	A	1959	G	BCL6	R550H	C	2016	T	C10orf92	K2386N	T	7497	G
ARHGAP40	R608C	C	1822	T	ATP10B	R835H	C	3351	T	BCL6	R594Q	C	2148	T	C10orf92	F2192L	G	6915	T
ARHGAP40	K481T	A	1442	C	ATP10B	Q894H	C	3529	A	BCL6	C354Y	C	1428	T	C10orf96	R35H	G	355	A
ARHGAP42	Q702R	A	2108	G	ATP10B	R977H	C	3777	T	BCL6B	A369S	G	1167	T	C11orf1	R67H	G	220	A
ARHGAP5	A808S	G	2737	T	ATP10D	R897C	C	2958	T	BCL7A	T52M	C	292	T	C11orf16	K22N	C	190	A
ARHGAP5	K220N	G	975	T	ATP11A	N340D	A	1106	G	BCL7A	R44Q	G	268	A	C11orf16	S16R	G	172	T
ARHGAP5	K254N	A	1077	C	ATP11A	G491S	G	1559	A	BCL7B	D179Y	C	959	A	C11orf16	V17M	C	173	T
ARHGAP5	F276C	T	1142	G	ATP11A	A602T	G	1892	A	BCL9	E802*	G	3144	T	C11orf2	L325M	C	1013	A
ARHGAP6	R58W	G	1045	A	ATP11A	T269M	C	894	T	BCL9	P1201T	C	4341	A	C11orf2	L674I	C	2060	A
ARHGAP9	R631Q	C	2085	T	ATP11A	Y233D	T	785	G	BCL9L	D261N	C	1746	T	C11orf21	P124H	G	423	T
ARHGAP9	R516G	T	1739	C	ATP11B	E659D	G	2237	T	BCL9L	A385T	C	2118	T	C11orf24	A182T	C	986	T
ARHGAP9	S371L	G	1305	A	ATP11B	L462S	T	1645	C	BCLAF1	R39H	C	369	T	C11orf30	E793G	A	2521	G
ARHGAP9	Q714P	T	2334	G	ATP11B	D341Y	G	1281	T	BCLAF1	R429W	G	1538	A	C11orf30	S1213L	C	3781	T
ARHGDIB	K49N	C	251	A	ATP11C	K52E	T	253	C	BCLAF1	K483N	T	1702	G	C11orf35	R241Q	C	785	T

ARHGEF1	P843L	C	2528	T	ATP11C	R284H	C	950	T	BCLAF1	R94I	C	534	A	C11orf40	S117F	G	350	A
ARHGEF1	E764*	G	2290	T	ATP12A	G567S	G	1886	A	BCLAF1	R69Q	C	459	T	C11orf41	A1356T	G	4190	A
ARHGEF1	R546W	C	1636	T	ATP12A	K466T	A	1584	C	BCLAF1	S422R	T	1517	G	C11orf41	P1486L	C	4581	T
ARHGEF1	F434V	T	1300	G	ATP13A1	-	C	0	T	BCMO1	A303T	G	1368	A	C11orf41	A1804V	C	5535	T
ARHGEF1	V522M	G	1564	A	ATP13A1	E924K	C	2797	T	BCMO1	N374H	A	1581	C	C11orf41	M1223T	T	3792	C
ARHGEF1	R69W	C	205	T	ATP13A1	F209C	A	653	C	BCO2	R139Q	G	537	A	C11orf41	T1136A	A	3530	G
ARHGEF10	R969C	C	2905	T	ATP13A2	P79S	G	269	A	BCO2	R332W	C	1115	T	C11orf41	R1507C	C	4643	T
ARHGEF10	T716M	C	2147	T	ATP13A3	A894T	C	3472	T	BCO2	R487Q	G	1581	A	C11orf41	L548V	T	1766	G
ARHGEF10	E214D	G	642	T	ATP13A3	F911L	A	3523	G	BCOR	N784S	T	2580	C	C11orf41	R1415H	G	4368	A
ARHGEF10	F894C	T	2681	G	ATP13A3	T169M	G	1298	A	BCOR	R118I	C	582	A	C11orf41	L1814M	C	5564	A
ARHGEF10L	L526I	C	1735	A	ATP13A3	I838M	T	3306	C	BCOR	E946D	C	3067	A	C11orf42	R279*	C	885	T
ARHGEF10L	P1155S	C	3622	T	ATP13A3	R138C	G	1204	A	BCOR	T329I	G	1215	A	C11orf42	G285E	G	904	A
ARHGEF11	M897V	T	3729	C	ATP13A4	L909M	G	3048	T	BCOR	K1360R	T	4308	C	C11orf42	A94T	G	330	A
ARHGEF11	A787T	C	3399	T	ATP13A5	E752*	C	2372	A	BCOR	V806I	C	2645	T	C11orf42	E99G	A	346	G
ARHGEF11	R1314L	C	4981	A	ATP13A5	H513L	T	1656	A	BCORL1	T345M	C	1148	T	C11orf44	A32T	G	117	A
ARHGEF11	G1505C	C	5553	A	ATP13A5	V256M	C	884	T	BCORL1	A1560V	C	4793	T	C11orf44	P24S	C	93	T
ARHGEF11	R1140W	G	4458	A	ATP13A5	P389H	G	1284	T	BCORL1	A1434T	G	4414	A	C11orf45	R112Q	C	529	T
ARHGEF11	-	C	0	A	ATP13A5	V758M	C	2390	T	BCR	S429L	C	2037	T	C11orf45	T3M	G	202	A
ARHGEF12	P1423L	C	4275	T	ATP1A1	R74*	C	472	T	BCR	R364Q	G	1842	A	C11orf46	R239H	G	873	A
ARHGEF12	S745N	G	2241	A	ATP1A1	S40A	T	370	G	BCS1L	N267T	A	937	C	C11orf46	V187L	G	716	T
ARHGEF12	D862N	G	2591	A	ATP1A1	R607Q	G	2072	A	BCS1L	V205I	G	750	A	C11orf46	N89H	A	422	C
ARHGEF15	P72H	C	367	A	ATP1A2	R443Q	G	1417	A	BDH1	A257T	C	1080	T	C11orf61	Q292K	G	897	T
ARHGEF15	A74V	C	373	T	ATP1A2	D744N	G	2319	A	BDH1	E118K	C	663	T	C11orf63	T671M	C	2309	T
ARHGEF15	R48Q	G	295	A	ATP1A2	D750A	A	2338	C	BDH2	T208M	G	744	A	C11orf65	N260K	G	850	T
ARHGEF16	N466S	A	1802	G	ATP1A3	R877W	G	2767	A	BDKRB1	F86V	T	476	G	C11orf65	K14N	C	112	A
ARHGEF16	A157T	G	874	A	ATP1A3	I61F	T	319	A	BDKRB1	R232W	C	914	T	C11orf66	R129W	C	510	T
ARHGEF16	E344K	G	1435	A	ATP1A4	G343W	G	1498	T	BDKRB2	T128M	C	579	T	C11orf66	I199V	A	720	G
ARHGEF16	A94D	C	686	A	ATP1A4	R212W	C	1105	T	BDKRB2	T128M	C	579	T	C11orf66	S18L	C	178	T
ARHGEF16	A79T	G	640	A	ATP1A4	G891C	G	3142	T	BDNF	R311*	G	1072	A	C11orf74	E127*	G	475	T
ARHGEF16	Q442H	G	1731	T	ATP1A4	R358H	G	1544	A	BDNF	T173M	G	659	A	C11orf75	R54H	C	419	T
ARHGEF17	I1360T	T	4100	C	ATP1A4	F872L	C	3087	A	BDNF	T231M	G	833	A	C11orf80	R540H	G	1626	A
ARHGEF17	A1240V	C	3740	T	ATP1B4	T146M	C	494	T	BDNF	E146K	C	577	T	C11orf82	W296C	G	938	T
ARHGEF17	S546*	C	1658	A	ATP2A1	V726M	G	2365	A	BDP1	V9G	T	289	G	C11orf82	G333*	G	1047	T
ARHGEF18	S768R	A	2555	C	ATP2A2	V687I	G	2622	A	BDP1	-	T	0	G	C11orf82	R345*	C	1083	T
ARHGEF18	P51L	C	405	T	ATP2A3	R328H	C	1134	T	BDP1	R1830M	G	5752	T	C11orf83	Q58*	C	264	T
ARHGEF18	S798L	C	2646	T	ATP2A3	T247M	G	891	A	BDP1	G526D	G	1840	A	C11orf85	M145T	A	707	G
ARHGEF19	R685W	G	2190	A	ATP2A3	D456N	C	1517	T	BDP1	S33T	T	360	A	C11orf85	R53C	G	430	A
ARHGEF19	E259D	C	914	A	ATP2A3	L49P	A	297	G	BDP1	T1816A	A	5709	G	C11orf85	E193K	C	850	T

ARHGEF2	A890T	C	2690	T	ATP2B1	M640I	C	2101	A	BDP1	E82D	A	509	C	C11orf87	V66L	G	519	C
ARHGEF2	S523L	G	1590	A	ATP2B1	T30M	G	270	A	BDP1	R2556*	C	7929	T	C11orf9	M876I	G	2724	A
ARHGEF2	G947D	C	2862	T	ATP2B1	R744Q	C	2412	T	BEGAIN	V178I	C	603	T	C11orf9	D18N	G	148	A
ARHGEF2	M29I	C	109	T	ATP2B2	T1220M	G	3729	A	BEND2	R453H	C	1491	T	C11orf9	P302L	C	1001	T
ARHGEF3	R377W	G	1239	A	ATP2B2	A742T	C	2294	T	BEND2	P341L	G	1155	A	C11orf9	Y407D	T	1315	G
ARHGEF3	N40T	T	229	G	ATP2B3	V1164M	G	3816	A	BEND3	I701T	A	2293	G	C11orf91	-	T	582	C
ARHGEF33	E32K	G	359	A	ATP2B3	A128V	C	709	T	BEND3	A161T	C	672	T	C11orf94	S54F	G	198	A
ARHGEF33	Q48K	C	407	A	ATP2B3	R1099M	G	3622	T	BEND3	Y788*	G	2555	T	C11orf95	E189D	C	586	A
ARHGEF33	E232*	G	959	T	ATP2B3	A32V	C	421	T	BEND3	G183R	C	738	T	C12orf10	R188Q	G	615	A
ARHGEF33	E167K	G	764	A	ATP2B3	L535I	C	1929	A	BEND3	R644Q	C	2122	T	C12orf11	R366*	G	1633	A
ARHGEF33	T512I	C	1800	T	ATP2B4	A854V	C	3684	T	BEND4	S406Y	G	1797	T	C12orf11	R336W	G	1543	A
ARHGEF33	R452W	C	1619	T	ATP2B4	P202S	C	1727	T	BEND5	P266L	G	884	A	C12orf12	T168M	G	937	A
ARHGEF33	Q48K	C	407	A	ATP2B4	I933V	A	3920	G	BEND5	R269L	C	893	A	C12orf23	K6T	A	391	C
ARHGEF33	S297P	T	1154	C	ATP2C1	T683I	C	2048	T	BEND5	R29Q	C	173	T	C12orf26	S313Y	C	959	A
ARHGEF33	K827N	G	2746	T	ATP2C1	A318G	C	953	G	BEND5	L97R	A	377	C	C12orf29	R272H	G	815	A
ARHGEF37	Y302C	A	1068	G	ATP2C2	G271R	G	900	A	BEND7	K224T	T	671	G	C12orf34	A129T	G	551	A
ARHGEF37	R547H	G	1803	A	ATP2C2	Q929P	A	2875	C	BEND7	A210V	G	629	A	C12orf34	S351N	G	1218	A
ARHGEF38	R95W	C	427	T	ATP4A	A969T	C	2934	T	BEST1	D168G	A	1263	G	C12orf34	A174S	G	686	T
ARHGEF4	Q936*	C	4004	T	ATP4A	R668H	C	2032	T	BEST3	R388Q	C	1390	T	C12orf35	N235K	C	1119	A
ARHGEF4	G985R	G	4151	A	ATP4A	G379D	C	1165	T	BEST3	R388W	G	1389	A	C12orf35	F983C	T	3362	G
ARHGEF4	R391W	C	1690	T	ATP4A	D21G	T	91	C	BET3L	F103L	A	405	C	C12orf35	K1390N	G	4584	T
ARHGEF6	A720S	C	3364	A	ATP4A	R703C	G	2136	A	BEX1	R56T	C	407	G	C12orf35	A1276T	G	4240	A
ARHGEF6	E259*	C	1981	A	ATP4A	K487R	T	1489	C	BFAR	Q416R	A	1524	G	C12orf35	V1382I	G	4558	A
ARHGEF7	R555Q	G	1914	A	ATP4A	A76V	G	256	A	BFSP1	A220S	C	698	A	C12orf35	N235H	A	1117	C
ARHGEF9	-	C	0	G	ATP4A	W901R	A	2730	G	BFSP1	D433N	C	1337	T	C12orf35	V551A	T	2066	C
ARID1A	R1109W	C	3696	T	ATP4A	F317L	A	980	T	BFSP1	R469Q	C	1446	T	C12orf35	S563Y	C	2102	A
ARID1A	R2143H	G	6799	A	ATP4A	A120T	C	387	T	BFSP1	A477V	G	1470	A	C12orf35	S1095A	T	3697	G
ARID1A	S2079I	G	6607	T	ATP4B	R19H	C	98	T	BFSP1	E409*	C	1265	A	C12orf35	L1267V	T	4213	G
ARID1A	R1223H	G	4039	A	ATP5A1	S106Y	G	462	T	BFSP2	P263L	C	877	T	C12orf4	R335Q	C	1092	T
ARID1A	R1276Q	G	4198	A	ATP5A1	R322H	C	1110	T	BFSP2	D270N	G	897	A	C12orf4	T216I	G	735	A
ARID1A	S1000Y	C	3370	A	ATP5C1	R23*	C	146	T	BFSP2	R154Q	G	550	A	C12orf4	R335Q	C	1092	T
ARID1B	R2252H	G	6755	A	ATP5L2	T85M	G	581	A	BFSP2	R199*	C	684	T	C12orf40	N526T	A	1731	C
ARID1B	S1175R	A	3523	C	ATP5SL	-	C	0	T	BHLHA15	Y178C	A	589	G	C12orf40	S627Y	C	2034	A
ARID1B	L1764F	G	5292	T	ATP6AP1	A185V	C	615	T	BHLHA15	R70L	G	265	T	C12orf40	Q179H	G	691	T
ARID1B	G568R	G	1702	A	ATP6AP1L	-	G	0	A	BHLHB9	K47N	G	712	T	C12orf41	H49L	T	221	A
ARID1B	P1999L	C	5996	T	ATP6AP1L	F45L	C	1460	A	BHLHE22	G224S	G	1204	A	C12orf41	E198*	C	667	A
ARID1B	G324A	G	971	C	ATP6AP1L	P78Q	C	1558	A	BHLHE22	A297V	C	1424	T	C12orf41	R94M	C	356	A
ARID1B	G326A	G	977	C	ATP6V0A1	M362I	G	1253	A	BHMT2	G67*	G	258	T	C12orf42	I143V	T	653	C
ARID1B	P605L	C	1814	T	ATP6V0A4	R449C	G	1628	A	BHMT2	M222I	G	725	T	C12orf43	S245N	C	757	T

ARID1B	P1475L	C	4424	T	ATP6V0A4	L345P	A	1317	G	BICC1	A640V	C	1923	T	C12orf43	A176G	G	550	C
ARID2	S668Y	C	2131	A	ATP6V0A4	N74H	T	503	G	BICC1	G151D	G	456	A	C12orf45	A92T	G	307	A
ARID2	S832*	C	2623	A	ATP6V0D1	F294L	G	1033	T	BICC1	K107T	A	324	C	C12orf45	T17A	A	82	G
ARID2	L1399*	T	4324	G	ATP6V1B1	R124Q	G	444	A	BICC1	R632*	C	1898	T	C12orf48	D109V	A	438	T
ARID2	R1504W	C	4638	T	ATP6V1B1	V493M	G	1550	A	BICC1	K744N	G	2236	T	C12orf50	K325T	T	1142	G
ARID2	Q958*	C	3000	T	ATP6V1B1	A276V	C	900	T	BICD1	M480V	A	1519	G	C12orf50	R33Q	C	266	T
ARID2	D444Y	G	1458	T	ATP6V1B1	S169Y	C	579	A	BICD1	P931L	C	2873	T	C12orf51	A1789V	G	5384	A
ARID2	Q488R	A	1591	G	ATP6V1B2	R494I	G	1521	T	BICD1	-	G	3009	T	C12orf51	P985S	G	2971	A
ARID2	R294I	G	1009	T	ATP6V1C1	Y367C	A	1345	G	BICD1	A72V	C	296	T	C12orf51	H3988R	T	1198 1	C
ARID3A	R476C	C	1716	T	ATP6V1C1	V183I	G	792	A	BICD2	E220K	C	726	T	C12orf51	R3638C	G	1093 0	A
ARID3A	E287D	G	1151	T	ATP6V1C1	N324S	A	1216	G	BICD2	L257M	G	837	T	C12orf51	D2234V	T	6719	A
ARID3B	M242V	A	926	G	ATP6V1C2	R230Q	G	798	A	BICD2	A814T	C	2508	T	C12orf51	A3821T	C	1147 9	T
ARID3B	G472S	G	1616	A	ATP6V1D	K208N	C	1175	A	BID	A137T	C	736	T	C12orf51	S3050C	T	9166	A
ARID3C	L107R	A	413	C	ATP6V1E2	R135C	G	1517	A	BID	K203N	C	936	A	C12orf51	T2389M	G	7184	A
ARID4A	G1106*	G	3689	T	ATP6V1F	N46T	A	138	C	BIN1	Q573H	C	2131	A	C12orf51	G2335D	C	7022	T
ARID4A	K528T	A	1956	C	ATP6V1H	E185*	C	705	A	BIN1	Q54*	G	572	A	C12orf51	L3124R	A	9389	C
ARID4A	W630*	G	2262	A	ATP6V1H	E25D	T	227	G	BIN1	D537Y	C	2021	A	C12orf51	E2572K	C	7732	T
ARID4A	K482N	G	1819	T	ATP7A	G618E	G	1853	A	BIN1	V525L	C	1985	A	C12orf51	A953V	G	2876	A
ARID4B	R1059*	G	3552	A	ATP7A	I603T	T	1808	C	BIN2	D522N	C	1626	T	C12orf51	A563V	G	1706	A
ARID4B	I436N	A	1684	T	ATP7B	I945V	T	2990	C	BIN2	F220L	G	722	T	C12orf51	E81*	C	259	A
ARID4B	S1152R	T	3831	G	ATP7B	Q383H	T	1306	A	BIRC2	D79Y	G	1634	T	C12orf52	S153L	C	938	T
ARID4B	S702L	G	2482	A	ATP7B	K164N	C	649	A	BIRC2	E422D	G	2665	T	C12orf52	R245H	G	1214	A
ARID5A	A17T	G	149	A	ATP7B	R1151C	G	3608	A	BIRC2	E578D	A	3133	C	C12orf52	K28N	G	564	T
ARID5B	E845K	G	2943	A	ATP7B	A753V	G	2415	A	BIRC5	D70Y	G	329	T	C12orf53	V107M	C	549	T
ARID5B	R999Q	G	3406	A	ATP8A1	R735W	G	2435	A	BIRC6	E1604*	G	4944	T	C12orf54	T39N	C	173	A
ARID5B	A1009G	C	3436	G	ATP8A1	R581Q	C	1974	T	BIRC6	I667N	T	2134	A	C12orf56	S353Y	G	1058	T
ARID5B	-	G	0	A	ATP8A1	A1016T	C	3278	T	BIRC6	R1030H	G	3223	A	C12orf56	A303T	C	907	T
ARID5B	-	T	0	C	ATP8A1	P1033L	G	3330	A	BIRC6	Y1928F	A	5917	T	C12orf60	D193Y	G	781	T
ARID5B	R34I	G	511	T	ATP8A1	Q468H	T	1636	G	BIRC6	-	A	0	C	C12orf60	K201N	A	807	C
ARID5B	N1136H	A	3816	C	ATP8A1	R14H	C	273	T	BIRC6	T374R	C	1255	G	C12orf63	K626M	A	1955	T
ARIH1	R132I	G	709	T	ATP8A2	I126V	A	518	G	BIRC6	K1272N	A	3950	C	C12orf63	C492Y	G	1553	A
ARIH2	R342C	C	1363	T	ATP8A2	-	A	0	C	BIRC6	N2010Y	A	6162	T	C12orf64	E664*	G	1989	T
ARL10	V82G	T	341	G	ATP8A2	A855T	G	2705	A	BIRC6	R3284H	G	9985	A	C12orf64	K140T	A	418	C
ARL11	S177N	G	865	A	ATP8A2	F961L	T	3023	C	BIRC6	T3864A	A	11724	G	C12orf64	L6I	C	15	A
ARL13B	K310T	A	1204	C	ATP8A2	R588W	C	1904	T	BIRC7	A71T	G	425	A	C12orf65	N58T	A	817	C
ARL13B	R79W	C	510	T	ATP8A2	V506M	G	1658	A	BIRC8	S100*	G	1547	C	C12orf65	-	A	1145	G
ARL14	T61A	A	368	G	ATP8A2	L264I	C	932	A	BLK	L138F	C	993	T	C12orf66	T225M	G	728	A

ARL16	R7W	G	118	A	ATP8A2	R216C	C	788	T	BLK	S341L	C	1603	T	C12orf69	S118L	G	426	A
ARL4C	V124A	A	385	G	ATP8A2	K151E	A	593	G	BLNK	N185H	T	553	G	C12orf69	E104V	T	384	A
ARL4D	R92C	C	455	T	ATP8A2	K345N	G	1177	T	BLOC1S2	D82Y	C	267	A	C12orf70	E86G	A	433	G
ARL5A	N59S	T	488	C	ATP8A2	E698K	G	2234	A	BLOC1S2	T38N	G	136	T	C12orf72	H234R	A	910	G
ARL6IP1	P172H	G	644	T	ATP8A2	I1003S	T	3150	G	BLVRA	V141A	T	498	C	C13orf1	A58T	C	277	T
ARL6IP1	K200N	C	729	A	ATP8B1	R628W	G	1882	A	BLZF1	R159C	C	898	T	C13orf1	A58T	C	277	T
ARL6IP4	S339L	C	1016	T	ATP8B1	Y924D	A	2770	C	BLZF1	-	A	0	G	C13orf18	P419Q	G	1861	T
ARL6IP6	E66*	G	907	T	ATP8B1	R882M	C	2645	A	BMF	E8D	C	259	A	C13orf18	E640K	C	2523	T
ARL8A	V53M	C	326	T	ATP8B1	V1202M	C	3604	T	BMI1	S274N	G	1326	A	C13orf18	V197A	A	1195	G
ARL9	A175T	G	779	A	ATP8B1	F673C	A	2018	C	BMI1	Q140K	C	923	A	C13orf23	G711D	C	2966	T
ARL9	R77W	C	485	T	ATP8B1	D379N	C	1135	T	BMI1	T63A	A	692	G	C13orf26	D179G	A	549	G
ARMC2	S444L	C	1499	T	ATP8B1	F124V	A	370	C	BMP1	K814T	A	2929	C	C13orf26	Y29H	T	98	C
ARMC2	V620M	G	2026	A	ATP8B2	R338H	G	1013	A	BMP1	R181Q	G	1030	A	C13orf27	Q140*	G	608	A
ARMC2	F310C	T	1097	G	ATP8B2	R576W	C	1726	T	BMP10	V255M	C	922	T	C13orf28	D127N	G	446	A
ARMC2	K435N	G	1473	T	ATP8B2	A212V	C	635	T	BMP10	E225*	C	832	A	C13orf28	L54M	C	227	A
ARMC2	R854I	G	2729	T	ATP8B2	S1194P	T	3580	C	BMP10	K91T	T	431	G	C13orf33	A66V	C	522	T
ARMC3	A389V	C	1250	T	ATP8B2	L460F	G	1380	T	BMP15	R8I	G	23	T	C13orf34	I428V	A	1282	G
ARMC3	Y820H	T	2542	C	ATP8B2	R1193H	G	3578	A	BMP2K	R1092C	C	3440	T	C13orf36	S28F	C	529	T
ARMC4	G798D	C	2486	T	ATP8B3	R562W	G	1918	A	BMP2KL	P251S	C	751	T	C14orf1	T75M	G	297	A
ARMC4	R629H	C	1979	T	ATP8B3	V1080I	C	3472	T	BMP3	S120L	C	679	T	C14orf1	R126W	G	449	A
ARMC4	E279K	C	928	T	ATP8B3	H410P	T	1463	G	BMP4	R280W	G	1232	A	C14orf101	V113I	G	459	A
ARMC4	E786A	T	2450	G	ATP8B3	-	C	0	T	BMP5	R181Q	C	1241	T	C14orf101	K274T	A	943	C
ARMC4	R6M	C	110	A	ATP8B3	L334H	A	1235	T	BMP5	F68S	A	902	G	C14orf102	A582G	G	1782	C
ARMC4	C784F	C	2444	A	ATP8B3	L185P	A	788	G	BMP5	R49W	G	844	A	C14orf102	W328*	C	1020	T
ARMC4	K937T	T	2903	G	ATP8B4	R549*	G	1787	A	BMP5	L424V	A	1969	C	C14orf102	A881T	C	2678	T
ARMC4	Q811H	T	2526	G	ATP8B4	A484T	C	1592	T	BMP5	K284N	T	1551	G	C14orf104	E683V	T	2129	A
ARMC5	R429C	C	1409	T	ATP8B4	L1173V	A	3659	C	BMP5	E224*	C	1369	A	C14orf104	R339Q	C	1097	T
ARMC5	C240Y	G	843	A	ATP9A	R201Q	C	867	T	BMP6	A451T	G	1510	A	C14orf104	E806*	C	2497	A
ARMC5	P654Q	C	2085	A	ATP9A	S244N	C	996	T	BMP6	S85L	C	413	T	C14orf106	Q386H	C	1617	A
ARMC5	R688Q	G	2187	A	ATP9A	A592T	C	2039	T	BMP7	R69H	C	712	T	C14orf106	T1094P	T	3739	G
ARMC5	R936H	G	2931	A	ATP9A	K1031E	T	3356	C	BMP8A	C334R	T	1346	C	C14orf115	V133M	G	588	A
ARMC5	A878T	G	2756	A	ATP9A	R455H	C	1629	T	BMP8B	P280L	G	1215	A	C14orf115	R276H	G	1018	A
ARMC6	Q431*	C	1291	T	ATP9A	E489K	C	1730	T	BMPER	E427K	G	1653	A	C14orf115	L137I	C	600	A
ARMC6	P258S	C	772	T	ATP9A	G394D	C	1446	T	BMPER	A578T	G	2106	A	C14orf135	A962T	G	3438	A
ARMC7	E75*	G	525	T	ATP9B	I1015V	A	3052	G	BMPER	T385M	C	1528	T	C14orf135	R559*	C	2229	T
ARMC8	R22H	G	336	A	ATP9B	G678R	G	2041	A	BMPER	A451V	C	1726	T	C14orf142	-	T	380	G
ARMC8	S76N	G	498	A	ATP9B	Y216H	T	655	C	BMPER	R439H	G	1690	A	C14orf145	E800D	C	2571	A
ARMC8	R401W	C	1472	T	ATPIF1	E51D	G	204	T	BMPER	S184N	G	925	A	C14orf145	R146I	C	608	A
ARMC9	R388Q	G	1163	A	ATR	G481D	C	1564	T	BMPER	L252M	C	1128	A	C14orf145	W493C	C	1650	A

ARMC9	T383M	C	1148	T	ATR	E293*	C	999	A	BMPR1A	G434D	G	1849	A	C14orf145	K983Q	T	3118	G
ARMC9	P155T	C	463	A	ATR	E2128D	C	6506	A	BMPR1A	K102N	A	854	C	C14orf145	E766K	C	2467	T
ARMCX1	R244H	G	1102	A	ATR	Q1334E	G	4122	C	BMPR1A	K333Q	A	1545	C	C14orf145	R568H	C	1874	T
ARMCX1	G17R	G	420	A	ATR	L1361V	A	4203	C	BMPR1B	E184D	A	552	C	C14orf145	-	C	0	A
ARMCX1	K77Q	A	600	C	ATRIP	R709M	G	2239	T	BMPR1B	E452*	G	1354	T	C14orf145	Q175H	T	696	G
ARMCX2	A39T	C	569	T	ATRIP	E573K	G	1830	A	BMPR2	G311R	G	1470	A	C14orf153	S397L	C	1190	T
ARMCX3	E351*	G	1531	T	ATRN	P29S	C	153	T	BMPR2	A35V	C	643	T	C14orf166	I230V	A	853	G
ARMCX5	E515D	A	2426	C	ATRN	F174C	T	589	G	BMPR2	H331Y	C	1530	T	C14orf166	R145C	C	598	T
ARNT	P785S	G	2554	A	ATRN	I194M	T	650	G	BMS1	T248A	A	805	G	C14orf166B	G315S	G	1067	A
ARNT	R101*	G	502	A	ATRN	R551Q	G	1720	A	BMS1	R887C	C	2722	T	C14orf166B	N104S	A	435	G
ARNT	-	C	0	A	ATRNL1	S1063N	G	3314	A	BMS1	R75Q	G	287	A	C14orf166B	L483V	T	1571	G
ARNT	L548V	A	1843	C	ATRNL1	-	G	0	T	BMX	R99Q	G	484	A	C14orf174	R615C	C	2129	T
ARNT	K419N	T	1458	G	ATRX	I2026L	T	6291	G	BMX	R414K	G	1429	A	C14orf177	S44F	C	550	T
ARNT2	R652Q	G	2121	A	ATRX	K2359R	T	7291	C	BNC1	L779F	C	2423	A	C14orf179	L55S	T	198	C
ARNT2	L141I	C	587	A	ATRX	K1867N	C	5816	A	BNC1	R451M	C	1438	A	C14orf182	R4Q	C	1732	T
ARNT2	P579S	C	1901	T	ATRX	Q2330R	T	7204	C	BNC1	E612*	C	1920	A	C14orf21	P595S	C	1876	T
ARNTL	S278I	G	1188	T	ATRX	K46T	T	352	G	BNC2	A445V	G	1392	A	C14orf21	R542H	G	1718	A
ARNTL	K405T	A	1569	C	ATXN1	K307R	T	1858	C	BNC2	S575R	T	1781	G	C14orf28	Y118H	T	618	C
ARPC1A	I141S	T	542	G	ATXN1	A505V	G	2452	A	BNC2	S575R	T	1781	G	C14orf37	T612N	G	1976	T
ARPC1A	M352T	T	1179	C	ATXN1	E357K	C	2007	T	BNC2	R291H	C	930	T	C14orf37	M360T	A	1220	G
ARRB1	V20I	C	280	T	ATXN10	R426*	C	1464	T	BNC2	F778C	A	2391	C	C14orf37	N111H	T	472	G
ARRB2	S352Y	C	1117	A	ATXN10	L310P	T	1117	C	BNC2	F442L	G	1384	T	C14orf37	E74D	T	363	G
ARRDC1	A81T	G	305	A	ATXN1L	T560M	C	1967	T	BNC2	E313K	C	995	T	C14orf38	A124V	G	371	A
ARRDC2	V30M	G	231	A	ATXN1L	G433D	G	1586	A	BNIPL	A266V	C	953	T	C14orf38	V717M	C	2149	T
ARRDC2	T134I	C	544	T	ATXN2	A1199V	G	3758	A	BOC	R821*	C	2800	T	C14orf38	E574D	C	1722	A
ARRDC2	V275I	G	966	A	ATXN2L	P1020S	C	3225	T	BOC	V625M	G	2212	A	C14orf38	N551S	T	1652	C
ARRDC3	E344D	T	1299	G	ATXN2L	D240N	G	885	A	BOC	A472T	G	1753	A	C14orf39	Q282H	C	1006	A
ARRDC5	T124I	G	371	A	ATXN2L	R301Q	G	1069	A	BOC	V403I	G	1546	A	C14orf4	E720K	C	3057	T
ARSA	G475S	C	1670	T	ATXN2L	R365*	C	1260	T	BOC	R630C	C	2227	T	C14orf4	P258L	G	1672	A
ARSB	L289I	G	1404	T	ATXN2L	P1071L	C	3379	T	BOD1L	R3024C	G	9206	A	C14orf4	Y423C	T	2167	C
ARSE	A463T	C	1454	T	ATXN3	R285*	G	922	A	BOD1L	M1120I	C	3496	T	C14orf4	E762D	C	3185	A
ARSF	R179C	C	756	T	ATXN7	S803F	C	2961	T	BOD1L	E1087*	C	3395	A	C14orf43	A164T	C	894	T
ARSH	R125W	C	373	T	ATXN7	P942Q	C	3378	A	BOD1L	T2111A	T	6467	C	C14orf43	R447Q	C	1744	T
ARSI	R324W	G	1550	A	ATXN7	G778A	G	2886	C	BOD1L	K1650R	T	5085	C	C14orf43	R598W	G	2196	A
ARSI	R544H	C	2211	T	ATXN7	A214T	G	1193	A	BOD1L	R1141H	C	3558	T	C14orf43	R455*	G	1767	A
ARSI	T348I	G	1623	A	ATXN7	N881S	A	3195	G	BOD1L	M2584V	T	7886	C	C14orf43	E954*	C	3264	A
ARSI	R454Q	C	1941	T	ATXN7L1	K779R	T	2363	C	BOD1L	P1537S	G	4745	A	C14orf45	K274N	G	945	T
ARSK	Q53*	C	362	T	ATXN7L2	P219S	C	670	T	BOD1L	T1647A	T	5075	C	C14orf45	E75D	G	348	T
ART3	A178T	G	651	A	ATXN7L2	R623Q	G	1883	A	BOD1L	A1619D	G	4992	T	C14orf49	E191K	C	586	T

ART5	R267W	G	1218	A	ATXN7L2	A693V	C	2093	T	BOD1L	T2245I	G	6870	A	C14orf50	N400S	A	1295	G
ART5	R145Q	C	853	T	ATXN7L2	A707T	G	2134	A	BOD1L	A2087T	C	6395	T	C14orf50	R268C	C	898	T
ARV1	R186W	C	555	T	AUH	F238L	G	738	T	BOD1L	R519*	G	1691	A	C14orf68	V279A	T	909	C
ARVCF	A732T	C	2486	T	AUH	S201F	G	626	A	BOD1L	R2970C	G	9044	A	C14orf68	R254H	G	834	A
ARVCF	R368W	G	1394	A	AUP1	H48R	T	361	C	BOD1L	S182F	G	681	A	C14orf73	V114I	G	416	A
ARVCF	G693S	C	2369	T	AURKAIP1	R154W	G	836	A	BOD1L	A2425V	G	7410	A	C14orf73	R178C	C	608	T
ARVCF	R576W	G	2018	A	AURKB	H133Y	G	511	A	BOD1L	S2260L	G	6915	A	C14orf73	R256H	G	843	A
ARVCF	Q138R	T	705	C	AURKC	R37H	G	299	A	BOD1L	S2167R	T	6635	G	C14orf73	A220T	G	734	A
ARVCF	R638Q	C	2205	T	AURKC	L74I	C	409	A	BOLA1	I36T	T	812	C	C14orf73	T540M	C	1695	T
ARX	R329K	C	1197	T	AUTS2	V769I	G	2626	A	BOLA1	A92V	C	980	T	C14orf73	T509M	C	1602	T
ARX	A469T	C	1616	T	AUTS2	E894G	A	3002	G	BPGM	P153S	C	648	T	C14orf73	Q675*	C	2099	T
ARX	M363V	T	1298	C	AUTS2	P417S	C	1570	T	BPGM	G180S	G	729	A	C14orf80	V465M	G	1523	A
AS3MT	A55V	C	241	T	AVEN	L145I	G	563	T	BPI	E3D	G	98	T	C15orf2	A80T	G	712	A
AS3MT	E94A	A	358	C	AVEN	S132I	C	525	A	BPIL1	R103C	C	502	T	C15orf2	P337L	C	1484	T
ASAH1	I146V	T	603	C	AVIL	E815*	C	2472	A	BPIL1	F242C	T	920	G	C15orf2	P645H	C	2408	A
ASAP1	A608V	G	1851	A	AVIL	C621Y	C	1891	T	BPIL1	A255T	G	958	A	C15orf2	A67T	G	673	A
ASAP1	P365S	G	1121	A	AVIL	K340N	C	1049	A	BPIL2	T3A	T	118	C	C15orf2	S994C	A	3454	T
ASAP1	R211M	C	660	A	AVL9	M596V	A	2007	G	BPIL2	F488V	A	1573	C	C15orf2	Q657L	A	2444	T
ASAP1	G833R	C	2525	T	AVP	L13R	A	88	C	BPIL3	Y183C	A	548	G	C15orf2	T580A	A	2212	G
ASAP1	S13L	G	66	A	AVPI1	A129T	C	385	T	BPIL3	F102L	C	306	A	C15orf2	D428G	A	1757	G
ASAP1	Q1031*	G	3119	A	AVPR1A	Q311R	T	2906	C	BPIL3	N151T	A	452	C	C15orf2	E610V	A	2303	T
ASAP1	A117V	G	378	A	AVPR1A	A63T	C	2161	T	BPIL3	Y366H	T	1096	C	C15orf2	P749S	C	2719	T
ASAP2	A168T	G	842	A	AVPR1B	R351H	G	1517	A	BPIL3	N435S	A	1304	G	C15orf2	K162N	G	960	T
ASAP2	A292T	G	1214	A	AVPR1B	A109V	C	791	T	BPTF	G543S	G	1688	A	C15orf2	R177M	G	1004	T
ASAP2	A588T	G	2102	A	AVPR2	A63T	G	332	A	BPTF	S1115*	C	3405	G	C15orf2	P240R	C	1193	G
ASAP2	R817W	C	2789	T	AWAT1	R200H	G	640	A	BPTF	K2761N	G	8344	T	C15orf2	S785Y	C	2828	A
ASAP3	C325R	A	1018	G	AXIN1	G233D	C	1070	T	BPTF	R2184C	C	6611	T	C15orf2	E1035*	G	3577	T
ASB10	G3D	C	134	T	AXIN1	R395C	G	1555	A	BPTF	K1491N	G	4534	T	C15orf23	E264K	G	905	A
ASB10	R317C	G	1075	A	AXIN1	K161T	T	854	G	BRAF	A718V	G	2214	A	C15orf27	E309K	G	1201	A
ASB10	M1V	T	127	C	AXIN2	M120I	C	674	A	BRAF	V600E	A	1860	T	C15orf33	Y373C	T	1412	C
ASB10	A242V	G	851	A	AXIN2	R714W	G	2454	A	BRAF	V600E	A	1860	T	C15orf33	I394M	A	1476	C
ASB10	A242V	G	851	A	AXIN2	S296N	C	1201	T	BRAF	A305V	G	975	A	C15orf39	P1033S	C	3417	T
ASB11	G109A	C	377	G	AXIN2	D434E	G	1616	T	BRAF	V600E	A	1860	T	C15orf39	D202Y	G	924	T
ASB12	R215L	C	840	A	AXL	G46V	G	327	T	BRAF	M53T	A	219	G	C15orf41	K78T	A	483	C
ASB13	P88L	G	290	A	AZGP1	A46T	C	273	T	BRAF	V600E	A	1860	T	C15orf42	R1574*	C	4825	T
ASB13	R29W	G	112	A	AZGP1	D55Y	C	300	A	BRAP	-	C	0	T	C15orf42	R623I	G	1973	T
ASB14	E189K	C	686	T	AZI1	L401P	A	1450	G	BRAP	-	A	0	G	C15orf42	S503G	A	1612	G
ASB14	V176A	A	648	G	AZI1	V161M	C	729	T	BRAP	A242D	G	919	T	C15orf42	A17T	G	154	A
ASB16	R420H	G	1343	A	AZI1	R305Q	C	1162	T	BRCA1	G1384W	C	4382	A	C15orf42	V942A	T	2930	C

ASB16	R128Q	G	467	A	AZI1	A513V	G	1786	A	BRCA1	K1254T	T	3993	G	C15orf43	K126Q	A	393	C
ASB17	L282I	G	984	T	AZI1	R925H	C	3022	T	BRCA2	R2896C	C	8919	T	C15orf44	G406S	C	1216	T
ASB2	K606N	C	1818	A	AZI1	R374L	C	1369	A	BRCA2	T1887M	C	5893	T	C15orf52	P263L	G	804	A
ASB2	S536G	T	1606	C	AZI1	T501I	G	1750	A	BRCA2	G1840V	G	5752	T	C15orf54	G115R	G	711	A
ASB2	R450H	C	1349	T	AZI1	R32H	C	343	T	BRCA2	L1457S	T	4603	C	C15orf55	L429M	C	1285	A
ASB2	P198L	G	593	A	AZU1	V62M	G	200	A	BRCA2	F701C	T	2335	G	C15orf55	R221H	G	662	A
ASB3	N278S	T	1074	C	B2M	I66N	T	267	A	BRCA2	L951I	C	3084	A	C15orf55	Q121H	A	363	C
ASB3	N306S	T	1158	C	B2M	F76C	T	297	G	BRCA2	K956T	A	3100	C	C15orf55	K105N	G	315	T
ASB3	V435I	C	1544	T	B2M	E89*	G	335	T	BRCA2	S3332Y	C	10228	A	C15orf55	Q721H	G	2163	T
ASB4	S333Y	C	1069	A	B3GALNT1	S106Y	G	666	T	BRD1	E520D	C	1590	A	C15orf59	L217F	C	996	A
ASB4	S139R	A	486	C	B3GALNT1	A130T	C	737	T	BRD1	E41*	C	151	A	C15orf59	R26*	G	421	A
ASB4	L154I	C	531	A	B3GALNT2	D398E	A	1423	C	BRD1	R668H	C	2033	T	C15orf60	R25W	C	101	T
ASB4	N262S	A	856	G	B3GALT2	A408T	C	1978	T	BRD1	A689V	G	2096	A	C15orf60	D102Y	G	332	T
ASB5	S23L	G	182	A	B3GALT2	R284Q	C	1607	T	BRD1	R933Q	C	2828	T	C15orf60	T109M	C	354	T
ASB5	H173Q	A	633	T	B3GALT5	F160L	C	1072	A	BRD1	A215T	C	673	T	C15orf61	Q73H	G	284	T
ASB5	L251V	A	865	C	B3GALTL	G57*	G	318	T	BRD1	R737Q	C	2240	T	C15orf61	L120V	T	423	G
ASB6	R324H	C	1137	T	B3GAT1	P247T	G	1132	T	BRD1	R259H	C	806	T	C15orf63	E84*	G	4361	T
ASB6	A320E	G	1125	T	B3GAT1	V89L	C	658	A	BRD3	G649R	C	2131	T	C16orf11	R359Q	G	1355	A
ASB6	K268N	C	970	A	B3GAT1	V11I	C	424	T	BRD4	R669C	G	2227	A	C16orf11	P30H	C	368	A
ASB6	R278H	C	999	T	B3GAT3	R45L	C	163	A	BRD4	N560K	A	1902	T	C16orf11	P192Q	C	854	A
ASB7	F315C	T	1729	G	B3GAT3	V8A	A	52	G	BRD4	R1060C	G	3400	A	C16orf11	G104R	G	589	A
ASB7	A304S	G	1695	T	B3GNT4	A56T	G	522	A	BRD4	P56H	G	389	T	C16orf11	A463T	G	1666	A
ASB8	R259C	G	944	A	B3GNT4	L242P	T	1081	C	BRD4	L1361I	G	4303	T	C16orf11	P102T	C	583	A
ASB8	P275S	G	992	A	B3GNT4	N227D	A	1035	G	BRD7	Q133R	T	403	C	C16orf3	A7V	G	579	A
ASCC2	S315Y	G	1058	T	B3GNT6	G282S	G	932	A	BRD7	R613*	G	1842	A	C16orf42	R276H	C	934	T
ASCC3	K1957T	T	6199	G	B3GNT6	P346S	C	1124	T	BRD7	R96W	G	291	A	C16orf45	T187M	C	746	T
ASCC3	V1198A	A	3922	G	B3GNT6	R350C	C	1136	T	BRD8	D834Y	C	2872	A	C16orf46	R351Q	C	1117	T
ASCC3	R518C	G	1881	A	B3GNT9	P159H	G	476	T	BRD8	Q61H	T	555	G	C16orf48	D310N	C	1250	T
ASCC3	R675C	G	2352	A	B3GNT9	V135M	C	403	T	BRD8	R831*	G	2863	A	C16orf48	Q293H	C	1201	G
ASCC3	G1009C	C	3354	A	B3GNTL1	S114L	G	355	A	BRD8	R54H	C	533	T	C16orf54	A88T	C	358	T
ASCC3	-	C	0	T	B3GNTL1	P90T	G	282	T	BRD8	V40I	C	490	T	C16orf57	R252H	G	838	A
ASCC3	R1808C	G	5751	A	B4GALNT1	A498T	C	1924	T	BRD8	S916R	G	3120	T	C16orf59	A121T	G	420	A
ASCL1	H177Y	C	1100	T	B4GALNT1	A30T	C	520	T	BRD8	E219A	T	1028	G	C16orf62	R318Q	G	965	A
ASCL3	Y144H	A	490	G	B4GALNT1	R5C	G	445	A	BRD8	R98W	G	664	A	C16orf62	N304K	C	924	G
ASF1A	K129E	A	579	G	B4GALNT1	S314I	C	1373	A	BRD9	R60*	G	345	A	C16orf62	V259I	G	787	A
ASF1A	Q75R	A	418	G	B4GALNT1	R228Q	C	1115	T	BRD9	D109G	T	493	C	C16orf68	R188W	C	820	T
ASF1A	E105K	G	507	A	B4GALNT2	R303C	C	966	T	BRDT	E474*	G	1733	T	C16orf68	V373M	G	1375	A
ASH1L	R1306Q	C	4557	T	B4GALNT2	G383D	G	1207	A	BRDT	R853W	C	2870	T	C16orf68	E286*	G	1114	T
ASH1L	R2426Q	C	7917	T	B4GALNT2	R494Q	G	1540	A	BRDT	Q164H	G	805	T	C16orf7	G605R	C	1938	T

ASH1L	R1516H	C	5187	T	B4GALNT3	R121H	G	375	A	BRDT	K298N	G	1207	T	C16orf7	R221M	C	787	A
ASH1L	R2968*	G	9542	A	B4GALNT3	G553D	G	1671	A	BRDT	D878N	G	2945	A	C16orf7	S589L	G	1891	A
ASH2L	A126V	C	435	T	B4GALNT3	M906V	A	2729	G	BRE	I312V	A	1072	G	C16orf7	P484H	G	1576	T
ASNA1	G171S	G	525	A	B4GALNT4	R114W	C	340	T	BRE	R23Q	G	206	A	C16orf70	S403L	C	1372	T
ASNSD1	V589M	G	2178	A	B4GALNT4	R881W	C	2641	T	BRE	F207V	T	757	G	C16orf71	P15L	C	522	T
ASPA	L147M	C	530	A	B4GALNT4	A238T	G	712	A	BRF1	I321L	T	1610	G	C16orf71	G76S	G	704	A
ASPDH	A27V	G	142	A	B4GALNT4	R815C	C	2443	T	BRF2	D30N	C	198	T	C16orf72	L196I	C	1013	A
ASPDH	G126W	C	438	A	B4GALNT4	R878H	G	2633	A	BRI3BP	A123T	G	453	A	C16orf73	L465V	A	1403	C
ASPDH	R89C	G	327	A	B4GALNT4	R850C	C	2548	T	BRI3BP	-	A	0	C	C16orf73	R342*	G	1034	A
ASPDH	V121M	C	423	T	B4GALNT4	R756H	G	2267	A	BRI3BP	G14V	G	127	T	C16orf74	-	A	0	G
ASPG	G386V	G	1157	T	B4GALT3	R3Q	C	231	T	BRIP1	G290S	C	1009	T	C16orf75	V107A	T	361	C
ASPG	R270C	C	808	T	B4GALT3	S49Y	G	369	T	BRIP1	A745T	C	2374	T	C16orf78	M28I	G	201	A
ASPG	A223T	G	667	A	B4GALT4	G255*	C	1405	A	BRIP1	A745T	C	2374	T	C16orf78	L208V	T	739	G
ASPG	P58H	C	173	A	B4GALT4	G218D	C	1295	T	BRIP1	L358P	A	1214	G	C16orf78	D241V	A	839	T
ASPG	F204L	C	612	A	B4GALT4	D154N	C	1102	T	BRIP1	K479T	T	1577	G	C16orf78	R95T	G	401	C
ASPG	R210W	C	628	T	B4GALT5	H176Y	G	714	A	BRIX1	I186L	A	919	C	C16orf80	R100C	G	604	A
ASPG	R270C	C	808	T	B4GALT6	E125K	C	670	T	BRMS1	I121V	T	508	C	C16orf88	R392C	G	1179	A
ASPG	L448R	T	1343	G	B4GALT7	A273T	G	928	A	BRMS1L	K98N	A	420	C	C16orf88	K442E	T	1329	C
ASPH	G40*	C	387	A	B9D2	R75G	G	402	C	BRP44	L75V	A	422	C	C16orf90	A39T	C	113	T
ASPH	E129G	T	655	C	BAAT	R297H	C	999	T	BRP44L	S108Y	G	445	T	C16orf91	A95T	C	283	T
ASPH	A189V	G	835	A	BAAT	L406I	G	1325	T	BRPF1	V1065M	G	3597	A	C16orf91	S165I	C	494	A
ASPH	H493Y	G	1746	A	BAAT	E54*	C	269	A	BRPF1	S460T	T	1782	A	C16orf91	I176M	T	528	C
ASPHD1	R222W	C	778	T	BACE1	G395V	C	1645	A	BRPF1	T441S	A	1725	T	C16orf92	F117L	T	372	G
ASPHD1	-	G	0	T	BACE1	R412*	G	1695	A	BRPF1	R946C	C	3240	T	C16orf93	Y214*	G	642	T
ASPHD2	R290H	G	1307	A	BACE1	T164I	G	952	A	BRPF3	R6W	C	240	T	C17orf101	P292L	G	966	A
ASPHD2	G121A	G	800	C	BACE2	A300V	C	1362	T	BRPF3	A763T	G	2511	A	C17orf101	S96G	T	377	C
ASPHD2	R258W	C	1210	T	BACH1	L87F	A	404	C	BRPF3	V1109I	G	3549	A	C17orf101	G256R	C	857	T
ASPM	Q1495P	T	4741	G	BACH1	N529S	A	1729	G	BRPF3	R970H	G	3133	A	C17orf102	R15*	G	132	A
ASPM	L250R	A	1006	C	BACH1	R142I	G	568	T	BRS3	A160V	C	707	T	C17orf102	S25N	C	163	T
ASPM	A2663T	C	8244	T	BACH2	F253C	A	1466	C	BRSK1	V448I	G	1342	A	C17orf104	F152V	T	596	G
ASPM	A1913V	G	5995	A	BAD	P101S	G	572	A	BRSK1	-	G	0	T	C17orf104	H503N	C	1649	A
ASPM	R2996W	G	9243	A	BAG1	A26V	G	511	A	BRSK1	V626M	G	1876	A	C17orf105	I39V	A	118	G
ASPM	K2683R	T	8305	C	BAG3	Y205C	A	920	G	BRSK1	R776*	C	2326	T	C17orf105	R138H	G	416	A
ASPM	V2362I	C	7341	T	BAG3	K534T	A	1907	C	BRSK2	A174V	C	774	T	C17orf106	R92C	C	572	T
ASPM	A2461V	G	7639	A	BAG4	P315L	C	1020	T	BRSK2	R410H	G	1482	A	C17orf28	L280M	G	987	T
ASPM	E3458D	T	1063 1	G	BAG4	Y321H	T	1037	C	BRSK2	S501G	A	1754	G	C17orf28	V58M	C	321	T
ASPM	K3080N	T	9497	A	BAGE3	K4315N	C	1316 4	A	BRWD1	S696N	C	2415	T	C17orf39	E178*	G	575	T
ASPM	R1164H	C	3748	T	BAGE3	G4749S	C	1446	T	BRWD1	E1647G	T	5268	C	C17orf42	R278Q	C	903	T

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ASPM	E918K	C	3009	T	BAGE3	R4196Q	C	12806	T	BRWD1	R1074C	G	3548	A	C17orf46	Q270H	C	906	A
ASPM	V1610D	A	5086	T	BAGE3	V4395A	A	13403	G	BRWD1	R1011Q	C	3360	T	C17orf47	R51*	G	287	A
ASPN	R370K	C	1353	T	BAGE3	E1152*	C	3673	A	BRWD1	K1749T	T	5574	G	C17orf47	L35I	G	239	T
ASPN	R84Q	C	495	T	BAGE3	P3967S	G	12118	A	BRWD3	C112R	A	551	G	C17orf50	H157R	A	515	G
ASPN	S348R	T	1286	G	BAGE3	G2479R	C	7654	T	BRWD3	S1643C	T	5144	A	C17orf51	S144T	A	686	T
ASPN	K276T	T	1071	G	BAGE3	Y4941C	T	15041	C	BRWD3	T362M	G	1302	A	C17orf51	P61S	G	437	A
ASPN	K252N	T	1000	G	BAGE3	E1436D	T	4527	G	BSDC1	L179F	G	547	A	C17orf53	R244I	G	916	T
ASPN	A25T	C	317	T	BAGE3	S1308P	A	4141	G	BSG	R380S	C	1236	A	C17orf53	R558Q	G	1858	A
ASPRV1	G162W	C	1061	A	BAGE3	S4304*	G	13130	T	BSG	R317C	C	1047	T	C17orf55	W210C	C	1062	A
ASPRV1	G203V	C	1185	A	BAGE3	R2884*	G	8869	A	BSN	D1685N	G	5167	A	C17orf56	T453M	G	1380	A
ASPRV1	E240D	C	1297	A	BAGE3	K1396N	T	4407	G	BSN	K650E	A	2062	G	C17orf56	N94D	T	302	C
ASPSCR1	R299W	C	897	T	BAGE3	R1292Q	C	4094	T	BSN	R3664W	C	11104	T	C17orf56	S216P	A	668	G
ASTE1	V316I	C	1153	T	BAHCC1	V1911I	G	5731	A	BSN	R1408C	C	4336	T	C17orf56	R60H	C	201	T
ASTE1	R570C	G	1915	A	BAHCC1	A2542V	C	7625	T	BSN	K3342R	A	10139	G	C17orf56	L20I	G	80	T
ASTE1	Q307H	C	1128	A	BAHCC1	R1684H	G	5051	A	BSN	P1243S	C	3841	T	C17orf57	S931L	C	3203	T
ASTL	P105H	G	314	T	BAHCC1	R319C	C	955	T	BSN	R2942Q	G	8939	A	C17orf57	S960Y	C	3290	A
ASTN1	D597N	C	2001	T	BAHCC1	A1400T	G	4198	A	BSN	R1023C	C	3181	T	C17orf57	K635N	G	2316	T
ASTN1	R850C	G	2760	A	BAHCC1	R2430W	C	7288	T	BSN	R3676C	C	11140	T	C17orf57	N700H	A	2509	C
ASTN1	Y203C	T	820	C	BAHCC1	K1729N	G	5187	T	BSN	L3785I	C	11467	A	C17orf57	L517V	C	1960	G
ASTN1	S790L	G	2581	A	BAHCC1	P1963L	C	5888	T	BSN	D805N	G	2527	A	C17orf58	R82Q	C	560	T
ASTN1	T1131M	G	3604	A	BAHCC1	G528D	G	1583	A	BSN	P253L	C	872	T	C17orf59	N219H	T	761	G
ASTN1	R1253H	C	3970	T	BAHD1	A702T	G	2175	A	BSND	F11L	C	287	A	C17orf63	A488V	G	1676	A
ASTN1	N1204H	T	3822	G	BAHD1	R172W	C	585	T	BSND	A192T	G	828	A	C17orf63	A43V	G	341	A
ASTN1	R1012Q	C	3247	T	BAHD1	R533H	G	1669	A	BSPRY	E182A	A	584	C	C17orf66	-	T	0	C
ASTN2	G1038W	C	3213	A	BAI1	T1124M	C	3554	T	BSX	R133C	G	446	A	C17orf68	A825T	C	2532	T
ASTN2	G326*	C	1077	A	BAI1	P75L	C	407	T	BTAF1	S1319P	T	3967	C	C17orf70	R522*	G	2283	A
ASTN2	F732V	A	2295	C	BAI1	D1173N	G	3700	A	BTAF1	K396*	A	1198	T	C17orf70	R188W	G	1281	A
ASTN2	R653C	G	2058	A	BAI1	A596V	C	1970	T	BTAF1	R1025*	A	3085	T	C17orf71	R127Q	G	422	A
ASXL1	L857P	T	2996	C	BAI1	N607K	C	2004	A	BTAF1	G1294V	G	3893	T	C17orf71	A830V	C	2531	T
ASXL1	R302C	C	1330	T	BAI1	L108P	T	506	C	BTAF1	D1625N	G	4885	A	C17orf71	G950V	G	2891	T
ASXL1	S25L	C	500	T	BAI1	T950M	C	3032	T	BTAF1	K1239N	G	3729	T	C17orf71	C197R	T	631	C
ASXL1	A1248V	C	4169	T	BAI1	V405M	G	1396	A	BTBD1	G365D	C	1297	T	C17orf74	Q146H	G	511	T
ASXL1	D756N	G	2692	A	BAI1	R490H	G	1652	A	BTBD11	A833T	G	3025	A	C17orf75	N181T	T	573	G
ASXL1	S1341N	G	4448	A	BAI1	E671D	G	2196	T	BTBD11	V613G	T	2366	G	C17orf76	D83A	T	276	G

ASXL1	A158V	C	899	T	BAI1	F553L	C	1842	A	BTBD11	R434H	G	1829	A	C17orf78	P154H	C	511	A
ASXL2	S250*	G	749	T	BAI2	R965C	G	3247	A	BTBD11	A185T	G	1081	A	C17orf80	L25V	T	267	G
ASXL3	V868I	G	2657	A	BAI2	P1556S	G	5020	A	BTBD11	A561V	C	2210	T	C17orf80	K113N	G	533	T
ASXL3	R1052M	G	3210	T	BAI2	G1055A	C	3518	G	BTBD11	V635A	T	2432	C	C17orf85	R491C	G	1494	A
ASXL3	A52V	C	210	T	BAI3	R1452W	C	5175	T	BTBD11	R710C	C	2656	T	C17orf85	R497I	C	1513	A
ASXL3	D106Y	G	371	T	BAI3	F73I	T	1038	A	BTBD11	F1063L	C	3717	G	C17orf87	A24D	G	71	T
ASXL3	I299S	T	951	G	BAI3	T428I	C	2104	T	BTBD11	D571G	A	2240	G	C17orf97	G7A	G	36	C
ASXL3	R933W	C	2852	T	BAI3	S408L	C	2044	T	BTBD12	R1366H	C	4738	T	C17orf98	A2V	G	27	A
ASXL3	Y2125*	T	6430	G	BAI3	-	G	0	T	BTBD12	V1284M	C	4491	T	C17orf99	T297M	C	890	T
ASZ1	K208T	T	686	G	BAI3	F611L	C	2654	A	BTBD12	W800R	A	3039	G	C18orf1	R280I	G	1507	T
ATAD1	P186S	G	935	A	BAI3	K1046R	A	3958	G	BTBD12	T697M	G	2731	A	C18orf1	P2L	C	673	T
ATAD1	H256N	G	1145	T	BAI3	R1197Q	G	4411	A	BTBD12	R1060Q	C	3820	T	C18orf22	K277N	G	969	T
ATAD2	T1311A	T	4039	C	BAIAP2	L393I	C	1270	A	BTBD12	E971*	C	3552	A	C18orf25	I237L	A	1088	C
ATAD2	R156Q	C	575	T	BAIAP2L1	T458M	G	1589	A	BTBD12	I854M	A	3203	C	C18orf26	A55S	G	209	T
ATAD2	R1367C	G	4207	A	BAIAP2L1	N152H	T	670	G	BTBD16	S395L	C	1435	T	C18orf26	K30N	G	136	T
ATAD2	L185V	G	661	C	BAIAP2L2	R228H	C	828	T	BTBD16	E217K	G	900	A	C18orf32	E43*	C	339	A
ATAD2	Q1377R	T	4238	C	BAIAP2L2	V169M	C	650	T	BTBD17	F231L	A	691	G	C18orf34	G867D	C	2742	T
C18orf34	I611V	T	1973	C	C4orf43	A113D	C	336	A	CAMTA1	F681V	T	2248	G	CCDC88C	A1289V	G	3965	A
C18orf54	P144S	C	546	T	C4orf46	E83*	C	492	A	CAMTA1	A802V	C	2612	T	CCDC88C	P2009L	G	6125	A
C18orf54	R517C	C	1665	T	C4orf49	T197A	T	769	C	CAMTA2	R1180*	G	3662	A	CCDC88C	E1819D	C	5556	A
C18orf8	E162K	G	605	A	C4orf49	R31C	G	271	A	CAND1	M323I	G	1406	T	CCDC88C	A485V	G	1553	A
C18orf8	-	A	0	C	C4orf50	E59*	C	1473	A	CAND1	A354V	C	1498	T	CCDC88C	A302V	G	1004	A
C18orf8	K556*	A	1787	T	C4orf6	R34H	G	276	A	CAND1	K661T	A	2419	C	CCDC88C	S787G	T	2458	C
C19orf12	E95K	C	410	T	C5	V1364A	A	4121	G	CAND2	E935K	G	2844	A	CCDC89	V321M	C	1108	T
C19orf12	K37N	C	238	A	C5	R1206C	G	3646	A	CAND2	S1096*	C	3328	A	CCDC9	R230Q	G	896	A
C19orf18	S78F	G	337	A	C5	L1129V	A	3415	C	CANT1	L5Q	A	448	T	CCDC9	G518D	G	1760	A
C19orf2	I48F	A	439	T	C5	Y256D	A	796	C	CANX	R479*	C	1435	T	CCDC91	E190*	G	584	T
C19orf2	P333S	C	1294	T	C5	T136I	G	437	A	CAP1	E156*	G	1027	T	CCDC91	E208K	G	638	A
C19orf2	E276K	G	1123	A	C5AR1	T62M	C	234	T	CAP1	Q260H	G	1341	T	CCDC93	V488D	A	1601	T
C19orf2	R413Q	G	1535	A	C5orf13	C45R	A	325	G	CAP2	V46M	G	668	A	CCDC93	K352T	T	1193	G
C19orf21	E283V	A	944	T	C5orf22	D172N	G	641	A	CAP2	G228V	G	1215	T	CCDC93	K308Q	T	1060	G
C19orf21	R406C	C	1312	T	C5orf25	R40C	C	525	T	CAPN1	G411R	G	1374	A	CCDC93	E292K	C	1012	T
C19orf22	A162T	C	552	T	C5orf25	R828C	C	2889	T	CAPN1	L370P	T	1252	C	CCDC94	R82C	C	280	T
C19orf25	P115H	G	383	T	C5orf30	A87T	G	567	A	CAPN10	G526S	G	1772	A	CCDC94	L300P	T	935	C
C19orf26	A714T	C	2415	T	C5orf30	R45Q	G	442	A	CAPN12	A440T	C	1627	T	CCDC96	K498R	T	1556	C
C19orf26	-	T	0	C	C5orf30	K166T	A	805	C	CAPN12	F367L	G	1410	T	CCDC96	N496I	T	1550	A
C19orf28	T390M	G	1339	A	C5orf32	G50S	G	812	A	CAPN12	L443P	A	1637	G	CCDC96	S555Y	G	1727	T
C19orf29	Y398C	T	1450	C	C5orf33	R378Q	C	1133	T	CAPN13	S247C	T	912	A	CCDC97	R146Q	G	559	A
C19orf29	R571Q	C	1969	T	C5orf35	V194L	G	966	C	CAPN13	R262Q	C	958	T	CCDC97	F111L	T	453	C

C19orf29	A452V	G	1612	A	C5orf36	G1029R	C	3086	T	CAPN13	R56C	G	339	A	CCDC99	R203H	G	887	A
C19orf29	R685H	C	2311	T	C5orf36	R1087H	C	3261	T	CAPN14	R277Q	C	972	T	CCDC99	S252N	G	1034	A
C19orf29	E550D	C	1907	A	C5orf36	S1161Y	G	3483	T	CAPN14	N503I	T	1650	A	CCDC99	R264Q	G	1070	A
C19orf29	T269A	T	1062	C	C5orf36	E1157*	C	3470	A	CAPN14	-	A	0	G	CCIN	R43H	G	239	A
C19orf29	R114W	G	597	A	C5orf36	L659I	G	1976	T	CAPN14	P5S	G	155	A	CCIN	R174C	C	631	T
C19orf29OS	A98T	G	292	A	C5orf36	F274L	G	823	T	CAPN14	R444I	C	1473	A	CCIN	P177S	C	640	T
C19orf36	G45R	G	557	A	C5orf38	R30Q	G	206	A	CAPN2	V485M	G	1762	A	CCIN	R327C	C	1090	T
C19orf43	S53L	G	216	A	C5orf38	K113N	G	456	T	CAPN2	R418Q	G	1562	A	CCK	A18T	C	958	T
C19orf44	V571A	T	1785	C	C5orf41	Q465H	G	1395	C	CAPN2	A179T	G	844	A	CCK	R106C	G	1222	A
C19orf45	S246L	C	878	T	C5orf41	R17Q	G	50	A	CAPN2	R318W	C	1261	T	CCKAR	P146S	G	631	A
C19orf46	A211T	C	743	T	C5orf41	F613C	T	1838	G	CAPN2	R285Q	G	1163	A	CCKAR	R73Q	C	413	T
C19orf46	R267Q	C	912	T	C5orf42	R785*	G	2447	A	CAPN5	E433K	G	1297	A	CCKAR	S233Y	G	893	T
C19orf46	G222V	C	777	A	C5orf42	L1379V	A	4229	C	CAPN6	R263C	G	955	A	CCKBR	R264*	C	983	T
C19orf46	A345T	C	1145	T	C5orf42	K3092Q	T	9368	G	CAPN6	A86E	G	425	T	CCKBR	G268R	G	995	A
C19orf46	A266S	C	908	A	C5orf42	E2906*	C	8810	A	CAPN7	K723N	G	2422	T	CCKBR	A62T	G	377	A
C19orf47	R244H	C	731	T	C5orf42	-	C	0	A	CAPN7	F543C	T	1881	G	CCKBR	R243H	G	921	A
C19orf51	R288S	G	862	T	C5orf42	R1424I	C	4365	A	CAPN8	P385H	G	1154	T	CCL14	C51Y	C	231	T
C19orf54	G323D	C	1088	T	C5orf42	R978Q	C	3027	T	CAPN8	-	C	0	T	CCL17	M6I	G	147	A
C19orf54	P346S	G	1156	A	C5orf44	R336M	G	1034	T	CAPN8	Q608H	C	1824	A	CCL2	A6T	G	72	A
C19orf55	A389T	G	1165	A	C5orf46	G13*	C	38	A	CAPN8	E175*	C	523	A	CCL2	V3I	G	63	A
C19orf55	F109L	T	325	C	C5orf46	L65I	G	194	T	CAPN8	F46C	A	137	C	CCL25	C31Y	G	198	A
C19orf55	D223N	G	667	A	C5orf47	A59V	C	281	T	CAPN9	A667V	C	2113	T	CCL25	-	G	0	A
C19orf60	A176V	C	527	T	C5orf48	L23I	C	80	A	CAPN9	R275Q	G	937	A	CCL25	R93Q	G	384	A
C19orf60	V201A	T	602	C	C5orf49	Y66H	A	665	G	CAPNS1	K9Q	A	179	C	CCL28	R50H	C	224	T
C19orf60	A181T	G	541	A	C5orf49	Y66H	A	665	G	CAPRIN1	P266S	C	985	T	CCL7	R71W	C	251	T
C19orf61	Q62*	G	527	A	C5orf49	R105C	G	782	A	CAPRIN1	W316*	G	1137	A	CCL7	R47I	G	180	T
C19orf62	K323T	A	1066	C	C5orf51	H207N	C	638	A	CAPRIN1	P409T	C	1414	A	CCM2	N12H	A	353	C
C19orf63	R109W	C	391	T	C5orf54	F480L	A	1904	C	CAPRIN1	K125N	A	564	C	CCNA1	Q80*	C	502	T
C19orf66	R14C	C	338	T	C5orf58	L8I	C	22	A	CAPRIN1	H554R	A	1850	G	CCNA1	Q128H	A	648	C
C19orf70	D82G	T	659	C	C5orf60	L84I	G	318	T	CAPRIN2	Q417H	C	2002	A	CCNA1	A262S	G	1048	T
C19orf71	R93H	G	299	A	C6	S273R	T	1082	G	CAPRIN2	-	C	0	A	CCNA1	V341I	G	1285	A
C19orf77	R27C	G	158	A	C6orf103	A553E	C	1699	A	CAPRIN2	K178N	C	1285	A	CCNA1	L192I	C	838	A
C1orf100	R122Q	G	478	A	C6orf103	W632G	T	1935	G	CAPRIN2	R149H	C	1197	T	CCNB1	A44V	C	384	T
C1orf100	R13H	G	151	A	C6orf103	F1004C	T	3052	G	CAPS	R275C	C	3381	T	CCNB2	R6C	C	207	T
C1orf100	R77*	C	342	T	C6orf114	G59V	C	699	A	CAPSL	R6H	C	144	T	CCNB3	Q1153E	C	3755	G
C1orf101	D435Y	G	1357	T	C6orf118	H199Y	G	616	A	CAPZA1	E200D	A	1272	C	CCNB3	K492N	G	1774	T
C1orf103	F574C	A	1977	C	C6orf118	L447I	A	1360	T	CAPZA2	E282D	G	985	T	CCND1	R260C	C	987	T
C1orf103	F300L	A	1154	G	C6orf118	A348V	G	1064	A	CAPZA2	K91N	G	412	T	CCND1	L233F	C	906	T
C1orf106	A448T	G	1542	A	C6orf118	A212T	C	655	T	CAPZA2	V32G	T	234	G	CCND1	A187T	G	768	A

C1orf107	V511I	G	1588	A	C6orf118	A212V	G	656	A	CAPZA2	K147N	A	580	C	CCNE1	P407L	C	1403	T
C1orf107	S182Y	C	602	A	C6orf120	A19V	C	82	T	CAPZA3	A226E	C	835	A	CCNE1	A214V	C	824	T
C1orf107	K389T	A	1223	C	C6orf125	R62*	G	225	A	CAPZB	R330I	C	989	A	CCNE2	T47A	T	245	C
C1orf107	R437Q	G	1367	A	C6orf132	R931C	G	2791	A	CARD10	R749W	G	2462	A	CCNF	K503T	A	1571	C
C1orf109	L159I	G	665	T	C6orf138	L690F	G	2102	A	CARD10	R404Q	C	1428	T	CCNF	V705I	G	2176	A
C1orf110	S162Y	G	503	T	C6orf145	E169K	C	1000	T	CARD10	A541T	C	1838	T	CCNG2	E225K	G	1029	A
C1orf110	F70L	G	228	T	C6orf146	N182S	T	545	C	CARD11	T353A	T	1461	C	CCNG2	-	G	1391	T
C1orf112	L612V	T	2181	G	C6orf150	E385D	T	1250	G	CARD11	R891Q	C	3076	T	CCNG2	C117R	T	705	C
C1orf112	S566I	G	2044	T	C6orf150	F379S	A	1231	G	CARD11	R912W	G	3138	A	CCNH	Q136*	G	631	A
C1orf113	E306D	G	1082	T	C6orf150	M32I	C	191	T	CARD11	R1027*	G	3483	A	CCNI	E64*	C	767	A
C1orf113	V96M	G	450	A	C6orf162	R29C	C	174	T	CARD11	A1046T	C	3540	T	CCNI2	V283I	G	898	A
C1orf113	P551L	C	1816	T	C6orf165	R601H	G	1914	A	CARD11	R920C	G	3162	A	CCNJ	R61C	C	540	T
C1orf114	T7S	G	173	C	C6orf165	K604T	A	1923	C	CARD11	N444K	G	1736	T	CCNJ	S316L	C	1306	T
C1orf116	S177R	T	779	G	C6orf165	M67I	G	313	C	CARD11	M12I	C	440	T	CCNJ	V283A	T	1207	C
C1orf124	P333H	C	1334	A	C6orf167	F532L	A	1862	T	CARD11	R424W	G	1674	A	CCNK	G354S	G	1060	A
C1orf125	E994Q	G	3367	C	C6orf167	A785S	C	2619	A	CARD11	S562*	G	2089	T	CCNK	E52V	A	155	T
C1orf125	A365V	C	1481	T	C6orf167	V1008M	C	3288	T	CARD14	A282V	C	1046	T	CCNK	A336V	C	1007	T
C1orf125	L466P	T	1784	C	C6orf167	Q148H	C	710	A	CARD14	A10T	G	229	A	CCNL1	F334L	A	1121	C
C1orf125	L957I	C	3256	A	C6orf168	S24P	A	353	G	CARD6	D490N	G	1484	A	CCNL1	H465Q	A	1514	T
C1orf125	H164R	A	878	G	C6orf168	E350K	C	1331	T	CARD6	F596V	T	1802	G	CCNL1	A309T	C	1044	T
C1orf125	R574*	C	2107	T	C6orf170	L1129I	G	3453	T	CARD8	D349G	T	1260	C	CCNL1	R239*	G	834	A
C1orf125	K109T	A	713	C	C6orf170	K338N	C	1082	A	CARD8	D329Y	C	1199	A	CCNL2	L291I	G	877	T
C1orf125	A670V	C	2396	T	C6orf174	G368C	C	1947	A	CARD9	R305H	C	1080	T	CCNL2	H512R	T	1541	C
C1orf127	P4L	G	16	A	C6orf174	G368C	C	1947	A	CARHSP1	D87N	C	619	T	CCNL2	A179V	G	542	A
C1orf127	A151V	G	457	A	C6orf174	R454K	C	2206	T	CARHSP1	P44L	G	491	A	CCNL2	L184I	G	556	T
C1orf127	Q87*	G	264	A	C6orf174	F277C	A	1675	C	CARM1	T480M	C	1565	T	CCNO	A87V	G	417	A
C1orf128	R131W	C	502	T	C6orf182	R256*	C	1343	T	CARNS1	R789C	C	2455	T	CCNT1	I244S	A	1054	C
C1orf128	H208R	A	734	G	C6orf203	L148P	T	1133	C	CARNS1	L902I	C	2794	A	CCNT1	K596T	T	2110	G
C1orf129	V358M	G	1171	A	C6orf203	G24C	G	760	T	CARNS1	R659Q	G	2066	A	CCNT2	Q45R	A	164	G
C1orf129	E90*	G	367	T	C6orf203	Q140P	A	1109	C	CARS	A631T	C	1961	T	CCNYL1	F348V	T	1253	G
C1orf129	L139R	T	1575	G	C6orf204	T766A	T	2918	C	CARS	K131E	T	461	C	CCPG1	R397S	C	1356	A
C1orf130	S29Y	C	152	A	C6orf204	P742S	G	2846	A	CARS	A215T	C	713	T	CCPG1	E92K	C	439	T
C1orf131	T142M	G	462	A	C6orf204	F357L	A	1691	G	CARS2	E167K	C	544	T	CCR2	A306V	C	1402	T
C1orf135	R187Q	C	615	T	C6orf204	E759D	C	2899	A	CARS2	P251L	G	797	A	CCR4	T348M	C	1211	T
C1orf14	V253F	C	757	A	C6orf204	K660N	C	2602	A	CASC1	N577H	T	1795	G	CCR4	C110R	T	496	C
C1orf14	R681M	C	2042	A	C6orf204	K220T	T	1281	G	CASC1	R470S	T	1476	G	CCR5	F263L	C	911	A
C1orf14	A597T	C	1789	T	C6orf211	D291G	A	1131	G	CASC1	E278*	C	898	A	CCR7	P278S	G	895	A
C1orf14	M565I	C	1695	A	C6orf221	R158C	C	525	T	CASC1	R54Q	C	227	T	CCR9	L87P	T	440	C
C1orf141	Q319H	C	1068	A	C6orf222	A442V	G	1503	A	CASC1	E45*	C	199	A	CCR9	N12D	A	214	G

C1orf145	P120T	G	362	T	C6orf222	A12V	G	213	A	CASC3	T689I	C	2361	T	CCRL1	Q26*	C	172	T
C1orf147	P99H	G	307	T	C6orf222	-	C	0	T	CASC3	D171E	T	808	G	CCRL1	Q26*	C	172	T
C1orf159	-	T	0	C	C6orf222	D494Y	C	1658	A	CASC5	S682Y	C	2206	A	CCRL2	R330C	C	1101	T
C1orf159	G219V	C	867	A	C6orf223	A208V	C	643	T	CASC5	Q1255H	A	3926	C	CCRL2	T102I	C	418	T
C1orf168	E650*	C	2029	A	C6orf223	A232S	G	714	T	CASC5	A1599T	G	4956	A	CCRN4L	P220L	C	852	T
C1orf170	P215S	G	643	A	C6orf57	R104C	C	334	T	CASC5	F1667V	T	5160	G	CCT2	V104I	G	404	A
C1orf173	S856P	A	2785	G	C6orf64	F116S	A	447	G	CASD1	K541I	A	1909	T	CCT2	R516H	G	1641	A
C1orf173	N1041D	T	3340	C	C6orf64	W83L	C	348	A	CASD1	K80N	G	527	T	CCT3	P75Q	G	444	T
C1orf173	S893Y	G	2897	T	C6orf70	-	T	0	C	CASD1	R496C	C	1773	T	CCT3	R518Q	C	1773	T
C1orf173	Q518R	T	1772	C	C6orf70	L466*	T	1430	G	CASD1	S579Y	C	2023	A	CCT4	R441*	G	1618	A
C1orf173	A1375T	C	4342	T	C6orf81	E183K	G	574	A	CASD1	W657G	T	2256	G	CCT4	H129R	T	683	C
C1orf173	F1163C	A	3707	C	C6orf81	A291T	G	898	A	CASD1	I762T	T	2572	C	CCT6A	R314H	G	1160	A
C1orf173	G1162E	C	3704	T	C6orf94	S207Y	C	724	A	CASK	G206S	C	1091	T	CCT6A	D284N	G	1069	A
C1orf173	T1036N	G	3326	T	C6orf94	A132T	G	498	A	CASK	R537*	G	2084	A	CCT6B	A417T	C	1343	T
C1orf173	K982T	T	3164	G	C6orf97	Q519H	G	1598	T	CASKIN1	V1284I	C	3882	T	CCT6B	D480Y	C	1532	A
C1orf173	K765I	T	2513	A	C6orf97	R39W	C	156	T	CASKIN1	R952H	C	2887	T	CCT6B	K146T	T	531	G
C1orf173	E641*	C	2140	A	C6orf97	E271D	A	854	C	CASKIN1	R271K	C	844	T	CCT7	Y358H	T	1213	C
C1orf174	R54*	G	259	A	C6orf97	R46Q	G	178	A	CASKIN1	T689N	G	2098	T	CCT8	A70S	C	415	A
C1orf175	V441A	T	1322	C	C7	C791Y	G	2731	A	CASKIN1	E656K	C	1998	T	CCT8	C430R	A	1495	G
C1orf175	A636V	C	1907	T	C7	V536I	G	1965	A	CASKIN2	E242D	C	1276	A	CCT8L2	D300N	C	1158	T
C1orf175	M1340T	T	4019	C	C7	C797Y	G	2749	A	CASKIN2	E227K	C	1229	T	CCT8L2	R133Q	C	658	T
C1orf183	W169C	C	665	G	C7	E720A	A	2518	C	CASKIN2	G773S	C	2867	T	CCT8L2	L228P	A	943	G
C1orf183	A117T	C	507	T	C7orf10	G357D	G	1094	A	CASKIN2	E671K	C	2561	T	CCT8L2	N291D	T	1131	C
C1orf185	T137I	C	410	T	C7orf10	V301I	G	925	A	CASKIN2	A1120V	G	3909	A	CD101	R814C	C	2498	T
C1orf185	A2T	G	4	A	C7orf11	-	C	0	A	CASKIN2	P1069S	G	3755	A	CD101	Q57P	A	228	C
C1orf186	A15T	C	682	T	C7orf16	R135G	A	1031	G	CASP1	K203E	T	643	C	CD101	P717S	C	2207	T
C1orf186	E123K	C	1006	T	C7orf27	A652T	C	2211	T	CASP10	M1I	G	438	T	CD101	K993T	A	3036	C
C1orf189	K15N	C	71	A	C7orf29	G83A	G	341	C	CASP2	R361C	C	1322	T	CD109	K429N	G	1399	T
C1orf190	T108N	C	416	A	C7orf30	L42F	C	277	T	CASP4	A290V	G	1780	A	CD109	S119I	G	468	T
C1orf194	R46W	G	212	A	C7orf31	I311M	T	1242	C	CASP4	G211D	C	1543	T	CD109	V531A	T	1704	C
C1orf200	I165V	T	643	C	C7orf34	K55N	G	163	T	CASP5	R414W	G	1272	A	CD109	L1321F	A	4075	C
C1orf201	N172D	T	649	C	C7orf42	V180M	G	793	A	CASP5	A125P	C	405	G	CD109	S1322I	G	4077	T
C1orf228	P294S	C	1187	T	C7orf43	S300A	A	1084	C	CASP5	E354D	C	1094	A	CD109	E541D	A	1735	C
C1orf26	-	T	0	C	C7orf44	K90R	T	588	C	CASP8	M163I	G	685	A	CD109	P91S	C	383	T
C1orf26	G90S	G	362	A	C7orf45	A58V	C	224	T	CASP8	Q388*	C	1358	T	CD160	L123R	A	591	C
C1orf27	A289S	G	1021	T	C7orf45	A129V	C	437	T	CASP8	I501T	T	1698	C	CD163	-	A	0	C
C1orf27	A24V	C	227	T	C7orf45	H212Y	C	685	T	CASP8	P291H	C	1068	A	CD163	N454S	T	1361	C
C1orf49	L84R	T	363	G	C7orf47	Q168*	G	693	A	CASP8AP2	P866L	C	2832	T	CD163	S448Y	G	1343	T
C1orf49	K101R	A	414	G	C7orf47	P53H	G	349	T	CASP8AP2	K1631*	A	5126	T	CD163L1	L270I	G	834	T

C1orf51	S55*	C	300	A	C7orf51	E381D	G	1302	T	CASP8AP2	E1294K	G	4115	A	CD163L1	E1428*	C	4308	A
C1orf51	S218N	G	789	A	C7orf52	P40S	G	357	A	CASP8AP2	R317C	C	1184	T	CD163L1	G704D	C	2137	T
C1orf54	M1K	T	772	A	C7orf53	T100P	A	433	C	CASP8AP2	K999E	A	3230	G	CD163L1	G1211C	C	3657	A
C1orf55	E328*	C	1001	A	C7orf57	R297*	C	890	T	CASQ1	A212T	G	830	A	CD163L1	L1332I	G	4020	T
C1orf58	F329C	T	1392	G	C7orf57	D194N	G	581	A	CASQ2	R121C	G	601	A	CD163L1	N847S	T	2566	C
C1orf61	K177N	C	530	A	C7orf58	F945C	T	3301	G	CASQ2	P353Q	G	1298	T	CD164	S49F	G	212	A
C1orf64	A58E	C	241	A	C7orf60	V359L	C	1241	G	CASQ2	L79R	A	476	C	CD164L2	G5*	C	154	A
C1orf65	R380W	C	1241	T	C7orf61	Y241C	T	722	C	CASR	R331W	C	1429	T	CD177	A8T	G	22	A
C1orf65	T28M	C	186	T	C7orf62	V110A	A	515	G	CASR	V1073A	T	3656	C	CD177P1	P135L	G	404	A
C1orf65	E403G	A	1311	G	C7orf62	L89P	A	452	G	CASR	L663F	C	2425	T	CD180	M77V	T	387	C
C1orf65	R307W	C	1022	T	C7orf62	P205S	G	799	A	CASR	A860V	C	3017	T	CD19	R163H	G	532	A
C1orf65	R345Q	G	1137	A	C7orf63	K125N	G	626	T	CASR	G447D	G	1778	A	CD1A	A102T	G	837	A
C1orf66	R194C	C	1210	T	C7orf63	R473*	C	1668	T	CASS4	R469Q	G	1631	A	CD1A	Y261H	T	1314	C
C1orf68	G230*	G	739	T	C7orf63	V775I	G	2574	A	CASS4	P167S	C	724	T	CD1A	G246D	G	1270	A
C1orf68	K80Q	A	289	C	C7orf63	K125N	G	626	T	CAST	T259M	C	939	T	CD1B	L316W	A	1055	C
C1orf69	P209S	C	627	T	C7orf64	E283G	A	889	G	CAST	K527N	G	1744	T	CD1B	Y230C	T	797	C
C1orf70	E149K	C	456	T	C7orf64	R245W	C	774	T	CASZ1	E1695D	C	5403	G	CD1C	L221P	T	954	C
C1orf74	R122H	C	622	T	C7orf64	Q98H	A	335	C	CASZ1	A829V	G	2804	A	CD1C	I299T	T	1188	C
C1orf74	T144I	G	688	A	C7orf64	R105S	A	356	C	CASZ1	G1465D	C	4712	T	CD1C	E80*	G	530	T
C1orf77	G179D	G	848	A	C7orf65	P16L	C	82	T	CASZ1	A1604T	C	5128	T	CD1C	A159T	G	767	A
C1orf83	R203W	C	806	T	C7orf66	F109L	A	382	C	CASZ1	R66H	C	515	T	CD1E	K330I	A	1228	T
C1orf83	K47N	G	340	T	C7orf69	K122T	A	410	C	CASZ1	A1040V	G	3437	A	CD1E	G218D	G	892	A
C1orf84	V30G	T	176	G	C7orf70	K228N	C	1152	A	CASZ1	R244H	C	1049	T	CD1E	P21H	C	301	A
C1orf84	R31C	C	178	T	C7orf70	R157H	C	938	T	CASZ1	S530N	C	1907	T	CD1E	P346H	C	1276	A
C1orf85	P299H	G	923	T	C7orf71	G99S	G	1011	A	CASZ1	A456T	C	1684	T	CD1E	S36P	T	345	C
C1orf85	T87I	G	287	A	C7orf72	V406I	G	1266	A	CASZ1	V1110M	C	3646	T	CD1E	K358N	G	1313	T
C1orf87	R220C	G	766	A	C8A	R484H	G	1547	A	CASZ1	R487H	C	1778	T	CD2	T235A	A	811	G
C1orf87	G245V	C	842	A	C8A	R111C	C	427	T	CASZ1	K1401Q	T	4519	G	CD2	E76D	G	336	T
C1orf87	H423R	T	1376	C	C8A	R484C	C	1546	T	CASZ1	K646N	C	2256	A	CD2	K85T	A	362	C
C1orf88	P90H	C	634	A	C8A	C121Y	G	458	A	CAT	-	A	0	G	CD200	F176L	C	672	A
C1orf9	K260N	A	904	C	C8A	R559I	G	1772	T	CAT	L39R	T	190	G	CD200R1L	G24E	C	297	T
C1orf9	D987N	G	3083	A	C8B	G577D	C	1797	T	CAT	A97T	G	363	A	CD200R1L	L180I	G	764	T
C1orf9	-	G	0	T	C8orf33	H58R	A	227	G	CATSPER 1	R332W	G	1132	A	CD209	-	C	0	A
C1orf9	K1097Q	A	3413	C	C8orf33	K72N	G	270	T	CATSPER 1	T676M	G	2165	A	CD209	L48I	G	209	T
C1orf92	G375D	G	1278	A	C8orf33	F241V	T	775	G	CATSPER 1	A466V	G	1535	A	CD209	Q98H	C	361	A
C1orf93	E102A	A	393	C	C8orf38	T57A	A	184	G	CATSPER 2	E435K	C	1317	T	CD209	Y31H	A	158	G

C1orf94	A187T	G	1098	A	C8orf41	R355H	C	1589	T	CATSPER 2	K60N	C	194	A	CD22	P419H	C	1333	A
C1orf95	W113C	G	444	T	C8orf42	G20V	C	633	A	CATSPER 3	D350N	G	1134	A	CD244	F121V	A	444	C
C1QA	A15T	G	43	A	C8orf42	P131S	G	965	A	CATSPER 3	Y129H	T	471	C	CD244	E311K	C	1014	T
C1QA	N137S	A	410	G	C8orf45	R570C	C	1879	T	CATSPER 4	A110T	G	328	A	CD247	R92Q	C	348	T
C1QB	P53H	C	498	A	C8orf47	R313Q	G	1086	A	CATSPER 4	A196V	C	587	T	CD247	P163L	G	561	A
C1QBP	S150L	G	527	A	C8orf47	E366*	G	1244	T	CATSPER 4	R90*	C	268	T	CD248	A303T	C	924	T
C1QC	K86E	A	354	G	C8orf48	D116Y	G	495	T	CATSPER B	L1004I	G	3150	T	CD248	G220C	C	675	A
C1QC	G103D	G	406	A	C8orf59	P79H	G	348	T	CATSPER B	G521E	C	1702	T	CD248	L561I	G	1698	T
C1QL2	N186T	T	1177	G	C8orf74	R99W	C	324	T	CATSPER B	S1106G	T	3456	C	CD27	R78W	C	443	T
C1QL2	A245T	C	1353	T	C8orf76	F268C	A	834	C	CATSPER B	I572M	T	1856	C	CD274	I38M	T	200	G
C1QL2	V181A	A	1162	G	C8orf80	M42T	A	268	G	CAV1	A120T	G	636	A	CD276	D45N	G	435	A
C1QL3	L55M	G	1103	T	C8orf80	L532P	A	1738	G	CBARA1	G71A	C	307	G	CD28	T209A	A	625	G
C1QL4	S16P	A	752	G	C8orf82	A149T	C	603	T	CBARA1	-	C	0	G	CD28	K55R	A	164	G
C1QTNF2	Q324H	C	976	A	C8orf82	G99D	C	454	T	CBFA2T2	A262V	C	824	T	CD300A	P284H	C	1139	A
C1QTNF2	G91C	C	275	A	C8orf85	P54L	C	180	T	CBFA2T2	P318S	C	991	T	CD300A	D112N	G	622	A
C1QTNF2	R73W	G	221	A	C8orf85	R73H	G	237	A	CBFA2T2	E11*	G	443	T	CD300E	S206A	A	616	C
C1QTNF2	E291K	C	875	T	C8orf85	A83E	C	267	A	CBFA2T2	T297A	A	928	G	CD300LF	T140M	G	522	A
C1QTNF2	K143N	T	433	G	C8orf86	S17I	C	75	A	CBFA2T3	A572V	G	1873	A	CD300LG	G21C	G	102	T
C1QTNF3	G51S	C	858	T	C8orf86	M74V	T	245	C	CBL	A602T	G	1942	A	CD34	I253M	A	1081	C
C1QTNF4	A103V	G	575	A	C9	T155K	G	560	T	CBLB	A215T	C	965	T	CD36	R96C	C	970	T
C1QTNF5	D79Y	C	467	A	C9	T24M	G	167	A	CBLB	E135D	T	727	G	CD37	S27N	G	201	A
C1QTNF6	A221T	C	734	T	C9	K435Q	T	1399	G	CBLC	G141R	G	484	A	CD3EAP	V405M	G	1213	A
C1QTNF6	Y206S	T	690	G	C9	E334*	C	1096	A	CBLC	S381L	C	1205	T	CD4	G180D	G	784	A
C1QTNF8	R60Q	C	453	T	C9orf100	S303T	A	1025	T	CBLN2	E107K	C	1093	T	CD40LG	R11Q	G	88	A
C1QTNF8	S130P	A	662	G	C9orf100	K334N	T	1120	G	CBLN3	W31*	C	564	T	CD47	F291L	A	977	G
C1R	E42D	C	126	A	C9orf102	R433W	A	1602	T	CBLN3	P6S	G	487	A	CD47	N142T	T	531	G
C1R	E319K	C	955	T	C9orf102	D521Y	G	1561	T	CBLN4	A151V	G	1753	A	CD48	G38C	C	200	A
C1R	P471S	G	1411	A	C9orf11	E42*	C	208	A	CBR1	V144I	G	605	A	CD48	T233M	G	786	A
C1RL	T426M	G	1294	A	C9orf116	P12L	G	56	A	CBR1	H184Y	C	725	T	CD5	G46S	G	239	A
C1RL	L29I	G	102	T	C9orf117	A365V	C	1134	T	CBR4	F180S	A	708	G	CD5	P2S	C	107	T
C1S	L377F	G	1759	C	C9orf125	V118I	C	674	T	CBS	H507R	T	1689	C	CD5	D450N	G	1451	A
C20orf103	A25T	G	565	A	C9orf125	H48R	T	465	C	CBS	G432E	C	1464	T	CD53	R165*	C	605	T

C20orf107	T97N	C	386	A	C9orf125	R229W	G	1007	A	CBX3	E65D	A	623	C	CD53	D120N	G	470	A
C20orf107	E118K	G	448	A	C9orf129	G167D	C	864	T	CBX4	G232R	C	872	T	CD55	N148T	A	522	C
C20orf108	S148N	G	534	A	C9orf129	R190C	G	932	A	CBX4	M274I	C	1000	T	CD55	E424*	G	1564	T
C20orf108	T149A	A	536	G	C9orf131	S1013L	C	3065	T	CBX6	R199C	G	719	A	CD58	R152*	G	521	A
C20orf111	R251Q	C	889	T	C9orf131	T1050I	C	3176	T	CBX6	R162H	C	609	T	CD58	P220R	G	726	C
C20orf112	R195H	C	727	T	C9orf139	P15Q	C	1558	A	CBX6	R199H	C	720	T	CD59	G11R	C	141	T
C20orf114	R373H	G	1279	A	C9orf139	S61G	A	1695	G	CBX7	R245*	G	939	A	CD5L	R150H	C	546	T
C20orf114	R229H	G	847	A	C9orf139	D99G	A	1810	G	CBX8	R322Q	C	1083	T	CD5L	R32H	C	192	T
C20orf117	T973M	G	3260	A	C9orf140	P317L	G	1078	A	CBY1	F3L	C	287	A	CD5L	E109*	C	422	A
C20orf117	R514Q	C	1883	T	C9orf150	D111N	G	1026	A	CBY3	A17T	C	105	T	CD6	H367Y	C	1322	T
C20orf117	S223L	G	1010	A	C9orf156	E133D	T	476	G	CC2D1A	P793T	C	2676	A	CD68	P147L	C	514	T
C20orf12	V644I	C	2139	T	C9orf167	A145V	C	630	T	CC2D1B	R543Q	C	1767	T	CD7	K206N	C	727	A
C20orf12	R148H	C	652	T	C9orf167	A409V	C	1422	T	CC2D1B	R534Q	C	1740	T	CD70	R11W	G	181	A
C20orf12	R125S	C	584	A	C9orf167	A145V	C	630	T	CC2D1B	E92V	T	414	A	CD70	R138C	G	562	A
C20orf123	R253Q	C	772	T	C9orf169	P89S	C	752	T	CC2D1B	L492M	G	1613	T	CD72	E273*	C	982	A
C20orf123	R426W	G	1290	A	C9orf170	R41Q	G	209	A	CC2D1B	R299L	C	1035	A	CD79A	P83L	C	433	T
C20orf123	L201F	G	615	A	C9orf171	G282D	G	893	A	CC2D2A	F404S	T	1450	C	CD80	E181*	C	904	A
C20orf123	R383H	C	1162	T	C9orf172	A668V	C	2003	T	CC2D2A	T1032A	A	3333	G	CD80	R107H	C	683	T
C20orf132	E119*	C	354	A	C9orf172	R720H	G	2159	A	CC2D2A	A375V	C	1363	T	CD80	E44*	C	493	A
C20orf132	Q57E	G	168	C	C9orf173	L217P	T	676	C	CC2D2A	R1049*	C	3384	T	CD82	A77T	G	473	A
C20orf132	L568P	A	1702	G	C9orf24	R6H	C	216	T	CC2D2A	R1224W	C	3909	T	CD82	L13I	C	281	A
C20orf132	E944*	C	2829	A	C9orf25	R149W	G	752	A	CC2D2A	L1616R	T	5086	G	CD83	A84T	G	421	A
C20orf132	S915A	A	2742	C	C9orf3	K693Q	A	2077	C	CCAR1	R300Q	G	1018	A	CD86	V199I	G	711	A
C20orf132	Q57K	G	168	T	C9orf4	R238I	C	713	A	CCAR1	R552H	G	1774	A	CD8A	E203D	C	665	A
C20orf135	G208C	G	665	T	C9orf41	V388M	C	1315	T	CCAR1	S456G	A	1485	G	CD93	I527T	A	1728	G
C20orf135	R161H	G	525	A	C9orf43	K258N	G	1172	T	CCAR1	L388V	T	1281	G	CD93	D337Y	C	1157	A
C20orf135	H47R	A	183	G	C9orf5	E401D	C	1235	A	CCBE1	D293G	T	878	C	CD97	F760S	T	2402	C
C20orf141	R34C	C	183	T	C9orf50	G412R	C	1436	G	CCBE1	R162Q	C	485	T	CD99L2	A201S	C	719	A
C20orf141	E13D	G	122	T	C9orf57	S157Y	G	566	T	CCBE1	S328Y	G	983	T	CDA	K26N	G	260	T
C20orf141	R236*	C	789	T	C9orf7	T52I	C	235	T	CCBL1	V31M	C	254	T	CDADC1	R510C	C	1641	T
C20orf151	R86L	C	414	A	C9orf7	A59T	G	255	A	CCBL1	E117K	C	512	T	CDAN1	E526D	C	1695	A
C20orf151	R179W	G	692	A	C9orf72	S108N	C	387	T	CCBL2	R355H	C	1402	T	CDAN1	S311T	A	1048	T
C20orf151	Q503R	T	1665	C	C9orf72	F367C	A	1164	C	CCBL2	S341Y	G	1360	T	CDC14A	G100D	G	763	A
C20orf152	R498P	G	1666	C	C9orf78	L31P	A	146	G	CCBL2	K82Q	T	582	G	CDC14A	N140S	A	883	G
C20orf160	R26C	C	89	T	C9orf79	V165M	G	559	A	CCBP2	L303I	C	1005	A	CDC14C	R55C	G	615	A
C20orf160	R131*	C	404	T	C9orf79	V86I	G	322	A	CCDC101	A72V	C	402	T	CDC16	Q87H	G	459	T
C20orf160	S41L	C	135	T	C9orf82	S256R	T	855	G	CCDC101	A66T	G	383	A	CDC16	R510*	C	1726	T
C20orf166	L62I	C	963	A	C9orf84	F159L	A	736	G	CCDC102B	E326*	G	1210	T	CDC16	P399L	C	1394	T
C20orf173	P41Q	G	267	T	C9orf84	F1308C	A	4184	C	CCDC104	D166N	G	694	A	CDC20	R380Q	G	1240	A

C20orf173	-	C	0	A	C9orf89	R37C	C	237	T	CCDC104	E96*	G	484	T	CDC20	D464Y	G	1491	T
C20orf177	T277A	A	1244	G	C9orf9	G136S	G	853	A	CCDC105	G17V	G	149	T	CDC20	T443A	A	1428	G
C20orf177	T136A	A	821	G	C9orf91	A142V	C	862	T	CCDC105	R399C	C	1294	T	CDC20B	P365R	G	1240	C
C20orf177	P172L	C	930	T	C9orf91	G13D	G	475	A	CCDC105	-	G	0	T	CDC20B	A403T	C	1353	T
C20orf186	C295Y	G	884	A	C9orf91	P308T	C	1359	A	CCDC105	R15H	G	143	A	CDC20B	E189K	C	711	T
C20orf186	A579T	G	1735	A	C9orf93	R81Q	G	570	A	CCDC106	A148T	G	1177	A	CDC20B	E123*	C	513	A
C20orf186	L81R	T	242	G	C9orf93	E272*	G	1142	T	CCDC106	R207H	G	1355	A	CDC20B	Q34P	T	247	G
C20orf194	R7C	G	87	A	C9orf93	-	G	0	T	CCDC106	D256N	G	1501	A	CDC23	Q488K	G	1493	T
C20orf194	R822G	T	2532	C	C9orf93	R345*	C	1361	T	CCDC108	V313I	C	1021	T	CDC23	A538V	G	1644	A
C20orf194	D652Y	C	2022	A	C9orf93	L458S	T	1701	C	CCDC108	A148T	C	526	T	CDC23	S345Y	G	1065	T
C20orf194	R156*	G	534	A	C9orf93	K593T	A	2106	C	CCDC108	R580H	C	1823	T	CDC25A	N70H	T	617	G
C20orf20	V106I	G	387	A	C9orf93	Q663H	A	2317	C	CCDC108	K1346N	T	4122	G	CDC25B	G187R	G	633	A
C20orf200	P70H	G	1007	T	C9orf98	R159K	C	998	T	CCDC108	D504N	C	1594	T	CDC25B	K473N	G	1493	T
C20orf201	R106H	C	457	T	C9orf98	P142H	G	947	T	CCDC108	Y180C	T	623	C	CDC25B	Q116R	A	421	G
C20orf202	G96C	G	349	T	C9orf98	F96C	A	809	C	CCDC108	R35K	C	188	T	CDC25C	R448Q	C	1622	T
C20orf24	R111C	C	461	T	CA1	E107D	T	436	G	CCDC109A	A277T	G	850	A	CDC26	R23Q	C	427	T
C20orf26	R583H	G	1824	A	CA1	V257L	C	884	G	CCDC109A	E218D	A	675	C	CDC27	Y641N	A	2048	T
C20orf27	T172M	G	667	A	CA10	L11I	G	708	T	CCDC109B	S292*	C	1008	A	CDC27	L698I	G	2219	T
C20orf29	R95H	G	467	A	CA10	R274H	C	821	T	CCDC11	L107F	T	412	A	CDC37	N178S	T	649	C
C20orf3	M58I	C	465	A	CA12	V202I	C	1045	T	CCDC110	E541D	T	1684	G	CDC42	R110*	C	544	T
C20orf4	R276W	C	919	T	CA13	R228C	C	1024	T	CCDC110	K195N	C	646	A	CDC42BPA	G1722R	C	6107	T
C20orf43	A62T	G	227	A	CA14	L79P	T	591	C	CCDC110	E122*	C	425	A	CDC42BPA	R450C	G	2291	A
C20orf43	G204D	G	654	A	CA14	F230L	T	1043	C	CCDC111	Y326*	T	1411	G	CDC42BPG	K704N	C	2112	A
C20orf46	R161Q	C	1154	T	CA14	E25A	A	429	C	CCDC112	R51C	G	439	A	CDC42BPG	G207R	C	619	T
C20orf54	R358M	C	1315	A	CA14	D49N	G	500	A	CCDC113	Q245K	C	789	A	CDC42BPG	V1301M	C	3901	T
C20orf57	G265W	C	870	A	CA14	S237*	C	1065	A	CCDC114	R554C	G	2343	A	CDC42BPG	A231T	C	691	T
C20orf7	A282T	G	963	A	CA3	S29L	C	169	T	CCDC116	R586H	G	1918	A	CDC42BPG	E521*	C	1561	A
C20orf71	F148S	T	653	C	CA3	F146C	T	520	G	CCDC117	M277I	G	1007	A	CDC42BPG	R1539Q	C	4616	T
C20orf71	L189I	C	775	A	CA5A	A208V	G	689	A	CCDC117	M277I	G	1007	A	CDC42EP1	R188C	C	982	T
C20orf71	L200I	C	808	A	CA5A	R26C	G	142	A	CCDC120	G407E	G	1220	A	CDC42EP1	D191G	A	992	G
C20orf85	A2V	C	66	T	CA5A	A231T	C	757	T	CCDC121	P51L	G	267	A	CDC42EP1	L15M	C	463	A
C20orf94	A2T	G	184	A	CA6	-	G	0	A	CCDC123	G681S	C	2130	T	CDC42EP2	V185M	G	1003	A
C20orf96	K183N	C	688	A	CA7	R215Q	G	753	A	CCDC123	R9H	C	115	T	CDC42EP3	E212K	C	1635	T
C21orf2	G268V	C	1002	A	CA8	M1T	A	250	G	CCDC123	-	A	0	C	CDC42EP3	P240S	G	1719	A
C21orf29	R514*	G	1606	A	CA9	H140N	C	522	A	CCDC125	R459C	G	1483	A	CDC42EP5	M99V	T	637	C
C21orf29	E628K	C	1948	T	CAB39	T288M	C	1292	T	CCDC125	D247Y	C	847	A	CDC42SE2	N51T	A	595	C
C21orf29	W644C	C	1998	A	CAB39	S229P	T	1114	C	CCDC127	S181N	C	675	T	CDC45	A179G	C	612	G
C21orf29	E256K	C	832	T	CAB39L	K296Q	T	1384	G	CCDC129	D607Y	G	1857	T	CDC45	R309C	C	1001	T
C21orf63	K58R	A	646	G	CABC1	D396N	G	3957	A	CCDC129	D209E	C	665	A	CDC45	F10L	C	106	A

C21orf67	P33A	G	343	C	CABIN1	E1056G	A	3294	G	CCDC129	R190Q	G	607	A	CDC6	G483W	G	1918	T
C21orf67	P167S	G	745	A	CABIN1	R1754W	C	5387	T	CCDC129	E364D	G	1130	T	CDC73	R263H	G	972	A
C21orf7	F207V	T	748	G	CABIN1	P1595L	C	4911	T	CCDC13	R425Q	C	1358	T	CDC73	R513Q	G	1722	A
C21orf70	E153K	G	505	A	CABIN1	Q1869*	C	5732	T	CCDC13	K711N	C	2217	A	CDC73	Y54H	T	344	C
C21orf88	S95A	A	359	C	CABLES1	L403M	C	1207	A	CCDC13	D650N	C	2032	T	CDC73	A102V	C	489	T
C21orf91	R265H	C	885	T	CABP4	P246H	C	814	A	CCDC130	V110M	G	578	A	CDC73	C145R	T	617	C
C22orf23	Q70H	C	419	A	CABP5	R173C	G	642	A	CCDC132	Y648N	T	2070	A	CDC73	E302*	G	1088	T
C22orf30	D1330N	C	4178	T	CABP5	G82V	C	370	A	CCDC132	R493H	G	1606	A	CDC73	A106S	G	500	T
C22orf30	L1261R	A	3972	C	CABP7	R135W	C	744	T	CCDC132	K243N	A	857	C	CDCA2	R611*	C	1831	T
C22orf30	R427C	G	1469	A	CABYR	E100D	A	452	C	CCDC132	K246N	G	866	T	CDCA2	S253P	T	757	C
C22orf30	L24V	A	260	C	CACHD1	T115M	C	344	T	CCDC134	R124G	A	474	G	CDCA2	S1000P	T	2998	C
C22orf31	S102L	G	357	A	CACHD1	R1184C	C	3550	T	CCDC134	R217Q	G	754	A	CDCA2	N379H	A	1135	C
C22orf33	G122S	C	577	T	CACNA1A	-	C	0	T	CCDC135	R615H	G	1933	A	CDCA5	P198H	G	662	T
C22orf33	L26F	C	291	A	CACNA1A	G28R	C	318	T	CCDC135	D332N	G	1083	A	CDCA7L	R387C	G	1439	A
C22orf33	K263N	T	1002	G	CACNA1A	A110V	G	565	A	CCDC135	V608M	G	1911	A	CDCP2	R176W	G	1374	A
C22orf36	R115*	G	367	A	CACNA1A	A110V	G	565	A	CCDC136	E638*	G	2279	T	CDCP2	P18T	G	900	T
C22orf42	S175Y	G	597	T	CACNA1A	E894D	C	2918	A	CCDC136	D1102V	A	3672	T	CDH1	L214R	T	832	G
C22orf43	-	C	0	T	CACNA1A	Y1244*	G	3968	T	CCDC136	E838D	G	2881	T	CDH1	S191N	G	763	A
C22orf43	E198D	T	892	A	CACNA1A	R201W	G	837	A	CCDC136	R497W	C	1856	T	CDH1	R732Q	G	2386	A
C22orf43	R75H	C	522	T	CACNA1A	L105V	A	549	C	CCDC136	N237H	A	1076	C	CDH10	R54C	G	668	A
C2CD2	R105Q	C	556	T	CACNA1A	A875V	G	2860	A	CCDC136	K529R	A	1953	G	CDH10	A490D	G	1977	T
C2CD2	S209F	G	868	A	CACNA1B	A57T	G	169	A	CCDC137	R170W	C	544	T	CDH10	G439*	C	1823	A
C2CD2	A529T	C	1827	T	CACNA1B	A407V	C	1220	T	CCDC137	V13L	G	73	T	CDH10	T701A	T	2609	C
C2CD2	L627I	G	2121	T	CACNA1B	R2231S	C	6691	A	CCDC14	S267G	T	890	C	CDH10	S747F	G	2748	A
C2CD2L	I123L	A	726	C	CACNA1B	F346S	T	1037	C	CCDC141	E8*	C	79	A	CDH10	-	C	0	T
C2CD2L	R532H	G	1954	A	CACNA1B	R1907Q	G	5720	A	CCDC141	R226C	G	733	A	CDH10	L64I	G	698	T
C2CD3	S307Y	G	1147	T	CACNA1B	V1376M	G	4126	A	CCDC141	P648H	G	2000	T	CDH11	T115M	G	960	A
C2CD3	V1659L	C	5202	G	CACNA1B	T1802M	C	5405	T	CCDC142	R597Q	C	2187	T	CDH11	R693H	C	2694	T
C2CD3	-	C	0	T	CACNA1B	R579W	C	1735	T	CCDC144A	V521A	T	1638	C	CDH11	V374G	A	1737	C
C2CD3	R62Q	C	412	T	CACNA1B	A653T	G	1957	A	CCDC144B	A68T	G	345	A	CDH11	W453*	C	1975	T
C2CD3	K1455N	C	4592	A	CACNA1B	E675K	G	2023	A	CCDC144B	-	T	0	C	CDH11	P580L	G	2355	A
C2CD3	V1235A	A	3931	G	CACNA1B	E1555*	G	4663	T	CCDC144B	N705K	C	2258	A	CDH11	P647Q	G	2556	T
C2CD4A	N66I	A	338	T	CACNA1B	E1555D	G	4665	T	CCDC146	R637Q	G	2037	A	CDH11	W57L	C	786	A
C2CD4C	V24M	C	275	T	CACNA1C	Y1264C	A	3791	G	CCDC146	A479V	C	1563	T	CDH11	D520Y	C	2174	A
C2CD4C	T73M	G	423	A	CACNA1C	A1287V	C	3860	T	CCDC147	V106A	T	451	C	CDH11	Q213R	T	1254	C
C2orf16	Q216K	C	697	A	CACNA1C	S1330G	A	3988	G	CCDC147	K272N	G	950	T	CDH12	V464I	C	2099	T
C2orf16	T1458K	C	4424	A	CACNA1C	G2116R	G	6346	A	CCDC147	K516Q	A	1680	C	CDH12	P35S	G	812	A
C2orf16	V343I	G	1078	A	CACNA1C	T598M	C	1793	T	CCDC147	R587Q	G	1894	A	CDH12	G87C	C	968	A
C2orf16	D1481V	A	4493	T	CACNA1C	A2059V	C	6176	T	CCDC147	-	A	0	C	CDH12	Q151K	G	1160	T

C2orf16	S62Y	C	236	A	CACNA1C	T1801A	A	5401	G	CCDC148	E567K	C	1850	T	CDH12	Q60E	G	887	C
C2orf16	Q72H	A	267	C	CACNA1C	R2122Q	G	6365	A	CCDC148	Q267*	G	950	A	CDH13	V96I	G	286	A
C2orf16	F206C	T	668	G	CACNA1D	R864C	C	2708	T	CCDC148	L446R	A	1488	C	CDH15	P783L	C	2413	T
C2orf16	S460Y	C	1430	A	CACNA1D	A671T	G	2129	A	CCDC15	R779*	C	2594	T	CDH15	R112H	G	400	A
C2orf16	D819N	G	2506	A	CACNA1D	R2132H	G	6513	A	CCDC15	Q333H	G	1258	T	CDH15	R35H	G	169	A
C2orf16	K887Q	A	2710	C	CACNA1D	R1545G	A	4751	G	CCDC15	V688M	G	2321	A	CDH15	G757S	G	2334	A
C2orf16	L1322V	T	4015	G	CACNA1D	A1278T	G	3950	A	CCDC15	E68*	G	461	T	CDH16	V56M	C	333	T
C2orf16	R1695H	G	5135	A	CACNA1D	P43S	C	245	T	CCDC150	K148N	G	579	T	CDH16	R776C	G	2493	A
C2orf18	V201I	G	663	A	CACNA1D	A1278T	G	3950	A	CCDC150	A907V	C	2855	T	CDH16	A536S	C	1773	A
C2orf29	S251Y	C	915	A	CACNA1D	A1481V	C	4560	T	CCDC151	A365T	C	1236	T	CDH16	S236N	C	874	T
C2orf29	N412H	A	1397	C	CACNA1D	K1280Q	A	3956	C	CCDC151	D332V	T	1138	A	CDH17	R193Q	C	703	T
C2orf3	R188I	C	697	A	CACNA1D	L1551*	T	4770	G	CCDC151	N494D	T	1623	C	CDH17	-	C	0	T
C2orf3	R287C	G	993	A	CACNA1D	N1895D	A	5801	G	CCDC151	A275V	G	967	A	CDH17	Y306*	A	1043	T
C2orf39	W244*	G	805	A	CACNA1D	R1357W	C	4187	T	CCDC154	E302D	C	1073	A	CDH18	R638C	G	2432	A
C2orf39	A683S	G	2121	T	CACNA1E	G2136C	G	6829	T	CCDC154	T97M	G	457	A	CDH18	R558Q	C	2193	T
C2orf39	A433E	C	1372	A	CACNA1E	E398*	G	1615	T	CCDC154	R126Q	C	544	T	CDH18	E391D	T	1693	G
C2orf39	L23I	C	141	A	CACNA1E	E398*	G	1615	T	CCDC154	T573M	G	1885	A	CDH19	N772H	T	2607	G
C2orf39	D60N	G	252	A	CACNA1E	A176T	G	949	A	CCDC157	R469W	C	2114	T	CDH19	K29N	C	380	A
C2orf39	Q456H	G	1442	T	CACNA1E	R378H	G	1556	A	CCDC157	R469Q	G	2115	A	CDH19	A676T	C	2319	T
C2orf40	A17V	C	159	T	CACNA1E	P744L	C	2654	T	CCDC157	A407V	C	1929	T	CDH19	D691N	C	2364	T
C2orf43	R42M	C	205	A	CACNA1E	V1471M	G	4834	A	CCDC157	L84P	T	960	C	CDH19	A269T	C	1098	T
C2orf43	T255P	T	843	G	CACNA1E	V1475A	T	4847	C	CCDC157	P220L	C	1368	T	CDH19	E724*	C	2463	A
C2orf43	F265L	A	875	C	CACNA1E	A2V	C	428	T	CCDC157	R274H	G	1530	A	CDH19	S407Y	G	1513	T
C2orf47	A90V	C	591	T	CACNA1E	L1365I	C	4516	A	CCDC157	A225T	G	1382	A	CDH19	M1I	C	296	T
C2orf53	V15A	A	570	G	CACNA1E	T1194M	C	4004	T	CCDC158	R583Q	C	1901	T	CDH2	N298D	T	1316	C
C2orf55	P673L	G	2350	A	CACNA1E	S745L	C	2657	T	CCDC158	E1098*	C	3445	A	CDH2	V90M	C	692	T
C2orf55	R236Q	C	1039	T	CACNA1E	A1126S	G	3799	T	CCDC158	I273L	T	970	G	CDH2	R823*	G	2891	A
C2orf55	R162M	C	817	A	CACNA1E	S1180L	C	3962	T	CCDC158	S63Y	G	341	T	CDH2	N492H	T	1898	G
C2orf56	I282T	T	885	C	CACNA1E	F1703V	T	5530	G	CCDC158	E58*	C	325	A	CDH2	R697H	C	2514	T
C2orf57	A375V	C	1175	T	CACNA1E	A36V	C	530	T	CCDC159	R148Q	G	942	A	CDH2	F267L	G	1225	T
C2orf57	S102G	A	355	G	CACNA1E	T564M	C	2114	T	CCDC160	E229*	G	1006	T	CDH2	V254A	A	1185	G
C2orf60	R149*	G	711	A	CACNA1F	A1090V	G	3331	A	CCDC17	R56W	G	316	A	CDH20	A694T	G	2092	A
C2orf60	A119V	G	622	A	CACNA1F	S177G	T	591	C	CCDC17	G178D	C	683	T	CDH20	G198S	G	604	A
C2orf63	L498R	A	1730	C	CACNA1F	V1019A	A	3118	G	CCDC18	R1081Q	G	3764	A	CDH20	A691V	C	2084	T
C2orf65	E320*	C	1075	A	CACNA1F	S39R	T	177	G	CCDC19	G529D	C	1651	T	CDH22	S322G	T	1365	C
C2orf65	T144A	T	547	C	CACNA1G	E776*	G	2326	T	CCDC19	Q323H	C	1034	A	CDH22	V210M	C	1029	T
C2orf65	-	C	0	A	CACNA1G	R1387H	G	4160	A	CCDC19	R254I	C	826	A	CDH22	R533H	C	1999	T
C2orf65	F384V	A	1267	C	CACNA1G	E1896K	G	5686	A	CCDC21	A59V	C	307	T	CDH22	T417M	G	1651	A
C2orf65	R378I	C	1250	A	CACNA1G	G229V	G	686	T	CCDC21	A433V	C	1429	T	CDH22	F217L	G	1052	T

C2orf67	C418Y	C	1517	T	CACNA1G	W356R	T	1066	A	CCDC21	V691L	G	2202	T	CDH23	-	G	0	T
C2orf67	P463L	G	1652	A	CACNA1G	C1441Y	G	4322	A	CCDC21	K727T	A	2311	C	CDH23	I664V	A	2377	G
C2orf67	K422Q	T	1528	G	CACNA1G	M386V	A	1156	G	CCDC22	R433H	G	1468	A	CDH23	I2172T	T	6902	C
C2orf67	K159T	T	740	G	CACNA1G	G1026R	G	3076	A	CCDC22	R607Q	G	1990	A	CDH23	R839H	G	2903	A
C2orf67	Y114H	A	604	G	CACNA1G	L512I	C	1534	A	CCDC22	R388H	G	1333	A	CDH23	D1418G	A	4640	G
C2orf7	P16T	G	114	T	CACNA1G	G1413D	G	4238	A	CCDC24	L192V	T	745	G	CDH23	E1314K	G	4327	A
C2orf7	A21T	C	129	T	CACNA1G	F1520S	T	4559	C	CCDC27	R509Q	G	1610	A	CDH23	Y1626*	C	5265	A
C2orf7	R110W	G	396	A	CACNA1H	P277L	C	1078	T	CCDC27	P132H	C	479	A	CDH23	A3058V	C	9560	T
C2orf70	R122Q	G	396	A	CACNA1H	R1412W	C	4482	T	CCDC28A	E67V	A	366	T	CDH23	I456V	A	1753	G
C2orf70	V18L	G	83	T	CACNA1H	G1106D	G	3565	A	CCDC30	Q381R	A	1232	G	CDH23	L2602I	C	8191	A
C2orf70	G130D	G	420	A	CACNA1H	V1850M	G	5796	A	CCDC30	Q295H	G	975	T	CDH23	E2554V	A	8048	T
C2orf71	P1188S	G	3562	A	CACNA1H	L1547F	C	4887	T	CCDC33	A406S	G	1216	T	CDH23	L173F	C	904	T
C2orf71	A717S	C	2149	A	CACNA1H	V1921M	G	6009	A	CCDC33	A290T	G	868	A	CDH23	F182L	C	933	A
C2orf71	T438I	G	1313	A	CACNA1H	R1202Q	G	3853	A	CCDC33	A641V	C	1922	T	CDH23	D2267G	A	7187	G
C2orf71	P1051L	G	3152	A	CACNA1I	R1467H	G	4400	A	CCDC36	A481V	C	1829	T	CDH23	R2683C	C	8434	T
C2orf71	S784Y	G	2351	T	CACNA1I	R601W	C	1801	T	CCDC36	N7T	A	407	C	CDH24	R74W	G	480	A
C2orf71	L469I	G	1405	T	CACNA1I	P946Q	C	2837	A	CCDC36	K21N	G	450	T	CDH24	I535V	T	1863	C
C2orf74	E134*	G	400	T	CACNA1I	L1739M	C	5215	A	CCDC36	Q165P	A	881	C	CDH24	R362C	G	1344	A
C2orf77	E419D	C	1351	A	CACNA1I	A453T	G	1357	A	CCDC36	S170Y	C	896	A	CDH26	E107D	G	621	T
C2orf78	Q519*	C	1676	T	CACNA1I	K908T	A	2723	C	CCDC37	R118H	G	452	A	CDH26	P749L	C	2546	T
C2orf78	L463F	C	1508	T	CACNA1I	D1741N	G	5221	A	CCDC37	T238N	C	812	A	CDH26	P493L	C	1778	T
C2orf78	F650L	C	2071	A	CACNA1I	R601Q	G	1802	A	CCDC37	E291K	G	970	A	CDH26	A374V	C	1421	T
C2orf81	S320A	A	1267	C	CACNA1S	A1028V	G	3310	A	CCDC37	N299H	A	994	C	CDH3	A312V	C	1479	T
C2orf82	R8H	G	321	A	CACNA1S	K1549N	C	4874	A	CCDC38	S423L	G	1502	A	CDH3	L168M	T	1046	A
C2orf84	L48I	T	142	A	CACNA1S	R252C	G	981	A	CCDC38	K304N	C	1146	A	CDH4	G733S	G	2208	A
C2orf84	R169I	G	506	T	CACNA1S	A818V	G	2680	A	CCDC39	I363K	A	1208	T	CDH4	A636V	C	1918	T
C2orf85	V118I	G	380	A	CACNA2D1	R273Q	C	1157	T	CCDC39	K373R	T	1238	C	CDH4	V753L	G	2268	C
C2orf85	G50W	G	176	T	CACNA2D1	-	C	0	T	CCDC39	R78C	G	352	A	CDH5	A187T	G	707	A
C2orf86	L592F	G	2302	A	CACNA2D1	I915M	T	3084	C	CCDC39	N331D	T	1111	C	CDH5	R622W	C	2012	T
C2orf86	R227Q	C	1208	T	CACNA2D1	P525S	G	1912	A	CCDC39	D99Y	C	415	A	CDH6	R702Q	G	2370	A
C2orf86	R227Q	C	1208	T	CACNA2D2	T752A	T	2254	C	CCDC39	L583I	G	1867	T	CDH6	F60L	C	445	A
C2orf86	M34T	A	629	G	CACNA2D3	E96K	G	334	A	CCDC39	-	A	0	T	CDH7	A446T	G	1661	A
C2orf86	T715I	G	2672	A	CACNA2D3	A1070V	C	3257	T	CCDC40	S598N	G	1813	A	CDH8	S408T	A	2177	T
C2orf86	R483Q	C	1976	T	CACNA2D3	E544K	G	1678	A	CCDC40	R979H	G	2956	A	CDH8	S59P	A	1130	G
C2orf86	F432V	A	1822	C	CACNA2D3	M935V	A	2851	G	CCDC40	R557W	C	1689	T	CDH8	P214S	G	1595	A
C2orf88	K5N	A	394	C	CACNA2D4	M926I	C	3009	A	CCDC40	E435D	G	1325	T	CDH8	L291H	A	1827	T
C2orf89	T398M	G	1236	A	CACNA2D4	E1026D	C	3309	A	CCDC40	T585N	C	1774	A	CDH8	E798*	C	3347	A
C2orf89	R370L	C	1152	A	CACNA2D4	R628*	G	2113	A	CCDC41	R630*	G	2421	A	CDH8	L81F	G	1196	A
C2orf89	R441H	C	1365	T	CACNA2D4	S602Y	G	2036	T	CCDC41	K571Q	T	2244	G	CDH8	L291H	A	1827	T

C3	K1381N	C	4236	A	CACNB1	E307K	C	1073	T	CCDC41	R511Q	C	2065	T	CDH9	-	C	0	A
C3	T1333I	G	4091	A	CACNB1	F385L	A	1307	G	CCDC42	K49R	T	373	C	CDH9	D240Y	C	891	A
C3	R1512H	C	4628	T	CACNB2	V177A	T	590	C	CCDC43	I63N	A	232	T	CDH9	S143L	G	601	A
C3	R881C	G	2734	A	CACNB2	K637R	A	1970	G	CCDC45	S243Y	C	830	A	CDH9	R678S	C	2207	A
C3	V602M	C	1897	T	CACNB2	E443D	G	1389	T	CCDC46	Q819R	T	2675	C	CDH9	Y732N	A	2367	T
C3	C728*	G	2277	T	CACNB3	-	G	0	A	CCDC47	A428T	C	1618	T	CDH9	Q762H	T	2459	G
C3	A1089P	C	3358	G	CACNB3	R397W	C	1390	T	CCDC48	G11S	G	31	A	CDH9	L706M	G	2289	T
C3	T1144M	G	3524	A	CACNB4	L342V	A	1092	C	CCDC48	E116G	A	347	G	CDH9	F698Y	A	2266	T
C3	M1563V	T	4780	C	CACNB4	I279R	A	904	C	CCDC50	A453V	C	1948	T	CDH9	R267Q	C	973	T
C3	-	A	0	C	CACNG2	A197V	G	1572	A	CCDC50	R263Q	G	1378	A	CDH9	R267*	G	972	A
C3AR1	G37*	C	201	A	CACNG3	V76M	G	1428	A	CCDC51	R194H	C	667	T	CDHR1	A617T	G	1952	A
C3orf1	G187D	G	762	A	CACNG3	R234Q	G	1903	A	CCDC51	V298I	C	978	T	CDHR1	R636C	C	2009	T
C3orf1	A127V	C	582	T	CACNG3	R65M	G	1396	T	CCDC51	R257H	C	856	T	CDHR1	R749H	G	2349	A
C3orf15	R292C	C	951	T	CACNG4	R105L	G	329	T	CCDC51	L320I	A	1044	T	CDHR1	F546L	C	1741	A
C3orf15	R610*	C	1905	T	CACNG5	T74A	A	280	G	CCDC52	S764P	A	2550	G	CDHR2	F866L	T	2870	C
C3orf15	W278L	G	910	T	CACNG6	P105S	C	903	T	CCDC52	Q602R	T	2065	C	CDHR2	G752V	G	2529	T
C3orf15	K537R	A	1687	G	CACNG7	D158N	G	684	A	CCDC52	E596D	C	2048	A	CDHR3	P321S	C	1041	T
C3orf15	L724I	C	2247	A	CACNG8	R150C	C	551	T	CCDC53	T37A	T	268	C	CDHR3	S35Y	C	184	A
C3orf16	R45W	G	590	A	CAD	T920M	C	2921	T	CCDC54	D206E	C	865	G	CDHR3	I105M	T	395	G
C3orf16	G251D	C	1209	T	CAD	R516Q	G	1709	A	CCDC54	K7Q	A	266	C	CDHR4	K202R	T	614	C
C3orf17	S503T	C	1700	G	CAD	V1929I	G	5947	A	CCDC54	H39Q	C	364	A	CDHR4	Y47H	A	148	G
C3orf17	F392S	A	1367	G	CAD	R2122H	G	6527	A	CCDC55	R526W	C	1639	T	CDHR4	V465M	C	1402	T
C3orf20	D277N	G	1281	A	CAD	R1948H	G	6005	A	CCDC55	E487D	G	1524	T	CDHR5	R360C	G	1183	A
C3orf20	R312*	C	1386	T	CAD	R2024Q	G	6233	A	CCDC56	I71V	T	231	C	CDHR5	S770R	G	2415	C
C3orf22	S119P	A	734	G	CAD	R191*	C	733	T	CCDC57	T315A	T	980	C	CDHR5	R782Q	C	2450	T
C3orf23	V135I	G	648	A	CAD	I113T	T	500	C	CCDC57	Q819P	T	2493	G	CDHR5	E123K	C	472	T
C3orf25	A566V	G	1860	A	CAD	S1052A	T	3316	G	CCDC58	R135Q	C	411	T	CDIPT	R173W	G	1394	A
C3orf30	A434V	C	1341	T	CAD	F1266L	C	3960	A	CCDC6	E139*	C	1051	A	CDK10	F302V	T	929	G
C3orf30	D179N	G	575	A	CADM1	L147M	G	439	T	CCDC6	V400M	C	1834	T	CDK10	C227Y	G	705	A
C3orf32	M1I	C	272	T	CADM2	S188N	G	563	A	CCDC6	E334K	C	1636	T	CDK12	R708C	C	2433	T
C3orf34	Q96R	T	710	C	CADM2	S230P	T	688	C	CCDC6	E285D	C	1491	A	CDK12	S316N	G	1258	A
C3orf38	-	G	0	A	CADM3	G107E	G	477	A	CCDC6	E139*	C	1051	A	CDK12	V1187A	T	3871	C
C3orf39	R24W	G	401	A	CADM3	A239V	C	873	T	CCDC60	R470C	C	1873	T	CDK12	S192Y	C	886	A
C3orf45	R70*	C	295	T	CADM3	P124S	C	527	T	CCDC60	N368D	A	1567	G	CDK13	R1426I	G	4882	T
C3orf55	S120P	T	499	C	CADM4	D378N	C	1181	T	CCDC61	R160H	G	479	A	CDK13	V1330M	G	4593	A
C3orf56	R226H	G	917	A	CADPS	E1260*	C	4138	A	CCDC62	C180Y	G	684	A	CDK13	G13R	G	642	A
C3orf56	P166H	C	737	A	CADPS	R1095W	G	3643	A	CCDC62	N300D	A	1043	G	CDK14	G268V	G	934	T
C3orf57	R58H	C	1744	T	CADPS	E1086*	C	3616	A	CCDC63	Y245*	C	930	A	CDK14	T125S	A	504	T
C3orf57	I42V	T	1695	C	CADPS	E334*	C	1360	A	CCDC63	A425T	G	1468	A	CDK15	E83D	G	335	T

C3orf57	R31*	G	1662	A	CADPS2	R212I	C	655	A	CCDC63	R188Q	G	752	A	CDK15	P326L	C	1063	T
C3orf58	C337G	T	1544	G	CADPS2	T519P	T	1575	G	CCDC63	R273H	G	1013	A	CDK16	A281S	G	1365	T
C3orf59	E34A	T	422	G	CADPS2	L659M	G	1995	T	CCDC63	D456N	G	1561	A	CDK18	V398M	G	1411	A
C3orf59	K215T	T	965	G	CADPS2	F296C	A	907	C	CCDC64	R315C	C	968	T	CDK18	K325E	A	1192	G
C3orf59	Q41P	T	443	G	CADPS2	A160T	C	498	T	CCDC64B	Q98*	G	337	A	CDK19	N156H	T	646	G
C3orf59	G217R	C	970	T	CAGE1	T175A	T	1088	C	CCDC64B	Q203*	G	652	A	CDK2	E2D	G	243	T
C3orf59	D113G	T	659	C	CAGE1	S277N	C	1395	T	CCDC65	K345R	A	1261	G	CDK2	K89T	A	503	C
C3orf59	N255Y	T	1084	A	CAGE1	E539K	C	2180	T	CCDC65	Q86H	A	485	C	CDK20	A240V	G	1025	A
C3orf59	P466L	G	1718	A	CALB1	F103C	A	490	C	CCDC65	K166N	A	725	C	CDK20	P228S	G	988	A
C3orf59	Q381P	T	1463	G	CALB1	E86D	C	440	A	CCDC66	V125I	G	443	A	CDK2AP1	E71G	T	734	C
C3orf62	E141K	C	1458	T	CALCOCO 2	K154T	A	512	C	CCDC66	K196N	G	658	T	CDK2AP2	T126M	G	926	A
C3orf62	E139D	C	1454	A	CALCR	S351F	G	1228	A	CCDC66	I307S	T	990	G	CDK4	D129Y	C	611	A
C3orf63	K1347T	T	4139	G	CALCR	M253V	T	933	C	CCDC67	E15D	G	145	T	CDK5	R214G	T	1322	C
C3orf63	E122*	C	463	A	CALCR	F94L	G	458	T	CCDC67	E53*	G	257	T	CDK5	N135S	T	1086	C
C3orf63	R172C	G	613	A	CALCRL	R417C	G	1963	A	CCDC67	K229Q	A	785	C	CDK5R1	E18V	A	742	T
C3orf63	N1634H	T	4999	G	CALCRL	D90A	T	983	G	CCDC67	N426S	A	1377	G	CDK5R1	P198L	C	1282	T
C3orf63	N1316H	T	4045	G	CALCRL	E457V	T	2084	A	CCDC68	R258C	G	1047	A	CDK5RAP1	R169Q	C	660	T
C3orf63	R755Q	C	2363	T	CALD1	Q668K	C	2231	A	CCDC69	L210M	G	803	T	CDK5RAP1	H376N	G	1280	T
C3orf64	E232D	T	1439	G	CALD1	V657M	G	2198	A	CCDC69	S139*	G	591	T	CDK5RAP1	D441N	C	1475	T
C3orf70	S187Y	G	751	T	CALD1	T82I	C	474	T	CCDC7	E205*	G	922	T	CDK5RAP2	E442*	C	1504	A
C3orf72	A143T	G	558	A	CALD1	R619H	G	2085	A	CCDC7	R339Q	G	1325	A	CDK5RAP2	E1216D	C	3828	A
C3orf75	A90V	G	440	A	CALD1	R593Q	G	2007	A	CCDC71	P220L	G	766	A	CDK5RAP2	L216M	G	826	T
C3orf75	A75V	G	395	A	CALD1	S743Y	C	2457	A	CCDC71	V450M	C	1455	T	CDK5RAP2	E1511*	C	4711	A
C3orf77	S1265L	C	3962	T	CALD1	K594N	A	2011	T	CCDC71	R66C	G	303	A	CDK5RAP2	K1028Q	T	3262	G
C3orf77	E1570*	G	4876	T	CALHM2	R173W	G	1022	A	CCDC73	E1009*	C	3069	A	CDK5RAP3	D293N	G	961	A
C3orf77	S90T	G	437	C	CALHM2	Y54H	A	665	G	CCDC73	K573N	T	1763	G	CDK5RAP3	I45T	T	218	C
C3orf77	A1560D	C	4847	A	CALHM3	R177W	G	737	A	CCDC73	-	C	0	A	CDK6	R220C	G	1070	A
C3orf77	H1654Y	C	5128	T	CALR	E240D	G	800	T	CCDC75	-	G	0	T	CDK8	R237*	C	1212	T
C3orf77	S448L	C	1511	T	CALR	N188D	A	642	G	CCDC75	K83N	G	382	T	CDK8	R200*	C	1101	T
C3orf77	S800Y	C	2567	A	CALR	K64T	A	271	C	CCDC78	L51I	G	243	T	CDK8	D240G	A	1222	G
C3orf77	S1173Y	C	3686	A	CALR3	E351K	C	1114	T	CCDC78	A172V	G	607	A	CDK8	R71*	C	714	T
C3orf77	L1401R	T	4370	G	CALU	K251N	G	1584	T	CCDC78	L53F	G	249	A	CDKAL1	P295L	C	1058	T
C3orf78	R19Q	G	207	A	CAMK1	T114M	G	519	A	CCDC8	S237*	G	1484	T	CDKAL1	Y148H	T	616	C
C4BPA	N528S	A	1777	G	CAMK1G	R112W	C	579	T	CCDC8	N270I	T	1583	A	CDKAL1	A557V	C	1844	T
C4BPA	D341Y	G	1215	T	CAMK1G	S129L	C	631	T	CCDC8	R50H	C	923	T	CDKAL1	-	G	0	T
C4orf14	P286S	G	2094	A	CAMK2A	G397A	C	1194	G	CCDC80	R442K	C	1325	T	CDKL1	P895H	G	2684	T
C4orf17	E224K	G	1032	A	CAMK2B	A365T	C	1303	T	CCDC80	R822H	C	2465	T	CDKL1	Q898P	T	2693	G
C4orf21	Q987*	G	3085	A	CAMK2N1	R55W	G	1004	A	CCDC80	S548Y	G	1643	T	CDKL1	F907L	G	2721	T
C4orf21	S1507P	A	4645	G	CAMKK1	R506Q	C	1665	T	CCDC81	A184T	G	978	A	CDKL2	D262Y	C	1298	A

C4orf21	S2102Y	G	6431	T	CAMKK1	V123A	A	516	G	CCDC81	Y620C	A	2287	G	CDKL2	F145V	A	947	C
C4orf21	Y1149*	A	3573	C	CAMKK1	E358K	C	1220	T	CCDC82	K523Q	T	1582	G	CDKL2	F82L	A	760	C
C4orf22	T96M	C	287	T	CAMKK2	V179I	C	1364	T	CCDC84	R167Q	G	556	A	CDKL3	R464H	C	1510	T
C4orf23	R597H	G	1808	A	CAMKV	P420T	G	1737	T	CCDC84	A240V	C	775	T	CDKL3	K375N	C	1244	A
C4orf23	K389T	A	1184	C	CAMLG	M38I	G	234	A	CCDC85A	S410T	G	1731	C	CDKL3	S177Y	G	649	T
C4orf29	E144G	A	775	G	CAMSAP1	D133N	C	466	T	CCDC85A	R270H	G	1311	A	CDKL4	R53C	G	157	A
C4orf31	R25Q	C	601	T	CAMSAP1	A1536V	G	4676	A	CCDC85A	I540L	A	2120	C	CDKL5	R840H	G	2794	A
C4orf31	L145V	A	960	C	CAMSAP1	R1108W	G	3391	A	CCDC85B	R26L	G	457	T	CDKN2A	R124H	C	583	T
C4orf35	E142V	A	484	T	CAMSAP1	A1312T	C	4003	T	CCDC87	R370H	C	1177	T	CDKN2A	R80*	G	450	A
C4orf35	E241K	G	780	A	CAMSAP1	S455L	G	1433	A	CCDC87	Y818*	A	2522	C	CDKN2A	A76T	C	438	T
C4orf35	P21Q	C	121	A	CAMSAP1L 1	S375R	A	1393	C	CCDC88A	A305T	C	1755	T	CDKN2A	R107H	C	532	T
C4orf37	V21M	C	151	T	CAMSAP1L 1	S282Y	C	1115	A	CCDC88A	R1412W	G	5076	A	CDKN2AIP	S151N	G	659	A
C4orf37	E151K	C	541	T	CAMSAP1L 1	S1029*	C	3356	A	CCDC88A	T15A	T	885	C	CDKN2B	R60H	C	507	T
C4orf37	T253P	T	847	G	CAMSAP1L 1	E1230*	G	3958	T	CCDC88A	R982*	G	3786	A	CDKN2B	R105W	G	641	A
C4orf38	A32T	C	706	T	CAMTA1	E310D	G	1137	T	CCDC88B	D512N	G	1578	A	CDNF	E163*	C	613	A
C4orf39	L33M	C	172	A	CAMTA1	A1117V	C	3557	T	CCDC88B	R979W	C	2979	T	CDNF	Q149P	T	572	G
C4orf41	E869*	G	2807	T	CAMTA1	R163W	C	694	T	CCDC88B	L123M	T	411	A	CDNF	E66*	C	322	A
C4orf41	W105C	G	517	T	CAMTA1	W967*	G	3107	A	CCDC88B	R472W	C	1458	T	CDO1	T148M	G	1000	A
C4orf41	K305N	G	1117	T	CAMTA1	N231T	A	899	C	CCDC88C	S689F	G	2165	A	CDO1	L95M	G	840	T
C4orf41	R360W	C	1280	T	CAMTA1	A849T	G	2752	A	CCDC88C	S317Y	G	1049	T	CDON	R1112Q	C	3463	T
CDON	S885*	G	2782	T	CHST1	R237C	G	1380	A	COCH	R148*	C	846	T	CREBBP	R2104C	G	7115	A
CDON	E501K	C	1629	T	CHST1	S201R	G	1274	T	COCH	P505S	C	1917	T	CREBBP	R1964H	C	6696	T
CDON	P690L	G	2197	A	CHST10	R208Q	C	1009	T	COCH	S300Y	C	1303	A	CREBBP	Q2199L	T	7401	A
CDON	T1162N	G	3613	T	CHST10	R229Q	C	1072	T	COG1	P851T	C	2587	A	CREBBP	A1907V	G	6525	A
CDON	R58C	G	300	A	CHST10	G220D	C	1045	T	COG1	K130T	A	425	C	CREBBP	A1782T	C	6149	T
CDON	S945Y	G	2962	T	CHST11	H174R	A	814	G	COG1	G305R	G	949	A	CREBBP	R1664C	G	5795	A
CDON	F31C	A	220	C	CHST11	R175H	G	817	A	COG1	R867C	C	2635	T	CREBBP	R2052W	G	6959	A
CDR2	A247V	G	1048	A	CHST12	R276W	C	961	T	COG2	R442H	G	1440	A	CREBBP	A619T	C	2660	T
CDR2	Q368R	T	1411	C	CHST12	E409D	A	1362	C	COG2	E62K	G	299	A	CREBBP	P2346L	G	7842	A
CDR2L	T184M	C	551	T	CHST13	G133S	G	447	A	COG4	A122V	G	378	A	CRELD1	S86G	A	855	G
CDR2L	R214Q	G	641	A	CHST13	A137T	G	459	A	COG4	R266Q	C	810	T	CRELD1	S178C	A	1131	T
CDRT15	G122E	C	381	T	CHST14	H318R	A	1153	G	COG5	R804H	C	2936	T	CRELD2	E373K	G	1252	A
CDRT15	K144N	T	448	G	CHST15	S408L	G	1866	A	COG5	L627V	A	2404	C	CRHBP	P303L	C	1330	T
CDS1	R399I	G	1619	T	CHST15	R519H	C	2199	T	COG5	R418C	G	1777	A	CRHBP	D139Y	G	837	T
CDS2	Y333C	A	1305	G	CHST15	L431F	G	1934	A	COG5	Y342D	A	1549	C	CRHBP	E245K	G	1155	A
CDS2	R248W	C	1049	T	CHST15	A385V	G	1797	A	COG6	S334Y	C	1002	A	CRIM1	R350*	C	1415	T

CDT1	P89T	C	319	A	CHST15	M89I	C	910	T	COG6	E139K	G	416	A	CRIP1	E45G	A	287	G
CDT1	R427*	C	1333	T	CHST15	R79Q	C	879	T	COG6	D567G	A	1701	G	CRIPAK	A59D	C	324	A
CDYL	R329C	C	1116	T	CHST3	A461T	G	1818	A	COG7	R756C	G	2452	A	CRIPT	C83Y	G	380	A
CDYL	E160K	G	609	A	CHST4	R336H	G	1202	A	COG7	A511V	G	1718	A	CRISP1	T134M	G	503	A
CDYL	A249T	G	876	A	CHST4	R52H	G	353	A	COIL	A230V	G	720	A	CRISP2	R88C	G	518	A
CDYL	I316F	A	1077	T	CHST4	R270H	G	1007	A	COIL	A25T	C	104	T	CRISP2	E46*	C	392	A
CDYL2	R285Q	C	959	T	CHST4	F57C	T	368	G	COL10A1	G86R	C	352	T	CRISP2	R88H	C	519	T
CDYL2	R79C	G	340	A	CHST5	A214V	G	2036	A	COL10A1	M343L	T	1123	A	CRISPLD1	G53V	G	533	T
CDYL2	V404I	C	1315	T	CHST6	A13V	G	218	A	COL10A1	S659A	A	2071	C	CRISPLD1	N211D	A	1006	G
CEACAM1	R58Q	C	406	T	CHST6	V56M	C	346	T	COL11A1	I124V	T	688	C	CRISPLD1	M423V	A	1642	G
CEACAM16	T147M	C	440	T	CHST6	R315C	G	1123	A	COL11A1	T1404P	T	4528	G	CRKL	K146R	A	946	G
CEACAM19	P298L	C	1103	T	CHST6	G357D	C	1250	T	COL11A1	Q1188*	G	3880	A	CRLF3	R180C	G	647	A
CEACAM21	R127I	G	406	T	CHST6	Q346*	G	1216	A	COL11A1	A1770V	G	5627	A	CRLS1	L176I	C	683	A
CEACAM3	P3A	C	248	G	CHST6	R177C	G	709	A	COL11A1	G379V	C	1454	A	CRLS1	R155Q	G	621	A
CEACAM4	A117T	C	460	T	CHST8	D221N	G	1166	A	COL12A1	S981N	C	3252	T	CRMP1	R352Q	C	1144	T
CEACAM5	N292S	A	1022	G	CHST8	A388T	G	1667	A	COL12A1	K831T	T	2802	G	CRMP1	T332M	G	1084	A
CEACAM5	T298M	C	1040	T	CHST9	H201N	G	887	T	COL12A1	A279S	C	1145	A	CRMP1	E549K	C	1734	T
CEACAM5	-	A	0	G	CHST9	R280C	G	1124	A	COL12A1	S1244N	C	4041	T	CRMP1	D529N	C	1674	T
CEACAM6	P3S	C	225	T	CHST9	K167T	T	786	G	COL12A1	E898K	C	3002	T	CRMP1	A496T	C	1575	T
CEACAM6	P220T	C	876	A	CHST9	E48*	C	428	A	COL12A1	T1353A	T	4367	C	CRMP1	T215N	G	733	T
CEACAM6	P59L	C	394	T	CHSY1	Q729H	C	2663	A	COL12A1	Q909H	T	3037	G	CRMP1	R62C	G	273	A
CEACAM6	A105T	G	531	A	CHSY1	S788N	C	2839	T	COL12A1	C2666*	G	8308	T	CRMP1	A199V	G	685	A
CEACAM6	S321R	A	1179	C	CHSY3	F205L	C	973	A	COL12A1	I2148V	T	6752	C	CRMP1	E239K	C	804	T
CEACAM7	A206V	G	819	A	CHSY3	Q356R	A	1425	G	COL12A1	E2979K	C	9245	T	CRMP1	D202Y	C	693	A
CEACAM8	K126Q	T	478	G	CHSY3	M644L	A	2288	T	COL12A1	E2531*	C	7901	A	CRMP1	-	C	0	A
CEACAM8	V229L	C	787	G	CHSY3	L275I	C	1181	A	COL12A1	E1342K	C	4334	T	CRNKL1	H414Y	G	1272	A
CEBPZ	R1019C	G	3201	A	CHSY3	R879Q	G	2994	A	COL12A1	Q1313H	T	4249	G	CRNKL1	D470G	T	1441	C
CEBPZ	E825D	C	2621	A	CHTF18	M198I	G	594	A	COL12A1	V596L	C	2096	A	CRNKL1	N7S	T	52	C
CECR1	F235L	G	976	T	CHTF18	R434W	C	1300	T	COL12A1	D440N	C	1628	T	CRNN	T21M	G	125	A
CECR2	L300I	C	898	A	CHUK	E194D	C	669	A	COL12A1	G173R	C	827	T	CROCC	L758F	C	2341	T
CECR2	R523W	C	1567	T	CIAPIN1	A254V	G	1002	A	COL12A1	G2872A	C	8925	G	CROCC	R1866C	C	5665	T
CECR2	R1332Q	G	3995	A	CIB2	S49G	T	474	C	COL13A1	E706K	G	2652	A	CROCC	R491Q	G	1541	A
CECR2	R338G	A	1012	G	CIB2	S32*	G	424	T	COL14A1	R566Q	G	1967	A	CROCC	A1740G	C	5288	G
CECR2	T1024M	C	3071	T	CIB3	E64K	C	240	T	COL14A1	P1772H	C	5585	A	CROCC	R1280W	C	3907	T
CECR2	N110K	T	330	G	CIB3	E155D	C	515	A	COL14A1	F1048S	T	3413	C	CROCC	R1154C	C	3529	T
CECR5	V365A	A	1120	G	CIB3	E26D	C	128	A	COL14A1	R1604*	C	5080	T	CROCC	Q1683R	A	5117	G
CECR5	Q349*	G	1071	A	CIC	R351W	C	1091	T	COL14A1	G138W	G	682	T	CROT	R215H	G	843	A

CECR6	V477M	C	1555	T	CIC	-	T	0	C	COL14A1	A822T	G	2734	A	CROT	Y141C	A	621	G
CEL	G567E	G	1716	A	CIC	R353*	C	1097	T	COL14A1	F1048C	T	3413	G	CROT	E30*	G	287	T
CEL	V245M	G	749	A	CIC	T303M	C	948	T	COL15A1	G987*	G	3382	T	CRP	N176H	T	630	G
CEL	A203S	G	623	T	CIC	P1336L	C	4047	T	COL15A1	A165T	G	916	A	CRP	K140N	C	524	A
CEL	R156H	G	483	A	CIC	A669T	G	2045	A	COL15A1	G39C	G	538	T	CRTAC1	D273N	C	1173	T
CEL	P61L	C	198	T	CIC	S68T	T	242	A	COL15A1	G1179*	G	3958	T	CRTAM	E24*	G	119	T
CELA1	Q37H	C	152	G	CIDEA	T131M	C	507	T	COL15A1	R552I	G	2078	T	CRTAP	A295T	G	982	A
CELA1	A140T	C	459	T	CIDEB	T155A	T	1651	C	COL15A1	E904*	G	3133	T	CRTAP	P289L	C	965	T
CELA2B	A23T	G	92	A	CIDEC	L138V	G	437	C	COL16A1	A1233V	G	4215	A	CRTC1	P428L	C	1371	T
CELA3B	S116L	C	366	T	CIITA	W822*	G	2615	A	COL16A1	D152N	C	971	T	CRTC1	H627Y	C	1967	T
CELF2	Q405P	A	1374	C	CILP	R175H	C	691	T	COL16A1	G1291R	C	4388	T	CRTC1	E246D	A	826	C
CELF2	A182V	C	705	T	CILP	R145C	G	600	A	COL16A1	P536H	G	2124	T	CRTC2	L343M	G	1155	T
CELF3	F140L	G	419	T	CILP	R1034H	C	3268	T	COL16A1	-	C	0	A	CRX	R69H	G	410	A
CELF3	E72K	C	213	T	CILP	R484Q	C	1618	T	COL16A1	F886L	G	3175	T	CRY1	H411Y	G	2090	A
CELF4	A391D	G	1568	T	CILP2	G967S	G	2984	A	COL16A1	G656R	C	2483	T	CRY2	R50H	G	171	A
CELF4	Q60*	G	574	A	CINP	S113Y	G	403	T	COL17A1	R1280H	C	4130	T	CRYAA	Y109H	T	417	C
CELF4	A373T	C	1513	T	CIRH1A	G119V	G	533	T	COL17A1	Q602*	G	2095	A	CRYAB	E88G	T	309	C
CELF4	P406L	G	1613	A	CIT	R1102W	G	3357	A	COL17A1	S1492I	C	4766	A	CRYBA4	R103H	G	343	A
CELF4	-	C	0	T	CIT	G1729D	C	5239	T	COL17A1	A635T	C	2194	T	CRYBA4	-	G	0	A
CELF4	A354V	G	1457	A	CIT	C1448Y	C	4396	T	COL17A1	R143*	G	718	A	CRYBB1	R92H	C	406	T
CELF5	V270M	G	845	A	CIT	P1871H	G	5665	T	COL18A1	L652M	C	1975	A	CRYBB3	S138G	A	492	G
CELF5	R222H	G	702	A	CIT	V376I	C	1179	T	COL18A1	D854N	G	2581	A	CRYBG3	P162H	C	549	A
CELF6	A280V	G	1094	A	CIT	R1083W	G	3300	A	COL18A1	G1383S	G	4168	A	CRYBG3	G347W	G	1103	T
CELF6	S105I	C	569	A	CIT	E98K	C	345	T	COL18A1	G302S	G	925	A	CRYBG3	G347V	G	1104	T
CELSR1	V2577M	C	7729	T	CITED1	P200L	G	797	A	COL18A1	G1102R	G	3325	A	CRYBG3	S145N	G	498	A
CELSR1	V702M	C	2104	T	CIZ1	F807L	G	2624	T	COL18A1	D1028G	A	3104	G	CRYBG3	E537D	A	1675	C
CELSR1	R647C	G	1939	A	CIZ1	E751D	C	2456	A	COL18A1	D1187N	G	3580	A	CRYBG3	R572C	C	1778	T
CELSR1	D2286N	C	6856	T	CIZ1	R329W	G	1188	A	COL18A1	S1377N	G	4151	A	CRYBG3	L754I	C	2324	A
CELSR1	A905V	G	2714	A	CIZ1	R310Q	C	1132	T	COL19A1	-	G	0	T	CRYGB	T107I	G	368	A
CELSR1	R2031H	C	6092	T	CKAP2	K452T	A	1445	C	COL19A1	G95D	G	386	A	CRYGB	L147P	A	488	G
CELSR1	G1662C	C	4984	A	CKAP2L	K243Q	T	806	G	COL1A1	R1260H	C	3898	T	CRYGC	S87F	G	298	A
CELSR1	A504D	G	1511	T	CKAP2L	E174K	C	599	T	COL1A1	L1384V	G	4269	C	CRYL1	R197H	C	653	T
CELSR1	S2140N	C	6419	T	CKAP4	R148K	C	527	T	COL1A1	R1217W	G	3768	A	CRYL1	A45T	C	196	T
CELSR1	N1482D	T	4444	C	CKAP5	G1813W	C	5547	A	COL1A1	R487C	G	1578	A	CRYL1	E100A	T	362	G
CELSR1	T337A	T	1009	C	CKAP5	E239K	C	825	T	COL1A2	S404Y	C	1682	A	CRYL1	V95A	A	347	G
CELSR1	L2454F	G	7360	A	CKAP5	E1888K	C	5772	T	COL1A2	G87R	G	730	A	CRYZL1	L316V	A	946	C
CELSR1	L1265Q	A	3794	T	CKB	G117D	C	430	T	COL1A2	G793V	G	2849	T	CRYZL1	W282*	C	845	T
CELSR1	R1044W	G	3130	A	CKM	D221N	C	735	T	COL1A2	P1011S	C	3502	T	CS	L21R	A	252	C
CELSR2	L17P	T	111	C	CKM	G356D	C	1141	T	COL1A2	G1081C	G	3712	T	CSAD	-	T	0	C

CELSR2	L783M	C	2408	A	CKM	W228L	C	757	A	COL1A2	A462T	G	1855	A	CSAD	R102W	G	538	A
CELSR2	R345C	C	1094	T	CKM	R252H	C	829	T	COL20A1	V1015I	G	3143	A	CSDC2	-	G	0	A
CELSR2	R444Q	G	1392	A	CKM	D190Y	C	642	A	COL20A1	W404*	G	1312	A	CSDC2	A59T	G	719	A
CELSR2	-	G	0	A	CKMT1A	L379I	C	1302	A	COL20A1	V417I	G	1349	A	CSDE1	Y102H	A	826	G
CELSR2	R989W	C	3026	T	CKMT2	V126I	G	489	A	COL20A1	L98F	C	392	T	CSDE1	K110N	T	852	G
CELSR2	R842H	G	2586	A	CKMT2	R220W	C	771	T	COL20A1	A673V	C	2118	T	CSE1L	N795D	A	2506	G
CELSR2	G1904S	G	5771	A	CKMT2	A365T	G	1206	A	COL20A1	P770S	C	2408	T	CSE1L	N338S	A	1136	G
CELSR2	G1948C	G	5903	T	CLASP1	A157V	G	860	A	COL20A1	K222T	A	765	C	CSE1L	G534W	G	1723	T
CELSR3	R398H	C	1474	T	CLASP1	R742C	G	2614	A	COL20A1	D326N	G	1076	A	CSF1R	F737L	G	2503	T
CELSR3	L2237V	G	6990	C	CLASP1	A635T	C	2293	T	COL21A1	E358K	C	1470	T	CSF1R	R142C	G	716	A
CELSR3	R2835C	G	8784	A	CLASP1	P94S	G	670	A	COL21A1	G931D	C	3190	T	CSF1R	A960T	C	3170	T
CELSR3	R2069W	G	6486	A	CLASP1	R717*	G	2539	A	COL21A1	F40L	A	516	G	CSF2RB	R177W	C	746	T
CELSR3	A2478V	G	7714	A	CLASP1	S266Y	G	1187	T	COL21A1	-	C	0	A	CSF3R	R367W	G	1647	A
CELSR3	R386H	C	1438	T	CLASP2	S1224*	G	4025	T	COL22A1	A2V	G	452	A	CSF3R	Y196H	A	1134	G
CELSR3	R359C	G	1356	A	CLASP2	-	C	0	A	COL22A1	A141T	C	868	T	CSF3R	L285F	G	1401	A
CELSR3	R301C	G	1182	A	CLASP2	R603Q	C	2162	T	COL22A1	R214W	G	1087	A	CSF3R	A859V	G	3124	A
CELSR3	G206E	C	898	T	CLASP2	V24A	A	425	G	COL22A1	G982R	C	3391	T	CSGALNAC T1	K380N	C	1794	A
CELSR3	G2104C	C	6591	A	CLC	G86D	C	333	T	COL22A1	P978L	G	3380	A	CSGALNAC T2	G457V	G	1705	T
CELSR3	E1454K	C	4641	T	CLCA2	D771G	A	2474	G	COL22A1	R1465H	C	4841	T	CSH2	G187A	C	702	G
CEND1	C119Y	C	532	T	CLCA2	F285V	T	1015	G	COL22A1	G1162*	C	3931	A	CSHL1	S193Y	G	578	T
CENPA	R43W	C	327	T	CLCA4	S242R	A	768	C	COL22A1	E769*	C	2752	A	CSMD1	S449Y	G	1346	T
CENPA	R80C	C	438	T	CLCC1	S55N	C	272	T	COL24A1	C1545W	G	5002	C	CSMD1	F272I	A	814	T
CENPB	E460D	C	1587	A	CLCN1	P155S	C	550	T	COL24A1	G1285D	C	4221	T	CSMD1	A1950P	C	5848	G
CENPB	S468L	G	1610	A	CLCN1	F385L	T	1240	C	COL24A1	R875C	G	2990	A	CSMD1	R2193*	G	6577	A
CENPE	S810L	G	2519	A	CLCN1	R199C	C	682	T	COL24A1	S464G	T	1757	C	CSMD1	V2609I	C	7825	T
CENPE	D2123G	T	6458	C	CLCN1	E291K	G	958	A	COL24A1	D477Y	C	1796	A	CSMD1	R2133K	C	6398	T
CENPE	I1242V	T	3814	C	CLCN1	R626Q	G	1964	A	COL24A1	F772L	A	2681	G	CSMD1	V1513M	C	4537	T
CENPE	A74V	G	311	A	CLCN2	R629H	C	2058	T	COL25A1	E437K	C	1840	T	CSMD1	K520Q	T	1558	G
CENPE	N2576K	A	7818	C	CLCN2	R350W	G	1220	A	COL25A1	P602L	G	2336	A	CSMD1	T1436M	G	4307	A
CENPE	K1942T	T	5915	G	CLCN2	M349T	A	1218	G	COL25A1	A7T	C	550	T	CSMD1	G962C	C	2884	A
CENPF	K1944N	G	6000	T	CLCN2	R471C	G	1583	A	COL25A1	E136*	C	937	A	CSMD1	R437H	C	1310	T
CENPF	L477P	T	1598	C	CLCN3	N168S	A	1057	G	COL25A1	E67K	C	730	T	CSMD1	G900V	C	2699	A
CENPF	R402H	G	1373	A	CLCN3	R373C	C	1671	T	COL27A1	R707Q	G	2120	A	CSMD1	A978T	C	2932	T
CENPF	K113N	A	507	T	CLCN3	F399C	T	1750	G	COL27A1	R412H	G	1235	A	CSMD1	C483*	A	1449	T
CENPF	Y2864H	T	8758	C	CLCN3	V597A	T	2344	C	COL27A1	P645S	C	1933	T	CSMD1	G90V	C	269	A
CENPF	R2309C	C	7093	T	CLCN4	R501S	G	1894	T	COL27A1	P1581H	C	4742	A	CSMD1	G1425E	C	4274	T
CENPF	D265Y	G	961	T	CLCN5	A652S	G	2336	T	COL27A1	R1474I	G	4421	T	CSMD1	F3081L	A	9241	G
CENPF	K429N	G	1455	T	CLCN6	R583Q	G	1751	A	COL28A1	G441R	C	1462	T	CSMD1	L2670F	G	8008	A

CENPF	E949K	G	3013	A	CLCN6	E595K	G	1786	A	COL28A1	T17M	G	191	A	CSMD1	P521Q	G	1562	T
CENPF	E1445K	G	4501	A	CLCN7	A655T	C	2000	T	COL28A1	R741W	G	2362	A	CSMD1	P8S	G	22	A
CENPF	N1730K	T	5358	A	CLCNKA	S350Y	C	1068	A	COL28A1	P698S	G	2233	A	CSMD1	S216Y	G	647	T
CENPF	E2140D	G	6588	T	CLCNKA	R438C	C	1331	T	COL2A1	R560W	G	1843	A	CSMD1	G2196S	C	6586	T
CENPF	K2448Q	A	7510	C	CLCNKB	A329T	G	1096	A	COL2A1	A94T	C	445	T	CSMD1	A2406S	C	7216	A
CENPF	E2859A	A	8744	C	CLCNKB	G456W	G	1477	T	COL2A1	L1412F	G	4399	A	CSMD1	C2266R	A	6796	G
CENPF	K3029T	A	9254	C	CLCNKB	L536M	C	1717	A	COL2A1	G819D	C	2621	T	CSMD1	G1803R	C	5407	T
CENPH	E190D	A	657	C	CLDN1	V100I	C	567	T	COL2A1	D1309G	T	4091	C	CSMD1	V2968F	C	8902	A
CENPI	E430K	G	1457	A	CLDN1	K106E	T	585	C	COL2A1	I54S	A	326	C	CSMD1	G3171*	C	9511	A
CENPJ	R284C	G	1036	A	CLDN10	A4V	C	241	T	COL3A1	G420S	G	1428	A	CSMD1	V2610M	C	7828	T
CENPJ	F1192L	G	3762	T	CLDN10	I122L	A	393	C	COL3A1	R1363Q	G	4258	A	CSMD2	A610T	C	1857	T
CENPJ	F133L	G	585	T	CLDN14	W30R	A	955	G	COL3A1	E71*	G	381	T	CSMD2	L3367F	G	1012 8	A
CENPM	V157M	C	557	T	CLDN14	Y62*	G	1053	C	COL4A1	P198S	G	714	A	CSMD2	D1503N	C	4536	T
CENPN	S62R	T	260	G	CLDN16	K112Q	A	582	C	COL4A1	-	C	0	T	CSMD2	A1269T	C	3834	T
CENPQ	S178R	C	623	A	CLDN17	F66L	G	337	T	COL4A1	R585C	G	1875	A	CSMD2	Q1660H	C	5009	G
CENPT	E339*	C	1052	A	CLDN19	G49W	C	336	A	COL4A1	V1659I	C	5097	T	CSMD2	A3525T	C	1060 2	T
CEP110	E2014D	G	6302	C	CLDN2	R189I	G	892	T	COL4A1	T1464S	G	4513	C	CSMD2	L1186F	G	3585	A
CEP110	K819Q	A	2715	C	CLDN25	H108Y	C	322	T	COL4A1	K640Q	T	2040	G	CSMD2	G2456S	C	7395	T
CEP110	-	G	0	T	CLDN25	E42K	G	124	A	COL4A2	R334W	C	1306	T	CSMD2	R3261C	G	9810	A
CEP120	E467D	C	1706	A	CLDN5	G70S	C	1269	T	COL4A2	E1345*	G	4339	T	CSMD2	T3301M	G	9931	A
CEP120	E695*	C	2388	A	CLDN5	A203V	G	1669	A	COL4A2	R740Q	G	2525	A	CSMD2	L1863P	A	5617	G
CEP120	K292T	T	1180	G	CLDN5	K150N	T	1511	G	COL4A2	-	G	0	T	CSMD2	L171M	G	540	T
CEP135	V227M	G	803	A	CLDN6	I123L	T	796	G	COL4A2	K544N	A	1938	C	CSMD2	F2038L	A	6141	G
CEP135	R162I	G	609	T	CLDN6	V220I	C	1087	T	COL4A2	K556N	A	1974	C	CSMD3	A1586S	C	5001	A
CEP152	I1261M	A	3903	C	CLDN8	L165P	A	642	G	COL4A3	L475M	C	1585	A	CSMD3	-	C	0	T
CEP152	K515T	T	1664	G	CLDN8	T121M	G	510	A	COL4A3	P1338S	C	4174	T	CSMD3	R2688H	C	8308	T
CEP152	H1420Y	G	4378	A	CLDN8	E163*	C	635	A	COL4A3	A932V	C	2957	T	CSMD3	A3693V	G	1132 3	A
CEP152	K379N	C	1257	A	CLDN9	A102V	C	878	T	COL4A3	T1172M	C	3677	T	CSMD3	P2348H	G	7288	T
CEP152	K368N	C	1224	A	CLDND1	Q249*	G	956	A	COL4A3	A1439V	C	4478	T	CSMD3	R1574Q	C	4966	T
CEP152	K280N	C	960	A	CLDND1	R27C	G	290	A	COL4A3	Y1521C	A	4724	G	CSMD3	A1527V	G	4825	A
CEP164	D404N	G	1357	A	CLDND1	K128T	T	594	G	COL4A3BP	R641Q	C	2216	T	CSMD3	R2180W	G	6783	A
CEP164	F408L	C	1371	A	CLEC12A	R87I	G	448	T	COL4A3BP	R728*	G	2476	A	CSMD3	P565L	G	1939	A
CEP164	R1361C	C	4228	T	CLEC12A	N176T	A	655	C	COL4A3BP	K498N	C	1788	A	CSMD3	N3574D	T	1096 5	C
CEP164	K794T	A	2528	C	CLEC12A	S90Y	C	457	A	COL4A4	G843V	C	2736	A	CSMD3	G1785R	C	5598	T
CEP192	S116N	G	427	A	CLEC12A	L117R	T	478	G	COL4A4	E964G	T	3099	C	CSMD3	P971T	G	3156	T
CEP192	I2517S	T	7630	G	CLEC14A	R434M	C	1648	A	COL4A4	A1567V	G	4908	A	CSMD3	I2520V	T	7803	C

CEP192	H194N	C	660	A	CLEC16A	R817H	G	2680	A	COL4A5	-	A	0	G	CSMD3	F2502L	G	7751	T
CEP192	D53N	G	237	A	CLEC16A	A1042V	C	3355	T	COL4A5	T1511M	C	4776	T	CSMD3	I2186L	T	6801	G
CEP192	P397L	C	1270	T	CLEC16A	T998A	A	3222	G	COL4A6	G1262R	C	3885	T	CSMD3	T2176I	G	6772	A
CEP192	Q2108H	G	6404	T	CLEC16A	A791T	G	2601	A	COL4A6	T1671M	G	5113	A	CSMD3	S1952P	A	6099	G
CEP192	R2118H	G	6433	A	CLEC16A	K75N	G	455	T	COL4A6	A891V	G	2773	A	CSMD3	F1418V	A	4497	C
CEP192	S645A	T	2013	G	CLEC16A	F751C	T	2482	G	COL4A6	P761L	G	2383	A	CSMD3	Q287K	G	1104	T
CEP192	T1655M	C	5044	T	CLEC17A	E48D	G	182	T	COL4A6	S394*	G	1282	T	CSMD3	K148T	T	688	G
CEP192	I2055S	T	6244	G	CLEC17A	R213Q	G	676	A	COL4A6	A355V	G	1165	A	CSMD3	E113*	C	582	A
CEP250	R399C	C	1915	T	CLEC1A	D280A	T	902	G	COL5A1	G631V	G	2306	T	CSMD3	T1173S	T	3762	A
CEP250	R2032*	C	6814	T	CLEC1B	R15W	G	243	A	COL5A1	D418N	G	1666	A	CSN3	T151M	C	538	T
CEP250	A800T	G	3118	A	CLEC2A	E100*	C	350	A	COL5A1	P463L	C	1802	T	CSN3	V155A	T	550	C
CEP250	R121*	C	1081	T	CLEC2B	Q43H	T	786	G	COL5A1	P290H	C	1283	A	CSNK1A1	Y320C	T	959	C
CEP250	S2331Y	C	7712	A	CLEC2B	N19D	T	712	C	COL5A1	G1066V	G	3611	T	CSNK1D	K294N	T	1198	G
CEP290	L1331V	A	3991	C	CLEC2D	R84I	G	273	T	COL5A1	G1495S	G	4897	A	CSNK1E	T334M	G	1112	A
CEP290	T835I	G	2504	A	CLEC2D	R37C	C	131	T	COL5A1	R449L	G	1760	T	CSNK1G2	R309W	C	1447	T
CEP290	K918N	C	2754	A	CLEC2D	N19T	A	78	C	COL5A2	R821*	G	2736	A	CSNK1G2	R263W	C	1309	T
CEP290	S722Y	G	2165	T	CLEC2L	E145A	A	434	C	COL5A2	A394V	G	1456	A	CSNK1G2	R263W	C	1309	T
CEP290	K170N	C	510	A	CLEC2L	I87F	A	259	T	COL5A2	P686T	G	2331	T	CSNK1G2	L411P	T	1754	C
CEP290	R151Q	C	452	T	CLEC2L	A80T	G	238	A	COL5A2	E1066*	C	3471	A	CSNK1G3	A189V	C	1285	T
CEP290	E9*	C	25	A	CLEC2L	E145K	G	433	A	COL5A2	G1023D	C	3343	T	CSNK1G3	K263N	A	1508	C
CEP290	V758A	A	2273	G	CLEC3A	D127Y	G	491	T	COL5A2	A331T	C	1266	T	CSNK2A2	M209I	C	769	T
CEP350	R427Q	G	1698	A	CLEC3A	R156C	C	578	T	COL5A3	K266N	C	884	A	CSNK2A2	R44Q	C	273	T
CEP350	P986S	C	3374	T	CLEC3A	R156C	C	578	T	COL5A3	V1201M	C	3687	T	CSPG4	R672*	G	2107	A
CEP350	Y1522C	A	4983	G	CLEC4C	A181V	G	734	A	COL5A3	P1294L	G	3967	A	CSPG4	G624S	C	1963	T
CEP350	R1728Q	G	5601	A	CLEC4C	F46V	A	328	C	COL5A3	A1096T	C	3372	T	CSPG4	L1674I	G	5113	T
CEP350	R1881C	C	6059	T	CLEC4D	S8N	G	216	A	COL5A3	G1187S	C	3645	T	CSPG4	T2184M	G	6644	A
CEP350	A202S	G	1022	T	CLEC4F	A315V	G	1021	A	COL5A3	G701V	C	2188	A	CSPG4	A2288G	G	6956	C
CEP350	S1157*	C	3888	A	CLEC4F	R258S	T	851	G	COL5A3	D741V	T	2308	A	CSPG4	W1668R	A	5095	G
CEP350	R1204C	C	4028	T	CLEC4F	-	C	0	T	COL5A3	E1708K	C	5208	T	CSPG5	A338T	C	3111	T
CEP350	F2548V	T	8060	G	CLEC4F	T392S	G	1252	C	COL5A3	-	C	0	A	CSPG5	G394V	C	3280	A
CEP350	R1482W	C	4862	T	CLEC4F	N144S	T	508	C	COL6A1	R731H	G	2306	A	CSPG5	S428L	G	3382	A
CEP350	R3003S	A	9427	C	CLEC4G	A227T	C	748	T	COL6A1	F762L	C	2400	A	CSPP1	R413*	C	1268	T
CEP55	R385*	C	1335	T	CLEC5A	A162V	G	682	A	COL6A1	A132T	G	508	A	CSPP1	I276V	A	857	G
CEP55	K29Q	A	267	C	CLEC6A	M2I	G	123	A	COL6A1	K121E	A	475	G	CSPP1	V1117I	G	3380	A
CEP55	R64*	C	372	T	CLEC7A	E242D	C	913	A	COL6A1	G404R	G	1324	A	CSPP1	N147H	A	470	C
CEP57	R81*	C	462	T	CLEC9A	S110N	G	942	A	COL6A1	R211H	G	746	A	CSPP1	K207E	A	650	G
CEP57	K345T	A	1255	C	CLEC9A	E139D	G	1030	T	COL6A1	A224T	G	784	A	CSRNP1	R122H	C	543	T
CEP63	E691K	G	2244	A	CLGN	V248I	C	1183	T	COL6A1	G556R	G	1780	A	CSRNP1	S432T	C	1473	G
CEP68	Q618*	C	2055	T	CLGN	E266*	C	1237	A	COL6A1	-	G	0	A	CSRNP1	K8T	T	201	G

CEP68	P103S	C	510	T	CLGN	F408S	A	1664	G	COL6A1	R79C	C	349	T	CSRNP2	G388D	C	1461	T
CEP68	R441W	C	1524	T	CLIC2	L79F	C	456	A	COL6A1	C810G	T	2542	G	CSRNP2	R184W	G	848	A
CEP68	D525G	A	1777	G	CLIC4	R206H	G	814	A	COL6A2	D330N	G	1092	A	CSRNP2	T5M	G	312	A
CEP70	-	A	0	G	CLIC4	A64V	C	388	T	COL6A2	A137T	G	513	A	CSRNP2	F49L	G	445	T
CEP72	L633R	T	1988	G	CLIC5	R196C	G	739	A	COL6A2	R734C	C	2304	T	CSRNP3	S593Y	C	2028	A
CEP76	R148H	C	669	T	CLIC6	K594N	G	1782	T	COL6A2	R784C	C	2454	T	CSRP2	A188T	C	645	T
CEP78	G52V	G	431	T	CLINT1	K131N	C	583	A	COL6A3	R1727W	G	5632	A	CSRP3	G135R	C	520	T
CEP97	N229D	A	719	G	CLINT1	A400V	G	1389	A	COL6A3	V1924I	C	6223	T	CST1	R46H	C	208	T
CER1	E174K	C	565	T	CLINT1	D185V	T	744	A	COL6A3	R1738H	C	5666	T	CST1	Y64C	T	262	C
CER1	H208R	T	668	C	CLINT1	A267V	G	990	A	COL6A3	P744L	G	2684	A	CST11	L109P	A	360	G
CERCAM	S380L	C	1537	T	CLIP1	S47L	G	295	A	COL6A3	G139S	C	868	T	CST2	V78M	C	303	T
CERCAM	E454G	A	1759	G	CLIP1	R511H	C	1687	T	COL6A3	G615C	C	2296	A	CST2	R66C	G	267	A
CERCAM	G567S	G	2097	A	CLIP1	K35N	T	260	G	COL6A3	V2793I	C	8830	T	CST2	F84L	G	323	T
CERK	D186N	C	669	T	CLIP2	A583V	C	2075	T	COL6A3	A1370T	C	4561	T	CST6	A119V	C	410	T
CERK	A375T	C	1236	T	CLIP2	C249Y	G	1073	A	COL6A3	R2342Q	C	7478	T	CST6	D109N	G	379	A
CERK	E202K	C	717	T	CLIP2	E933G	A	3125	G	COL6A3	K2916E	T	9199	C	CST7	R20Q	G	269	A
CERKL	E91*	C	271	A	CLIP2	A869V	C	2933	T	COL6A3	G2705E	C	8567	T	CST8	K25N	A	432	C
CES1	W176*	C	635	T	CLIP2	R515C	C	1870	T	COL6A3	-	C	0	A	CST9L	F87L	G	560	T
CES1	D420E	G	1368	T	CLIP2	Q775H	G	2652	T	COL6A3	-	C	0	T	CST9L	K140N	C	719	A
CES1	D91Y	C	379	A	CLIP3	T276M	G	1055	A	COL6A3	G2190V	C	7022	A	CSTF1	R426Q	G	1477	A
CES1	A81V	G	350	A	CLIP3	A271T	C	1039	T	COL6A3	D1958Y	C	6325	A	CSTF2	A482V	C	1461	T
CES2	R136Q	G	1391	A	CLIP3	R86C	G	484	A	COL6A3	R1464Q	C	4844	T	CSTF2T	Q524H	T	1618	G
CES3	L527M	C	1650	A	CLIP4	D50Y	G	387	T	COL6A3	K1156N	C	3921	A	CSTF3	A42V	G	291	A
CES7	R497Q	C	1610	T	CLIP4	M277R	T	1069	G	COL6A3	R874Q	C	3074	T	CT45A5	D75Y	C	468	A
CES7	L566F	G	1816	A	CLIP4	V31A	T	331	C	COL6A3	D598N	C	2245	T	CTAGE1	E98*	C	396	A
CES7	R486Q	C	1577	T	CLIP4	P458H	C	1612	A	COL6A3	R1504W	G	4963	A	CTAGE1	R173W	G	621	A
CES7	R530I	C	1709	A	CLIP4	K394N	A	1421	C	COL6A5	R2471Q	G	7906	A	CTAGE1	A651T	C	2055	T
CES7	-	C	0	A	CLIP4	E410K	G	1467	A	COL6A5	V1864M	G	6084	A	CTAGE5	D148V	A	779	T
CES8	F175L	C	525	A	CLIP4	R497K	G	1729	A	COL6A5	D76N	G	720	A	CTAGE5	T291M	C	1208	T
CES8	A500T	G	1498	A	CLK1	R458*	G	1707	A	COL6A5	D218N	G	1146	A	CTAGE5	E504*	G	1846	T
CETN1	L137I	C	451	A	CLK1	W272R	A	1149	G	COL6A5	R252M	G	1249	T	CTAGE9	D33N	C	97	T
CETN2	E99D	C	364	A	CLK2	Q475R	T	1740	C	COL6A5	S386Y	C	1651	A	CTBP1	R173H	C	700	T
CETP	L313P	T	1068	C	CLK2	S131T	A	707	T	COL6A5	R884C	C	3144	T	CTBP1	R36Q	C	289	T
CETP	V239I	G	845	A	CLK2	N295I	T	1200	A	COL6A5	P1632S	C	5388	T	CTBP2	R697Q	C	2221	T
CETP	R54*	C	290	T	CLK2	P401T	G	1517	T	COL6A5	A1891V	C	6166	T	CTBP2	R513Q	C	1669	T
CETP	L245P	T	864	C	CLK2	R268H	C	1119	T	COL6A5	S1971Y	C	6406	A	CTBP2	C349S	A	1176	T
CETP	A212V	C	765	T	CLK2	A446T	C	1652	T	COL6A5	A2312T	G	7428	A	CTBP2	A446T	C	1467	T
CFD	A15V	C	69	T	CLK2	F272C	A	1131	C	COL6A6	R1173C	C	3548	T	CTBP2	Y76H	A	357	G
CFD	D141N	G	446	A	CLK4	R127H	C	516	T	COL6A6	A1818T	G	5483	A	CTBP2	T42M	G	256	A

CFDP1	A93V	G	411	A	CLK4	R24H	C	207	T	COL6A6	H1746R	A	5268	G	CTBS	H326R	T	1026	C
CFH	R257H	G	1010	A	CLK4	V191I	C	707	T	COL6A6	T424M	C	1302	T	CTBS	M92T	A	324	G
CFH	G35D	G	344	A	CLK4	E369D	T	1243	G	COL6A6	K869N	A	2638	C	CTCF	K405E	A	1657	G
CFH	G894V	G	2921	T	CLLU1OS	M101I	C	305	A	COL6A6	S460L	C	1410	T	CTCF	D693N	G	2521	A
CFH	R175Q	G	764	A	CLMN	A814T	C	2556	T	COL6A6	R786C	C	2387	T	CTCF	R377C	C	1573	T
CFH	S933Y	C	3038	A	CLMN	N849T	T	2662	G	COL6A6	F320L	T	989	C	CTCFL	A233T	C	890	T
CFH	I8S	T	263	G	CLMN	D766A	T	2413	G	COL6A6	R1739*	C	5246	T	CTDP1	Q736H	G	2355	T
CFH	L12V	T	274	G	CLN3	L113M	A	610	T	COL6A6	Q1072*	C	3245	T	CTDP1	-	G	0	T
CFH	G45D	G	374	A	CLN5	M1I	G	1295	A	COL6A6	R1745M	G	5265	T	CTDSP2	R152H	C	984	T
CFH	S58Y	C	413	A	CLN6	R110C	G	486	A	COL6A6	D451Y	G	1382	T	CTDSP2	A241T	C	1250	T
CFH	I685T	T	2294	C	CLN8	A84V	C	490	T	COL7A1	R1772Q	C	5423	T	CTH	R265*	C	937	T
CFHR1	R302W	C	992	T	CLNK	E281K	C	1081	T	COL7A1	A1232S	C	3802	A	CTH	A357V	C	1214	T
CFHR1	R309H	G	1014	A	CLNK	D16N	C	286	T	COL7A1	P367S	G	1207	A	CTHRC1	C126R	T	518	C
CFHR1	E37D	A	199	C	CLOCK	F480V	A	1689	C	COL7A1	G1353R	C	4165	T	CTHRC1	P69H	C	348	A
CFHR1	R69C	C	293	T	CLOCK	K712T	T	2386	G	COL7A1	A18V	G	161	A	CTLA4	I102T	T	462	C
CFHR2	R132W	C	471	T	CLP1	R170Q	G	648	A	COL7A1	R2745Q	C	8342	T	CTNNA1	R379H	G	1136	A
CFHR2	P41S	C	198	T	CLPB	R520C	G	1608	A	COL7A1	P1753T	G	5365	T	CTNNA1	M726V	A	2176	G
CFHR4	N310K	T	999	A	CLPB	P644S	G	1980	A	COL7A1	R2795C	G	8491	A	CTNNA1	T654M	C	1961	T
CFHR4	A309V	C	995	T	CLPP	R83C	C	370	T	COL7A1	G1374A	C	4229	G	CTNNA2	A252T	G	759	A
CFHR4	V313A	T	1007	C	CLPTM1	R90H	G	274	A	COL7A1	K2562N	C	7794	A	CTNNA2	A586T	G	1761	A
CFHR5	Y63*	T	226	G	CLPTM1	R74H	G	226	A	COL7A1	G1988V	C	6071	A	CTNNA2	F609L	C	1832	A
CFI	S553R	T	1737	G	CLPTM1L	R221C	G	919	A	COL8A1	P296H	C	1132	A	CTNNA2	R328C	C	987	T
CFI	D211Y	C	711	A	CLPTM1L	T490M	G	1727	A	COL8A1	V110L	G	573	T	CTNNA3	F718S	A	2328	G
CFL1	R21H	C	296	T	CLPTM1L	R533W	G	1855	A	COL8A1	G607C	G	2064	T	CTNNA3	Q376*	G	1301	A
CFP	R359*	G	1196	A	CLPTM1L	A353V	G	1316	A	COL8A2	G618S	C	1859	T	CTNNB1	S45P	T	289	C
CFP	R438Q	C	1434	T	CLRN1	Y171*	A	804	C	COL8A2	Y599C	T	1803	C	CTNNB1	R225C	C	829	T
CFTR	G1185D	G	3686	A	CLRN2	A13V	C	38	T	COL9A1	P271L	G	958	A	CTNNB1	T41A	A	277	G
CFTR	I331T	T	1124	C	CLRN2	A207V	C	620	T	COL9A2	G241V	C	819	A	CTNNB1	G730S	G	2344	A
CFTR	R1097C	C	3421	T	CLRN3	-	C	0	T	COL9A3	P562H	C	1688	A	CTNNB1	Q302H	A	1062	C
CFTR	K698E	A	2224	G	CLRN3	V129M	C	548	T	COL9A3	R402Q	G	1208	A	CTNNB1	E571*	G	1867	T
CFTR	K166M	A	629	T	CLSPN	K287Q	T	939	G	COL9A3	G346D	G	1040	A	CTNNBL1	R485C	C	1570	T
CFTR	R555S	A	1797	C	CLSPN	V1250A	A	3829	G	COL9A3	R423Q	G	1271	A	CTNNBL1	-	T	0	C
CFTR	D1152A	A	3587	C	CLSPN	-	A	0	G	COLEC10	D132N	G	469	A	CTNNBL1	-	G	0	T
CGA	V92A	A	376	G	CLSPN	A1215T	C	3723	T	COLEC11	V257M	G	769	A	CTNNBL1	E223A	A	785	C
CGGBP1	P85S	G	715	A	CLSPN	R815*	G	2523	A	COLEC11	A213T	G	637	A	CTNNBL1	R38C	C	229	T
CGN	R267H	G	933	A	CLSPN	R795C	G	2463	A	COLEC11	A12V	C	35	T	CTNND1	R344*	C	1601	T
CGN	R991W	C	3104	T	CLSPN	D1323Y	C	4047	A	COLEC12	A270V	G	1024	A	CTNND1	M298V	A	1463	G
CGN	E527K	G	1712	A	CLSTN1	M819T	A	3249	G	COLEC12	G542C	C	1839	A	CTNND1	R215H	G	1215	A
CGNL1	R45Q	G	212	A	CLSTN1	S436F	G	2100	A	COLEC12	A233T	C	912	T	CTNND1	H273Y	C	1388	T

CGREF1	G393E	C	1183	T	CLSTN2	S780R	A	2528	C	COLEC12	Q172H	C	731	A	CTNND1	A683D	C	2619	A
CGREF1	G376E	C	1132	T	CLSTN2	R777C	C	2519	T	COLQ	G243V	C	854	A	CTNND1	K399N	G	1768	T
CGREF1	L135P	A	409	G	CLSTN2	A880V	C	2829	T	COLQ	P140S	G	544	A	CTNND1	A373T	G	1688	A
CHAC1	A241T	G	1030	A	CLSTN2	V828L	G	2672	T	COMMD1	-	T	603	C	CTNND2	V660G	A	2169	C
CHAC2	L148R	T	538	G	CLSTN2	E505D	A	1705	C	COMMD2	T112M	G	390	A	CTNND2	R82*	G	434	A
CHAD	A166T	C	649	T	CLSTN2	R428W	C	1472	T	COMMD3	V45A	T	578	C	CTNND2	R889Q	C	2856	T
CHAD	G97D	C	443	T	CLSTN3	R947H	G	3118	A	COMMD6	F86V	A	394	C	CTNND2	A615S	C	2033	A
CHAD	D261E	A	936	C	CLSTN3	E39D	G	395	T	COMMD7	A82D	G	851	T	CTNS	R114C	C	799	T
CHADL	R518H	C	1606	T	CLSTN3	E950K	G	3126	A	COMMD7	Q115H	C	951	A	CTNS	A212V	C	1094	T
CHADL	R107H	C	373	T	CLTC	M1538I	G	4888	A	COMP	V487L	C	1495	A	CTNS	V163M	G	946	A
CHADL	R582*	G	1797	A	CLTC	Q1083R	A	3522	G	COMP	L9F	G	61	A	CTPS	R389W	C	1673	T
CHADL	A175T	C	576	T	CLTC	F368C	T	1377	G	COPA	D399G	T	1274	C	CTPS	V34A	T	609	C
CHAF1A	R319H	G	1056	A	CLTC	N1469T	A	4680	C	COPB2	Q687H	C	2243	A	CTPS2	K193N	T	1323	G
CHAF1A	E388K	G	1262	A	CLU	R279H	C	909	T	COPB2	I295N	A	1066	T	CTR9	K982Q	A	3101	C
CHAF1A	V917M	G	2849	A	CLU	N479T	T	1509	G	COPB2	R17*	G	231	A	CTR9	A48V	C	300	T
CHAF1A	R528W	C	1682	T	CLU	F482C	A	1518	C	COPG	-	C	0	A	CTRC	G87*	G	285	T
CHAF1B	T432M	C	1446	T	CLUAP1	S367P	T	1204	C	COPG	V579M	G	1839	A	CTSA	R344C	C	1312	T
CHAF1B	C191G	T	722	G	CLUL1	I436T	T	1452	C	COPG	I383T	T	1252	C	CTSA	G76S	G	508	A
CHAF1B	Y225D	T	824	G	CLVS2	-	G	0	T	COPG	F498L	T	1596	C	CTSA	I465L	A	1675	C
CHAT	R186W	C	709	T	CLYBL	D73N	G	244	A	COPG	R247C	C	843	T	CTSB	I184V	T	804	C
CHCHD1	Q81H	G	256	T	CLYBL	I29V	A	112	G	COPG2	R238H	C	713	T	CTSB	S257L	G	1024	A
CHCHD1	P101S	C	314	T	CLYBL	D68E	T	231	G	COPG2	L223V	G	667	C	CTSC	K227N	C	782	A
CHCHD2	A67V	G	363	A	CMAS	N373H	A	1196	C	COPS2	P300Q	G	978	T	CTSC	L381H	A	1243	T
CHCHD6	R162C	C	556	T	CMAS	E426K	G	1355	A	COPS2	A234V	G	780	A	CTSC	V348A	A	1144	G
CHCHD6	E169Q	G	577	C	CMKLR1	R151C	G	815	A	COPS3	T311A	T	1038	C	CTSC	R250Q	C	850	T
CHCHD7	M108T	T	494	C	CMPK1	Y61*	C	213	A	COPS3	V164M	C	597	T	CTSE	F246L	C	856	A
CHD1	R1189Q	C	3716	T	CMPK2	Q191R	T	572	C	COPS6	R315*	C	980	T	CTSG	R120Q	C	396	T
CHD1	R900Q	C	2849	T	CMTM1	K80T	A	306	C	COPS6	M206I	G	655	T	CTSG	R122*	G	401	A
CHD1	D1388N	C	4312	T	CMTM3	Y59F	A	702	T	COPS7A	R151W	C	628	T	CTSL1	V126M	G	1266	A
CHD1	R697*	G	2239	A	CMTM4	R191H	C	754	T	COPS8	P185S	C	1206	T	CTSL1	R153W	C	1347	T
CHD1	P450H	G	1499	T	CMTM5	R8Q	G	239	A	COQ10A	S129P	T	385	C	CTSL2	V282A	A	1095	G
CHD1	F1414Y	A	4391	T	CMYA5	V3613A	T	10910	C	COQ10B	A29T	G	223	A	CTSL2	K54N	C	412	A
CHD1	R1574I	C	4871	A	CMYA5	A3703D	C	11180	A	COQ2	A267V	G	800	A	CTSO	I244M	T	802	C
CHD1L	A668T	G	2022	A	CMYA5	T2928A	A	8854	G	COQ3	C239R	A	740	G	CTSS	A164T	C	751	T
CHD1L	R319Q	G	976	A	CMYA5	E409D	G	1299	T	COQ6	P373L	C	1198	T	CTSW	V301I	G	943	A
CHD1L	R457C	C	1389	T	CMYA5	S589Y	C	1838	A	COQ6	D146Y	G	516	T	CTSW	R62H	G	227	A
CHD1L	K519N	A	1577	T	CMYA5	S771Y	C	2384	A	COQ9	P214L	C	657	T	CTTN	A321T	G	1167	A
CHD1L	R806H	G	2437	A	CMYA5	S1667Y	C	5072	A	CORIN	P1017H	G	3050	T	CTTN	T364M	C	1297	T

CHD2	R1546*	C	5343	T	CMYA5	I2441M	T	7395	G	CORIN	K780N	T	2340	G	CTTNBP2	A1069T	C	3297	T
CHD2	S1221F	C	4369	T	CMYA5	E3590*	G	10840	T	CORO1B	R30H	C	193	T	CTTNBP2	T1481A	T	4533	C
CHD2	I1223F	A	4374	T	CMYA5	S3692L	C	11147	T	CORO1B	-	A	0	G	CTTNBP2	N79I	T	328	A
CHD2	R403Q	G	1915	A	CMYA5	E3796*	G	11458	T	CORO1B	R70H	C	313	T	CTTNBP2	I259M	T	869	C
CHD2	-	T	0	C	CMYA5	L3901I	C	11773	A	CORO1C	A424V	G	1271	A	CTTNBP2	V1361I	C	4173	T
CHD3	G157R	G	470	A	CNBD1	I263S	T	788	G	CORO2B	R113Q	G	632	A	CTTNBP2	R1271W	G	3903	A
CHD3	R1960C	C	5879	T	CNDP1	S282C	A	1072	T	CORO6	V280M	C	839	T	CTTNBP2	K244N	C	824	A
CHD3	R1744*	C	5231	T	CNDP1	R401I	G	1430	T	CORO7	A146T	C	538	T	CTTNBP2	A86T	C	348	T
CHD3	F847S	T	2541	C	CNDP2	P136L	C	723	T	CORO7	-	A	0	G	CTTNBP2	A869V	G	2698	A
CHD3	P2013H	C	6039	A	CNDP2	A146V	C	753	T	CORT	R80*	C	593	T	CTTNBP2	R1219C	G	3747	A
CHD3	E511D	G	1534	T	CNDP2	E40K	G	434	A	COTL1	S115R	T	506	G	CTTNBP2NL	L18I	C	277	A
CHD3	L1200M	C	3599	A	CNGA1	R547H	C	1781	T	COX10	R142Q	G	502	A	CTTNBP2NL	E245K	G	958	A
CHD3	F1063V	T	3188	G	CNGA1	P364L	G	1232	A	COX10	A199S	G	672	T	CTU1	R72H	C	280	T
CHD4	R1338I	C	4177	A	CNGA1	R712Q	C	2276	T	COX15	P310T	G	979	T	CTU1	T114M	G	406	A
CHD4	G776D	C	2491	T	CNGA2	S530T	G	1622	C	COX15	V49A	A	197	G	CTU2	V38L	G	160	C
CHD4	-	C	0	A	CNGA2	E427K	G	1312	A	COX16	R85M	C	398	A	CUBN	L3216I	G	9712	T
CHD4	W421L	C	1426	A	CNGA2	A80S	G	271	T	COX18	G84D	C	343	T	CUBN	H1089Y	G	3331	A
CHD4	K1718T	T	5317	G	CNGA2	T5N	C	47	A	COX19	A4D	G	101	T	CUBN	D1055V	T	3230	A
CHD4	K1051R	T	3316	C	CNGA3	A162V	C	1055	T	COX19	K53E	T	247	C	CUBN	R1921H	C	5828	T
CHD4	S781N	C	2506	T	CNGA3	G548C	G	2212	T	COX7A2	E72D	T	527	G	CUBN	N1280I	T	3905	A
CHD5	D81Y	C	341	A	CNGA3	R21K	G	632	A	COX7A2L	E33*	C	927	A	CUBN	S3173A	A	9583	C
CHD5	V1875M	C	5723	T	CNGA4	R496W	C	1593	T	COX8A	A16T	G	120	A	CUBN	N1646H	T	5002	G
CHD5	E1664K	C	5090	T	CNGA4	R143C	C	534	T	CP	Q711*	G	2394	A	CUBN	P1529L	G	4652	A
CHD5	K98N	C	394	A	CNGB1	A78V	G	290	A	CP	K712N	T	2399	G	CUBN	E938K	C	2878	T
CHD6	L2434I	G	7478	T	CNGB1	A1141V	G	34790	A	CP	D640Y	C	2181	A	CUBN	G3471E	C	10478	T
CHD6	A345T	C	1211	T	CNGB1	R729Q	C	22430	T	CP	R436Q	C	1570	T	CUBN	G818R	C	2518	T
CHD6	R155Q	C	642	T	CNGB1	P115L	G	4010	A	CPA1	R386C	C	1306	T	CUEDC1	G92S	C	688	T
CHD6	V1274A	A	3999	G	CNGB3	R456C	G	14120	A	CPA1	K194N	G	732	T	CUEDC2	R264L	C	937	A
CHD6	R1595C	G	4961	A	CNGB3	P309Q	G	9720	T	CPA2	-	G	0	T	CUL2	A516V	G	1782	A
CHD6	R810C	G	2606	A	CNGB3	-	C	00	G	CPA2	A193T	G	596	A	CUL2	S637L	G	21450	A
CHD6	T2204A	T	6788	C	CNIH	V52A	A	2590	G	CPA3	K124N	G	424	T	CUL2	K629N	C	21220	A
CHD6	S2629Y	G	8064	T	CNIH	F130L	A	4940	C	CPA3	A177T	G	581	A	CUL2	V184A	A	7860	G
CHD6	G1915*	C	5921	A	CNIH3	S159N	G	13580	A	CPA3	I39T	T	168	C	CUL2	M566I	C	19330	A
CHD6	F1499L	A	4675	C	CNIH3	E71K	G	10930	A	CPA4	T405M	C	1242	T	CUL3	R305C	G	12520	A

CHD6	I361M	A	1261	C	CNKSR1	R147*	C	478	T	CPA4	K20T	A	87	C	CUL3	I145L	T	772	G
CHD7	R1330W	C	4465	T	CNKSR2	E83D	A	285	C	CPA4	-	G	0	T	CUL4A	A335V	C	1088	T
CHD7	A2391V	C	7649	T	CNKSR2	R806Q	G	2453	A	CPA4	S284L	C	879	T	CUL4A	F665C	T	2078	G
CHD7	A2726S	G	8653	T	CNKSR2	Q319H	G	993	T	CPA5	R129C	C	1005	T	CUL4B	V183A	A	950	G
CHD7	D1356G	A	4544	G	CNKSR2	A556E	C	1703	A	CPA6	K434N	C	1558	A	CUL4B	R365I	C	1496	A
CHD7	P1987H	C	6437	A	CNN1	S254L	C	925	T	CPA6	V107A	A	576	G	CUL7	R1019H	C	3142	T
CHD7	R1608G	A	5299	G	CNNM1	R714W	C	2429	T	CPAMD8	E1155K	C	3462	T	CUL7	T1449A	T	4431	C
CHD7	R858Q	G	3050	A	CNNM1	P841L	C	2811	T	CPAMD8	R340H	C	1018	T	CUL7	R960C	G	2964	A
CHD7	F1482L	C	4923	A	CNNM1	R586W	C	2045	T	CPAMD8	Y499F	T	1495	A	CUL9	R1139Q	G	3491	A
CHD8	I1740V	T	5218	C	CNNM1	R584W	C	2039	T	CPAMD8	R616H	C	1846	T	CUL9	R2066Q	G	6272	A
CHD8	P2146S	G	6436	A	CNNM1	N474S	A	1710	G	CPAMD8	R1146Q	C	3436	T	CUL9	G1560D	G	4754	A
CHD8	D1735N	C	5203	T	CNNM1	R210W	C	917	T	CPAMD8	P490S	G	1467	A	CUL9	R2168C	C	6577	T
CHD8	D1058A	T	3173	G	CNNM2	R488C	C	1629	T	CPAMD8	T648M	G	1942	A	CUL9	M1633V	A	4972	G
CHD8	R1396C	G	4186	A	CNNM2	D532G	A	1762	G	CPAMD8	A272V	G	814	A	CUL9	R1878C	C	5707	T
CHD8	I805M	A	2415	C	CNNM2	S489P	T	1632	C	CPAMD8	S250N	C	748	T	CUL9	M781L	A	2416	T
CHD9	R1357Q	G	4279	A	CNNM2	G461D	G	1549	A	CPB1	R237H	G	1044	A	CUL9	G386V	G	1232	T
CHD9	R1533Q	G	4807	A	CNNM2	V567I	G	1866	A	CPB1	V335M	G	1337	A	CUL9	L2420V	C	7333	G
CHD9	R1794H	G	5590	A	CNNM3	Y557H	T	1697	C	CPB2	G196C	C	603	A	CUL9	Q2208R	A	6698	G
CHD9	K2205Q	A	6822	C	CNNM3	T619M	C	1884	T	CPB2	F201L	G	620	T	CUX1	P1264L	C	3811	T
CHD9	R2567I	G	7909	T	CNNM3	Y646C	A	1965	G	CPD	G4D	G	68	A	CUX1	D806G	A	2437	G
CHD9	E1376K	G	4335	A	CNNM3	R506Q	G	1545	A	CPE	A72T	G	494	A	CUX1	S903R	A	2727	C
CHD9	G372D	G	1324	A	CNNM4	L150P	T	547	C	CPE	G375V	G	1404	T	CUX1	A487V	C	1483	T
CHD9	A1072T	G	3423	A	CNNM4	A473T	G	1515	A	CPEB1	K312N	C	936	A	CUX1	A409V	C	1246	T
CHD9	G2701V	G	8311	T	CNNM4	G404S	G	1308	A	CPEB1	E84V	T	251	A	CUX1	A65V	C	214	T
CHD9	G2857*	G	8778	T	CNOT1	R1992Q	C	6266	T	CPEB2	-	G	0	T	CUX2	E220D	G	813	T
CHD9	H314R	A	1150	G	CNOT1	E843K	C	2818	T	CPEB3	Y629C	T	2059	C	CUX2	A757V	C	2423	T
CHD9	E715D	A	2354	C	CNOT1	K596T	T	2078	G	CPEB4	R589*	C	2313	T	CUX2	P1433S	C	4450	T
CHD9	R2387*	C	7368	T	CNOT1	R1189H	C	3857	T	CPLX4	R74I	C	408	A	CUZD1	Y601C	T	2752	C
CHDH	F481L	A	1879	G	CNOT1	T209M	G	917	A	CPM	R337I	C	1057	A	CUZD1	Y170C	T	1459	C
CHEK2	M374T	A	1197	G	CNOT1	L1946P	A	6128	G	CPM	F31Y	A	139	T	CWC15	F209V	A	748	C
CHEK2	P225S	G	749	A	CNOT1	M673T	A	2309	G	CPN1	R322W	G	1216	A	CWC22	R128H	C	683	T
CHEK2	V25I	C	149	T	CNOT1	G919D	C	3047	T	CPN1	D312N	C	1186	T	CWC22	E404D	T	1512	G
CHEK2	Q36*	G	182	A	CNOT1	R1870H	C	5900	T	CPN1	A241T	C	973	T	CWC25	R34W	G	253	A
CHEK2	E364*	C	1166	A	CNOT1	Y1548H	A	4933	G	CPN2	R278W	G	922	A	CWF19L1	R399Q	C	1283	T
CHEK2	E348G	T	1119	C	CNOT1	Q1271L	T	4103	A	CPN2	R316H	C	1037	T	CWF19L2	P341H	G	1045	T
CHERP	H500Y	G	1572	A	CNOT1	D362N	C	1375	T	CPN2	V212A	A	725	G	CWF19L2	K524T	T	1594	G
CHERP	P584S	G	1824	A	CNOT1	-	C	0	T	CPNE1	R129W	G	520	A	CX3CR1	A383V	G	1148	A
CHERP	K256E	T	840	C	CNOT1	Y594H	A	2071	G	CPNE1	T505I	G	1649	A	CX3CR1	T249M	G	746	A
CHERP	R523W	G	1641	A	CNOT1	R1941*	G	6112	A	CPNE1	N208S	T	758	C	CXADR	-	G	0	A

CHERP	S830L	G	2563	A	CNOT1	R1640Q	C	5210	T	CPNE1	K261N	C	918	A	CXCL12	I79V	T	279	C
CHFR	V627L	C	1943	A	CNOT1	N415H	T	1534	G	CPNE3	L150V	C	506	G	CXCL14	-	T	517	C
CHFR	F242L	A	790	C	CNOT1	A224T	C	961	T	CPNE3	N138T	A	471	C	CXCL16	R169H	C	1038	T
CHGA	R456W	C	1626	T	CNOT10	S342A	T	1340	G	CPNE5	T65A	T	818	C	CXCL17	G31C	C	307	A
CHGA	A180V	C	799	T	CNOT2	F317S	T	1529	C	CPNE5	F193L	G	1204	T	CXCL17	P71S	G	427	A
CHGA	V411I	G	1491	A	CNOT2	K435Q	A	1882	C	CPNE5	R78C	G	857	A	CXCL17	T66I	G	413	A
CHGB	A512D	C	1739	A	CNOT3	S657L	C	2286	T	CPNE6	R102Q	G	551	A	CXCL3	N102K	G	384	T
CHGB	R178*	C	736	T	CNOT3	S667L	C	2316	T	CPNE7	G378D	G	1263	A	CXCL3	I100M	T	378	C
CHGB	R202I	G	809	T	CNOT3	N592D	A	2090	G	CPNE7	R367M	G	1230	T	CXCL9	R120H	C	398	T
CHGB	E450*	G	1552	T	CNOT3	G304S	G	1226	A	CPNE7	R27L	G	210	T	CXCR1	P257H	G	891	T
CHI3L1	R304C	G	1036	A	CNOT4	R323Q	C	1275	T	CPNE7	G8E	G	153	A	CXCR1	D11N	C	152	T
CHI3L2	Y336D	T	1077	G	CNOT4	A220V	G	966	A	CPNE8	R157S	C	568	A	CXCR1	G324D	C	1092	T
CHIC1	D47E	T	218	A	CNOT4	R44Q	C	438	T	CPNE8	G543*	C	1724	A	CXCR1	N311H	T	1052	G
CHIC1	P32S	C	171	T	CNOT6	M192V	A	923	G	CPNE8	K405N	T	1312	G	CXCR1	R144H	C	552	T
CHIC2	Y149C	T	530	C	CNOT6	Y482C	A	1794	G	CPNE8	E293D	T	976	G	CXCR2	T237M	C	1137	T
CHID1	Q100L	T	299	A	CNOT6	R87C	C	608	T	CPNE8	P412S	G	1331	A	CXCR2	D94N	G	707	A
CHIT1	A170S	C	543	A	CNOT6L	A313V	G	938	A	CPNE9	F76L	C	418	A	CXCR2	T116A	A	773	G
CHIT1	Y346C	T	1072	C	CNOT6L	V363M	C	1087	T	CPO	W297L	G	936	T	CXCR2	I169S	T	933	G
CHL1	L1043R	T	3770	G	CNP	S82L	C	389	T	CPOX	R332W	G	1213	A	CXCR5	V108M	G	432	A
CHL1	V663F	G	2629	T	CNP	E266K	G	940	A	CPOX	G308C	C	1141	A	CXCR5	A188T	G	672	A
CHL1	A24V	C	713	T	CNPY3	R121Q	G	733	A	CPOX	G189C	C	784	A	CXCR6	A277T	G	1215	A
CHL1	A725T	G	2815	A	CNPY3	G67S	G	570	A	CPOX	L418S	A	1472	G	CXCR7	W19*	G	367	A
CHL1	R438H	G	1955	A	CNPY4	F163S	T	620	C	CPPED1	T105M	G	425	A	CXCR7	R320S	C	1268	A
CHL1	R82W	C	886	T	CNR1	I105T	A	522	G	CPPED1	A285T	C	964	T	CXorf1	Y12*	C	304	A
CHL1	E447*	G	1981	T	CNRIP1	P5S	G	619	A	CPPED1	N170S	T	620	C	CXorf22	R29L	G	152	T
CHL1	L592F	G	2418	T	CNRIP1	Y25D	A	679	C	CPS1	E838*	G	2591	T	CXorf27	A98T	G	315	A
CHL1	Q862H	G	3228	T	CNST	L623S	T	2137	C	CPS1	P739Q	C	2295	A	CXorf30	K916N	G	2748	T
CHL1	N864H	A	3232	C	CNTD2	D83N	C	296	T	CPS1	A1186T	G	3635	A	CXorf36	G195D	C	659	T
CHM	D143G	T	458	C	CNTD2	A109T	C	374	T	CPS1	R832C	C	2573	T	CXorf56	A65V	G	240	A
CHM	L527F	C	1611	G	CNTF	F98C	T	373	G	CPS1	S1209L	C	3705	T	CXorf57	N597K	T	1900	G
CHM	R293*	G	907	A	CNTFR	A22T	C	358	T	CPS1	I10S	T	108	G	CXorf64	Q123H	G	449	T
CHML	R90C	G	432	A	CNTFR	N190D	T	862	C	CPSF1	E451K	C	1426	T	CXorf64	P181S	C	621	T
CHMP1A	V192M	C	707	T	CNTLN	E737G	A	2294	G	CPSF1	G1292R	C	3949	T	CXorf66	Y350C	T	1073	C
CHMP2A	Q121*	G	517	A	CNTN1	E54D	G	241	T	CPSF2	D110Y	G	565	T	CXXC1	R415H	C	1977	T
CHMP4A	T141A	T	722	C	CNTN1	Y864C	A	2670	G	CPSF2	K350T	A	1286	C	CXXC1	A388T	C	1895	T
CHMP4B	K178N	G	699	T	CNTN1	V61F	G	260	T	CPSF3	L526P	T	1783	C	CXXC5	S18T	G	767	C
CHMP4B	L180V	T	703	G	CNTN1	R186W	C	635	T	CPSF3	E339*	G	1221	T	CYB561	H160Y	G	608	A
CHMP6	A46T	G	214	A	CNTN2	-	T	0	C	CPSF3L	R215C	G	726	A	CYB561	V138M	C	542	T
CHMP7	-	T	0	C	CNTN2	W731*	G	2387	A	CPSF3L	T93S	G	361	C	CYB5B	L139M	C	574	A

CHMP7	V212F	G	1282	T	CNTN2	L928I	C	2976	A	CPSF3L	P2H	G	88	T	CYB5B	E76A	A	386	C
CHN1	D286G	T	1171	C	CNTN3	K444T	T	1359	G	CPSF4L	R73Q	C	280	T	CYB5B	E89*	G	424	T
CHN1	E49*	C	459	A	CNTN3	V1026G	A	3105	C	CPSF7	D406E	A	1299	C	CYB5D1	K53N	G	548	T
CHN2	D336N	G	1536	A	CNTN3	S457Y	G	1398	T	CPT1A	N733H	T	2367	G	CYB5D2	L114P	T	929	C
CHODL	R130Q	G	780	A	CNTN4	-	G	0	A	CPT1B	V419M	C	1360	T	CYB5RL	R168Q	C	826	T
CHORDC1	E301A	T	1312	G	CNTN4	R584M	G	2030	T	CPT1B	G506C	C	1621	A	CYBA	A161T	C	517	T
CHPF	A591T	C	2020	T	CNTN4	Q383R	A	1427	G	CPT1B	H445L	T	1439	A	CYC1	G100S	G	341	A
CHPF	A122V	G	614	A	CNTN4	S487G	A	1738	G	CPT1C	V458I	G	1577	A	CYC1	V136M	G	449	A
CHPF	R435L	C	1553	A	CNTN4	I864S	T	2870	G	CPT1C	R315W	C	1148	T	CYFIP1	A511T	G	1531	A
CHPF2	V358I	G	2585	A	CNTN4	S882F	C	2924	T	CPT1C	V232G	T	900	G	CYFIP1	L646P	T	1937	C
CHPF2	R532*	C	3107	T	CNTN5	V919I	G	2760	A	CPT1C	S676*	C	2232	A	CYFIP1	R562W	C	1684	T
CHPF2	E689G	A	3579	G	CNTN5	T667I	C	2005	T	CPT2	H584P	A	2266	C	CYFIP1	A351T	G	1051	A
CHPF2	I180V	A	2051	G	CNTN5	I738F	A	2217	T	CPVL	T372A	T	1233	C	CYFIP1	Y691C	A	2072	G
CHPF2	V118M	G	1865	A	CNTN5	R229Q	G	691	A	CPVL	R464Q	C	1510	T	CYFIP2	R1123H	G	3506	A
CHPF2	-	A	0	G	CNTN5	D151Y	G	456	T	CPVL	-	A	0	G	CYFIP2	T975A	A	3061	G
CHPF2	G47R	G	1652	A	CNTN5	V756A	T	2272	C	CPXCR1	Y259C	A	1035	G	CYFIP2	T54A	A	298	G
CHRD	G69W	G	451	T	CNTN5	S975Y	C	2929	A	CPXM1	R414W	G	1305	A	CYFIP2	I290M	T	1008	G
CHRD	A472T	G	1660	A	CNTN5	S1042Y	C	3130	A	CPXM1	R518H	C	1618	T	CYFIP2	F299V	T	1033	G
CHRD	A719V	C	2402	T	CNTN6	S745L	C	2861	T	CPXM1	A673V	G	2083	A	CYLC1	K585N	G	1792	T
CHRD	R734Q	G	2447	A	CNTN6	G596C	G	2413	T	CPXM1	E710K	C	2193	T	CYLC1	E590*	G	1805	T
CHRD	R927*	C	3025	T	CNTN6	-	G	0	T	CPXM1	A53V	G	223	A	CYLC2	E291*	G	941	T
CHRDL2	S182L	G	819	A	CNTN6	P285Q	C	1481	A	CPXM2	P85S	G	408	A	CYLC2	K190T	A	639	C
CHRDL2	P385H	G	1428	T	CNTNAP1	-	A	0	G	CPXM2	R325H	C	1129	T	CYLC2	D216Y	G	716	T
CHRDL2	A268V	G	1077	A	CNTNAP1	R382S	C	1360	A	CPXM2	-	A	0	G	CYLC2	K320N	G	1030	T
CHRDL2	P29S	G	359	A	CNTNAP1	E129K	G	601	A	CPZ	H120Y	C	532	T	CYLD	K578T	A	2148	C
CHRM2	Y131C	A	1009	G	CNTNAP2	A674T	G	2536	A	CR1	R1544H	G	4771	A	CYorf15A	R90I	G	269	T
CHRM2	N284H	A	1467	C	CNTNAP2	P621H	C	2378	A	CR1	R101C	C	441	T	CYP11A1	G86D	C	412	T
CHRM2	K214R	A	1258	G	CNTNAP2	K34E	A	616	G	CR1	F1711L	C	5273	A	CYP11A1	-	C	0	T
CHRM4	P207H	G	671	T	CNTNAP2	K331N	G	1509	T	CR1	F2058L	C	6314	A	CYP11A1	R185H	C	709	T
CHRM5	K428E	A	1952	G	CNTNAP2	Y658D	T	2488	G	CR1	L2318I	C	7092	A	CYP11A1	V213I	C	792	T
CHRM5	Y171H	T	1181	C	CNTNAP3	D496N	C	1560	T	CR2	-	G	0	T	CYP11A1	G86D	C	412	T
CHRM5	T224A	A	1340	G	CNTNAP3	S265G	T	867	C	CRABP2	T58I	G	328	A	CYP11B1	Q70H	C	217	A
CHRNA1	V263I	C	854	T	CNTNAP3	L432I	G	1368	T	CRADD	R13H	G	142	A	CYP11B1	R101C	G	308	A
CHRNA1	V53M	C	224	T	CNTNAP4	R402Q	G	1344	A	CRAMP1L	R842*	C	2611	T	CYP11B1	R209H	C	633	T
CHRNA1	C187Y	C	627	T	CNTNAP4	F985L	C	3094	A	CRAMP1L	-	T	0	C	CYP11B1	A418T	C	1259	T
CHRNA1	Y322C	T	1032	C	CNTNAP4	T1214I	C	3780	T	CRAMP1L	R218H	G	740	A	CYP11B1	R403W	G	1214	A
CHRNA1	V330I	C	1055	T	CNTNAP4	L415R	T	1383	G	CRAMP1L	S240*	C	806	A	CYP11B1	R525C	G	1580	A
CHRNA10	R151H	C	524	T	CNTNAP4	R1266H	G	3936	A	CRAT	E156K	C	761	T	CYP11B2	A414V	G	1244	A
CHRNA10	R143H	C	500	T	CNTNAP4	R282H	G	984	A	CRB1	G850C	G	2683	T	CYP11B2	R454H	C	1364	T

CHRNA10	A130T	C	460	T	CNTNAP4	K901T	A	2841	C	CRB1	G936R	G	2941	A	CYP11B2	R141Q	C	425	T
CHRNA2	Y240C	T	1328	C	CNTNAP4	S212Y	C	774	A	CRB1	G454*	G	1495	T	CYP17A1	A457T	C	1541	T
CHRNA2	G169D	C	1115	T	CNTNAP4	Q219R	A	795	G	CRB1	D249N	G	880	A	CYP17A1	R21W	T	233	A
CHRNA2	A177T	C	1138	T	CNTNAP4	G717V	G	2289	T	CRB1	N287T	A	995	C	CYP17A1	R496C	G	1658	A
CHRNA2	S406N	C	1826	T	CNTNAP4	T5A	A	398	G	CRB1	M774I	G	2457	A	CYP19A1	R499M	C	1650	A
CHRNA4	C161R	A	703	G	CNTNAP5	Q864H	G	2956	C	CRB1	F786Y	T	2492	A	CYP19A1	S314F	G	1095	A
CHRNA4	R369Q	C	1328	T	CNTNAP5	D519Y	G	1919	T	CRB1	T1264K	C	3926	A	CYP1A1	-	A	0	G
CHRNA4	P559S	G	1897	A	CNTNAP5	K164N	G	856	T	CRB2	G795S	G	2384	A	CYP1B1	R80C	G	640	A
CHRNA5	R248H	G	943	A	CNTNAP5	G1256D	G	4131	A	CRB2	E792K	G	2375	A	CYP1B1	A338T	C	1414	T
CHRNA5	V441I	G	1521	A	CNTNAP5	I518M	T	1918	G	CRB2	F1207L	C	3622	A	CYP20A1	F364L	T	1171	C
CHRNA6	A32V	G	141	A	CNTNAP5	R643W	C	2291	T	CRB3	V62M	G	380	A	CYP24A1	I447S	A	1734	C
CHRNA6	K114T	T	387	G	CNTNAP5	R839Q	G	2880	A	CRBN	S272Y	G	838	T	CYP24A1	R310W	G	1322	A
CHRNA6	F471V	A	1457	C	CNTNAP5	R1121*	C	3725	T	CRBN	W223R	A	690	G	CYP26A1	E413*	G	1282	T
CHRNA9	S127F	C	519	T	CNTROB	A530V	C	2514	T	CREB3	R159*	C	913	T	CYP26B1	R473C	G	1621	A
CHRNA9	R138Q	G	552	A	CNTROB	K90N	G	1195	T	CREB3	A304P	G	1348	C	CYP26B1	T504M	G	1715	A
CHRNB1	V56I	G	233	A	CNTROB	K710N	G	3055	T	CREB3L1	T416M	C	1682	T	CYP26B1	V479I	C	1639	T
CHRNB1	V132M	G	461	A	COASY	R231C	C	893	T	CREB3L1	E265D	G	1230	T	CYP26B1	R363H	C	1292	T
CHRNB2	V454I	G	1624	A	COASY	R528H	G	1785	A	CREB3L1	R508M	G	1958	T	CYP26C1	T486A	A	1456	G
CHRNB2	R358H	G	1337	A	COBL	D520G	T	1744	C	CREB3L1	P62H	C	620	A	CYP26C1	A320T	G	958	A
CHRNB3	G246E	G	865	A	COBL	R358Q	C	1258	T	CREB3L1	A235V	C	1139	T	CYP26C1	L188I	C	562	A
CHRNB4	R410S	C	1342	A	COBL	-	C	0	A	CREB3L2	M381T	A	1494	G	CYP26C1	D370Y	G	1108	T
CHRNB4	L345I	G	1145	T	COBL	L207P	A	805	G	CREB3L2	T118A	T	704	C	CYP27A1	R323Q	G	1395	A
CHRND	E94*	G	312	T	COBLL1	L586S	A	1762	G	CREB3L2	S103N	C	660	T	CYP27A1	R225C	C	1100	T
CHRND	R363H	G	1120	A	COBLL1	E654K	C	1965	T	CREB3L4	R278H	G	1099	A	CYP27A1	F185I	T	980	A
CHRND	-	A	0	G	COBLL1	R284H	C	856	T	CREB3L4	G59D	G	442	A	CYP27B1	S44T	A	282	T
CHRND	S154Y	C	493	A	COBLL1	I269L	T	810	G	CREB5	Q268R	A	1193	G	CYP27C1	I132L	T	525	G
CHRNG	A259T	G	796	A	COBLL1	L122F	C	371	A	CREBBP	R742C	G	3029	A	CYP27C1	S130N	C	520	T
CHST1	R408H	C	1894	T	COCH	P465S	C	1797	T	CREBBP	R413Q	C	2043	T	CYP2A13	R129H	G	395	A
CYP2A13	H254Y	C	769	T	DERL3	-	C	0	T	DNAH5	D2761Y	C	8386	A	DST	T2904A	T	8710	C
CYP2A7	T216M	G	1189	A	DES	R227C	C	765	T	DNAH5	E2250K	C	6853	T	DST	E1340K	C	4018	T
CYP2B6	R336H	G	1014	A	DES	R315H	G	1030	A	DNAH5	R761I	C	2387	A	DST	E650*	C	1948	A
CYP2C18	I472V	A	1613	G	DES	R160Q	G	565	A	DNAH5	-	C	0	A	DSTYK	S514N	C	1572	T
CYP2C18	R186Q	G	756	A	DES	S460N	G	1465	A	DNAH5	R2943H	C	8933	T	DTD1	V67A	T	380	C
CYP2C18	L205R	T	813	G	DES	T445M	C	1420	T	DNAH5	V1022D	A	3170	T	DTHD1	K516N	A	1693	C
CYP2C18	D165Y	G	692	T	DET1	R123Q	C	368	T	DNAH5	R3398H	C	10298	T	DTHD1	R711I	G	2277	T
CYP2C19	E318K	G	1034	A	DET1	R35H	C	104	T	DNAH5	M2928V	T	8887	C	DTL	R77L	G	544	T
CYP2C19	R335Q	G	1086	A	DET1	R265W	G	793	A	DNAH5	P615H	G	1949	T	DTL	S468F	C	1717	T
CYP2C8	S460F	G	1474	A	DEXI	L2F	G	459	A	DNAH5	K4200R	T	12704	C	DTNA	P706A	C	2416	G
CYP2C9	R433Q	G	1310	A	DFFB	R172Q	G	838	A	DNAH5	R3767H	C	11405	T	DTWD2	A102S	C	338	A

CYP2C9	L11I	C	43	A	DFFB	E321D	G	1286	T	DNAH5	A3294T	C	9985	T	DTX1	A117T	G	685	A
CYP2D6	G113R	C	452	T	DFNA5	R351W	G	1477	A	DNAH5	R3553Q	C	10763	T	DTX1	P19L	C	392	T
CYP2D6	L160I	G	593	T	DFNA5	P142L	G	851	A	DNAH5	N3429K	G	10392	C	DTX2	Q25P	A	584	C
CYP2E1	E328*	G	1006	T	DFNA5	A394T	C	1606	T	DNAH5	R2503C	G	7612	A	DTX3	R268W	C	1111	T
CYP2E1	D470Y	G	1432	T	DFNA5	S252F	G	1181	A	DNAH5	S4425R	G	13380	T	DTX3L	P222L	C	854	T
CYP2E1	K160N	G	504	T	DFNB31	R818S	G	2621	T	DNAH5	R2501W	G	7606	A	DTX3L	L453I	C	1546	A
CYP2E1	E328*	G	1006	T	DFNB31	A834T	C	2669	T	DNAH5	Q451E	G	1456	C	DTX3L	R660Q	G	2168	A
CYP2J2	A133T	C	441	T	DFNB59	D219Y	G	1011	T	DNAH5	T3876P	T	11731	G	DTX4	R402W	C	1461	T
CYP2J2	C227R	A	723	G	DGAT1	P238L	G	981	A	DNAH5	M2461T	A	7487	G	DULLARD	L20P	A	439	G
CYP2J2	T456A	T	1410	C	DGAT1	V192A	A	843	G	DNAH5	V2044I	C	6235	T	DUOX1	V1162I	G	3830	A
CYP2J2	R200H	C	643	T	DGAT2	G296V	G	1146	T	DNAH5	R956C	G	2971	A	DUOX1	R1214C	C	3986	T
CYP2R1	I301T	A	902	G	DGAT2	D356N	G	1325	A	DNAH5	R4243H	C	12833	T	DUOX1	R1294W	C	4226	T
CYP2R1	V64D	A	191	T	DGAT2L6	F16L	C	148	A	DNAH5	E4026K	C	12181	T	DUOX1	R1024H	G	3417	A
CYP2R1	G486D	C	1457	T	DGCR14	R191G	T	615	C	DNAH5	R3755K	C	11369	T	DUOX1	I1045N	T	3480	A
CYP2S1	P77H	C	285	A	DGCR14	R242Q	C	769	T	DNAH5	R3096Q	C	9392	T	DUOX1	R1473W	C	4763	T
CYP2U1	R466Q	G	1672	A	DGCR2	R38C	G	360	A	DNAH5	E3093D	C	9384	A	DUOX2	R1211H	C	4013	T
CYP2W1	G375S	G	1136	A	DGCR2	D62N	C	432	T	DNAH5	S2458N	C	7478	T	DUOX2	T1321A	T	4342	C
CYP3A43	T374M	C	1121	T	DGCR2	R85W	G	501	A	DNAH5	D1341Y	C	4126	A	DUOX2	D193G	T	959	C
CYP3A43	A337T	G	1009	A	DGCR2	F35L	A	351	G	DNAH5	N375H	T	1228	G	DUOX2	F140L	A	799	G
CYP3A5	E283*	C	947	A	DGCR6	Q153H	G	611	T	DNAH5	E54K	C	265	T	DUOX2	D534Y	C	1981	A
CYP3A5	A121D	G	462	T	DGCR8	K457T	A	1799	C	DNAH5	K3920T	T	11864	G	DUOX2	R317S	G	1330	T
CYP3A7	R478H	C	1538	T	DGCR8	V526I	G	2005	A	DNAH5	T2176M	G	6632	A	DUPD1	A160V	G	479	A
CYP3A7	A150D	G	554	T	DGCR8	F532L	C	2025	A	DNAH5	R2771C	G	8416	A	DUPD1	Q203P	T	608	G
CYP46A1	Q175K	C	624	A	DGKA	P718S	C	2416	T	DNAH6	I2463M	A	7526	G	DUS1L	S186L	G	759	A
CYP46A1	S99P	T	396	C	DGKA	-	A	0	G	DNAH6	C4109F	G	12463	T	DUS1L	Y98D	A	494	C
CYP4A11	V3I	C	58	T	DGKA	T637A	A	2173	G	DNAH6	L342M	C	1161	A	DUS2L	S121F	C	532	T
CYP4A11	K115N	T	396	G	DGKA	K643T	A	2192	C	DNAH6	K1349E	A	4182	G	DUS2L	L207I	C	789	A
CYP4A11	R96C	G	337	A	DGKB	R466H	C	1562	T	DNAH6	Y1415F	A	4381	T	DUS3L	Q487K	G	1501	T
CYP4B1	R439H	G	1352	A	DGKB	L781M	G	2506	T	DNAH6	V2100A	T	6436	C	DUS3L	W539R	A	1657	T
CYP4B1	P421S	C	1297	T	DGKB	K408T	T	1388	G	DNAH6	F3165C	T	9631	G	DUS3L	R551W	G	1693	A
CYP4B1	R398W	C	1228	T	DGKD	-	T	0	C	DNAH6	E3236K	G	9843	A	DUS3L	R584Q	C	1793	T
CYP4F12	E71*	G	272	T	DGKG	H289R	T	1406	C	DNAH7	L252M	G	855	T	DUS3L	-	T	0	C
CYP4F2	E72G	T	266	C	DGKG	Q16H	T	588	G	DNAH7	R688W	G	2163	A	DUS3L	P397L	G	1232	A
CYP4F2	R46H	C	188	T	DGKG	G385S	C	1693	T	DNAH7	N2282T	T	6946	G	DUS3L	Q230R	T	731	C
CYP4F22	R515C	C	1547	T	DGKG	F583L	G	2289	T	DNAH7	D1809N	C	5526	T	DUS4L	R101H	G	664	A
CYP4F22	T410M	C	1233	T	DGKG	G249W	C	1285	A	DNAH7	F3304C	A	10012	C	DUS4L	A107V	C	682	T
CYP4F22	S395N	G	1188	A	DGKH	R273C	C	838	T	DNAH7	R1839*	G	5616	A	DUSP1	A327T	C	1222	T
CYP4F22	F132L	C	400	A	DGKH	A751D	C	2273	A	DNAH7	D3765N	C	11394	T	DUSP10	T110I	G	568	A
CYP4F22	L303S	T	912	C	DGKH	Q275R	A	845	G	DNAH8	S4350P	T	13048	C	DUSP10	I210L	T	867	G

CYP4F8	H263R	A	788	G	DGKI	R258Q	C	1003	T	DNAH8	A3779V	C	11336	T	DUSP12	R230*	C	720	T
CYP4F8	N420D	A	1258	G	DGKI	A1041V	G	3352	A	DNAH8	A1878T	G	5632	A	DUSP13	A15T	C	586	T
CYP4F8	S109P	T	325	C	DGKI	A689S	C	2295	A	DNAH8	Q2318E	C	6952	G	DUSP13	L241I	G	1264	T
CYP4F8	F244V	T	730	G	DGKI	V1018M	C	3282	T	DNAH8	Q911K	C	2731	A	DUSP13	G200E	C	1142	T
CYP4V2	R296C	C	1190	T	DGKI	A283D	G	1078	T	DNAH8	Q1340*	C	4018	T	DUSP16	S92P	A	906	G
CYP4Z1	K75T	A	227	C	DGKI	R794C	G	2610	A	DNAH8	N3960T	A	11879	C	DUSP16	I185F	T	1185	A
CYP51A1	D152N	C	620	T	DGKI	I946M	T	3068	C	DNAH8	V2003A	T	6008	C	DUSP22	A41V	C	609	T
CYP51A1	R506*	G	1682	A	DGKI	G590E	C	1999	T	DNAH8	I259S	T	776	G	DUSP22	R119C	C	842	T
CYP51A1	R258H	C	939	T	DGKI	R237*	G	939	A	DNAH8	F648L	T	1942	C	DUSP23	R37Q	G	181	A
CYP7A1	T142M	G	488	A	DGKQ	S371L	G	1186	A	DNAH8	S705Y	C	2114	A	DUSP27	R409W	C	1391	T
CYP7A1	R483W	G	1510	A	DGKQ	G629E	C	1960	T	DNAH8	D807N	G	2419	A	DUSP27	E145D	G	601	T
CYP7A1	S327R	T	1042	G	DGKZ	C793Y	G	2503	A	DNAH8	E1033*	G	3097	T	DUSP27	D319N	G	1121	A
CYP7A1	R154K	C	524	T	DGKZ	P264L	C	916	T	DNAH8	E1742D	G	5226	T	DUSP27	W938G	T	2978	G
CYP7B1	R361Q	C	1286	T	DGKZ	E1010*	G	3153	T	DNAH8	R3012Q	G	9035	A	DUSP4	F259L	G	1167	T
CYP8B1	R28C	G	407	A	DGKZ	R530G	C	1713	G	DNAH8	L3396M	C	10186	A	DUSP5	K294Q	A	1164	C
CYP8B1	R496H	C	1812	T	DGKZ	I474T	T	1546	C	DNAH8	F3963S	T	11888	C	DUSP6	V239I	C	1195	T
CYR61	E137*	G	633	T	DGKZ	A176T	G	651	A	DNAH8	E4027D	A	12081	C	DUSP8	I30T	A	526	G
CYSLTR1	R22H	C	358	T	DGKZ	I537V	A	1734	G	DNAH8	K4363E	A	13087	G	DUSP8	R602C	G	2241	A
CYSLTR2	F5C	T	17	G	DGKZ	R468H	G	1528	A	DNAH9	R2965C	C	8961	T	DUSP8	G23R	C	504	T
CYTH1	A386T	C	1227	T	DHCR7	G213C	C	910	A	DNAH9	A2803V	C	8476	T	DUXA	R152*	G	499	A
CYTH1	V142I	C	495	T	DHCR7	I370V	T	1381	C	DNAH9	L570R	T	1777	G	DUXA	R105H	C	359	T
CYTH2	P76H	C	527	A	DHCR7	A417G	G	1523	C	DNAH9	R965L	G	2962	T	DUXA	R162K	C	530	T
CYTH2	R318Q	G	1253	A	DHCR7	V340I	C	1291	T	DNAH9	R4271C	C	12879	T	DVL1L1	R227C	G	964	A
CYTH2	I391S	T	1472	G	DHDH	A111V	C	372	T	DNAH9	Q4411R	A	13300	G	DVL1L1	A385T	C	1438	T
CYTH3	E268K	C	939	T	DHDH	F268S	T	843	C	DNAH9	R2072C	C	6282	T	DVL1L1	R227H	C	965	T
CYTH4	E64A	A	378	C	DHDH	R127H	G	420	A	DNAH9	R3286H	G	9925	A	DYDC1	R59H	C	341	T
CYTH4	N221D	A	848	G	DHDPSL	G199S	G	956	A	DNAH9	R733W	C	2265	T	DYM	D562N	C	2049	T
CYTL1	R134C	G	427	A	DHFRL1	K64N	C	529	A	DNAH9	R803I	G	2476	T	DYM	R602Q	C	2170	T
CYTSA	A1016T	G	3249	A	DHFRP1	M112I	C	830	A	DNAH9	E1050D	G	3218	T	DYM	E125V	T	739	A
CYTSA	R399W	C	1398	T	DHH	P119H	G	663	T	DNAH9	G1310E	G	3997	A	DYM	H570N	G	2073	T
CYTSA	R740W	C	2421	T	DHH	A302V	G	1212	A	DNAH9	R1640*	C	4986	T	DYM	R533*	G	1962	A
CYTSB	R831H	G	2543	A	DHODH	R231C	C	712	T	DNAH9	Y2756C	A	8335	G	DYNC1H1	T4552A	A	1381 8	G
CYTSB	I824V	A	2521	G	DHODH	T31M	C	113	T	DNAH9	Y3699H	T	11163	C	DYNC1H1	G1955D	G	6028	A
CYTSB	R310W	C	979	T	DHODH	V104M	G	331	A	DNAH9	H3978R	A	12001	G	DYNC1H1	T2428M	C	7447	T
CYTSB	E190*	G	619	T	DHPS	P185H	G	656	T	DNAH9	L4484I	C	13518	A	DYNC1H1	A2772V	C	8479	T
CYTSB	E390*	G	1219	T	DHRS1	L282I	G	1068	T	DNAI1	V466M	G	1567	A	DYNC1H1	N799K	C	2561	G
CYYR1	P111H	G	654	T	DHRS1	A174V	G	745	A	DNAI2	D146G	A	536	G	DYNC1H1	R914H	G	2905	A
D2HGDH	L505M	C	1722	A	DHRS12	P275L	G	838	A	DNAI2	S398L	C	1292	T	DYNC1H1	N2003T	A	6172	C
D2HGDH	D403N	G	1416	A	DHRS13	A3S	C	134	A	DNAJA1	T288A	A	1045	G	DYNC1H1	N518S	A	1717	G

D2HGDH	G98S	G	501	A	DHRS2	R276W	C	1264	T	DNAJA3	F328C	T	1060	G	DYNC1H1	R2453H	G	7522	A
DAAM1	F972L	C	3041	A	DHRS7C	V302M	C	917	T	DNAJA4	P181L	C	770	T	DYNC1H1	R3219C	C	9819	T
DAAM1	R31Q	G	217	A	DHRS7C	A136V	G	420	A	DNAJA4	P359H	C	1304	A	DYNC1H1	A1303V	C	4072	T
DAAM2	R209C	C	781	T	DHRS9	D188Y	G	2065	T	DNAJB11	R206*	C	1545	T	DYNC1I1	K327N	G	1174	T
DAAM2	T146P	A	592	C	DHTKD1	A574T	G	1782	A	DNAJB12	Q404H	C	1362	A	DYNC1I1	K25Q	A	266	C
DAAM2	R597H	G	1946	A	DHTKD1	G566R	G	1758	A	DNAJB13	G10R	G	779	A	DYNC1I2	E29*	G	252	T
DAAM2	T482M	C	1601	T	DHTKD1	V806M	G	2478	A	DNAJB13	I159N	T	1227	A	DYNC1LI1	I87M	A	365	C
DAAM2	P954S	C	3016	T	DHTKD1	S634N	G	1963	A	DNAJB13	K66T	A	948	C	DYNC2H1	E670*	G	2152	T
DAAM2	R414W	C	1396	T	DHX15	S2P	A	161	G	DNAJB13	E149D	G	1198	T	DYNC2H1	D2059Y	G	6319	T
DAAM2	E735V	A	2360	T	DHX15	R706Q	C	2274	T	DNAJB2	A50T	G	436	A	DYNC2H1	E3167*	G	9643	T
DAAM2	K85N	G	411	T	DHX15	D621Y	C	2018	A	DNAJB2	R286W	C	1144	T	DYNC2H1	R4030G	A	1223 2	G
DAAM2	F957L	C	3027	A	DHX29	A902T	C	2853	T	DNAJB5	S66R	A	557	C	DYNC2H1	R2426H	G	7421	A
DAB1	T215M	G	782	A	DHX29	N841D	T	2670	C	DNAJB5	R236C	C	1067	T	DYNC2H1	V1975A	T	6068	C
DAB1	Q452K	G	1492	T	DHX29	R984Q	C	3100	T	DNAJB6	P273H	C	1023	A	DYNC2H1	R2620*	C	8002	T
DAB1	G48R	C	280	T	DHX29	W161*	C	632	T	DNAJB7	R297C	G	1021	A	DYNC2H1	-	G	0	A
DAB2	Q319P	T	1424	G	DHX29	S657P	A	2118	G	DNAJB9	D121Y	G	907	T	DYNC2H1	S3292P	T	1001 8	C
DAB2	-	T	2781	G	DHX29	R832H	C	2644	T	DNAJC10	R180Q	G	954	A	DYNC2H1	E38*	G	256	T
DAB2	D244N	C	1198	T	DHX30	R324H	G	983	A	DNAJC10	P639Q	C	2331	A	DYNC2H1	K2225T	A	6818	C
DAB2IP	R333H	G	1180	A	DHX30	V1192I	G	3586	A	DNAJC10	R366Q	G	1512	A	DYNC2H1	R2325Q	G	7118	A
DAB2IP	R132H	G	577	A	DHX30	R323C	C	979	T	DNAJC10	R180*	C	953	T	DYNC2H1	E2632K	G	8038	A
DAB2IP	A836V	C	2689	T	DHX30	R1208*	C	3634	T	DNAJC11	R104*	G	434	A	DYNC2H1	Q3166H	A	9642	C
DAB2IP	A437T	G	1491	A	DHX34	V517I	G	1898	A	DNAJC11	E105K	C	437	T	DYNC2H1	E3992A	A	1211 9	C
DAB2IP	P94S	C	462	T	DHX34	L175P	T	873	C	DNAJC13	R1745H	G	5482	A	DYNC2H1	E4139G	A	1256 0	G
DAB2IP	R333C	C	1179	T	DHX34	S750T	G	2598	C	DNAJC13	V670I	G	2256	A	DYNC2H1	E4217*	G	1279 3	T
DAB2IP	T76M	C	409	T	DHX34	P575H	C	2073	A	DNAJC13	R1209C	C	3873	T	DYNLL1P1	A25T	C	73	T
DACH1	S149I	C	446	A	DHX35	V522L	G	1597	T	DNAJC13	R2084*	C	6498	T	DYNLRB1	R122*	C	627	T
DACH1	V518M	C	1552	T	DHX35	R371M	G	1145	T	DNAJC16	L410P	T	1393	C	DYNLRB2	R58C	C	292	T
DACH1	P185H	G	554	T	DHX35	R533*	C	1630	T	DNAJC17	N43H	T	154	G	DYRK1A	R559C	C	1750	T
DACH2	T148N	C	443	A	DHX36	T903A	T	2788	C	DNAJC2	R303W	G	1158	A	DYRK1A	E160K	G	553	A
DACH2	Q390H	G	1170	T	DHX36	G51D	C	233	T	DNAJC2	A348T	C	1293	T	DYRK1B	W297R	A	1169	G
DACH2	E496*	G	1486	T	DHX36	Q580R	T	1820	C	DNAJC2	L116V	A	597	C	DYRK1B	T441M	G	1602	A
DACT1	T795M	C	2408	T	DHX36	R165*	G	574	A	DNAJC21	A247T	G	966	A	DYRK1B	A399T	C	1475	T
DACT1	G661R	G	2005	A	DHX36	K798T	T	2474	G	DNAJC21	R192W	C	801	T	DYRK1B	M596L	T	2066	G
DACT1	R587H	G	1784	A	DHX36	E436*	C	1387	A	DNAJC21	K541T	A	1849	C	DYRK4	F179L	C	679	A
DACT1	A707T	G	2143	A	DHX37	R1101C	G	3400	A	DNAJC22	R80C	C	1442	T	DYRK4	A314T	G	1082	A
DACT1	F241V	T	745	G	DHX37	R307L	C	1019	A	DNAJC24	K33Q	A	213	C	DYSF	E2035G	A	6245	G

DACT2	I461T	A	1471	G	DHX37	R940S	C	2919	A	DNAJC24	A18T	G	168	A	DYSF	D2061N	G	6322	A
DACT2	R197G	T	678	C	DHX37	N123S	T	467	C	DNAJC24	E61K	G	297	A	DYSF	R1845W	C	5674	T
DACT3	S101R	T	375	G	DHX37	A736T	C	2305	T	DNAJC25	E203*	G	663	T	DYSF	V677M	G	2170	A
DACT3	A518V	G	1627	A	DHX38	R1164W	C	3845	T	DNAJC4	S33N	G	560	A	DYSF	A1080G	C	3380	G
DAG1	S239P	T	1133	C	DHX38	R639Q	G	2271	A	DNAJC5	R36W	C	259	T	DYSF	L1099P	T	3437	C
DAG1	T436M	C	1725	T	DHX38	A772T	G	2669	A	DNAJC5	T146M	C	590	T	DYSF	D1248N	G	3883	A
DAG1	P398S	C	1610	T	DHX38	R324W	C	1325	T	DNAJC5	N62S	A	338	G	DYSF	R1625*	C	5014	T
DAG1	R640Q	G	2337	A	DHX38	R203*	C	962	T	DNAJC5	A70T	G	361	A	DYSF	E1887K	G	5800	A
DAGLA	G465S	G	1509	A	DHX38	S979L	C	3291	T	DNAJC5	A63V	C	341	T	DYSF	E1353K	G	4198	A
DAGLB	A286V	G	1027	A	DHX38	W215*	G	1000	A	DNAJC5B	R77I	G	521	T	DYSF	R409*	C	1366	T
DAGLB	A145V	G	604	A	DHX38	R201L	G	957	T	DNAJC5B	K50N	G	441	T	DYSF	K111T	A	473	C
DAGLB	R568C	G	1872	A	DHX40	R712*	C	2281	T	DNAJC5B	E34*	G	391	T	DYSF	-	T	0	C
DAGLB	F536L	A	1776	G	DHX57	D160N	C	605	T	DNAJC5B	R193Q	G	869	A	DYSF	I517L	A	1690	C
DAK	R397Q	G	1447	A	DHX57	R526Q	C	1704	T	DNAJC6	R806*	C	2617	T	DYSF	H711R	A	2273	G
DALRD3	L19M	G	62	T	DHX57	H980Q	A	3067	C	DNAJC6	D104Y	G	511	T	DYSF	R1113H	G	3479	A
DALRD3	Y497C	T	1497	C	DHX57	S462Y	G	1512	T	DNAJC6	R174Q	G	722	A	DYSF	G1667V	G	5141	T
DAO	G315R	G	1096	A	DHX57	F400C	A	1326	C	DNAJC6	S709I	G	2327	T	DYTN	R146C	G	553	A
DAO	R286C	C	1009	T	DHX57	S341Y	G	1149	T	DNAJC7	R68*	G	439	A	DYTN	S442C	T	1441	A
DAO	A36T	G	259	A	DHX8	R365W	C	1165	T	DNAJC9	E181*	C	2214	A	DYTN	T223I	G	785	A
DAOA	C132*	C	442	A	DHX8	G17D	G	122	A	DNASE1	A157V	C	654	T	DYTN	S177T	C	647	G
DAP3	E285D	G	979	T	DHX8	R494W	C	1552	T	DNASE1L2	A41D	C	255	A	DYTN	P317S	G	1066	A
DAP3	S252Y	C	879	A	DHX8	S500Y	C	1571	A	DNASE1L2	P290A	C	1001	G	DYX1C1	L48V	A	510	C
DAPK1	P1369H	C	4289	A	DHX9	A450V	C	1459	T	DNASE1L2	Q162H	G	619	T	DYX1C1	K143N	T	797	G
DAPK1	V309I	G	1108	A	DHX9	R1052*	C	3264	T	DNASE1L2	S225G	A	806	G	DYX1C1	D125Y	C	741	A
DAPK1	E113V	A	521	T	DHX9	R1154W	C	3570	T	DNASE1L3	R206H	C	1102	T	DZIP1	R595*	G	2216	A
DAPK1	M764V	A	2473	G	DHX9	R141*	C	531	T	DNASE1L3	E242*	C	1209	A	DZIP1	K805N	T	2848	G
DAPK1	G1418S	G	4435	A	DIAPH1	K1089T	T	3407	G	DNASE2	C347Y	C	1186	T	DZIP1	K605T	T	2247	G
DAPK1	A496S	G	1669	T	DIAPH1	T472A	T	1555	C	DNASE2	-	C	0	T	DZIP1	E505*	C	1946	A
DAPK3	R454C	G	1453	A	DIAPH1	E203*	C	748	A	DNASE2B	K271Q	A	844	C	DZIP1	E348K	C	1475	T
DAPK3	V257I	C	862	T	DIAPH1	K38T	T	254	G	DND1	R225C	G	717	A	DZIP1	A817V	G	2883	A
DAPK3	G20D	C	152	T	DIAPH2	P266H	C	1193	A	DNER	R483C	G	1582	A	DZIP1L	R147H	C	803	T
DAPP1	S137F	C	478	T	DIAPH2	Y231H	T	1087	C	DNHD1	G883R	G	3211	A	DZIP1L	E750D	C	2613	A
DARC	R91H	G	447	A	DIAPH3	R1191*	G	3663	A	DNHD1	R1084C	C	3814	T	DZIP1L	L584V	G	2113	C
DARC	V106E	T	492	A	DIAPH3	T917M	G	2842	A	DNHD1	E3573D	G	11283	T	DZIP3	T405A	A	1443	G
DARS2	R542*	C	2351	T	DIAPH3	A750V	G	2341	A	DNHD1	A4570V	C	14273	T	DZIP3	M783I	G	2579	C
DARS2	E167*	G	1226	T	DIAPH3	S302R	T	996	G	DNHD1	R2191*	C	7135	T	E2F2	R168H	C	930	T
DARS2	L486F	C	2183	T	DICER1	R1060H	C	3361	T	DNHD1	A3578V	C	11297	T	E2F8	R154C	G	460	A
DAXX	R306Q	C	1122	T	DICER1	E1813Q	C	5619	G	DNHD1	R2423C	C	7831	T	E2F8	R183*	G	547	A
DAZAP1	R130M	G	578	T	DICER1	E1813Q	C	5619	G	DNHD1	R3551C	C	11215	T	E4F1	A134T	G	448	A

DAZL	T274M	G	1109	A	DICER1	E866K	C	2778	T	DNHD1	S877L	C	3194	T	E4F1	R62H	G	233	A
DAZL	T177M	G	818	A	DICER1	K704T	T	2293	G	DNHD1	R4411C	C	13795	T	E4F1	P86H	C	305	A
DAZL	-	C	0	T	DIDO1	R2171H	C	6838	T	DNHD1	Q1435R	A	4868	G	EAF1	A5T	G	438	A
DBC1	L90M	G	734	T	DIDO1	R2207W	G	6945	A	DNHD1	D148N	G	1006	A	EAF1	K156T	A	892	C
DBC1	R92H	C	741	T	DIDO1	R1845C	G	5859	A	DNHD1	R2222H	G	7229	A	EBAG9	F19L	C	281	A
DBC1	S530I	C	2055	A	DIDO1	R37Q	C	436	T	DNHD1	A3534V	C	11165	T	EBF1	A405T	C	1496	T
DBC1	M1I	C	469	A	DIDO1	R62W	G	510	A	DNHD1	G3538D	G	11177	A	EBF1	R209W	G	908	A
DBF4B	R511C	C	1744	T	DIDO1	Y1391C	T	4498	C	DNHD1	L4038I	C	12676	A	EBF1	R51W	G	434	A
DBH	V434M	G	1312	A	DIMT1L	M154V	T	621	C	DNHD1	G1081R	G	3805	C	EBF1	F287L	G	1144	T
DBN1	E630K	C	2060	T	DIMT1L	T237I	G	871	A	DNHD1	R4442H	G	13889	A	EBF2	R363I	C	1105	A
DBN1	S391A	A	1343	C	DIO1	D84G	A	257	G	DNHD1	L3188I	C	10126	A	EBF3	M528V	T	1655	C
DBN1	I283L	T	1019	G	DIO3	V184I	G	696	A	DNHD1	-	G	0	T	EBF3	G582R	C	1817	T
DBNDD1	P230L	G	689	A	DIP2A	I1541N	T	4777	A	DNHD1	R2233C	C	7261	T	EBF3	P316L	G	1020	A
DBNDD1	I132F	T	394	A	DIP2A	R863W	C	2742	T	DNHD1	A2283V	C	7412	T	EBF3	A383V	G	1221	A
DBNL	A98V	C	391	T	DIP2A	Q172L	A	670	T	DNLZ	-	C	0	A	EBF3	N287D	T	932	C
DBR1	V441A	A	1476	G	DIP2A	P1070S	C	3363	T	DNM1	W525*	G	1667	A	EBF3	G119R	C	428	T
DBT	D127N	C	393	T	DIP2A	R1469W	C	4560	T	DNM1	V174M	G	612	A	EBF3	E399D	C	1270	A
DBX1	P209S	G	625	A	DIP2A	A677T	G	2184	A	DNM1	A251T	G	843	A	EBF4	V274I	G	820	A
DBX2	P118S	G	524	A	DIP2A	A415E	C	1399	A	DNM1L	R736H	G	2209	A	EBI3	E213*	G	690	T
DBX2	E41D	C	295	A	DIP2B	E294D	A	1038	T	DNM1L	D281G	A	844	G	EBNA1BP2	A115T	C	485	T
DCAF10	S333Y	C	1363	A	DIP2B	I235L	A	859	C	DNM1L	R472W	C	1416	T	ECE1	R590H	C	1769	T
DCAF11	E36D	G	835	T	DIP2B	R708W	C	2278	T	DNM1L	S411L	C	1234	T	ECE1	A446V	G	1337	A
DCAF12	D30A	T	431	G	DIP2B	K663M	A	2144	T	DNM2	A269V	C	970	T	ECE1	M645V	T	1933	C
DCAF12	S309T	A	1267	T	DIP2B	V1534I	G	4756	A	DNM2	D106N	G	480	A	ECE2	R108H	G	323	A
DCAF12	-	A	0	G	DIP2B	R1310W	C	4084	T	DNM2	R672H	G	2179	A	ECE2	S642Y	C	1925	A
DCAF12	G450E	C	1691	T	DIP2B	K771N	A	2469	C	DNM3	R818H	G	2629	A	ECE2	R438C	C	1312	T
DCAF12L1	A66T	C	439	T	DIP2C	W316*	C	1035	T	DNM3	K315Q	A	1119	C	ECEL1	A243T	C	938	T
DCAF12L1	V125M	C	616	T	DIP2C	L901I	G	2789	T	DNMBP	S726*	G	2269	T	ECEL1	A114T	C	551	T
DCAF12L1	R76W	G	469	A	DIP2C	E202*	C	692	A	DNMBP	P1433L	G	4390	A	ECEL1	V249I	C	956	T
DCAF12L1	S173R	T	760	G	DIP2C	S1462P	A	4472	G	DNMBP	P610S	G	1920	A	ECH1	R59H	C	261	T
DCAF12L2	D414Y	C	1267	A	DIP2C	P479L	G	1524	A	DNMBP	V1590I	C	4860	T	ECHDC1	T141P	T	457	G
DCAF12L2	T131P	T	418	G	DIP2C	S1346L	G	4125	A	DNMBP	G591S	C	1863	T	ECHDC2	R78C	G	262	A
DCAF12L2	L404P	A	1238	G	DIRAS3	R103H	C	945	T	DNMBP	-	T	0	C	ECHS1	S186L	G	913	A
DCAF12L2	R307*	G	946	A	DIRAS3	E210*	C	1265	A	DNMBP	R1284Q	C	3943	T	ECM1	R232H	G	829	A
DCAF12L2	R137W	G	436	A	DIRC2	F85L	C	653	A	DNMBP	R1125W	G	3465	A	ECM1	R198Q	G	727	A
DCAF12L2	R132C	G	421	A	DIS3	P381H	G	1243	T	DNMT1	R262Q	C	965	T	ECM1	F345V	T	1167	G
DCAF13	R459Q	G	1376	A	DIS3	P381T	G	1242	T	DNMT1	R974H	C	3101	T	ECSIT	V152I	C	588	T
DCAF13	S55R	C	165	G	DIS3	K9Q	T	126	G	DNMT1	A1329T	C	4165	T	ECT2	K801N	G	2560	T
DCAF15	Q241R	A	743	G	DIS3L	G306*	G	931	T	DNMT1	D718V	T	2333	A	ECT2L	R233*	C	858	T

DCAF17	E334*	G	1327	T	DIS3L	V393A	T	1193	C	DNMT1	I1444N	A	4511	T	ECT2L	S324I	G	1132	T
DCAF4	R377Q	G	1350	A	DIS3L	R873C	C	2632	T	DNMT1	R1008Q	C	3203	T	ECT2L	F663L	C	2150	A
DCAF4L1	A189V	C	663	T	DIS3L	A90S	G	283	T	DNMT3A	A353V	G	1396	A	ECT2L	D97N	G	450	A
DCAF4L1	A79V	C	333	T	DIS3L	Q673*	C	2032	T	DNMT3A	A380T	C	1476	T	ECT2L	R685Q	G	2215	A
DCAF4L1	D362N	G	1181	A	DIS3L2	R11Q	G	308	A	DNMT3B	R537W	C	1930	T	EDA	T338M	C	1255	T
DCAF4L2	D72N	C	311	T	DISC1	R418H	G	1306	A	DNMT3B	R683H	G	2369	A	EDA2R	Y8C	T	23	C
DCAF4L2	G374V	C	1218	A	DISC1	S24N	G	124	A	DNMT3B	F549L	C	1968	A	EDAR	A174T	C	964	T
DCAF4L2	L349F	G	1142	A	DISC1	R84K	G	304	A	DNMT3B	G15S	G	364	A	EDARADD	T5M	C	181	T
DCAF4L2	A358T	C	1169	T	DISP1	S538Y	C	1777	A	DNTT	E492*	G	1576	T	EDC4	A445T	G	1523	A
DCAF4L2	S129Y	G	483	T	DISP1	S1043L	C	3292	T	DNTT	C188G	T	664	G	EDC4	V203M	G	797	A
DCAF5	S350Y	G	1268	T	DISP1	T197A	A	753	G	DNTT	R411H	G	1334	A	EDEM1	A455T	G	1496	A
DCAF5	P758S	G	2491	A	DISP1	A616V	C	2011	T	DNTTIP2	T87A	T	297	C	EDEM2	K266R	T	903	C
DCAF6	R661K	G	2076	A	DISP1	M464T	T	1555	C	DOC2A	D83G	T	439	C	EDEM2	S522L	G	1671	A
DCAF6	R243H	G	822	A	DISP1	S957L	C	3034	T	DOC2B	P255L	G	764	A	EDEM3	P746H	G	2504	T
DCAF6	V637I	G	2003	A	DISP2	R261Q	G	869	A	DOCK1	E843K	G	2591	A	EDEM3	S266I	C	1064	A
DCAF6	R191Q	G	666	A	DISP2	R97Q	G	377	A	DOCK1	N1515T	A	4608	C	EDEM3	R265Q	C	1061	T
DCAF6	R40I	G	213	T	DISP2	L79P	T	323	C	DOCK1	A1665T	G	5057	A	EDF1	R133Q	C	426	T
DCAF6	P715S	C	2237	T	DIXDC1	Q367H	G	1101	T	DOCK1	R1327W	C	4043	T	EDF1	D136N	C	434	T
DCAF8	F376L	G	1563	T	DIXDC1	T555M	C	1664	T	DOCK1	R1694L	G	5145	T	EDF1	L130F	G	416	A
DCAF8	V440I	C	1753	T	DIXDC1	R564Q	G	1691	A	DOCK1	D600G	A	1863	G	EDIL3	L137R	A	829	C
DCAF8	G205S	C	1048	T	DIXDC1	R364K	G	1091	A	DOCK1	T596I	C	1851	T	EDIL3	G35D	C	523	T
DCAF8	N58S	T	608	C	DKK3	E114*	C	565	A	DOCK1	R1419W	C	4319	T	EDIL3	Q361H	T	1502	G
DCAF8	F347S	A	1475	G	DKK3	L359P	A	1301	G	DOCK1	P83L	C	312	T	EDN1	R162S	A	753	C
DCBLD1	T458M	C	1498	T	DLC1	R1182H	C	3955	T	DOCK10	V248M	C	810	T	EDN3	R137W	C	795	T
DCC	L1198M	C	3592	A	DLC1	G834S	C	2910	T	DOCK10	T1953M	G	5926	A	EDN3	R230H	G	1075	A
DCC	S1202N	G	3605	A	DLC1	S586R	G	2168	T	DOCK10	A140V	G	487	A	EDN3	K188Q	A	948	C
DCC	V764I	G	2290	A	DLC1	E1335*	C	4413	A	DOCK10	M1216K	A	3715	T	EDNRA	S382L	C	1660	T
DCC	S690R	A	2068	C	DLC1	L476R	A	1837	C	DOCK10	A177V	G	598	A	EDNRA	C270Y	G	1324	A
DCDC1	E204D	T	814	G	DLC1	Q328H	C	1394	A	DOCK10	L1179Q	A	3604	T	EDNRA	E335K	G	1518	A
DCDC1	K315T	T	1146	G	DLD	F190C	T	850	G	DOCK10	L1820I	G	5526	T	EDNRB	R100H	C	452	T
DCDC2	V35I	C	405	T	DLEC1	V243I	G	748	A	DOCK10	H1430N	G	4356	T	EDNRB	T140N	G	572	T
DCDC2	E442*	C	1626	A	DLEC1	S844L	C	2552	T	DOCK10	R352*	G	1122	A	EDNRB	I312M	A	1089	C
DCDC2B	-	A	0	G	DLEU7	R92*	G	324	A	DOCK10	F206L	G	686	T	EDNRB	R291*	G	1024	A
DCDC5	P290L	G	869	A	DLEU7	A158V	G	766	A	DOCK10	R135*	G	471	A	EEA1	A672S	C	2279	A
DCDC5	R501W	G	1501	A	DLEU7	A17V	G	100	A	DOCK11	F1990C	T	6043	G	EEA1	K333N	C	1264	A
DCDC5	H318Y	G	952	A	DLG1	I612V	T	2024	C	DOCK11	V760A	T	2353	C	EEF1A1P9	E45A	T	1126	G
DCDC5	Q798H	T	2392	G	DLG1	F660S	A	2169	G	DOCK11	Q1276H	G	3902	T	EEF1A2	R247C	G	810	A
DCDC5	P740S	G	2216	A	DLG2	A111D	G	644	T	DOCK2	E1616V	A	4899	T	EEF1A2	G446A	C	1408	G
DCDC5	K129N	C	387	A	DLG2	V296I	C	1198	T	DOCK2	-	A	0	C	EEF1A2	A46E	G	208	T

DCDC5	E116*	C	346	A	DLG2	T235M	G	1016	A	DOCK2	M1333T	T	4050	C	EEF1D	A537V	G	2069	A
DCHS1	R2064H	C	6603	T	DLG2	A271V	G	1124	A	DOCK2	V1175M	G	3575	A	EEF1D	Q182R	T	1004	C
DCHS1	R850H	C	2961	T	DLG2	G342R	C	1336	T	DOCK2	P732S	C	2246	T	EEF2	C41Y	C	205	T
DCHS1	V1684E	A	5463	T	DLG2	Q39H	T	429	G	DOCK3	K1215N	G	3668	T	EEF2	G699S	C	2178	T
DCHS1	A1433V	G	4710	A	DLG4	R614W	G	2693	A	DOCK3	Y1373*	C	4142	A	EEF2K	A617T	G	2310	A
DCHS1	D473Y	C	1829	A	DLG4	R356Q	C	1920	T	DOCK3	R1498S	G	4517	T	EEF2K	V388M	G	1623	A
DCHS1	Q1310H	C	4342	A	DLG4	R155S	C	1318	A	DOCK3	R1857W	C	5592	T	EEF2K	V168M	G	963	A
DCHS2	E2645*	C	7933	A	DLG5	R249Q	C	752	T	DOCK3	T555K	C	1687	A	EFCAB1	D210G	T	789	C
DCHS2	E2575D	C	7725	A	DLG5	V1374I	C	4126	T	DOCK3	R621W	C	1884	T	EFCAB2	K211N	A	774	C
DCHS2	D2419Y	C	7255	A	DLG5	E1290K	C	3874	T	DOCK3	R844C	C	2553	T	EFCAB2	E145D	G	576	T
DCHS2	Q1585H	C	4755	A	DLG5	A1708T	C	5128	T	DOCK3	R499Q	G	1519	A	EFCAB4A	Q9H	G	748	T
DCHS2	N1424T	T	4271	G	DLG5	E257Q	C	775	G	DOCK3	R1774C	C	5343	T	EFCAB4A	R100H	G	1020	A
DCHS2	E568K	C	2063	T	DLG5	R1730Q	C	5195	T	DOCK3	F236L	C	731	A	EFCAB4B	F705L	G	2687	T
DCHS2	P2272H	G	6815	T	DLG5	G731C	C	2197	A	DOCK3	S791Y	C	2395	A	EFCAB5	F1140L	C	3612	A
DCHS2	L1214I	G	3640	T	DLG5	E1472K	C	4420	T	DOCK3	I1053S	T	3181	G	EFCAB6	A955V	G	3118	A
DCHS2	E127*	C	379	A	DLG5	T1422A	T	4270	C	DOCK3	D1457G	A	4393	G	EFCAB6	R246I	C	991	A
DCHS2	E2606K	C	7816	T	DLG5	Y1390H	A	4174	G	DOCK4	H1373Y	G	4116	A	EFCAB6	G525D	C	1828	T
DCHS2	C2603Y	C	7808	T	DLG5	N390I	T	1175	A	DOCK4	R132H	C	394	T	EFCAB6	R1207C	G	3873	A
DCHS2	E2895*	C	8683	A	DLG5	D610Y	C	1834	A	DOCK4	A757V	G	2269	A	EFCAB6	S1239N	C	3970	T
DCHS2	S1630Y	G	4889	T	DLGAP1	A602T	C	1871	T	DOCK4	L592*	A	1774	C	EFCAB6	V170G	A	763	C
DCHS2	D1176Y	C	3526	A	DLGAP1	D105Y	C	380	A	DOCK4	R1927H	C	5779	T	EFCAB6	R429*	G	1539	A
DCHS2	S781Y	G	2342	T	DLGAP1	T126M	G	444	A	DOCK4	-	A	0	G	EFCAB6	F233L	A	953	T
DCK	R104Q	G	509	A	DLGAP1	L945P	A	2901	G	DOCK4	L1058V	A	3171	C	EFCAB6	K172N	T	770	G
DCK	L216F	C	844	T	DLGAP1	D506N	C	1583	T	DOCK4	L1818F	G	5451	A	EFCAB6	G137V	C	664	A
DCLK1	A18V	G	265	A	DLGAP2	E189D	G	635	T	DOCK4	Q1247H	C	3740	A	EFCAB7	V553M	G	1903	A
DCLK1	S289*	G	1078	T	DLGAP2	R912Q	G	2803	A	DOCK4	N1227T	T	3679	G	EFCAB7	D8N	G	268	A
DCLK2	R780H	G	2339	A	DLGAP2	R105W	C	381	T	DOCK4	V758M	C	2271	T	EFCAB8	T1222M	C	3759	T
DCLK2	S392R	A	1174	C	DLGAP2	Y380C	A	1207	G	DOCK4	R177W	G	528	A	EFCAB8	G527S	G	1673	A
DCLK3	S10I	C	520	A	DLGAP2	R912W	C	2802	T	DOCK5	K1473E	A	4461	G	EFCAB8	T1189M	C	3660	T
DCLK3	A119T	C	846	T	DLGAP2	R637Q	G	1978	A	DOCK5	L703P	T	2152	C	EFCAB8	N211T	A	726	C
DCLK3	E523K	C	2058	T	DLGAP2	F709V	T	2193	G	DOCK5	A809T	G	2469	A	EFCAB8	Q303H	G	1003	T
DCLRE1A	K948R	T	3538	C	DLGAP2	G72R	G	282	A	DOCK5	R1653H	G	5002	A	EFCAB8	M794V	A	2474	G
DCLRE1A	G941C	C	3516	A	DLGAP3	R593H	C	2047	T	DOCK5	D331V	A	1036	T	EFCAB8	N437H	A	1403	C
DCLRE1A	L381R	A	1837	C	DLGAP3	G757C	C	2538	A	DOCK5	A1346T	G	4080	A	EFEMP1	D31N	C	527	T
DCLRE1B	T426M	C	1723	T	DLGAP3	A820T	C	2727	T	DOCK5	E1458*	G	4416	T	EFEMP1	R362Q	C	1521	T
DCLRE1C	F393C	A	1216	C	DLGAP3	P720T	G	2427	T	DOCK6	L667Q	A	2041	T	EFEMP2	L276M	G	1020	T
DCLRE1C	L639F	G	1953	A	DLGAP4	S90R	C	469	A	DOCK6	T1793M	G	5419	A	EFEMP2	Y155H	A	657	G
DCLRE1C	P396T	G	1224	T	DLGAP4	R617*	C	2048	T	DOCK6	V1756M	C	5307	T	EFEMP2	C247R	A	933	G
DCN	S214N	C	895	T	DLGAP4	A774V	C	2520	T	DOCK6	R323C	G	1008	A	EFHA2	T477N	C	1472	A

DCN	R156C	G	720	A	DLGAP4	A272T	G	1013	A	DOCK6	A922V	G	2806	A	EFHA2	A54V	C	203	T
DCP1A	A279V	G	929	A	DLGAP4	A39V	C	315	T	DOCK6	P69S	G	246	A	EFHA2	A103T	G	349	A
DCP1A	R132*	G	487	A	DLGAP4	S320T	T	1157	A	DOCK7	V1289I	C	3899	T	EFHA2	R210*	C	670	T
DCP1A	-	C	0	T	DLGAP4	R515C	C	1742	T	DOCK7	R854C	G	2594	A	EFHA2	L395I	C	1225	A
DCP2	T213P	A	835	C	DLGAP5	T759I	G	2493	A	DOCK7	R1701*	G	5135	A	EFHA2	V462I	G	1426	A
DCP2	K224T	A	869	C	DLGAP5	L293V	A	1094	C	DOCK7	S1177T	A	3563	T	EFHB	T384M	G	1313	A
DCP2	N337T	A	1208	C	DLK1	V184I	G	792	A	DOCK7	S963Y	G	2922	T	EFHB	P106S	G	478	A
DCPS	P239Q	C	1045	A	DLK2	P182H	G	796	T	DOCK7	R1326Q	C	4011	T	EFHB	R733Q	C	2360	T
DCST1	D418N	G	1348	A	DLK2	R219H	C	907	T	DOCK7	K830N	T	2524	G	EFHB	K494T	T	1643	G
DCST1	D597G	A	1886	G	DLL1	V644M	C	2264	T	DOCK8	V759M	G	2387	A	EFHB	Y427*	A	1443	C
DCST2	R365C	G	1152	A	DLL1	Q645H	C	2269	A	DOCK8	R934Q	G	2913	A	EFHB	T343A	T	1189	C
DCST2	R299Q	C	955	T	DLL3	G344S	G	1088	A	DOCK8	V726A	T	2289	C	EFHB	K293Q	T	1039	G
DCST2	D214N	C	699	T	DLL3	-	T	0	C	DOCK8	R539H	G	1728	A	EFHC1	I122T	T	468	C
DCST2	R90M	C	328	A	DLL3	G325C	G	1031	T	DOCK8	R1388Q	G	4275	A	EFHC1	E274D	A	925	C
DCST2	S172P	A	573	G	DLX2	A120T	C	720	T	DOCK8	Q81H	G	355	T	EFHC1	Q584P	A	1854	C
DCT	V496A	A	1914	G	DLX3	Y50H	A	374	G	DOCK8	M1287T	T	3972	C	EFHC1	R244Q	G	834	A
DCT	F209V	A	1052	C	DLX3	R130Q	C	615	T	DOCK9	-	T	0	C	EFHC2	S431Y	G	1292	T
DCT	R27Q	C	507	T	DMAP1	P313Q	C	1016	A	DOCK9	M1429V	T	4340	C	EFHC2	M508V	T	1522	C
DCTN1	R773C	G	2628	A	DMAP1	R252C	C	832	T	DOCK9	R1763W	G	5342	A	EFHC2	C57W	G	171	C
DCTN1	R1219H	C	3967	T	DMBT1	V626M	G	1982	A	DOCK9	M2049I	C	6202	A	EFHC2	R228W	G	682	A
DCTN1	R953Q	C	3169	T	DMBT1	G577D	G	1836	A	DOCK9	I1493V	T	4532	C	EFHD1	A57T	G	646	A
DCTN2	L178P	A	679	G	DMBT1	W1077*	G	3337	A	DOHH	P151L	G	615	A	EFHD2	I112V	A	411	G
DCTN4	I359S	A	1178	C	DMBT1	R2027C	C	6185	T	DOK1	K334Q	A	1669	C	EFNA1	A16T	G	564	A
DCTN5	P158L	C	624	T	DMBT1	R2537Q	G	7716	A	DOK1	A410D	C	1898	A	EFNA2	V90M	G	268	A
DCTN6	N105T	A	401	C	DMBX1	R72C	C	220	T	DOK2	G4R	C	93	T	EFNB2	G309S	C	1075	T
DCTPP1	E66G	T	292	C	DMBX1	Y321C	A	968	G	DOK2	R91H	C	355	T	EFNB3	R106H	G	714	A
DCUN1D1	K166N	C	652	A	DMD	I2353M	A	7266	C	DOK3	V96M	C	291	T	EFNB3	R106C	C	713	T
DCUN1D3	R37H	C	396	T	DMD	I2236T	A	6914	G	DOK5	R295Q	G	1234	A	EFNB3	R262H	G	1182	A
DCUN1D5	N140S	T	687	C	DMD	A3492T	C	1068 1	T	DOK5	R283H	G	1198	A	EFR3A	A449V	C	1571	T
DCX	S63N	C	360	T	DMD	A2986V	G	9164	A	DOK6	S262Y	C	975	A	EFR3A	A575V	C	1949	T
DDA1	A91V	C	399	T	DMD	F911V	A	2938	C	DOLK	K321N	C	1393	A	EFR3A	V453A	T	1583	C
DDA1	-	T	434	C	DMD	L460V	A	1585	C	DOPEY1	E869G	A	2866	G	EFR3A	F592V	T	1999	G
DDAH1	E137D	T	506	A	DMD	Y3092H	A	9481	G	DOPEY1	D481G	A	1702	G	EFR3A	R628Q	G	2108	A
DDB1	R1138Q	C	3639	T	DMD	R3391Q	C	1037 9	T	DOPEY1	M1062V	A	3444	G	EFR3B	R237W	C	892	T
DDB1	T985A	T	3179	C	DMD	A203T	C	814	T	DOPEY1	G2269W	G	7065	T	EFR3B	Q578R	A	1916	G
DDB1	I258T	A	999	G	DMD	S1511I	C	4739	A	DOPEY2	R1915Q	G	5829	A	EFR3B	F473I	T	1600	A
DDC	K432N	T	1365	G	DMD	G754R	C	2467	G	DOPEY2	R746H	G	2322	A	EFR3B	N538S	A	1796	G
DDHD1	L580I	G	1738	T	DMD	R3381*	G	1034	A	DOPEY2	S1139N	G	3501	A	EFTUD1	C379Y	C	1305	T

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DDHD2	S25Y	C	353	A	DMD	D1916G	T	5954	C	DOPEY2	R2032H	G	6180	A	EFTUD1	R1095*	G	3452	A
DDHD2	R476K	G	1706	A	DMD	R1728H	C	5390	T	DOPEY2	Y297C	A	975	G	EFTUD1	V495A	A	1653	G
DDHD2	R570Q	G	1988	A	DMD	A798V	G	2600	A	DOPEY2	T778M	C	2418	T	EFTUD2	R495W	G	1744	A
DDHD2	D707Y	G	2398	T	DMD	L553I	G	1864	T	DOPEY2	R1626Q	G	4962	A	EFTUD2	L617I	G	2110	T
DDI1	R83Q	G	491	A	DMD	D2505G	T	7721	C	DOPEY2	E2286*	G	6941	T	EFTUD2	A445T	C	1594	T
DDI1	V293A	T	1121	C	DMKN	A415V	G	1421	A	DOT1L	T431A	A	1327	G	EFTUD2	Q892H	C	2937	A
DDI1	Q211R	A	875	G	DMP1	S435C	C	1403	G	DOT1L	R411H	G	1268	A	EGF	C380Y	G	1584	A
DDI1	D343N	G	1270	A	DMPK	G577D	C	2274	T	DOT1L	A195T	G	619	A	EGF	Q510*	C	1973	T
DDI2	R267M	G	971	T	DMPK	T286M	G	1401	A	DOT1L	A1432T	G	4330	A	EGF	R394*	C	1625	T
DDIT3	A154V	G	641	A	DMRT1	M1L	A	150	C	DOT1L	P1260L	C	3815	T	EGF	S226Y	C	1122	A
DDIT3	Q26*	G	256	A	DMRT1	S347I	G	1189	T	DOT1L	R413H	G	1274	A	EGF	S1064L	C	3636	T
DDOST	R139*	G	521	A	DMRT1	A42V	C	274	T	DOT1L	R344H	G	1067	A	EGFL7	A156T	G	1377	A
DDR2	F424L	T	1708	C	DMRT1	E110D	G	479	T	DOT1L	K550Q	A	1684	C	EGFLAM	K288N	G	1210	T
DDR2	K616N	G	2286	T	DMRT2	R212H	G	835	A	DOT1L	A370T	G	1144	A	EGFLAM	R802M	G	2751	T
DDX1	I36L	A	495	C	DMRT2	P470L	C	1609	T	DPAGT1	F284L	A	1073	G	EGFLAM	R924W	C	3116	T
DDX10	V638A	T	1990	C	DMRT2	N301I	A	1102	T	DPCD	R11W	C	80	T	EGFLAM	A354D	C	1407	A
DDX10	N59T	A	253	C	DMRT3	S463L	C	1426	T	DPEP1	L153P	T	661	C	EGFLAM	R368Q	G	1449	A
DDX11	G689S	G	2316	A	DMRTA1	N384H	A	1375	C	DPEP1	R110W	C	531	T	EGFR	R427C	C	1456	T
DDX11	S96Y	C	538	A	DMRTA1	T94M	C	506	T	DPEP1	R198C	C	795	T	EGFR	R671C	C	2188	T
DDX11L8	N788S	A	2363	G	DMRTA2	R205H	C	1007	T	DPEP2	R110H	C	381	T	EGFR	R165Q	G	671	A
DDX12	A375V	G	1375	A	DMRTB1	A52V	C	210	T	DPEP2	M54V	T	212	C	EGFR	R671C	C	2188	T
DDX17	E485K	C	1553	T	DMRTB1	Y288H	T	917	C	DPEP3	R234H	C	1056	T	EGLN1	E375V	T	4280	A
DDX17	T667A	T	2099	C	DMRTC2	Q268R	A	886	G	DPEP3	N135T	T	759	G	EGLN1	K291R	T	4028	C
DDX18	D176E	T	656	A	DMTF1	S593G	A	2103	G	DPF1	R110I	C	329	A	EGLN2	R233C	C	1051	T
DDX18	S559Y	C	1804	A	DMTF1	R265*	C	1119	T	DPF1	R343Q	C	1028	T	EGLN2	P403Q	C	1562	A
DDX18	R539H	G	1744	A	DMTF1	T315A	A	1269	G	DPF1	K269R	T	806	C	EGLN2	R355W	C	1417	T
DDX19A	T21P	A	224	C	DMTF1	P603T	C	2133	A	DPF3	R79H	C	236	T	EGR2	P369S	G	1431	A
DDX19B	-	T	0	C	DMWD	R100C	G	344	A	DPH1	L174I	C	520	A	EGR2	S429I	C	1612	A
DDX20	E141A	A	750	C	DMWD	R586C	G	1802	A	DPH1	P55H	C	164	A	EGR2	R353H	C	1384	T
DDX21	R440H	G	1417	A	DMWD	S354P	A	1106	G	DPH1	A379V	C	1136	T	EGR3	A139T	C	773	T
DDX21	R440C	C	1416	T	DMWD	K271N	C	859	A	DPH2	I104V	A	482	G	EGR3	P269L	G	1164	A
DDX21	I245L	A	831	C	DMXL1	R1340W	C	4098	T	DPH3	L79*	A	332	C	EGR3	T124M	G	729	A
DDX24	K96N	C	387	A	DMXL1	H2570Y	C	7788	T	DPP10	R91Q	G	627	A	EGR4	A39V	G	504	A
DDX24	P217L	G	749	A	DMXL1	R1678C	C	5112	T	DPP10	K362E	A	1439	G	EHBP1	F584L	C	2234	A
DDX24	Y457H	A	1468	G	DMXL1	H1865P	A	5674	C	DPP10	L144I	C	785	A	EHBP1	K398N	A	1676	C
DDX24	R793C	G	2476	A	DMXL1	-	G	0	T	DPP10	R602I	G	2160	T	EHBP1L1	V1162M	G	3749	A
DDX25	A2V	C	146	T	DMXL1	V2518I	G	7632	A	DPP4	D725N	C	2734	T	EHBP1L1	E800K	G	2663	A
DDX25	A472T	G	1555	A	DMXL1	D2808G	A	8503	G	DPP4	E117*	C	910	A	EHD1	K13Q	T	292	G

DDX25	G442S	G	1465	A	DMXL1	K92N	G	356	T	DPP6	V16M	G	633	A	EHD2	T246M	C	987	T
DDX26B	A825T	G	2807	A	DMXL1	N201S	A	682	G	DPP6	Y825C	A	2615	G	EHD2	P319S	C	1205	T
DDX26B	R345Q	G	1368	A	DMXL2	R1362Q	C	4292	T	DPP6	Y493C	A	1619	G	EHD2	V174M	G	770	A
DDX26B	F738C	T	2547	G	DMXL2	G1188S	C	3769	T	DPP7	S168R	T	507	G	EHD3	R167W	C	784	T
DDX27	R713Q	G	2147	A	DMXL2	-	A	0	G	DPP7	D237G	T	715	C	EHD3	K461E	A	1666	G
DDX28	A433V	G	2152	A	DMXL2	M2662I	C	8193	T	DPP7	L429P	A	1291	G	EHD3	R287Q	G	1145	A
DDX28	H359Q	G	1931	T	DMXL2	R2794Q	C	8588	T	DPP7	F63L	G	194	T	EHD3	E91D	G	558	T
DDX28	P506L	G	2371	A	DMXL2	P937T	G	3016	T	DPP8	A269T	C	2386	T	EHD3	E513D	G	1824	T
DDX28	Q428*	G	2136	A	DMXL2	T873P	T	2824	G	DPP8	M21T	A	1643	G	EHD4	V444M	C	1414	T
DDX31	A620S	C	2010	A	DMXL2	L2294I	G	7087	T	DPP9	R231W	G	732	A	EHD4	F203L	G	693	T
DDX31	R590W	G	1920	A	DMXL2	R829Q	C	2693	T	DPP9	A860T	C	2619	T	EHF	L3P	T	119	C
DDX31	I732V	T	2346	C	DNA2	E164*	C	490	A	DPP9	T408M	G	1264	A	EHF	R278C	C	943	T
DDX31	Q602*	G	1956	A	DNAH1	K2332N	G	6996	T	DPPA4	V193L	C	632	A	EHF	P13H	C	149	A
DDX31	K775T	T	2476	G	DNAH1	K1062E	A	3184	G	DPPA5	P113T	G	407	T	EHF	F288C	T	974	G
DDX31	D657N	C	2121	T	DNAH1	A3042T	G	9124	A	DPY19L1	A243V	G	873	A	EHHADH	G286R	C	932	T
DDX39	V140I	C	418	T	DNAH1	S295N	G	884	A	DPY19L1	A114V	G	486	A	EHMT1	A63T	G	214	A
DDX39	R223Q	C	668	T	DNAH1	R1827H	G	5480	A	DPY19L3	E552*	G	1869	T	EHMT1	Y952H	T	2881	C
DDX3X	T498A	A	2347	G	DNAH1	A162T	G	484	A	DPY19L4	T242A	A	848	G	EHMT1	V651M	G	1978	A
DDX4	G180D	G	631	A	DNAH1	R1132H	G	3395	A	DPY19L4	R14I	G	165	T	EHMT1	D1176Y	G	3553	T
DDX4	L671F	G	2105	T	DNAH1	A1993V	C	5978	T	DPY19L4	R613I	G	1962	T	EI24	L286R	T	857	G
DDX41	S544L	G	1631	A	DNAH1	R597H	G	1790	A	DPYD	R561Q	C	1783	T	EI24	C92Y	G	275	A
DDX41	G331S	C	991	T	DNAH1	A825V	C	2474	T	DPYD	D11N	C	132	T	EI24	E55*	G	163	T
DDX41	E274D	C	822	A	DNAH1	S2487I	G	7460	T	DPYD	A112T	C	435	T	EIF1AY	R13L	G	185	T
DDX42	-	G	0	A	DNAH1	R3672W	C	1101 4	T	DPYD	R561Q	C	1783	T	EIF2A	K388N	A	1273	C
DDX42	R827Q	G	2715	A	DNAH1	R3776L	G	1132 7	T	DPYD	A340S	C	1119	A	EIF2AK1	K421Q	T	1408	G
DDX43	S340*	C	1177	A	DNAH1	R374H	G	1121	A	DPYS	A469G	G	1535	C	EIF2AK3	R541H	C	1924	T
DDX43	I114M	T	500	G	DNAH1	R3696C	C	1108 6	T	DPYS	K368N	T	1233	G	EIF2AK3	R1065*	G	3495	A
DDX46	R354Q	G	1219	A	DNAH1	K689R	A	2066	G	DPYSL2	A193T	G	938	A	EIF2AK3	A704T	C	2412	T
DDX49	T350M	C	1106	T	DNAH1	I802V	A	2404	G	DPYSL2	I24L	A	431	C	EIF2AK3	T537K	G	1912	T
DDX5	E81D	T	413	G	DNAH1	L1554P	T	4661	C	DPYSL3	D185N	C	751	T	EIF2AK3	K125Q	T	675	G
DDX50	T188A	A	669	G	DNAH1	P3179L	C	9536	T	DPYSL4	R75M	G	388	T	EIF2AK4	R483H	G	1498	A
DDX51	I202T	A	644	G	DNAH10	R72I	G	240	T	DPYSL4	V51I	G	315	A	EIF2AK4	L1588V	T	4812	G
DDX53	S189F	C	654	T	DNAH10	S4252Y	C	1278 0	A	DPYSL4	A260V	C	943	T	EIF2B3	K148E	T	569	C
DDX53	T561A	A	1769	G	DNAH10	R3394W	C	1020 5	T	DPYSL4	-	G	0	T	EIF2C1	R712H	G	2348	A
DDX54	V303M	C	935	T	DNAH10	R346C	C	1061	T	DPYSL4	H36R	A	271	G	EIF2C2	R663H	C	2028	T
DDX54	E636K	C	1934	T	DNAH10	V728A	T	2208	C	DPYSL5	Y472C	A	1573	G	EIF2C2	R837*	G	2549	A

DDX55	I40T	T	143	C	DNAH10	A3666T	G	11021	A	DPYSL5	E223D	G	827	C	EIF2C3	R689*	C	2414	T
DDX55	P13H	C	62	A	DNAH10	H3875Q	T	11650	A	DQX1	P72S	G	434	A	EIF2C4	R58H	G	418	A
DDX55	R584I	G	1775	T	DNAH10	S1615P	T	4868	C	DQX1	H223D	G	887	C	EIF2C4	R56W	C	411	T
DDX56	E167K	C	606	T	DNAH10	T4453R	C	13383	G	DQX1	L601F	G	2021	A	EIF2S2	R329H	C	1208	T
DDX58	K508R	T	1681	C	DNAH10	R1184*	C	3575	T	DQX1	R572Q	C	1935	T	EIF2S2	T111P	T	553	G
DDX59	R318H	C	1167	T	DNAH10	R3699H	G	11121	A	DRAM1	G106R	G	779	A	EIF2S2	L54V	A	382	C
DDX59	V342A	A	1239	G	DNAH10	R4071W	C	12236	T	DRAM2	F25L	A	693	C	EIF3A	R1087W	G	3387	A
DDX59	E170*	C	722	A	DNAH10	A1616T	G	4871	A	DRAP1	R126W	C	621	T	EIF3A	E875D	C	2753	G
DDX59	R113C	G	551	A	DNAH10	E3804*	G	11435	T	DRD1	R23C	G	1012	A	EIF3A	E774K	C	2448	T
DDX59	S617Y	G	2064	T	DNAH10	E1432K	G	4319	A	DRD2	R145C	G	668	A	EIF3B	K604E	A	1810	G
DDX59	R264Q	C	1005	T	DNAH10	R1562I	G	4710	T	DRD2	R296L	C	1122	A	EIF3B	R664C	C	1990	T
DDX59	E183D	T	763	G	DNAH10	S2371Y	C	7137	A	DRD3	A393V	G	1468	A	EIF3D	K35N	T	176	G
DDX6	-	C	0	A	DNAH10	G2577C	G	7754	T	DRD3	S307L	G	1210	A	EIF3D	R95Q	C	355	T
DDX60	R261C	G	1073	A	DNAH10	D3705G	A	11139	G	DRD3	A161V	G	772	A	EIF3E	Q247H	C	769	A
DDX60L	H251Y	G	972	A	DNAH10	K4036T	A	12132	C	DRD4	R412C	C	1246	T	EIF3E	R271W	G	839	A
DDX60L	S1562N	C	4906	T	DNAH11	I1088S	T	3294	G	DRGX	R35H	C	104	T	EIF3E	L26I	G	104	T
DDX60L	F1520V	A	4779	C	DNAH11	R2075C	C	6254	T	DRGX	R207C	G	619	A	EIF3G	V312I	C	998	T
DDX60L	E669D	T	2228	G	DNAH11	S2452L	C	7386	T	DRGX	K134T	T	401	G	EIF3H	R294C	G	880	A
DDX60L	S428A	A	1503	C	DNAH11	R2852Q	G	8586	A	DRGX	C187*	G	561	T	EIF3H	E193*	C	577	A
DEAF1	T472M	G	2108	A	DNAH11	A3214V	C	9672	T	DRP2	D716N	G	2414	A	EIF3J	F179L	T	675	G
DECR2	T274S	A	958	T	DNAH11	V2080A	T	6270	C	DRP2	A406D	C	1485	A	EIF3J	V251A	T	890	C
DECR2	T55M	C	302	T	DNAH11	R2879C	C	8666	T	DRP2	R840C	C	2786	T	EIF3J	A2V	C	143	T
DEDD	R43C	G	362	A	DNAH11	G3149S	G	9476	A	DSC1	Q164H	C	754	A	EIF3K	Y21C	A	249	G
DEDD2	R276W	G	894	A	DNAH11	S692R	A	2105	C	DSC1	K538T	T	1875	G	EIF3L	I571V	A	1711	G
DEDD2	R172W	G	582	A	DNAH11	S3156N	G	9498	A	DSC3	G487R	C	1614	T	EIF3L	I127V	A	379	G
DEDD2	S254P	A	828	G	DNAH11	T3790P	A	11399	C	DSCAM	T1728M	G	5661	A	EIF3L	T419M	C	1256	T
DEF6	K583M	A	1753	T	DNAH11	A1281V	C	3873	T	DSCAM	R1644Q	C	5409	T	EIF4A1P4	S7F	C	156	T
DEF6	L229P	T	691	C	DNAH11	A1281V	C	3873	T	DSCAM	I877K	A	3108	T	EIF4A1P4	S2Y	C	141	A
DEF8	R72W	C	303	T	DNAH11	Q1014*	C	3071	T	DSCAM	T651M	G	2430	A	EIF4A3	R172C	G	692	A
DEF8	D406N	G	1305	A	DNAH11	Y2336H	T	7037	C	DSCAM	D775E	G	2803	T	EIF4B	R246C	C	942	T
DEFB110	G27V	C	126	A	DNAH11	V718A	T	2184	C	DSCAM	A676T	C	2504	T	EIF4B	R167*	C	705	T
DEFB112	S53*	G	158	T	DNAH11	-	G	0	T	DSCAM	L544F	G	2108	A	EIF4E1B	P30H	C	673	A
DEFB114	R32C	G	94	A	DNAH11	E259*	G	806	T	DSCAM	A1167S	C	3977	A	EIF4E1B	R172G	A	1098	G

DEFB115	A30V	C	89	T	DNAH11	N762K	T	2317	G	DSCAM	S870A	A	3086	C	EIF4E1B	N37H	A	693	C
DEFB121	A75E	G	338	T	DNAH11	R1562Q	G	4716	A	DSCAM	L751F	C	2731	G	EIF4E2	P224S	C	1343	T
DEFB123	P66S	C	376	T	DNAH11	E1624*	G	4901	T	DSCAM	R498Q	C	1971	T	EIF4E3	E160*	C	486	A
DEFB129	E151*	G	482	T	DNAH11	F2107V	T	6350	G	DSCAML1	D224Y	C	670	A	EIF4E3	V206I	C	624	T
DEFB133	R39*	G	115	A	DNAH11	K2359E	A	7106	G	DSCAML1	P1014L	G	3041	A	EIF4E3	-	C	0	A
DEFB133	F51L	G	153	T	DNAH11	T3013M	C	9069	T	DSCAML1	A151T	C	451	T	EIF4ENIF1	R255*	G	987	A
DEFB134	D15G	T	105	C	DNAH11	E3700*	G	11129	T	DSCAML1	A1604S	C	4810	A	EIF4ENIF1	A73D	G	442	T
DEFB135	A2T	G	4	A	DNAH11	R790G	A	2399	G	DSCAML1	V1762I	C	5284	T	EIF4ENIF1	A258V	G	997	A
DEFB136	N63D	T	187	C	DNAH11	D1494A	A	4512	C	DSCAML1	R1368Q	C	4103	T	EIF4ENIF1	D88H	C	486	G
DEGS1	F236L	C	874	A	DNAH12	R2241I	C	6903	A	DSCAML1	V678G	A	2033	C	EIF4ENIF1	S679Y	G	2260	T
DENND1A	P472L	G	1617	A	DNAH12	R622H	C	2046	T	DSCAML1	D629Y	C	1885	A	EIF4ENIF1	E234K	C	924	T
DENND1A	R597H	C	1992	T	DNAH12	Y1559H	A	4856	G	DSCC1	E258K	C	907	T	EIF4G1	P671T	C	2210	A
DENND1A	P767S	G	2501	A	DNAH12	K2360T	T	7260	G	DSCR3	A61T	C	419	T	EIF4G2	-	A	0	G
DENND1C	R420*	G	1350	A	DNAH12	T1550M	G	4830	A	DSCR3	N275T	T	1062	G	EIF4G2	P428L	G	1283	A
DENND1C	A760T	C	2370	T	DNAH12	E1048K	C	3323	T	DSCR4	S61R	T	265	G	EIF4G2	F111L	A	331	G
DENND1C	R515H	C	1636	T	DNAH12	K751R	T	2433	C	DSCR6	P137L	C	620	T	EIF4G2	R787H	C	2360	T
DENND2A	S572Y	G	2133	T	DNAH12	D2196V	T	6768	A	DSE	R6W	C	210	T	EIF4G3	P132L	G	590	A
DENND2A	Q29*	G	503	A	DNAH14	E471*	G	1626	T	DSE	F480S	T	1633	C	EIF4G3	D852E	A	2751	C
DENND2A	S572Y	G	2133	T	DNAH14	F4379L	C	13352	A	DSEL	K56R	T	1641	C	EIF4G3	R517Q	C	1745	T
DENND2C	R862H	C	3211	T	DNAH14	R2804C	C	8625	T	DSEL	Y1177C	T	5004	C	EIF5	R15H	G	566	A
DENND2C	R658*	G	2598	A	DNAH14	L1938I	T	6027	A	DSEL	K56R	T	1641	C	EIF5	E384*	G	1672	T
DENND2C	K546N	C	2264	A	DNAH14	G1594*	G	4995	T	DSEL	P1158H	G	4947	T	EIF5	N170H	A	1030	C
DENND2C	R798Q	C	3019	T	DNAH14	L136P	T	622	C	DSEL	C838R	A	3986	G	EIF5	E262*	G	1306	T
DENND2C	E760K	C	2904	T	DNAH14	E206*	G	831	T	DSEL	L247F	C	2215	A	EIF5B	E602G	A	2007	G
DENND2C	F540C	A	2245	C	DNAH14	F769V	T	2520	G	DSEL	L243F	G	2201	A	EIF5B	-	G	0	A
DENND2D	Q78*	G	462	A	DNAH14	I784M	T	2567	G	DSEL	A573V	G	3192	A	EIF5B	S990F	C	3171	T
DENND3	V1004M	G	3288	A	DNAH14	L928M	C	2997	A	DSEL	R90H	C	1743	T	ELAC1	A139V	C	523	T
DENND3	A25V	C	352	T	DNAH14	S3858Y	C	11788	A	DSEL	Q482H	C	2920	A	ELAC2	Q810*	G	2502	A
DENND3	D1073Y	G	3495	T	DNAH14	L4223*	T	12883	G	DSEL	F123S	A	1842	G	ELAC2	V790M	C	2442	T
DENND4A	H174Q	G	907	C	DNAH17	T3693M	G	11078	A	DSG1	A184T	G	762	A	ELAC2	R477I	C	1504	A
DENND4A	L1732I	A	5579	T	DNAH17	A2801V	G	8402	A	DSG1	F747L	C	2453	A	ELAVL1	V166M	C	496	T
DENND4A	R1544*	G	5015	A	DNAH17	A4222V	G	12665	A	DSG2	P538L	C	1801	T	ELAVL2	P326H	G	1003	T
DENND4A	R365Q	C	1479	T	DNAH17	T305M	G	914	A	DSG2	A641T	G	2109	A	ELAVL2	R337H	C	1036	T
DENND4A	R865H	C	2979	T	DNAH17	S3407G	T	10219	C	DSG2	F310V	T	1116	G	ELAVL2	Q80R	T	265	C

DENND4A	A129T	C	770	T	DNAH17	G2869V	C	8606	A	DSG2	D509N	G	1713	A	ELAVL4	N138S	A	728	G	
DENND4B	R347C	G	1440	A	DNAH17	S3949N	C	11846	T	DSG3	R429H	G	1369	A	ELF1	L468V	A	1717	C	
DENND4B	P228L	G	1084	A	DNAH17	N3281S	T	9842	C	DSG3	R67I	G	283	T	ELF1	E158*	C	787	A	
DENND4B	R1348Q	C	4444	T	DNAH17	R3741W	G	11221	A	DSG3	V538I	G	1695	A	ELF2	Q471R	T	1618	C	
DENND4B	P328R	G	1384	C	DNAH17	G1501S	C	4501	T	DSG3	A195T	G	666	A	ELF2	K458N	T	1580	G	
DENND4B	S1278L	G	4234	A	DNAH17	R488H	C	1463	T	DSG3	Q341K	C	1104	A	ELF3	A32V	C	3287	T	
DENND4B	R97H	C	691	T	DNAH17	E3617K	C	10849	T	DSG3	V260G	T	862	G	ELF3	G118W	G	3544	T	
DENND4C	H1335Y	C	4036	T	DNAH17	E3573K	C	10717	T	DSG3	I405S	T	1297	G	ELFN2	A353V	G	1063	A	
DENND4C	E1155D	A	3498	T	DNAH17	P3144L	G	9431	A	DSG3	E498K	G	1575	A	ELFN2	R598Q	C	1798	T	
DENND4C	S828L	C	2516	T	DNAH17	A2834V	G	8501	A	DSG4	R128Q	G	518	A	ELFN2	R423H	C	1273	T	
DENND5A	P992H	G	3230	T	DNAH17	F2702L	G	8106	T	DSG4	G634D	G	2036	A	ELK1	R335W	G	1103	A	
DENND5A	P619H	G	2111	T	DNAH17	E1290D	C	3870	A	DSG4	E270D	G	945	T	ELK1	K315N	C	1045	A	
DENND5A	S1157L	G	3725	A	DNAH17	A522T	C	1564	T	DSG4	L310I	C	1063	A	ELK3	I76T	T	506	C	
DENND5B	R707C	G	2119	A	DNAH2	E240*	G	732	T	DSG4	T927N	C	2915	A	ELK3	D310N	G	1207	A	
DENND5B	G1125V	C	3374	A	DNAH2	F1587L	C	4775	A	DSP	R1738*	C	5553	T	ELK3	A42T	G	403	A	
DENND5B	M506I	C	1518	A	DNAH2	R1991H	G	5986	A	DSP	N1197T	A	3931	C	ELK3	K192T	A	854	C	
DENND5B	A309V	G	926	A	DNAH2	D2109N	G	6339	A	DSP	R2586*	C	8097	T	ELL	A254T	C	813	T	
DENND5B	H359Y	G	1075	A	DNAH2	R1978H	G	5947	A	DSP	R2586Q	G	8098	A	ELL	R522C	G	1617	A	
DENND5B	R723C	G	2167	A	DNAH2	R2255C	C	6777	T	DSP	R1308W	C	4263	T	ELL2	R209M	C	976	A	
DENND5B	R934*	G	2800	A	DNAH2	M3250L	A	9762	C	DSPP	E129*	G	505	T	ELL2	P384S	G	1500	A	
DENND5B	D607E	A	1821	C	DNAH2	V3443M	G	10341	A	DSPP	N157H	A	589	C	ELMO1	R76*	G	874	A	
DENND5B	L268I	G	802	T	DNAH2	S4269N	G	12820	A	DSPP	N440S	A	1439	G	ELMO2	R574*	G	1930	A	
DENND5B	D518E	A	1554	C	DNAH3	D2941Y	C	8821	A	DST	R7470*	G	22408	A	ELMO2	A112V	G	545	A	
DEPDC1	L700F	T	2217	A	DNAH3	R2359Q	C	7076	T	DST	A1055T	C	3163	T	ELMO2	A241T	C	931	T	
DEPDC1	D133H	C	514	G	DNAH3	D2355N	C	7063	T	DST	R488H	C	1463	T	ELMO2	A385V	G	1364	A	
DEPDC1B	R34H	C	169	T	DNAH3	K3148N	T	9444	A	DST	S2221F	G	6662	A	ELMO2	Y48H	A	352	G	
DEPDC1B	A251T	C	819	T	DNAH3	Y3772C	T	11315	C	DST	S7537N	C	22610	T	ELMO3	G417S	G	1306	A	
DEPDC4	K143N	T	432	G	DNAH3	R513H	C	1538	T	DST	R7152M	C	21455	A	ELMO3	A431V	C	1349	T	
DEPDC5	R986C	C	3026	T	DNAH3	E1388*	C	4162	A	DST	D6301G	T	18902	C	ELMO3	R390H	G	1226	A	
DEPDC5	A602T	G	1874	A	DNAH3	G2436W	C	7306	A	DST	R7301W	G	21901	A	ELMO3	Y306C	A	974	G	
DEPDC5	S692A	T	2144	G	DNAH3	R308Q	C	923	T	DST	R1373Q	C	4118	T	ELMOD2	K96T	A	419	C	
DEPDC6	R54C	C	347	T	DNAH3	S706N	C	2117	T	DST	I5996V	T	17986	C	ELMOD3	R148C	C	1058	T	
DEPDC6	A364V	C	1278	T	DNAH3	N3982H	T	11944	G	DST	K670N	T	2010	A	ELMOD3	E106D	G	934	T	
DEPDC6	R163C	C	674	T	DNAH3	A3679T	C	11031	T	DST	E5770D	T	17310	G	ELOF1	A80V	G	303	A	

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DEPDC7	A305V	C	1006	T	DNAH3	K3593N	C	1077 9	A	DST	A4552V	G	13655	A	ELOVL1	R48H	C	261	T
DEPDC7	K31T	A	184	C	DNAH3	E981K	C	2941	T	DST	K4047T	T	12140	G	ELOVL1	I49T	A	264	G
DERA	V38M	G	244	A	DNAH3	E811K	C	2431	T	DST	M3962I	C	11886	A	ELOVL2	F39L	A	199	G
DERA	R287Q	G	992	A	DNAH3	N681T	T	2042	G	DST	E3807K	C	11419	T	ELOVL3	F107C	T	541	G
DERL1	R229*	G	971	A	DNAH5	E4463K	C	1349 2	T	DST	F3300L	A	9900	C	ELOVL3	F158L	T	695	G
DERL3	R18Q	C	72	T	DNAH5	R3743I	C	1133 3	A	DST	E3005*	C	9013	A	ELOVL4	E96G	T	588	C
ELOVL4	S294*	G	1182	T	FAM46C	R268C	C	1049	T	FREM3	R1698M	C	5093	A	GPM6A	G181*	C	587	A
ELOVL5	R324W	G	1311	A	FAM46D	R318K	G	1192	A	FREM3	F344V	A	1030	C	GPN1	F122C	T	386	G
ELOVL6	R192L	C	739	A	FAM47A	Q585R	T	1787	C	FREM3	V1593M	C	4777	T	GPN3	Q279*	G	891	A
ELSPBP1	F114L	C	520	A	FAM47A	R255C	G	796	A	FREM3	P815S	G	2443	A	GPR1	H146R	T	800	C
ELTD1	G104A	C	375	G	FAM47B	A612D	C	1853	A	FRMD1	A176T	C	591	T	GPR101	S331R	T	991	G
ELTD1	A542V	G	1689	A	FAM47B	E75K	G	241	A	FRMD3	E393*	C	1384	A	GPR101	R380C	G	1138	A
ELTD1	D423E	A	1333	C	FAM47B	A101V	C	320	T	FRMD3	-	A	0	G	GPR107	A45T	G	640	A
ELTD1	F201V	A	665	C	FAM47C	K1025I	A	3088	T	FRMD4A	R900Q	C	3068	T	GPR107	D563Y	G	2194	T
EMCN	K260N	C	959	A	FAM47C	S928Y	C	2797	A	FRMD4A	Y96*	G	657	T	GPR107	S148N	G	950	A
EMD	F241S	T	1010	C	FAM47C	Y1022D	T	3078	G	FRMD4A	A919V	G	3125	A	GPR109B	I64V	T	250	C
EME1	D447N	G	1412	A	FAM48A	Q807R	T	2604	C	FRMD4A	R851C	G	2920	A	GPR110	-	A	0	C
EME2	A306T	G	916	A	FAM48A	R506Q	C	1701	T	FRMD4A	N803S	T	2777	C	GPR111	R376I	G	1127	T
EMID1	A411V	C	1359	T	FAM48A	K399T	T	1380	G	FRMD4A	R480H	C	1808	T	GPR111	G455D	G	1364	A
EMID1	H336R	A	1134	G	FAM48A	Y409C	T	1410	C	FRMD4A	R851H	C	2921	T	GPR112	Y2775*	T	8616	A
EMID1	G305S	G	1040	A	FAM48A	S320T	A	1142	T	FRMD4A	I145M	A	804	C	GPR112	K352N	G	1347	T
EMID1	A391V	C	1299	T	FAM49A	R164C	G	711	A	FRMD4B	G267*	C	883	A	GPR112	K453N	G	1650	T
EMID2	T74M	C	434	T	FAM49A	R123G	T	588	C	FRMD4B	D757G	T	2354	C	GPR112	E807D	G	2712	T
EMID2	P174L	C	734	T	FAM49A	R140*	G	639	A	FRMD5	V364I	C	1267	T	GPR112	E908*	G	3013	T
EMID2	A231G	C	905	G	FAM49A	D64Y	C	411	A	FRMD6	R557C	C	1865	T	GPR112	I1667T	T	5291	C
EMILIN1	A140V	C	918	T	FAM50A	N44I	A	241	T	FRMD6	R404W	C	1406	T	GPR112	M1978T	T	6224	C
EMILIN1	V63M	G	686	A	FAM53A	R221H	C	860	T	FRMD8	R208Q	G	815	A	GPR112	S806Y	C	2708	A
EMILIN1	R596W	C	2285	T	FAM53A	G233D	C	896	T	FRMPD1	-	A	0	G	GPR113	A481V	G	1442	A
EMILIN1	R748H	G	2742	A	FAM53A	R387C	G	1357	A	FRMPD1	Y330C	A	1088	G	GPR113	A771V	G	2312	A
EMILIN1	F873C	T	3117	G	FAM53B	R154H	C	673	T	FRMPD1	N1143T	A	3527	C	GPR113	Q260K	G	778	T
EMILIN1	A136V	C	906	T	FAM54B	T116M	C	481	T	FRMPD1	E1279*	G	3934	T	GPR113	L297H	A	890	T
EMILIN2	R673M	G	2177	T	FAM55A	R452H	C	1355	T	FRMPD1	E1484K	G	4549	A	GPR113	A392V	G	1175	A
EMILIN2	R377I	G	1289	T	FAM55B	K62T	A	283	C	FRMPD2	L449M	G	1648	T	GPR113	V299I	C	895	T
EMILIN3	R692W	G	2267	A	FAM55C	R339C	C	1607	T	FRMPD2	C141R	A	724	G	GPR114	E26K	G	158	A
EMILIN3	L402M	G	1397	T	FAM55C	L358V	T	1664	G	FRMPD2	S647P	A	2242	G	GPR114	A121T	G	443	A
EML1	D365G	A	1163	G	FAM55D	Q380*	G	1319	A	FRMPD2	F535L	G	1908	T	GPR114	-	G	0	A

EML1	F416L	T	1317	G	FAM57B	A49T	C	491	T	FRMPD4	A945V	C	2834	T	GPR115	V501M	G	1501	A
EML1	R302W	C	973	T	FAM58A	L69P	A	309	G	FRMPD4	E1117K	G	3349	A	GPR115	E289D	G	867	T
EML2	E569G	T	1741	C	FAM58A	P15R	G	147	C	FRMPD4	A522V	C	1565	T	GPR116	F1095L	G	3514	T
EML3	A273T	C	815	T	FAM58A	S118N	C	456	T	FRRS1	R278Q	C	1435	T	GPR116	A723V	G	2397	A
EML3	R854P	C	2559	G	FAM59A	V343F	C	1031	A	FRS2	V473M	G	1927	A	GPR116	S1218R	G	3883	T
EML3	A107T	C	317	T	FAM59A	K656N	C	1972	A	FRS2	E128D	A	894	C	GPR116	V682L	C	2273	G
EML3	P238Q	G	711	T	FAM59A	G410R	C	1232	T	FRY	S539N	G	2112	A	GPR116	K491Q	T	1700	G
EML3	R185H	C	552	T	FAM59B	S767L	C	2300	T	FRY	T2194M	C	7077	T	GPR116	N411T	T	1461	G
EML3	K572N	C	1714	A	FAM59B	K986T	A	2957	C	FRY	R757C	C	2765	T	GPR12	A87T	C	481	T
EML4	D765G	A	2556	G	FAM5B	R67H	G	512	A	FRY	T2194M	C	7077	T	GPR120	I349L	A	1101	C
EML4	N90S	A	531	G	FAM5B	P771S	C	2623	T	FRY	P53L	C	654	T	GPR123	R355W	C	1063	T
EML4	N183T	A	810	C	FAM5B	L518P	T	1865	C	FRY	H1121Y	C	3857	T	GPR123	T706M	C	2117	T
EML5	R464I	C	1577	A	FAM5C	A298V	G	1125	A	FRY	R2484C	C	7946	T	GPR123	R163C	C	487	T
EML5	T1454I	G	4547	A	FAM5C	G162*	C	716	A	FRY	S1822T	G	5961	C	GPR123	A834T	G	2500	A
EML5	R292Q	C	1061	T	FAM5C	R530H	C	1821	T	FRY	G1176D	G	4023	A	GPR123	R427Q	G	1280	A
EML5	N364H	T	1276	G	FAM5C	R507*	G	1751	A	FRY	V2377I	G	7625	A	GPR123	Q174*	C	520	T
EML5	S1808P	A	5608	G	FAM5C	L97I	G	521	T	FRY	I279S	T	1332	G	GPR123	A878T	G	2632	A
EML5	A1606V	G	5003	A	FAM5C	R681W	G	2273	A	FRY	L604I	C	2306	A	GPR123	D1002Y	G	3004	T
EML5	H1080R	T	3425	C	FAM5C	R353H	C	1290	T	FRY	F799C	T	2892	G	GPR124	A1151G	C	3465	G
EML5	K1763T	T	5474	G	FAM5C	C441S	A	1553	T	FRY	G1378E	G	4629	A	GPR124	P708H	C	2136	A
EML5	R475I	C	1610	A	FAM63A	F363L	G	1089	T	FRY	K2017T	A	6546	C	GPR124	E707K	G	2132	A
EML5	K405N	T	1401	G	FAM65A	L810M	C	2428	A	FRY	S2350Y	C	7545	A	GPR125	R1170H	C	3779	T
EML6	R230H	G	1209	A	FAM65A	S196N	G	587	A	FRY	S2579Y	C	8232	A	GPR125	A906T	C	2986	T
EML6	K841T	A	3042	C	FAM65B	S559L	G	1852	A	FRY	R2830K	G	8985	A	GPR125	R692Q	C	2345	T
EML6	V1036A	T	3627	C	FAM65C	Q937H	C	3223	A	FRYL	A194T	C	580	T	GPR126	M1032T	T	3506	C
EML6	R1508H	G	5043	A	FAM65C	R102C	G	716	A	FRYL	L1407V	A	4219	C	GPR126	N345T	A	1445	C
EML6	D136V	A	927	T	FAM65C	R810W	G	2840	A	FRYL	Q1797*	G	5389	A	GPR126	I95M	T	696	G
EML6	K804N	A	2932	C	FAM69A	L156I	G	537	T	FRYL	A1185V	G	3554	A	GPR126	I774S	T	2732	G
EML6	K1082Q	A	3764	C	FAM69A	L204I	G	681	T	FRYL	R1341*	G	4021	A	GPR128	D392N	G	1442	A
EML6	R1377Q	G	4650	A	FAM69B	A238T	G	808	A	FRYL	R985*	G	2953	A	GPR128	A2S	G	272	T
EMP1	D59Y	G	422	T	FAM69B	R344C	C	1126	T	FRYL	S856N	C	2567	T	GPR128	V679A	T	2304	C
EMP2	A78T	C	442	T	FAM69C	R181W	G	550	A	FRYL	T2155A	T	6463	C	GPR132	P365T	G	1680	T
EMP3	V21M	G	315	A	FAM69C	F91L	G	282	T	FRYL	N1669S	T	5006	C	GPR132	R316C	G	1533	A
EMR1	T432M	C	1333	T	FAM69C	L187M	G	568	T	FRYL	G901V	C	2702	A	GPR132	C280F	C	1426	A
EMR1	E539V	A	1654	T	FAM69C	A152D	G	464	T	FSCB	T239S	T	1024	A	GPR132	A246T	C	1323	T
EMR1	A887T	G	2697	A	FAM69C	E81K	C	250	T	FSCB	V714I	C	2449	T	GPR133	D215N	G	1202	A
EMR1	G249D	G	784	A	FAM69C	I353L	T	1066	G	FSCN1	F187L	T	655	C	GPR133	S701R	A	2660	C
EMR1	T794M	C	2419	T	FAM69C	E319D	T	966	G	FSCN2	G53R	G	298	A	GPR137C	F348C	T	1043	G
EMR1	A887T	G	2697	A	FAM71A	A391V	C	1576	T	FSCN2	K32N	G	237	T	GPR139	R291W	G	1172	A

EMR2	R725Q	C	2630	T	FAM71A	R440H	G	1723	A	FSCN2	L65M	C	334	A	GPR141	Y127C	A	669	G
EMR2	A415S	C	1699	A	FAM71A	R30Q	G	493	A	FSCN3	A214S	G	859	T	GPR141	K121E	A	650	G
EMR2	K479N	C	1893	A	FAM71A	E36G	A	511	G	FSCN3	R285C	C	1072	T	GPR141	S37A	T	398	G
EMR3	R222H	C	813	T	FAM71A	R67H	G	604	A	FSCN3	A452V	C	1574	T	GPR143	A211T	C	719	T
EMR3	-	C	0	A	FAM71A	E265*	G	1197	T	FSCN3	T240M	C	938	T	GPR144	A145V	C	434	T
EMR3	Y306C	T	1065	C	FAM71B	K416E	T	1342	C	FSD1	S24N	G	147	A	GPR144	P772S	C	2314	T
EMR3	V617A	A	1998	G	FAM71B	A364V	G	1187	A	FSD1	R271H	G	888	A	GPR144	G743V	G	2228	T
EMR3	F595L	G	1933	T	FAM71B	A247V	G	836	A	FSD1	V395I	G	1259	A	GPR144	R176C	C	526	T
EMX1	S230I	G	1067	T	FAM71B	A375V	G	1220	A	FSD1L	N515S	A	1663	G	GPR144	R514H	G	1541	A
EMX2	R26C	C	899	T	FAM71B	T252M	G	851	A	FSD1L	N275H	A	942	C	GPR144	A404V	C	1211	T
EMX2	E195K	G	1406	A	FAM71B	M18T	A	149	G	FSHR	K608N	C	1944	A	GPR144	K715N	G	2145	T
EMX2	A160T	G	1301	A	FAM71B	G256W	C	862	A	FSIP1	K367Q	T	1317	G	GPR148	A131T	G	393	A
EN1	G363D	C	2104	T	FAM71B	I318N	A	1049	T	FSIP1	R376H	C	1345	T	GPR148	T262A	A	786	G
EN2	A325T	G	1222	A	FAM71C	M124V	A	792	G	FSIP2	R5471I	G	16412	T	GPR149	A491V	G	1572	A
ENAM	L27I	C	360	A	FAM71C	R75C	C	645	T	FSIP2	D5789Y	G	17365	T	GPR149	R310H	C	1029	T
ENAM	G1071R	G	3492	A	FAM71E1	R98C	G	650	A	FSIP2	D6423N	G	19267	A	GPR149	R542C	G	1724	A
ENAM	E55D	G	446	T	FAM71E1	V119I	C	713	T	FSIP2	-	G	0	A	GPR152	L290P	A	874	G
ENAM	A863S	G	2868	T	FAM71E2	I812L	T	2620	G	FST	G59D	G	559	A	GPR152	W111*	C	337	T
ENAM	R778*	A	2613	T	FAM73A	-	G	0	A	FST	R35L	G	487	T	GPR153	A222T	C	924	T
ENC1	Y245H	A	1864	G	FAM73A	Q396H	G	1220	T	FSTL3	A198V	C	628	T	GPR153	A50T	C	408	T
ENC1	E128G	T	1514	C	FAM73B	T214I	C	641	T	FSTL4	I794T	A	2631	G	GPR153	R73H	C	478	T
ENDOG	A130T	G	599	A	FAM73B	R398Q	G	1193	A	FSTL4	G14V	C	291	A	GPR155	-	C	0	A
ENDOU	-	A	0	G	FAM73B	E429*	G	1285	T	FSTL4	T768M	G	2553	A	GPR155	F244L	A	971	T
ENG	S167I	C	901	A	FAM73B	G370*	G	1108	T	FSTL5	R404C	G	1647	A	GPR156	S95N	C	730	T
ENGASE	R43P	G	136	C	FAM75A6	T645A	T	1962	C	FSTL5	D252Y	C	1191	A	GPR156	A412V	G	1681	A
ENGASE	P639S	C	1923	T	FAM75A6	K9Q	T	54	G	FSTL5	D252Y	C	1191	A	GPR156	D478Y	C	1878	A
ENO3	A234T	G	794	A	FAM78B	N81S	T	709	C	FSTL5	A537V	G	2047	A	GPR158	K856Q	A	2925	C
ENO3	K239N	G	811	T	FAM78B	E16D	C	515	A	FSTL5	G317D	C	1387	T	GPR158	L687P	T	2419	C
ENOPH1	A138V	C	681	T	FAM81B	M388I	G	1210	A	FSTL5	R404C	G	1647	A	GPR158	R236H	G	1066	A
ENOSF1	D274N	C	820	T	FAM81B	K345R	A	1080	G	FSTL5	E48D	T	581	G	GPR158	V346I	G	1395	A
ENOSF1	P361H	G	1082	T	FAM82A1	R130C	C	504	T	FTCD	V498M	C	1536	T	GPR158	T920A	A	3117	G
ENOSF1	T54M	G	161	A	FAM82A1	P180S	C	654	T	FTCD	D74N	C	264	T	GPR161	E334*	C	1314	A
ENOSF1	A97T	C	289	T	FAM82A2	R209K	C	1694	T	FTCD	C523Y	C	1612	T	GPR162	R115H	G	879	A
ENOSF1	E190K	C	568	T	FAM82B	N157K	A	631	C	FTCD	R381W	G	1185	A	GPR162	G5V	G	549	T
ENOX1	V580I	C	2316	T	FAM83A	R347Q	G	1385	A	FTCD	R382C	G	1188	A	GPR162	R217W	C	1184	T
ENOX1	P103L	G	886	A	FAM83A	R318C	C	1297	T	FTCD	R320W	G	1002	A	GPR17	S146N	G	511	A
ENOX1	R298C	G	1470	A	FAM83C	R578W	G	1850	A	FTCD	Y225H	A	717	G	GPR17	K331Q	A	1065	C
ENOX1	R315C	G	1521	A	FAM83C	L273F	G	935	A	FTHL17	V111I	C	431	T	GPR17	R301C	C	975	T
ENOX1	R298H	C	1471	T	FAM83D	S263L	C	829	T	FTMT	D104E	T	321	G	GPR171	A38V	G	344	A

ENOX1	E397K	C	1767	T	FAM83E	E245K	C	798	T	FTMT	R69H	G	215	A	GPR171	F104L	G	543	T
ENOX2	A222V	G	687	A	FAM83E	R440H	C	1384	T	FTSJ1	C312Y	G	1258	A	GPR172A	V160M	G	807	A
ENPEP	D221N	G	1003	A	FAM83F	R349W	C	1139	T	FTSJ2	R53W	G	186	A	GPR172A	P184Q	C	880	A
ENPEP	A262V	C	1127	T	FAM83H	D624N	C	2335	T	FTSJ2	F117C	A	379	C	GPR172A	P403L	C	1537	T
ENPEP	I403S	T	1550	G	FAM83H	Q799R	T	2861	C	FTSJ3	M420T	A	1905	G	GPR172A	S137R	C	740	A
ENPEP	D849Y	G	2887	T	FAM83H	A366V	G	1562	A	FTSJ3	A377V	G	1776	A	GPR172B	R310C	G	1601	A
ENPP1	R821C	C	2481	T	FAM84A	T200I	C	599	T	FTSJD1	K592T	T	2112	G	GPR173	L105F	C	571	T
ENPP1	F708L	T	2142	C	FAM86A	R299W	G	964	A	FTSJD1	Y543H	A	1964	G	GPR176	E360*	C	1944	A
ENPP1	R476Q	G	1447	A	FAM86A	Y131C	T	461	C	FTSJD2	F401L	C	1367	A	GPR179	A379V	G	1157	A
ENPP2	S302L	G	991	A	FAM86A	Q235*	G	772	A	FUBP1	R451C	G	1440	A	GPR179	E2231*	C	6712	A
ENPP3	Y201H	T	929	C	FAM86B2	V84A	A	251	G	FUBP1	R365*	G	1182	A	GPR179	R478Q	C	1454	T
ENPP3	F270L	T	1136	C	FAM86C	C154G	T	460	G	FUBP1	P517L	G	1639	A	GPR179	Q1533*	G	4618	A
ENPP5	K361N	C	1344	A	FAM8A1	F317L	C	1006	A	FUBP1	Q179P	T	625	G	GPR179	K1685R	T	5075	C
ENPP5	P274Q	G	1082	T	FAM90A1	P71L	G	212	A	FUBP1	R451C	G	1440	A	GPR179	R752H	C	2276	T
ENPP5	S3L	G	269	A	FAM90A1	E172K	C	514	T	FUK	R243Q	G	786	A	GPR179	E2266*	C	6817	A
ENPP6	E52D	C	298	A	FAM90A1	T350K	G	1049	T	FUK	Y18H	T	110	C	GPR179	S841L	G	2543	A
ENSA	M77I	C	327	A	FAM90A1	P71S	G	211	A	FUNDC2	V130G	T	643	G	GPR18	T279M	G	1337	A
ENSA	Q3H	C	105	A	FAM90A1	E127D	C	381	A	FUNDC2	K68T	A	457	C	GPR19	V141L	C	776	A
ENTHD1	K87N	C	512	A	FAM90A20	P228L	C	683	T	FURIN	A369T	G	1384	A	GPR19	D387Y	C	1514	A
ENTPD1	S381P	T	1319	C	FAM91A1	A379T	G	1381	A	FURIN	A489V	C	1745	T	GPR19	D191Y	C	926	A
ENTPD1	E90*	G	446	T	FAM91A1	V514I	G	1786	A	FURIN	G586D	G	2036	A	GPR20	R238W	G	801	A
ENTPD1	F260C	T	957	G	FAM92A1	E191K	G	674	A	FURIN	Y571H	T	1990	C	GPR20	P2S	G	93	A
ENTPD1	I284L	A	1028	C	FAM92A2	K185N	G	555	T	FURIN	T262P	A	1063	C	GPR22	S106*	C	1660	A
ENTPD3	L408R	T	1341	G	FAM92A2	F291V	T	871	G	FUS	P431L	C	1383	T	GPR26	A288T	G	915	A
ENTPD3	V358G	T	1191	G	FAM92B	T39M	G	272	A	FUT1	H117Y	G	1324	A	GPR26	E165K	G	546	A
ENTPD3	K119N	A	475	C	FAM98A	P69L	G	260	A	FUT1	R212H	C	1610	T	GPR27	L296I	C	886	A
ENTPD3	K270N	G	928	T	FAM98A	S284N	C	905	T	FUT1	W313C	C	1914	A	GPR27	R268H	G	803	A
ENTPD3	E451*	G	1469	T	FAM9A	A24V	G	182	A	FUT11	A111S	G	374	T	GPR3	A5V	C	113	T
ENTPD8	T39I	G	300	A	FAM9A	R286K	C	968	T	FUT11	D287G	A	903	G	GPR31	T267M	G	1298	A
ENTPD8	A351T	C	1235	T	FAM9B	R13H	C	227	T	FUT2	T299M	C	1017	T	GPR31	A71T	C	709	T
ENTPD8	V488I	C	1646	T	FAM9C	S118Y	G	563	T	FUT2	V4I	G	131	A	GPR32	S330A	T	1125	G
ENTPD8	A203V	G	792	A	FANCA	R1186M	C	3599	A	FUT6	P6L	G	17	A	GPR35	A317V	C	950	T
EOMES	P472S	G	1432	A	FANCA	L908P	A	2765	G	FUT7	P152H	G	1474	T	GPR35	C168Y	G	503	A
EOMES	G596S	C	1804	T	FANCA	P808S	G	2464	A	FUT7	R323H	C	1987	T	GPR35	P263S	C	787	T
EP300	Q974R	A	4140	G	FANCC	R548*	G	1897	A	FUT7	V199M	C	1614	T	GPR37	A31D	G	743	T
EP300	P551S	C	2870	T	FANCC	-	C	0	A	FUT8	R559*	C	3402	T	GPR37	T458A	T	2023	C
EP300	W1466L	G	5616	T	FANCD2	K864N	G	2685	T	FUT9	S296G	A	1212	G	GPR37	E371K	C	1762	T
EP300	Q2215H	A	7864	C	FANCD2	E1011*	G	3124	T	FUT9	F53L	C	485	A	GPR37L1	I242T	T	831	C
EP300	P1986A	C	7175	G	FANCD2	F421L	C	1356	A	FUZ	I79V	T	399	C	GPR39	R398C	C	1661	T

EP300	Q1862P	A	6804	C	FANCD2	I1125V	A	3466	G	FXR1	R505W	C	1897	T	GPR39	V73M	G	686	A
EP300	A1936V	C	7026	T	FANCD2	R1273*	C	3910	T	FXR1	R315*	C	1327	T	GPR4	R14H	C	986	T
EP300	R397Q	G	2409	A	FANCG	L355I	G	1555	T	FXR1	A515V	C	1928	T	GPR4	R14C	G	985	A
EP300	R604Q	G	3030	A	FANCG	A360T	C	1570	T	FXR1	G582D	G	2129	A	GPR4	G94W	C	1225	A
EP300	C1183Y	G	4767	A	FANCI	M363I	G	1179	T	FXR1	E410D	A	1614	C	GPR44	R239Q	C	828	T
EP300	Q2298*	C	8111	T	FANCI	A9T	G	115	A	FXYD2	Q47*	G	205	A	GPR52	W192*	G	614	A
EP400	A2523T	G	7676	A	FANCI	V509A	T	1616	C	FXYD3	G109C	G	472	T	GPR52	V123A	T	406	C
EP400	A2523T	G	7676	A	FANCI	L421F	C	1351	T	FYB	K125N	C	498	A	GPR52	K182N	A	584	C
EP400	T576M	C	1836	T	FANCI	S1211Y	C	3722	A	FYB	K45N	C	258	A	GPR55	R296H	C	1080	T
EP400	V1193I	G	3686	A	FANCI	C650S	T	2038	A	FYB	K741T	T	2345	G	GPR56	L426I	C	1607	A
EP400	R1786C	C	5465	T	FANCL	-	T	0	C	FYB	E475K	C	1546	T	GPR56	V369I	G	1436	A
EP400	T556M	C	1776	T	FANCM	R1570C	C	4807	T	FYCO1	A967V	G	3106	A	GPR6	P116L	C	347	T
EP400	R2320H	G	7068	A	FANCM	S1829C	C	5585	G	FYCO1	K1154T	T	3667	G	GPR6	V315M	G	943	A
EP400	R1786C	C	5465	T	FANCM	K636N	A	2007	C	FYCO1	R442W	G	1530	A	GPR6	A106V	C	317	T
EP400	P2076L	C	6336	T	FANCM	K932T	A	2894	C	FYCO1	E411K	C	1437	T	GPR6	E350D	G	1050	T
EP400	P2855L	C	8673	T	FANCM	S1874G	A	5719	G	FYN	R77C	G	836	A	GPR61	S41P	T	804	C
EP400	A2655V	C	8073	T	FANCM	Q564K	C	1789	A	FYN	F109L	A	934	C	GPR63	R405C	G	1691	A
EP400	D951N	G	2960	A	FANK1	M1L	A	105	T	FYTTD1	R42Q	G	347	A	GPR63	M385T	A	1632	G
EP400	S1431C	C	4401	G	FANK1	A227T	G	679	A	FYTTD1	I297V	A	1111	G	GPR64	N194D	T	744	C
EPAS1	A506T	G	2026	A	FAP	Y729H	A	2393	G	FZD1	Q117H	G	764	T	GPR68	Q344H	C	1297	G
EPAS1	D258N	G	1282	A	FAR1	R160H	G	634	A	FZD1	R391C	C	1584	T	GPR68	G100S	C	563	T
EPAS1	A698T	G	2602	A	FAR1	K221Q	A	816	C	FZD1	M520T	T	1972	C	GPR75	N310I	T	1200	A
EPAS1	G633D	G	2408	A	FAR2	R459C	C	1643	T	FZD1	T503M	C	1921	T	GPR75	P256S	G	1037	A
EPB41	-	G	0	A	FAR2	-	G	0	A	FZD1	A430V	C	1702	T	GPR75	T297A	T	1160	C
EPB41L1	-	G	0	T	FAR2	R386I	G	1425	T	FZD10	A92T	G	730	A	GPR78	V43I	G	544	A
EPB41L1	R892C	C	4123	T	FAR2	E407D	A	1489	C	FZD10	R424Q	G	1727	A	GPR78	R227C	C	1096	T
EPB41L1	A921T	G	4210	A	FARP1	A541V	C	1887	T	FZD10	A205T	G	1069	A	GPR78	R168H	G	920	A
EPB41L2	R663H	C	2060	T	FARP1	R711G	A	2396	G	FZD10	R261H	G	1238	A	GPR78	R71W	C	628	T
EPB41L2	L202R	A	677	C	FARP1	S383L	C	1413	T	FZD10	C309R	T	1381	C	GPR78	R342C	C	1441	T
EPB41L2	G681W	C	2113	A	FARP2	R872C	C	2784	T	FZD2	V379M	G	1267	A	GPR78	R236H	G	1124	A
EPB41L2	E708*	C	2194	A	FARP2	F756L	C	2438	A	FZD2	C100R	T	430	C	GPR78	P341L	C	1439	T
EPB41L2	E360G	T	1151	C	FARS2	A225V	C	1005	T	FZD2	V464I	G	1522	A	GPR81	V237M	C	1213	T
EPB41L3	V1002M	C	3345	T	FARSA	R392W	G	1222	A	FZD2	R442H	G	1457	A	GPR83	V378F	C	1304	A
EPB41L3	E777K	C	2670	T	FARSA	R298W	G	940	A	FZD3	K502N	G	1984	T	GPR85	A192V	G	1179	A
EPB41L3	R546K	C	1978	T	FARSA	G470D	C	1457	T	FZD3	R420Q	G	1737	A	GPR87	V47M	C	604	T
EPB41L3	T278A	T	1173	C	FARSB	K483Q	T	1711	G	FZD6	R416Q	G	1523	A	GPR87	K290*	T	1333	A
EPB41L3	-	C	0	T	FASN	R1662H	C	5102	T	FZD7	A390T	G	1229	A	GPR88	R31H	G	531	A
EPB41L3	D64A	T	532	G	FASN	A2323V	G	7085	A	FZD7	S95Y	C	345	A	GPR88	R60*	C	617	T
EPB41L4A	R595Q	C	2061	T	FASN	W1511C	C	4650	A	FZD7	S378L	C	1194	T	GPR97	-	T	0	C

EPB41L4A	R430H	C	1566	T	FASN	V1973M	C	6034	T	FZD8	A455V	G	1369	A	GPR97	A337S	G	1112	T
EPB41L4A	R246Q	C	1014	T	FASTK	H222N	G	742	T	FZD9	A285V	C	1083	T	GPR97	R139Q	G	519	A
EPB41L4A	T68M	G	480	A	FASTK	R543C	G	1705	A	FZD9	A212T	G	863	A	GPR97	-	G	0	A
EPB41L4A	R316C	G	1223	A	FASTKD2	A238T	G	1060	A	FZD9	E127D	G	610	T	GPR98	S2200Y	C	6695	A
EPB41L4A	R442Q	C	1602	T	FASTKD2	S36*	C	455	A	FZD9	W537R	T	1838	C	GPR98	A5484T	G	1654 6	A
EPB41L4A	N401H	T	1478	G	FASTKD3	R406C	G	1353	A	FZD9	T393P	A	1406	C	GPR98	V1312M	G	4030	A
EPB41L4A	R479H	C	1713	T	FAT1	E4457K	C	1355 7	T	FZR1	R313Q	G	972	A	GPR98	R5246*	C	1583 2	T
EPB41L4B	E329K	C	1503	T	FAT1	E2924K	C	8958	T	FZR1	R477H	G	1464	A	GPR98	K4079N	G	1233 3	T
EPB41L5	T158A	A	686	G	FAT1	E1420*	C	4446	A	G2E3	S701F	C	2221	T	GPR98	G4416A	G	1334 3	C
EPB41L5	R378*	C	1346	T	FAT1	P509L	G	1714	A	G2E3	R161Q	G	601	A	GPR98	A6224V	C	1876 7	T
EPB41L5	C154Y	G	675	A	FAT1	A173T	C	705	T	G2E3	R382*	C	1263	T	GPR98	E664*	G	2086	T
EPB41L5	F257V	T	983	G	FAT1	P1351L	G	4240	A	G2E3	S438Y	C	1432	A	GPR98	-	T	0	C
EPB42	T564M	G	2149	A	FAT1	L3065S	A	9382	G	G2E3	F599V	T	1914	G	GPR98	A1047E	C	3236	A
EPB49	R23H	G	523	A	FAT1	P4455L	G	1355 2	A	G2E3	L633F	C	2016	T	GPR98	P2313L	C	7034	T
EPC1	R199*	G	865	A	FAT1	-	C	0	A	G3BP1	D338V	A	1158	T	GPR98	G2898V	G	8789	T
EPC1	C185G	A	823	C	FAT1	V2957I	C	9057	T	G3BP1	V126I	G	521	A	GPR98	R1740W	A	5314	T
EPC1	F94C	A	551	C	FAT1	R2600*	G	7986	A	G3BP1	S388F	C	1308	T	GPR98	L1742F	G	5322	T
EPC2	H732R	A	2229	G	FAT1	S2313F	G	7126	A	G3BP2	E315K	C	1729	T	GPR98	D2039H	G	6211	C
EPC2	R332C	C	1028	T	FAT1	E833A	T	2686	G	G3BP2	E187D	C	1347	G	GPR98	I639M	T	2013	G
EPHA1	V103M	C	394	T	FAT1	S458N	C	1561	T	G3BP2	E152D	T	1242	G	GPR98	I977V	A	3025	G
EPHA1	R929C	G	2872	A	FAT2	L3809I	G	1143 8	T	G6PC	K60T	A	258	C	GPR98	F1292L	C	3972	A
EPHA1	R844W	G	2617	A	FAT2	R3465Q	C	1040 7	T	G6PC	K207R	A	699	G	GPR98	A1602V	C	4901	T
EPHA1	C944R	A	2917	G	FAT2	T1361M	G	4095	A	G6PC	K354N	G	1141	T	GPR98	S1796Y	C	5483	A
EPHA1	Y493C	T	1565	C	FAT2	H3853Y	G	1157 0	A	G6PC2	F28C	T	175	G	GPR98	S2200Y	C	6695	A
EPHA1	R844Q	C	2618	T	FAT2	R214*	G	653	A	G6PC3	A156V	C	683	T	GPR98	L2492R	T	7571	G
EPHA1	R351H	C	1139	T	FAT2	R4304Q	C	1292 4	T	G6PD	V387I	C	1212	T	GPR98	L3032I	C	9190	A
EPHA10	V317M	C	1035	T	FAT2	Y492D	A	1487	C	G6PD	Q289H	C	920	A	GPR98	A3782V	C	1144 1	T
EPHA10	G238E	C	799	T	FAT2	V3004I	C	9023	T	GAA	E762K	G	2651	A	GPR98	L4323I	C	1306 3	A
EPHA10	A225V	G	760	A	FAT3	V301A	T	919	C	GAA	E748D	G	2611	T	GPR98	S5821Y	C	1755 8	A
EPHA10	R11H	C	118	T	FAT3	S3505L	C	1053 1	T	GAA	A452V	C	1722	T	GPR98	F6181C	T	1863 8	G

EPHA2	V383M	C	1302	T	FAT3	T2527I	C	7597	T	GAA	G461S	G	1748	A	GPR98	I3519R	T	10652	G
EPHA2	P63L	G	343	A	FAT3	R4213C	C	12654	T	GAB1	P127S	C	806	T	GPRASP1	A1012T	G	3744	A
EPHA3	S91P	T	496	C	FAT3	S3200L	C	9616	T	GAB1	-	G	0	A	GPRASP1	R1222C	C	4374	T
EPHA3	A427V	C	1505	T	FAT3	E3493D	G	10496	T	GAB1	T157N	C	897	A	GPRASP2	V738I	G	2832	A
EPHA3	T102S	A	529	T	FAT3	V1661I	G	4998	A	GAB1	D86Y	G	683	T	GPRC5A	R238C	C	1362	T
EPHA3	A748T	G	2467	A	FAT3	R4233H	G	12715	A	GAB2	R100C	G	323	A	GPRC5A	S110F	C	979	T
EPHA4	A193T	C	619	T	FAT3	V62I	G	201	A	GAB3	R322C	G	1012	A	GPRC5B	A31T	C	283	T
EPHA4	A458T	C	1414	T	FAT3	L621F	C	1878	T	GAB3	L552F	G	1702	A	GPRC5B	P82L	G	437	A
EPHA4	P694A	G	2122	C	FAT3	E1522K	G	4581	A	GAB4	N444D	T	1438	C	GPRC5B	P367S	G	1291	A
EPHA4	R311Q	C	974	T	FAT3	E1137*	G	3426	T	GAB4	E483A	T	1556	G	GPRC5B	G280S	C	1030	T
EPHA4	P112L	G	377	A	FAT3	A3964V	C	11908	T	GAB4	V382F	C	1252	A	GPRC5B	A194T	C	772	T
EPHA4	C73F	C	260	A	FAT3	T4190M	C	12586	T	GABBR2	A46T	C	596	T	GPRC5C	G43*	G	638	T
EPHA5	I808L	T	3023	G	FAT3	A991V	C	2989	T	GABBR2	F760L	G	2740	T	GPRC5D	V252G	A	755	C
EPHA5	R541*	G	2222	A	FAT3	S1404N	G	4228	A	GABBR2	R304Q	C	1371	T	GPRC6A	A687T	C	2059	T
EPHA6	H686N	C	2094	A	FAT3	G3374R	G	10137	A	GABBR2	V138I	C	872	T	GPRC6A	T881I	G	2642	A
EPHA6	R182H	G	583	A	FAT3	D928Y	G	2799	T	GABBR2	R174W	G	980	A	GPRC6A	Y494C	T	1481	C
EPHA6	A614V	C	1879	T	FAT3	S1461Y	C	4399	A	GABPB2	A84V	C	582	T	GPRIN1	R386C	G	1334	A
EPHA6	A153V	C	496	T	FAT3	K2320R	A	6976	G	GABRA1	F253C	T	1226	G	GPRIN1	R995C	G	3161	A
EPHA6	V845M	G	2571	A	FAT3	A3704V	C	11128	T	GABRA1	E396*	G	1654	T	GPRIN2	A359V	C	1349	T
EPHA6	A9V	C	64	T	FAT3	T51S	A	168	T	GABRA2	Y237C	T	717	C	GPRIN2	S122P	T	637	C
EPHA7	M572T	A	1900	G	FAT3	G427C	G	12966	T	GABRA2	D441E	A	1330	C	GPRIN3	N45D	T	652	C
EPHA7	Q987H	T	3146	G	FAT3	P1649L	C	4963	T	GABRA4	E283*	C	1830	A	GPS1	S16Y	C	77	A
EPHA7	E460K	C	1563	T	FAT4	R511C	C	15442	T	GABRA4	N47H	T	1122	G	GPS2	S214L	G	1156	A
EPHA7	L195S	A	769	G	FAT4	A2421T	G	72744	A	GABRA5	K190N	A	910	C	GPSM1	F551L	C	1873	A
EPHA7	T122A	T	549	C	FAT4	K945N	G	28484	T	GABRA5	N43S	A	468	G	GPSM2	Y65H	T	966	C
EPHA8	A665S	G	2065	T	FAT4	R2329C	C	69984	T	GABRA5	Q224H	G	1012	T	GPSM2	R400H	G	1972	A
EPHA8	G156C	G	538	T	FAT4	V1430I	G	43014	A	GABRA6	E320K	G	1233	A	GPT	R252H	G	978	A
EPHA8	R522H	G	1637	A	FAT4	D1883N	G	56604	A	GABRA6	V32I	G	369	A	GPT2	R206Q	G	729	A
EPHA8	S770R	A	2380	C	FAT4	Q47R	A	153	G	GABRB1	A363T	G	1379	A	GPX2	G28C	C	84	A
EPHA8	R946Q	G	2909	A	FAT4	A3113V	C	93514	T	GABRB1	R405H	G	1506	A	GPX4	R39C	C	192	T
EPHA8	R992W	C	3046	T	FAT4	R1806H	G	54304	A	GABRB1	P54S	C	452	T	GPX4	A140T	G	495	A
EPHA8	A306V	C	989	T	FAT4	V134I	G	413	A	GABRB1	R416C	C	1538	T	GPX8	L34I	C	175	A
EPHA8	V418M	G	1324	A	FAT4	R3615W	C	10856	T	GABRB1	T258A	A	1064	G	GRAMD1A	R686W	C	20566	T

EPHB1	D706N	G	2486	A	FAT4	S4685R	C	14068	G	GABRB2	T106P	T	316	G	GRAMD1A	R139H	G	416	A
EPHB1	E873D	G	2989	T	FAT4	A132T	G	407	A	GABRB2	R387W	G	1159	A	GRAMD1A	S301R	C	903	A
EPHB1	Y471F	A	1782	T	FAT4	L540M	C	1631	A	GABRB3	A5V	G	94	A	GRAMD1A	A640T	G	1918	A
EPHB1	G33D	G	468	A	FAT4	G947D	G	2853	A	GABRB3	S356N	C	1147	T	GRAMD1A	G368S	G	1102	A
EPHB1	Q839H	G	2887	T	FAT4	L2423S	T	7281	C	GABRB3	R353H	C	1138	T	GRAMD1B	R612W	C	2163	T
EPHB1	K643N	G	2299	C	FAT4	F2513I	T	7550	A	GABRB3	K127N	T	461	G	GRAMD1B	G70S	G	537	A
EPHB2	R164Q	G	509	A	FAT4	T3352N	C	10068	A	GABRD	-	T	0	C	GRAMD1B	P57L	C	499	T
EPHB2	R306H	G	935	A	FAT4	A4031V	C	12105	T	GABRD	A263V	C	871	T	GRAMD1B	P18S	C	381	T
EPHB2	G501S	G	1519	A	FAT4	A132T	G	407	A	GABRD	V127M	G	462	A	GRAMD1B	M202I	G	935	T
EPHB2	R610W	C	1846	T	FAT4	W906*	G	2731	A	GABRE	L6F	G	70	A	GRAMD2	M325V	T	997	C
EPHB2	R1033W	C	3115	T	FAT4	G2170V	G	6522	T	GABRE	I234T	A	755	G	GRAMD2	E63*	C	211	A
EPHB2	S218L	C	671	T	FAT4	L419P	T	1269	C	GABRG1	S16I	C	215	A	GRAMD3	K177N	G	731	T
EPHB3	Q997R	A	3442	G	FAT4	E4032K	G	12107	A	GABRG2	D461G	A	1740	G	GRAMD3	K141E	A	621	G
EPHB3	A683T	G	2499	A	FAT4	V4258I	G	12785	A	GABRG3	R309C	C	925	T	GRAMD4	P545S	C	1846	T
EPHB3	E85G	A	706	G	FAT4	E1642*	G	4937	T	GABRG3	S360P	T	1078	C	GRAMD4	R476Q	G	1640	A
EPHB3	T94M	C	733	T	FAT4	R1685Q	G	5067	A	GABRG3	A330V	C	989	T	GRAP	S115L	G	544	A
EPHB3	M752I	G	2708	A	FAT4	R2203W	C	6620	T	GABRG3	L55P	T	164	C	GRB10	R315Q	C	975	T
EPHB4	R866H	C	3066	T	FAT4	D2664N	G	8003	A	GABRG3	C419F	G	1256	T	GRB10	A166T	C	527	T
EPHB4	R535W	G	2072	A	FAT4	D3012Y	G	9047	T	GABRG3	E26*	G	76	T	GRB10	Y354H	A	1091	G
EPHB4	R165C	G	962	A	FAT4	L3123V	T	9380	G	GABRP	D415G	A	1442	G	GRB10	F261V	A	812	C
EPHB4	R535W	G	2072	A	FAT4	E3293*	G	9890	T	GABRQ	G569V	G	1726	T	GRB14	R260K	C	1318	T
EPHB4	R866H	C	3066	T	FAT4	A1693T	G	5090	A	GABRR2	M401V	T	1260	C	GRB7	R339Q	G	1016	A
EPHB4	S726L	G	2646	A	FATE1	-	G	0	T	GABRR3	S183L	G	1232	A	GRB7	A160V	C	479	T
EPHB6	L814F	C	3227	T	FAU	R115H	C	451	T	GABRR3	F41L	G	807	T	GRB7	R461H	G	1382	A
EPHB6	V491I	G	2258	A	FBF1	H1028Y	G	3356	A	GABRR3	F33V	A	781	C	GREB1	R1758W	C	5572	T
EPHB6	R133C	C	1184	T	FBF1	P257L	G	1044	A	GAD1	A277V	C	1380	T	GREB1	R1254C	C	4060	T
EPHB6	Q86H	G	1045	T	FBF1	A833T	C	2771	T	GAD1	G506D	G	2067	A	GREB1	A135T	G	703	A
EPHB6	R106*	C	1103	T	FBF1	A1012V	G	3309	A	GAD2	R27*	C	582	T	GREB1	S1427L	C	4580	T
EPHX1	A205T	G	693	A	FBF1	R997C	G	3263	A	GADD45A	G39R	G	549	C	GREB1	V1211I	G	3931	A
EPHX1	G225W	G	753	T	FBF1	A313T	C	1211	T	GADD45A	Q79R	A	670	G	GREB1	A1808V	C	5723	T
EPHX3	R52Q	C	364	T	FBF1	K1123N	C	3643	A	GADD45B	D128N	G	604	A	GREB1	P347S	C	1339	T
EPHX4	A308T	G	1020	A	FBL	A228T	C	796	T	GADD45G	P153T	C	566	A	GREB1	P1417T	C	4549	A
EPHX4	Y120*	T	458	G	FBLN1	R615W	C	1946	T	GADL1	R7C	G	170	A	GREB1	R1697W	C	5389	T
EPM2AIP1	R56C	G	393	A	FBLN1	G287R	G	962	A	GAK	A404T	C	1321	T	GREB1	Y568C	A	2003	G
EPM2AIP1	E393*	C	1404	A	FBLN2	R1097H	G	3409	A	GAK	A476S	C	1537	A	GREB1	R1049Q	G	3446	A
EPN1	R174Q	G	1068	A	FBLN2	G234D	G	820	A	GAK	T761A	T	2392	C	GREB1	-	G	0	T

EPN1	T580M	C	2286	T	FBLN2	S551P	T	1770	C	GAL	F96C	T	505	G	GREB1L	S257L	C	1041	T
EPN2	A428T	G	1711	A	FBLN5	E488*	C	1767	A	GAL	N84H	A	468	C	GREB1L	G444S	G	1601	A
EPN2	A102T	G	733	A	FBLN7	T407M	C	1491	T	GAL3ST1	Q366*	G	1414	A	GREB1L	P1383T	C	4418	A
EPN3	P412H	C	1423	A	FBLN7	V2A	T	276	C	GAL3ST1	R317C	G	1267	A	GREB1L	R1889C	C	5936	T
EPN3	L188M	C	750	A	FBLN7	E102K	G	575	A	GAL3ST2	V103M	G	438	A	GREB1L	L1182M	C	3815	A
EPOR	E197D	C	727	A	FBN1	K2839N	C	8845	A	GAL3ST2	G326S	G	1107	A	GREB1L	D1619Y	G	5126	T
EPRS	G1108D	C	3593	T	FBN1	R464C	G	1718	A	GAL3ST2	A189T	G	696	A	GRHL1	R434*	C	1441	T
EPRS	Y690H	A	2338	G	FBN1	A1152V	G	3783	A	GAL3ST2	A164T	G	621	A	GRHL1	Y356H	T	1207	C
EPRS	-	C	0	A	FBN1	T791A	T	2699	C	GAL3ST2	G326S	G	1107	A	GRHL1	A47V	C	281	T
EPRS	G465W	C	1663	A	FBN1	A252D	G	1083	T	GAL3ST2	R211C	C	762	T	GRHL1	R188W	C	703	T
EPS15L1	E809D	C	2452	A	FBN1	E2253*	C	7085	A	GAL3ST2	L140P	T	550	C	GRHL1	R301*	C	1042	T
EPS15L1	A596V	G	1812	A	FBN1	R974H	C	3249	T	GAL3ST3	A186V	G	839	A	GRHL1	R434Q	G	1442	A
EPS8	R571Q	C	2149	T	FBN1	D2411N	C	7559	T	GAL3ST3	R252W	G	1036	A	GRHL1	R536*	C	1747	T
EPS8	R571*	G	2148	A	FBN1	R2051K	C	6480	T	GAL3ST3	V116M	C	628	T	GRHL2	-	T	0	C
EPS8	L149I	G	882	T	FBN1	R1840C	G	5846	A	GAL3ST3	A295S	C	1165	A	GRHL2	E137K	G	747	A
EPS8L1	P410L	C	1333	T	FBN1	Q1751K	G	5579	T	GAL3ST3	E410K	C	1510	T	GRHL2	R537Q	G	1948	A
EPS8L1	G405R	G	1317	A	FBN1	E2193K	C	6905	T	GAL3ST3	S16I	C	329	A	GRHL3	A529V	C	1713	T
EPS8L2	P244S	C	977	T	FBN1	D1197G	T	3918	C	GAL3ST4	K76T	T	416	G	GRHL3	V261I	G	908	A
EPS8L3	R229W	G	915	A	FBN1	F13L	A	367	C	GALC	D49E	G	362	T	GRHL3	F550L	T	1775	C
EPS8L3	P187L	G	790	A	FBN2	P830Q	G	2928	T	GALC	R127Q	C	595	T	GRHPR	-	A	0	G
EPS8L3	A547V	G	1870	A	FBN2	R1068W	G	3641	A	GALK1	R117W	G	349	A	GRHPR	K233T	A	783	C
EPS8L3	A494V	G	1711	A	FBN2	C1621F	C	5301	A	GALK2	P89L	C	364	T	GRHPR	V239G	T	801	G
EPSTI1	E244*	C	795	A	FBN2	A246V	G	1176	A	GALK2	E298D	G	992	T	GRIA1	R455H	G	1507	A
EPSTI1	E92D	C	341	A	FBN2	C980W	G	3379	C	GALNT1	R134Q	G	504	A	GRIA1	-	A	2864	C
EPYC	E258G	T	866	C	FBN2	R2094W	G	6719	A	GALNT10	A421T	G	1398	A	GRIA1	R126L	G	520	T
ERAL1	K320N	G	993	T	FBN2	E908G	T	3162	C	GALNT10	V559A	T	1813	C	GRIA1	G871C	G	2754	T
ERAP1	Y145H	A	691	G	FBN2	N1218S	T	4092	C	GALNT11	E412V	A	1465	T	GRIA1	S645F	C	2077	T
ERAP2	R205C	C	1324	T	FBN2	Q2564*	G	8129	A	GALNT11	R126H	G	607	A	GRIA2	G520R	G	2017	A
ERAP2	D641V	A	2633	T	FBN2	G2442*	C	7763	A	GALNT14	Q40*	G	179	A	GRIA2	L269F	G	1266	T
ERAS	S181L	C	793	T	FBN2	N732D	T	2633	C	GALNT14	D114G	T	402	C	GRIA2	S613L	C	2297	T
ERBB2	G1056S	G	3404	A	FBN2	G666*	C	2435	A	GALNT14	Q433H	C	1360	A	GRIA3	A14V	C	333	T
ERBB2	L755M	T	2501	A	FBN3	L37S	A	396	G	GALNT2	R194*	C	652	T	GRIA3	D416Y	G	1538	T
ERBB2IP	E303K	G	998	A	FBN3	T2628M	G	8169	A	GALNT2	F316L	C	1020	A	GRIA3	R692*	A	2366	T
ERBB2IP	N156I	A	558	T	FBN3	W2332C	C	7282	A	GALNT2	S560L	C	1751	T	GRIA4	T875M	C	3070	T
ERBB2IP	K356T	A	1158	C	FBN3	P2662L	G	8271	A	GALNT3	Y497C	T	2266	C	GRIA4	V780I	G	2784	A
ERBB2IP	D400E	T	1291	G	FBN3	G2434D	C	7587	T	GALNT3	M408I	C	2000	T	GRIA4	S598N	G	2239	A
ERBB3	P262S	C	977	T	FBN3	A623V	G	2154	A	GALNT3	G428D	C	2059	T	GRIA4	E488*	G	1908	T
ERBB3	S846I	G	2730	T	FBN3	M862T	A	2871	G	GALNT5	R747W	C	2724	T	GRIA4	A854T	G	3006	A
ERBB3	G284R	G	1043	A	FBN3	V1559D	A	4962	T	GALNT5	R561H	G	2167	A	GRID1	A453V	G	1358	A

ERBB3	G325R	G	1166	A	FBN3	Q199R	T	882	C	GALNT5	I174T	T	1006	C	GRID1	R148H	C	443	T
ERBB3	M60K	T	372	A	FBN3	V2101A	A	6588	G	GALNT5	E264*	G	1275	T	GRID1	R977Q	C	2930	T
ERBB3	V104M	G	503	A	FBN3	G1735D	C	5490	T	GALNT5	R784Q	G	2836	A	GRID1	R535W	G	1603	A
ERBB3	V295A	T	1077	C	FBN3	E1435K	C	4589	T	GALNT6	T346P	T	1357	G	GRID2	P991A	C	3229	G
ERBB4	T461A	T	1692	C	FBN3	G41D	C	408	T	GALNT6	R430H	C	1610	T	GRID2	K167T	A	758	C
ERBB4	R81*	G	552	A	FBN3	P2078Q	G	6519	T	GALNT7	W649S	G	2029	C	GRID2	T537M	C	1868	T
ERBB4	R106C	G	627	A	FBN3	R2108C	G	6608	A	GALNT7	Y112C	A	418	G	GRID2	A744V	C	2489	T
ERBB4	R1273W	G	4128	A	FBP2	T40M	G	186	A	GALNT7	F556V	T	1749	G	GRID2	R128M	G	641	T
ERBB4	R168W	G	813	A	FBP2	K231N	C	760	A	GALNT7	E256*	G	849	T	GRID2	R550*	C	1906	T
ERBB4	R488W	G	1773	A	FBRSL1	A293T	G	877	A	GALNT7	E516*	G	1629	T	GRID2IP	R834W	G	2500	A
ERBB4	Y1301C	T	4213	C	FBRSL1	R424W	C	1270	T	GALNT8	A271T	G	903	A	GRID2IP	R772H	C	2315	T
ERBB4	E874*	C	2931	A	FBRSL1	R436W	C	1306	T	GALNT8	R294W	C	972	T	GRID2IP	A38V	G	113	A
ERBB4	A1039E	G	3427	T	FBXL13	N192I	T	1002	A	GALNT8	L213F	G	731	T	GRID2IP	A1190V	G	3569	A
ERBB4	V20I	C	369	T	FBXL16	F133L	A	729	G	GALNT9	E315K	C	1059	T	GRID2IP	R1144W	G	3430	A
ERC1	T511A	A	1937	G	FBXL17	R216*	G	848	A	GALNT9	R533H	C	1714	T	GRIK1	K464R	T	1423	C
ERC1	N303H	A	1313	C	FBXL17	R216*	G	848	A	GALNT9	V214M	C	756	T	GRIK1	V832E	A	2527	T
ERC1	E591D	A	2179	C	FBXL17	T277A	T	1618	C	GALNTL2	E395*	G	1686	T	GRIK1	F225L	G	707	T
ERC1	R1020I	G	3465	T	FBXL18	R446C	G	1413	A	GALNTL2	A266V	C	1300	T	GRIK2	E233*	G	1187	T
ERC2	R415C	G	1499	A	FBXL18	G93D	C	355	T	GALNTL2	E395K	G	1686	A	GRIK2	R15C	C	533	T
ERC2	R619Q	C	2112	T	FBXL19	C39R	T	273	C	GALNTL4	E207K	C	1040	T	GRIK2	E723*	G	2657	T
ERC2	A688S	C	2318	A	FBXL19	R626C	C	2034	T	GALNTL4	R272Q	C	1236	T	GRIK2	E743K	G	2717	A
ERC2	D760Y	C	2534	A	FBXL19	P205L	C	772	T	GALNTL5	T158A	A	693	G	GRIK2	E469*	G	1895	T
ERC2	S666Y	G	2253	T	FBXL19	R312Q	G	1093	A	GALNTL5	-	G	0	T	GRIK2	E665K	G	2483	A
ERC2	R619Q	C	2112	T	FBXL2	R235Q	G	795	A	GALNTL5	K267N	G	1022	T	GRIK2	R873C	C	3107	T
ERC2	E350D	C	1306	A	FBXL20	E83D	C	492	A	GALNTL5	E321*	G	1182	T	GRIK3	R450W	G	1365	A
ERC2	S321R	T	1217	G	FBXL3	P96Q	G	612	T	GALNTL6	R126C	C	1033	T	GRIK3	V106M	C	333	T
ERC2	E257K	C	1025	T	FBXL3	V419M	C	1580	T	GALNTL6	N238I	A	1370	T	GRIK3	D155N	C	480	T
ERCC2	A144V	G	509	A	FBXL3	D423N	C	1592	T	GALNTL6	Y399*	C	1854	A	GRIK4	E762K	G	2341	A
ERCC2	Q187K	G	637	T	FBXL4	S596L	G	2216	A	GALNTL6	A454V	C	2018	T	GRIK4	R760Q	G	2336	A
ERCC2	F403C	A	1286	C	FBXL4	R98Q	C	722	T	GALR1	S140L	C	419	T	GRIK4	G60D	G	236	A
ERCC2	R75I	C	302	A	FBXL5	V324G	A	1096	C	GALR1	N233S	A	698	G	GRIK4	E233G	A	755	G
ERCC3	D258E	A	869	T	FBXL5	M18T	A	178	G	GALR1	A80T	G	238	A	GRIK5	R682W	G	2079	A
ERCC3	K528N	C	1679	A	FBXL6	G419D	C	1281	T	GALR2	A222T	G	745	A	GRIK5	R41H	C	157	T
ERCC4	L49I	C	154	A	FBXL7	G393S	G	1658	A	GALR2	V291A	T	953	C	GRIK5	L254P	A	796	G
ERCC4	A257V	C	779	T	FBXL7	R49H	G	627	A	GALR3	V94I	G	305	A	GRIK5	A401V	G	1237	A
ERCC4	S561I	G	1691	T	FBXL7	V191I	G	1052	A	GALR3	R180H	G	564	A	GRIK5	A101T	C	336	T
ERCC4	S613L	C	1847	T	FBXL7	R317C	C	1430	T	GALR3	L59P	T	201	C	GRIK5	Y686H	A	2091	G
ERCC4	A315V	C	953	T	FBXL7	T160M	C	960	T	GALT	P145T	C	475	A	GRIN1	P473S	C	1423	T
ERCC5	P414L	C	2664	T	FBXL7	R353W	C	1538	T	GALT	T350P	A	1090	C	GRIN1	C329R	T	991	C

ERCC5	Q900H	A	4123	C	FBXL7	K411T	A	1713	C	GALT	R223H	G	710	A	GRIN1	E246K	G	742	A
ERCC6	D454Y	C	1439	A	FBXO10	T902M	G	2754	A	GALT	I32V	A	136	G	GRIN1	K343N	G	1035	T
ERCC6	R670W	G	2087	A	FBXO11	R800W	G	2471	A	GAMT	N170D	T	585	C	GRIN2A	A136P	C	716	G
ERCC6	V780I	C	2417	T	FBXO11	R208C	G	695	A	GAMT	R192H	C	652	T	GRIN2A	K1124N	C	3682	A
ERCC6	K663E	T	2066	C	FBXO15	C70R	A	288	G	GAN	E3D	G	153	T	GRIN2A	N491S	T	1782	C
ERCC6	S146F	G	516	A	FBXO16	W219R	A	805	G	GAN	R477Q	G	1574	A	GRIN2A	R504W	G	1820	A
ERCC6L	D507N	C	1655	T	FBXO17	T261M	G	942	A	GAN	S183Y	C	692	A	GRIN2B	A271V	G	1022	A
ERCC6L	W268*	C	940	T	FBXO17	H72Y	G	374	A	GANAB	Y460H	A	1411	G	GRIN2B	I766N	A	2507	T
ERCC8	K232E	T	737	C	FBXO17	P361H	G	1242	T	GANAB	D717Y	C	2182	A	GRIN2B	A109T	C	535	T
ERCC8	A203T	C	650	T	FBXO18	D914N	G	2844	A	GANAB	G238E	C	746	T	GRIN2B	-	T	0	C
ERF	P518L	G	1711	A	FBXO18	V1093I	G	3381	A	GANAB	R839Q	C	2549	T	GRIN2C	A834T	C	2647	T
ERF	E41K	C	279	T	FBXO18	I512S	T	1639	G	GANAB	Q436P	T	1340	G	GRIN2C	L78I	G	379	T
ERF	E434K	C	1458	T	FBXO18	I989S	T	3070	G	GANAB	D496Y	C	1519	A	GRIN2C	A608V	G	1970	A
ERG	R57H	C	356	T	FBXO18	F536L	T	1710	C	GANC	I74M	T	462	G	GRIN2D	T429M	C	1374	T
ERG	D182N	C	730	T	FBXO2	R177C	G	871	A	GAP43	T233M	C	1166	T	GRIN3A	H103Y	G	908	A
ERG	L165*	A	680	T	FBXO21	Y172C	T	554	C	GAP43	K191N	G	1041	T	GRIN3A	R366M	C	1698	A
ERG	R147W	G	625	A	FBXO21	I347T	A	1079	G	GAPDH	A329T	G	1651	A	GRIN3A	R225C	G	1274	A
ERGIC1	G172R	G	653	A	FBXO21	L179*	A	575	C	GAPDH	V68A	T	869	C	GRIN3A	I954T	A	3462	G
ERGIC2	N375S	T	1124	C	FBXO22OS	V327I	G	1084	A	GAPT	L19I	C	517	A	GRIN3A	R708*	G	2723	A
ERI3	D293N	C	1059	T	FBXO24	P540H	C	1631	A	GAPVD1	R43H	G	288	A	GRIN3A	R1090C	G	3869	A
ERI3	E67K	C	381	T	FBXO24	R527C	C	1591	T	GAPVD1	D810N	G	2588	A	GRIN3A	E871A	T	3213	G
ERICH1	V35I	C	181	T	FBXO24	D112N	G	346	A	GARNL3	V46M	G	488	A	GRIN3A	R225C	G	1274	A
ERICH1	E409K	C	1303	T	FBXO24	L187I	C	571	A	GARNL3	R396H	G	1539	A	GRIN3A	A127V	G	981	A
ERICH1	D400N	C	1276	T	FBXO25	V143M	G	546	A	GARNL3	L236I	C	1058	A	GRIN3B	G866W	G	2596	T
ERLEC1	G5D	G	145	A	FBXO25	K146N	G	557	T	GARS	T127A	A	620	G	GRINA	R304Q	G	1189	A
ERLIN1	A254T	C	3468	T	FBXO27	V222G	A	785	C	GART	A529S	C	1849	A	GRIP1	E899Q	C	2936	G
ERLIN2	A225D	C	789	A	FBXO28	R325*	C	992	T	GAS1	C203Y	C	1018	T	GRIP1	R985I	C	3195	A
ERMN	H12Y	G	268	A	FBXO3	R329H	C	1014	T	GAS2	S180Y	C	845	A	GRIP1	N421S	T	1503	C
ERMN	S245N	C	968	T	FBXO30	A428T	C	1449	T	GAS2L2	P739S	G	2243	A	GRIP1	T215M	G	885	A
ERMN	R75I	C	458	A	FBXO31	R288H	C	907	T	GAS2L2	P778H	G	2361	T	GRIP1	N160D	T	719	C
ERMP1	V231I	C	781	T	FBXO32	K143N	C	621	A	GAS2L2	K502N	C	1534	A	GRIPAP1	V776I	C	2361	T
ERMP1	Y446C	T	1427	C	FBXO32	K131R	T	584	C	GAS2L2	R439I	C	1344	A	GRIPAP1	R471H	C	1447	T
ERN1	R946Q	C	2950	T	FBXO33	N512T	T	1873	G	GAS2L2	D431N	C	1319	T	GRK1	V399L	G	1427	C
ERN1	D167N	C	612	T	FBXO34	E100K	G	543	A	GAS2L3	Y158H	T	603	C	GRK4	G562D	G	2028	A
ERN1	H43R	T	241	C	FBXO34	R278S	C	1077	A	GAS2L3	R610H	G	1960	A	GRK5	R216C	C	975	T
ERN2	A736V	G	2376	A	FBXO34	R670W	C	2253	T	GAS2L3	P17L	C	181	T	GRK5	N306S	A	1246	G
ERN2	T731M	G	2361	A	FBXO38	A1053S	G	3325	T	GAS6	R557C	G	1822	A	GRK5	K389N	G	1496	T
ERO1L	E311*	C	1155	A	FBXO38	E557K	G	1837	A	GAS6	P102L	G	458	A	GRK5	V466I	G	1725	A
ERO1L	V140A	A	643	G	FBXO38	R1158C	C	3640	T	GAS7	A4T	C	171	T	GRK5	C520*	C	1889	A

ERO1L	R55K	C	388	T	FBXO38	I185N	T	722	A	GAS7	R92Q	C	436	T	GRK6	Y309H	T	1085	C
ERO1LB	V440F	C	1520	A	FBXO39	M112I	G	457	A	GAS7	T466K	G	1558	T	GRK7	R68H	G	340	A
ERO1LB	R286H	C	1059	T	FBXO39	D238N	G	833	A	GAS8	A460T	G	1500	A	GRK7	R35H	G	241	A
ERO1LB	Y177H	A	731	G	FBXO39	A40V	C	240	T	GAST	R57*	C	236	T	GRK7	R32Q	G	232	A
ERO1LB	N264H	T	992	G	FBXO40	H313Q	C	1353	A	GATA1	V278M	G	943	A	GRK7	L264I	C	927	A
ERP29	L19M	C	173	A	FBXO40	G337D	G	1424	A	GATA2	R330*	G	1320	A	GRLF1	R783*	C	2347	T
ERP29	R75H	G	342	A	FBXO40	L562I	C	2098	A	GATA2	A109V	G	658	A	GRLF1	R1187Q	G	3560	A
ERP29	A163T	G	605	A	FBXO41	A377V	G	1130	A	GATA3	V68F	G	770	T	GRLF1	A435V	C	1304	T
ERP44	R148W	G	642	A	FBXO42	P420H	G	1476	T	GATA3	S317F	C	1518	T	GRLF1	R1187Q	G	3560	A
ERV3	E325K	C	1474	T	FBXO42	V74D	A	438	T	GATA3	K377N	A	1699	C	GRLF1	K221Q	A	661	C
ERV3	S172P	A	1015	G	FBXO43	W532*	C	2309	T	GATA3	A396T	G	1754	A	GRM1	M442V	A	1794	G
ERVWE1	R26C	G	1119	A	FBXO43	V625I	C	2586	T	GATA4	A388V	C	1721	T	GRM1	R305H	G	1384	A
ESAM	D132G	T	525	C	FBXO43	V324M	C	1683	T	GATA4	C274F	G	1379	T	GRM1	P898A	C	3162	G
ESCO1	R206H	C	1703	T	FBXO43	R132I	C	1108	A	GATA4	P307S	C	1477	T	GRM1	A265D	C	1264	A
ESCO1	K490Q	T	2554	G	FBXO44	R219W	C	757	T	GATA6	R456H	G	1644	A	GRM1	-	A	0	G
ESCO2	P592H	C	1845	A	FBXO44	R174H	G	623	A	GATA6	L454V	T	1637	G	GRM2	T791I	C	2606	T
ESM1	G105S	C	459	T	FBXO45	S54P	T	457	C	GATAD2A	V592M	G	2135	A	GRM2	A740T	G	2452	A
ESPL1	L101I	C	392	A	FBXO45	R229I	G	983	T	GATAD2A	T336A	A	1367	G	GRM2	Q848R	A	2777	G
ESPL1	L344R	T	1122	G	FBXO46	G283R	C	970	T	GATAD2A	R185W	C	914	T	GRM2	A16V	C	281	T
ESPN	F114L	T	508	C	FBXO48	A23T	C	475	T	GATAD2B	T328S	T	1226	A	GRM2	F428C	T	1517	G
ESPN	Y380C	A	1307	G	FBXO48	I46M	A	546	C	GATS	E79K	C	491	T	GRM3	I530S	T	2688	G
ESPN	R806W	C	2584	T	FBXO6	R45Q	G	269	A	GATS	Q114H	C	598	A	GRM3	V271I	G	1910	A
ESPN	D237G	A	878	G	FBXO7	P83T	C	574	A	GATSL3	S43N	C	258	T	GRM4	G417D	C	1420	T
ESPNL	V436L	G	1569	T	FBXO8	E252G	T	1618	C	GBA	R398*	G	1314	A	GRM4	M839T	A	2686	G
ESPNL	A84T	G	513	A	FBXO8	E216*	C	1509	A	GBA2	Y72C	T	739	C	GRM4	K901T	T	2872	G
ESPNL	S752L	C	2518	T	FBXW10	L652I	C	2173	A	GBA2	W645*	C	2459	T	GRM4	G24D	C	241	T
ESR1	A58T	G	542	A	FBXW11	D373N	C	1488	T	GBA3	I103V	A	409	G	GRM5	R727*	G	2570	A
ESR1	A491T	G	1841	A	FBXW12	R411H	G	1418	A	GBAS	T32A	A	123	G	GRM5	A1070T	C	3599	T
ESR1	R211I	G	1002	T	FBXW12	G136D	G	593	A	GBAS	K91T	A	301	C	GRM5	R869M	C	2997	A
ESR1	G215*	G	1013	T	FBXW12	A287T	G	1045	A	GBE1	F543C	A	2272	C	GRM5	S440P	A	1709	G
ESR2	R207Q	C	1038	T	FBXW12	V144A	T	617	C	GBF1	R678Q	G	2293	A	GRM5	R292H	C	1266	T
ESR2	P118L	G	771	A	FBXW12	S225Y	C	860	A	GBF1	S1239G	A	3975	G	GRM5	R1028H	C	3474	T
ESRP1	R140Q	G	602	A	FBXW2	K302T	T	1093	G	GBF1	A1739T	G	5475	A	GRM5	R762K	C	2676	T
ESRP1	V520F	G	1741	T	FBXW4P1	V406I	C	1835	T	GBF1	H1440R	A	4579	G	GRM5	V217M	C	1040	T
ESRP1	I188S	T	746	G	FBXW4P1	L343M	G	1646	T	GBF1	A1243V	C	3988	T	GRM5	E1122K	C	3755	T
ESRP1	L281P	T	1025	C	FBXW7	S582L	G	1894	A	GBF1	R530C	C	1848	T	GRM5	A855T	C	2954	T
ESRP1	G534R	G	1783	A	FBXW7	E369*	C	1254	A	GBF1	A1243V	C	3988	T	GRM5	D333N	C	1388	T
ESRP1	R539Q	G	1799	A	FBXW7	K185N	C	704	A	GBP1	S428L	G	1503	A	GRM6	R486*	G	1456	A
ESRP1	R582Q	G	1928	A	FBXW7	H470R	T	1558	C	GBP1	R48H	C	363	T	GRM6	R777Q	C	2330	T

ESRP2	A397T	C	1728	T	FBXW7	R465H	C	1543	T	GBP1	S502L	G	1725	A	GRM6	A447V	G	1340	A
ESRRA	R352Q	G	1226	A	FBXW7	R222*	G	813	A	GBP2	A313T	C	1206	T	GRM6	A390T	C	1168	T
ESRRB	G492D	G	1776	A	FBXW7	I257N	A	919	T	GBP2	A240T	C	987	T	GRM7	R659Q	G	2250	A
ESRRB	R184C	C	851	T	FBXW7	R505C	G	1662	A	GBP2	Q517R	T	1819	C	GRM7	Y762H	T	2558	C
ESRRB	A307V	C	1221	T	FBXW7	R465C	G	1542	A	GBP3	C223R	A	872	G	GRM7	T634M	C	2175	T
ESRRB	E151K	G	752	A	FBXW7	N542I	T	1774	A	GBP4	A354D	G	1159	T	GRM7	K389E	A	1439	G
ESRRB	I206M	T	919	G	FBXW7	S582L	G	1894	A	GBP4	S50Y	G	247	T	GRM7	A812T	G	2708	A
ESRRG	K402E	T	1471	C	FBXW7	D560G	T	1828	C	GBP5	D140N	C	955	T	GRM7	S352P	T	1328	C
ESRRG	V58I	C	439	T	FBXW7	R465C	G	1542	A	GBP5	P37H	G	647	T	GRM7	A251V	C	1026	T
ESRRG	T46M	G	404	A	FBXW7	R367*	G	1248	A	GBP5	T438A	T	1849	C	GRM7	F808L	T	2698	G
ESX1	P113L	G	422	A	FBXW7	E369*	C	1254	A	GBP6	R523H	G	1661	A	GRM8	R30I	C	898	A
ESX1	P121Q	G	446	T	FBXW7	R224Q	C	820	T	GBP6	N323K	C	1062	G	GRM8	Q503*	G	2316	A
ESX1	P284H	G	935	T	FBXW7	D600Y	C	1947	A	GBP6	V180I	G	631	A	GRM8	W305*	C	1724	T
ESYT1	R967C	C	2949	T	FBXW7	R505C	G	1662	A	GBP6	A9V	C	119	T	GRM8	S219L	G	1465	A
ESYT1	A859V	C	2626	T	FBXW7	R465H	C	1543	T	GBP6	S270Y	C	902	A	GRM8	K382N	C	1955	A
ESYT1	L142F	C	474	T	FBXW8	A567T	G	1781	A	GBP7	R577*	G	1868	A	GRM8	R355I	C	1873	A
ESYT1	R332*	C	1044	T	FBXW8	D285N	G	935	A	GBX1	P54L	G	161	A	GRM8	-	A	0	G
ESYT2	R826H	C	2477	T	FBXW8	V431I	G	1373	A	GBX1	N85D	T	253	C	GRM8	R30I	C	898	A
ESYT2	S236G	T	706	C	FBXW8	S526N	G	1659	A	GBX1	K283N	C	849	A	GRN	T409K	C	1445	A
ESYT2	S534A	A	1600	C	FBXW8	D588N	G	1844	A	GBX2	A141V	G	460	A	GRPEL2	R96G	A	396	G
ESYT2	N559H	T	1675	G	FBXW9	R7L	C	57	A	GC	F178C	A	628	C	GRPR	A274T	G	1218	A
ESYT3	R417W	C	1435	T	FCAMR	G57D	C	645	T	GCAT	A98V	C	356	T	GRTP1	V244M	C	784	T
ESYT3	V404M	G	1396	A	FCAR	R110W	C	338	T	GCC1	A98T	C	717	T	GRTP1	A143S	C	481	A
ESYT3	P48S	C	328	T	FCAR	P167S	C	509	T	GCC1	R662H	C	2410	T	GRWD1	V186M	G	757	A
ESYT3	N180I	A	725	T	FCAR	R110W	C	338	T	GCC1	R569W	G	2130	A	GRWD1	R182Q	G	746	A
ETAA1	S569T	G	1836	C	FCAR	A51S	G	161	T	GCC2	Q1060H	G	3227	T	GRXCR1	R150W	C	448	T
ETAA1	R139H	G	546	A	FCER1A	N256T	A	857	C	GCC2	E535K	G	1650	A	GRXCR1	D137N	G	409	A
ETAA1	V546D	T	1767	A	FCER1G	R45*	C	176	T	GCDH	R243W	C	804	T	GRXCR1	Q234H	G	702	T
ETAA1	P53S	C	287	T	FCF1	S89P	T	316	C	GCDH	R94W	C	357	T	GSC	S223*	G	815	T
ETFA	I269L	T	886	G	FCGBP	V849I	C	2553	T	GCDH	R82H	G	322	A	GSC	V114D	A	488	T
ETFDH	E412D	A	1568	T	FCGBP	V525A	A	1582	G	GCET2	R13Q	C	172	T	GSDMA	R167*	C	617	T
ETNK1	G323D	G	990	A	FCGBP	Q4923H	C	1477 7	A	GCFC1	D615Y	C	2033	A	GSDMA	R427H	G	1398	A
ETNK2	V291M	C	913	T	FCGBP	R534H	C	1609	T	GCFC1	E18D	C	244	A	GSDMB	R273I	C	949	A
ETS1	V137I	C	494	T	FCGBP	V4787I	C	1436 7	T	GCFC1	G348S	C	1232	T	GSDMB	G304V	C	1042	A
ETS1	S228F	G	768	A	FCGBP	P4736S	G	1421 4	A	GCFC1	M1I	C	193	T	GSDMC	C115Y	C	1226	T
ETS2	E287K	G	1319	A	FCGR2A	K243T	A	766	C	GCFC1	R252H	C	945	T	GSDMC	T22P	T	946	G
ETS2	L446I	C	1796	A	FCGR3A	D118E	G	538	T	GCFC1	G802C	C	2594	A	GSDMC	E15D	C	927	G

ETV1	K47Q	T	246	G	FCGR3A	F255C	A	948	C	GCFC1	R482H	C	1635	T	GSDMC	D131Y	C	1273	A
ETV2	A72V	C	654	T	FCGR3B	V265M	C	797	T	GCG	S71F	G	212	A	GSDMC	L12W	A	917	C
ETV3	V209M	C	690	T	FCGRT	A242T	G	1126	A	GCG	Y65*	G	195	C	GSG1L	R300*	G	983	A
ETV3	R475Q	C	1489	T	FCHO1	L70F	C	433	T	GCG	Y65*	G	195	C	GSG1L	L10P	A	114	G
ETV5	T484A	T	1697	C	FCHO1	D313N	G	1162	A	GCG	Y5D	A	13	C	GSG1L	R322Q	C	1050	T
ETV6	P214L	C	915	T	FCHO2	A521T	G	1677	A	GCGR	V326I	G	1253	A	GSG1L	V139A	A	501	G
ETV6	R369W	C	1379	T	FCHSD1	A665T	C	2044	T	GCK	A450T	C	1510	T	GSG2	G117W	G	382	T
ETV6	R259Q	G	1050	A	FCHSD1	A580T	C	1789	T	GCK	H142R	T	587	C	GSK3A	V133M	C	525	T
ETV6	R399H	G	1470	A	FCHSD1	R117W	G	400	A	GCKR	A614V	C	1904	T	GSK3A	R243C	G	855	A
ETV7	A99V	G	538	A	FCHSD2	S698R	T	2261	G	GCKR	F299C	T	959	G	GSK3A	A82T	C	372	T
ETV7	P18H	G	295	T	FCN2	G308*	G	936	T	GCLC	P206Q	G	1101	T	GSK3B	R111*	G	563	A
EVC	A368T	G	1286	A	FCRL2	S59Y	G	223	T	GCM1	H423Y	G	1479	A	GSK3B	R367*	G	1331	A
EVC	R643H	G	2112	A	FCRL3	P284H	G	1024	T	GCM2	R265I	C	942	A	GSK3B	A231T	C	923	T
EVC	R678C	C	2216	T	FCRL3	R293Q	C	1051	T	GCM2	K449N	T	1495	G	GSK3B	Y140C	T	651	C
EVC	K533T	A	1782	C	FCRL3	L299M	G	1068	T	GCM2	R265I	C	942	A	GSN	T733M	C	2267	T
EVC2	T290M	G	923	A	FCRL3	V283A	A	1021	G	GCM2	R177I	C	678	A	GSN	A424T	G	1339	A
EVC2	L188F	G	616	A	FCRL4	R413W	G	1373	A	GCN1L1	V750M	C	2261	T	GSN	F392L	C	1245	A
EVC2	A1177V	G	3584	A	FCRL5	A363T	C	1245	T	GCN1L1	P1094L	G	3294	A	GSN	E722G	A	2234	G
EVC2	P1256S	G	3820	A	FCRL5	T962A	T	3042	C	GCN1L1	P993S	G	2990	A	GSPT1	K359T	T	1324	G
EVC2	L1212M	G	3688	T	FCRL5	T213A	T	795	C	GCN1L1	V1658M	C	4985	T	GSR	R233C	G	697	A
EVC2	T647I	G	1994	A	FCRL5	L75I	G	381	T	GCN1L1	V732I	C	2207	T	GSR	R233H	C	698	T
EVC2	R335W	G	1057	A	FCRL6	D366Y	G	1097	T	GCN1L1	A247V	G	753	A	GSTA2	F222L	A	822	C
EVC2	A703T	C	2161	T	FCRLA	R192G	A	816	G	GCN1L1	A72T	C	227	T	GSTA2	F197L	A	747	C
EVC2	L253P	A	812	G	FCRLB	A187V	C	775	T	GCNT2	F34L	T	637	G	GSTA4	E33*	C	245	A
EVC2	A897D	G	2744	T	FDPS	S9F	C	141	T	GCNT3	K281N	G	1291	C	GSTA5	I219M	A	816	C
EVC2	D1202Y	C	3658	A	FDPS	K323N	A	1084	C	GCNT3	R264H	G	1239	A	GSTA5	I188L	T	721	G
EVC2	E473*	C	1471	A	FDX1	M137I	G	662	A	GCNT3	D304Y	G	1358	T	GSTA5	Y95H	A	442	G
EVI5	E278*	C	842	A	FDX1	E95*	G	534	T	GCNT3	K311N	G	1381	T	GSTCD	R600*	C	2018	T
EVI5L	R765H	G	2366	A	FDXR	L57P	A	203	G	GCNT4	S453*	G	2220	T	GSTCD	R257K	G	990	A
EVL	S360L	C	1166	T	FECH	W307*	C	955	T	GCNT4	V103A	A	1170	G	GSTCD	R480C	C	1658	T
EVPL	V200M	C	826	T	FECH	Y282H	A	878	G	GCNT7	G244R	C	1802	T	GSTM5	R101H	G	345	A
EVPL	A173V	G	746	A	FECH	V45I	C	167	T	GCNT7	E238K	C	1784	T	GSTO2	L93P	T	907	C
EVPL	A1664T	C	5218	T	FEM1B	R246Q	G	1352	A	GCNT7	E128K	C	1454	T	GSTO2	E85*	G	882	T
EVPL	W424L	C	1499	A	FEM1B	L36I	C	721	A	GDAP1	L28M	C	161	A	GSTP1	L63P	T	437	C
EVPL	R1757C	G	5497	A	FEM1C	E163D	C	1051	A	GDAP2	R174H	C	771	T	GSTZ1	Q207*	C	901	T
EVPLL	R60W	C	433	T	FEM1C	F554S	A	2223	G	GDAP2	R187C	G	809	A	GSX2	A170T	G	822	A
EVX2	A304V	G	1048	A	FEM1C	L87V	A	821	C	GDE1	L23V	G	231	C	GTDC1	D297E	A	1044	T
EVX2	G103D	C	445	T	FER	K29N	G	471	T	GDF1	A305V	G	2308	A	GTF2A1	Q78H	C	666	A
EWSR1	R298W	C	913	T	FER	E315*	G	1327	T	GDF10	A190V	G	835	A	GTF2A1	A100V	G	731	A

EWSR1	G613D	G	1859	A	FER	D479G	A	1820	G	GDF10	A47T	C	405	T	GTF2E1	R432H	G	1388	A
EXD1	Q336H	C	1199	A	FER	K8N	G	408	T	GDF10	R277H	C	1096	T	GTF2E1	K272R	A	908	G
EXD1	A90V	G	460	A	FER	E390D	A	1554	C	GDF10	V148G	A	709	C	GTF2E1	H234R	A	794	G
EXD1	K410T	T	1420	G	FER1L6	V1382L	G	4158	T	GDF11	T149M	C	483	T	GTF2E1	D5E	T	108	G
EXD2	H442R	A	1453	G	FER1L6	E1478K	G	4446	A	GDF15	L110H	T	361	A	GTF2F1	R460H	C	1664	T
EXD2	T549I	C	1774	T	FER1L6	V1065M	G	3207	A	GDF2	V193M	C	737	T	GTF2F1	E326K	C	1261	T
EXD2	-	G	0	T	FER1L6	N598S	A	1807	G	GDF3	R84C	G	315	A	GTF2F1	A357T	C	1354	T
EXD3	P436S	G	1502	A	FER1L6	E677*	G	2043	T	GDF3	R266H	C	862	T	GTF2F1	P332L	G	1280	A
EXO1	R557H	G	2263	A	FER1L6	G810D	G	2443	A	GDF3	R250G	T	813	C	GTF2H2D	P124S	C	565	T
EXO1	K451T	A	1945	C	FER1L6	R10I	G	43	T	GDF3	R84C	G	315	A	GTF2H4	C16Y	G	270	A
EXOC1	R580H	G	2087	A	FER1L6	D1435Y	G	4317	T	GDF5OS	A166S	G	938	T	GTF2IRD1	A53T	G	370	A
EXOC1	R562Q	G	2033	A	FER1L6	F1707L	C	5135	A	GDF6	P21S	G	161	A	GTF2IRD1	R208*	C	835	T
EXOC1	A692V	C	2423	T	FERD3L	E75*	C	282	A	GDF6	Y381*	A	1243	C	GTF2IRD1	K303N	G	1122	T
EXOC1	A328T	G	1330	A	FERMT1	E666A	T	2786	G	GDF6	P90L	G	369	A	GTF2IRD1	-	G	0	A
EXOC2	E214K	C	776	T	FERMT1	A345V	G	1823	A	GDF7	R221H	G	1238	A	GTF2IRD1	P630L	C	2102	T
EXOC2	I139F	T	551	A	FERMT1	R98C	G	1081	A	GDF7	R351H	G	1628	A	GTF2IRD2	V599G	A	1986	C
EXOC2	R518H	C	1689	T	FERMT2	R666C	G	2182	A	GDF7	A396D	C	1763	A	GTF3C1	R799C	G	2435	A
EXOC2	L277F	G	965	A	FERMT2	R525H	C	1760	T	GDF9	W278*	C	1701	T	GTF3C1	A1922V	G	5805	A
EXOC3	R406Q	G	1244	A	FERMT2	G415D	C	1430	T	GDF9	R122L	C	1232	A	GTF3C1	N1665D	T	5033	C
EXOC3	E124G	A	398	G	FERMT3	A144V	C	580	T	GDF9	L430V	A	2155	C	GTF3C1	G733W	C	2237	A
EXOC3L	-	C	0	T	FERMT3	R629Q	G	2035	A	GDF9	T95A	T	1150	C	GTF3C2	A490T	C	1898	T
EXOC3L	G39V	C	357	A	FES	L285F	C	995	T	GDNF	G127C	C	548	A	GTF3C3	A168V	G	593	A
EXOC4	Q628R	A	1912	G	FES	R154C	C	602	T	GDNF	Y173H	A	686	G	GTF3C4	S611L	C	2396	T
EXOC4	Y789D	T	2394	G	FES	A22V	C	207	T	GDPD1	Y286C	A	994	G	GTF3C4	D804N	G	2974	A
EXOC5	F222C	A	916	C	FETUB	N125S	A	635	G	GDPD2	E331G	A	1243	G	GTF3C4	W169*	G	1071	A
EXOC5	E16*	C	297	A	FEZ1	R16*	G	238	A	GDPD2	R395W	C	1434	T	GTF3C4	R326*	C	1540	T
EXOC6	L674I	C	2034	A	FEZ1	E142D	T	618	G	GDPD3	D309N	C	1303	T	GTF3C4	L557V	T	2233	G
EXOC6	E15K	G	57	A	FEZ2	M358L	T	1119	A	GDPD4	T231A	T	942	C	GTF3C5	E441G	A	1330	G
EXOC6	L136I	C	420	A	FEZ2	E123D	T	416	A	GDPD4	G202E	C	856	T	GTF3C6	K94N	A	492	C
EXOC6	S284P	T	864	C	FEZF1	H474R	T	1489	C	GDPD5	M499V	T	1984	C	GTPBP1	R649*	C	2178	T
EXOC6	N638D	A	1926	G	FEZF2	A44V	G	350	A	GDPD5	T55M	G	653	A	GTPBP10	-	G	0	T
EXOC6	N769D	A	2319	G	FEZF2	E82G	T	464	C	GDPD5	P485H	G	1943	T	GTPBP3	D255N	G	828	A
EXOC6B	R785Q	C	2485	T	FEZF2	L79I	G	454	T	GEMIN4	L689H	A	2185	T	GTPBP4	P365T	C	1175	A
EXOC6B	P456H	G	1498	T	FEZF2	R315C	G	1162	A	GEMIN4	T392M	G	1294	A	GTPBP4	K490Q	A	1550	C
EXOC6B	R785W	G	2484	A	FEZF2	E248D	T	963	G	GEMIN4	R917K	C	2869	T	GTPBP5	P233H	C	716	A
EXOC7	V218I	C	706	T	FFAR1	R258Q	G	773	A	GEMIN4	V840M	C	2637	T	GTPBP5	A252T	G	772	A
EXOC7	Q686H	C	2112	A	FFAR1	A229P	G	685	C	GEMIN4	E11*	C	150	A	GTPBP5	C206Y	G	635	A
EXOC7	G497S	C	1543	T	FFAR2	H247P	A	740	C	GEMIN4	E800K	C	2517	T	GTSE1	R130Q	G	601	A
EXOC7	S705N	C	2168	T	FGA	R181*	G	620	A	GEMIN5	G276C	C	902	A	GUCA1B	R63*	G	283	A

EXOC7	P640L	G	1973	A	FGA	E702K	C	2183	T	GEMIN5	I201V	T	677	C	GUCA1C	G33S	C	230	T
EXOC8	T425M	G	1361	A	FGA	G235R	C	782	T	GEMIN5	E1450K	C	4424	T	GUCA1C	L46M	G	269	T
EXOC8	K242E	T	811	C	FGA	A403T	C	1286	T	GEMIN5	R719W	G	2231	A	GUCA2A	P75S	G	229	A
EXOC8	R388*	G	1249	A	FGB	R196C	C	649	T	GEMIN5	D195G	T	660	C	GUCA2A	A108V	G	329	A
EXOSC1	R100Q	C	331	T	FGB	S6Y	C	80	A	GEMIN5	F387L	G	1237	T	GUCY1A2	V653M	C	2347	T
EXOSC10	E302K	C	954	T	FGB	Y368C	A	1166	G	GEMIN7	A61T	G	332	A	GUCY1A2	P707L	G	2510	A
EXOSC10	K806N	C	2468	A	FGD2	E498K	G	1663	A	GEN1	L81P	T	315	C	GUCY1A3	R95I	G	725	T
EXOSC4	G30C	G	198	T	FGD2	S139N	G	587	A	GEN1	I9M	T	100	G	GUCY1A3	R574*	C	2161	T
EXOSC5	S217L	G	673	A	FGD2	R478H	G	1604	A	GET4	R186H	G	651	A	GUCY1A3	G183S	G	988	A
EXOSC5	E77K	C	252	T	FGD3	H670Y	C	2504	T	GFAP	R258C	G	832	A	GUCY1A3	K53N	G	600	T
EXOSC6	R265P	C	824	G	FGD3	E169K	G	1001	A	GFAP	R30H	C	149	T	GUCY1B2	M72V	T	647	C
EXOSC7	P69L	C	254	T	FGD3	A324V	C	1467	T	GFAP	P229S	G	745	A	GUCY1B2	E160*	C	911	A
EXOSC9	A295T	G	988	A	FGD4	R181M	G	966	T	GFI1	G290D	C	1188	T	GUCY1B3	I543M	A	1749	G
EXOSC9	-	G	0	A	FGD4	I116V	A	770	G	GFI1	T417M	G	1569	A	GUCY1B3	R574*	C	1840	T
EXOSC9	S113L	C	443	T	FGD4	K5R	A	438	G	GFI1	V305M	C	1232	T	GUCY1B3	E588A	A	1883	C
EXOSC9	D245Y	G	838	T	FGD4	S390Y	C	1593	A	GFI1B	A39V	C	941	T	GUCY2C	A1031S	C	3228	A
EXPH5	P198Q	G	704	T	FGD5	K12N	G	146	T	GFI1B	F252L	C	1581	A	GUCY2C	D517V	T	1687	A
EXPH5	A91T	C	382	T	FGD5	G1252S	G	3864	A	GFM1	A265G	C	832	G	GUCY2C	N1018S	T	3190	C
EXPH5	-	A	0	G	FGD5	A505V	C	1624	T	GFM1	S279L	C	874	T	GUCY2C	R319*	G	1092	A
EXPH5	R1303Q	C	4019	T	FGD5	A1266T	G	3906	A	GFM1	A264T	G	828	A	GUCY2D	R964C	C	2964	T
EXPH5	K498T	T	1604	G	FGD5	V1025I	G	3183	A	GFM1	R303Q	G	946	A	GUCY2D	G180S	G	612	A
EXT1	R595H	C	2437	T	FGD5	N817Y	A	2559	T	GFOD1	S254L	G	1426	A	GUCY2D	D903G	A	2782	G
EXT1	A331V	G	1645	A	FGD6	L79M	G	459	T	GFOD1	V176M	C	1191	T	GUCY2D	R424W	C	1344	T
EXT1	-	C	0	A	FGD6	F956S	A	3091	G	GFOD2	S138L	G	759	A	GUCY2D	R574C	C	1794	T
EXT2	-	T	0	C	FGD6	E1279*	C	4059	A	GFPT1	R111H	C	511	T	GUCY2F	F576L	A	2018	G
EXT2	S19L	C	497	T	FGD6	I52T	A	379	G	GFPT1	A316T	C	1125	T	GUCY2F	S420C	T	1550	A
EXT2	R197*	C	1030	T	FGD6	K33T	T	322	G	GFPT1	R633Q	C	2077	T	GUF1	T336A	A	1200	G
EXTL1	R191W	C	1438	T	FGF1	G135S	C	483	T	GFRA1	G55V	C	532	A	GUF1	A323V	C	1162	T
EXTL1	F86V	T	1123	G	FGF10	M204V	T	725	C	GFRA2	R178H	C	1208	T	GUF1	K442T	A	1519	C
EXTL1	F397L	T	2058	A	FGF10	S128N	C	498	T	GFRA2	R218H	C	1328	T	GUF1	E451*	G	1545	T
EXTL2	V98A	A	1730	G	FGF11	E151D	G	704	T	GFRA3	A236T	C	953	T	GUF1	R585W	C	1947	T
EXTL2	L300R	A	2336	C	FGF11	K189T	A	817	C	GFRA3	R3H	C	255	T	GUF1	E653Q	G	2151	C
EXTL3	L260F	G	1395	C	FGF12	Y134H	A	1226	G	GFRA4	A214V	G	641	A	GUSB	R261H	C	913	T
EXTL3	S201T	G	1217	C	FGF12	A2D	G	831	T	GGA2	A63V	G	271	A	GUSB	V75M	C	354	T
EXTL3	G888S	G	3277	A	FGF12	R58H	C	999	T	GGA2	R416G	T	1329	C	GUSB	R625K	C	2005	T
EYA1	Q384R	T	1791	C	FGF13	G124D	C	371	T	GGA3	G480D	C	1448	T	GUSB	G512R	C	1665	T
EYA1	S83T	A	887	T	FGF13	Q39H	T	117	A	GGA3	R22H	C	74	T	GXYLT1	S198L	G	818	A
EYA1	F82V	A	884	C	FGF13	D110Y	C	328	A	GGCT	S136F	G	542	A	GXYLT2	V330G	T	1150	G
EYA1	L374*	A	1761	C	FGF14	R27M	C	176	A	GGCX	A22T	C	145	T	GYG2	S85L	C	536	T

EYA1	S169R	T	1145	G	FGF16	A9T	G	25	A	GGCX	-	A	0	G	GYG2	D46Y	G	418	T
EYA2	T292M	C	1272	T	FGF16	Y53H	T	157	C	GGCX	T631A	T	1972	C	GYG2	E428K	G	1564	A
EYA2	R248L	G	1140	T	FGF17	R96Q	G	790	A	GGH	G12D	C	318	T	GYLTL1B	R267W	C	898	T
EYA2	R255Q	G	1161	A	FGF18	V37M	G	646	A	GGH	M160T	A	762	G	GYLTL1B	R267W	C	898	T
EYA2	G173S	G	914	A	FGF19	R99W	G	757	A	GGN	S327L	G	1115	A	GYLTL1B	S109N	G	425	A
EYA3	-	T	0	C	FGF19	R43H	C	590	T	GGN	P626S	G	2011	A	GYLTL1B	R699H	G	2195	A
EYA3	S86L	G	498	A	FGF2	R249Q	G	814	A	GGN	R334Q	C	1136	T	GYPA	S139Y	G	532	T
EYA3	R418C	G	1493	A	FGF2	R262Q	G	853	A	GGPS1	R117C	C	521	T	GYS1	R498C	G	1689	A
EYA3	K285N	C	1096	A	FGF23	R179Q	C	682	T	GGT1	A64T	G	677	A	GYS2	N228S	T	938	C
EYA4	A635T	G	2361	A	FGF23	R160Q	C	625	T	GGT5	R362C	G	1418	A	GYS2	A252T	C	1009	T
EYA4	T295I	C	1342	T	FGF3	R44W	G	621	A	GGT5	R419Q	C	1590	T	GYS2	K702N	C	2361	A
EYA4	K400T	A	1657	C	FGF3	R181C	G	1032	A	GGT6	S168Y	G	563	T	GYS2	F312L	G	1191	T
EYS	S1628F	G	5410	A	FGF4	A168T	C	821	T	GGT7	R593H	C	1823	T	GYS2	E61D	C	438	A
EYS	R794Q	C	2908	T	FGF4	R134Q	C	720	T	GGT7	W222*	C	711	T	GZF1	S265N	G	871	A
EYS	T3002A	T	9531	C	FGF5	S127T	T	605	A	GGTLC1	F80L	A	371	G	GZF1	D170N	G	585	A
EYS	I454S	A	1888	C	FGF5	K236N	G	934	T	GH2	A184V	G	613	A	GZMA	R202*	C	639	T
EYS	T695A	T	2610	C	FGF7	R78M	G	762	T	GH2	T93M	G	340	A	GZMB	P160S	G	483	A
EYS	V2252A	A	7282	G	FGF7	L14F	C	569	T	GH2	Q22K	G	126	T	GZMH	L8F	C	69	A
EYS	R1463G	T	4914	C	FGF7	E132*	G	923	T	GHDC	A189T	C	583	T	GZMK	A125V	C	444	T
EYS	N1906S	T	6244	C	FGF8	S57F	G	229	A	GHDC	R85G	T	271	C	GZMK	Q95*	C	353	T
EYS	D1286G	T	4384	C	FGF8	R206W	G	675	A	GHRHR	-	G	0	T	GZMK	D196G	A	657	G
EYS	R1242I	C	4252	A	FGF9	V7A	T	550	C	GHSR	P41L	G	165	A	GZMM	V5G	T	59	G
EYS	N1163H	T	4014	G	FGFR1	R675Q	C	2753	T	GIGYF1	R202W	G	1814	A	GZMM	-	G	0	T
EYS	N968S	T	3430	C	FGFR1OP2	E52*	G	496	T	GIGYF1	S212G	T	1844	C	H1F0	S66L	C	635	T
EYS	F182C	A	1072	C	FGFR1OP2	K199N	G	939	T	GIGYF1	R128C	G	1592	A	H1FNT	R155Q	G	776	A
EZH2	C300R	A	1020	G	FGFR1OP2	K13T	A	380	C	GIGYF2	D55Y	G	360	T	H1FNT	A192T	G	886	A
EZH2	R358C	G	1194	A	FGFR3	R850*	C	2548	T	GIGYF2	Q684R	A	2248	G	H1FOO	K323N	G	974	T
EZH2	E725K	C	2295	T	FGFR4	A590V	C	1769	T	GIGYF2	E1138V	A	3610	T	H1FX	S31P	A	463	G
EZH2	N428T	T	1405	G	FGFR4	G214R	G	640	C	GIGYF2	M768I	G	2501	A	H2AFX	A71T	C	266	T
EZH2	E169D	T	629	G	FGFR4	R892L	G	2675	T	GIMAP1	A234E	C	841	A	H2AFX	V125A	A	429	G
EZR	P480L	G	1573	A	FGFR4	Q74*	C	220	T	GIMAP1	A218T	G	792	A	H2AFY	A58V	G	767	A
F10	E304K	G	948	A	FGFRL1	V492A	T	2055	C	GIMAP2	L206F	G	712	C	H2AFY2	P107S	C	583	T
F10	E54K	G	198	A	FGFRL1	S224L	C	1251	T	GIMAP2	S50L	C	243	T	H2AFY2	A68T	G	466	A
F10	Q144H	G	470	T	FGFRL1	S486T	T	2036	A	GIMAP4	L65I	C	276	A	H2BFM	P229L	C	686	T
F11	F210C	T	981	G	FGFRL1	G300S	G	1478	A	GIMAP4	A243E	C	811	A	H2BFM	V96I	G	286	A
F11R	R9S	C	132	A	FGG	Y314C	T	967	C	GIMAP6	R152Q	C	879	T	H2BFWT	R3H	C	35	T
F12	G65D	C	243	T	FGG	R8W	G	48	A	GIMAP6	K347N	C	1465	A	H2BFWT	E49*	C	172	A
F13A1	D575N	C	1989	T	FGG	Y382H	A	1170	G	GIMAP7	P90T	C	425	A	H3F3B	S87I	C	393	A
F13A1	R261H	C	1048	T	FGGY	R109Q	G	510	A	GIMAP8	A609D	C	2400	A	H6PD	R455Q	G	1637	A

F13A1	G313D	C	1204	T	FGGY	R118*	C	536	T	GIMAP8	S299A	T	1469	G	HABP2	R480C	C	1534	T
F13A1	E659*	C	2241	A	FGL2	F356L	A	1099	G	GIN1	Q226H	T	773	G	HACE1	T624P	T	2147	G
F13A1	P656H	G	2233	T	FGL2	F437V	A	1342	C	GINS1	E158*	G	566	T	HACE1	R332Q	C	1272	T
F13A1	G449D	C	1612	T	FGL2	E170*	C	541	A	GINS1	R83H	G	342	A	HACL1	S157N	C	838	T
F13A1	F214C	A	907	C	FGR	R267H	C	1089	T	GINS2	E112K	C	435	T	HACL1	P248S	G	1110	A
F13A1	D197N	C	855	T	FGR	T297I	G	1179	A	GINS3	F155L	C	673	A	HADH	S78L	C	233	T
F13B	K207N	T	665	G	FH	D179N	C	574	T	GINS4	L65F	C	403	T	HADHA	C4Y	C	141	T
F13B	E509K	C	1569	T	FHAD1	E214G	A	779	G	GIPC1	A251T	C	783	T	HADHA	D442N	C	1454	T
F13B	E337D	C	1055	A	FHAD1	-	A	0	C	GIPC1	S68N	C	235	T	HADHA	F327C	A	1110	C
F2	T510M	C	1585	T	FHAD1	F641C	T	2060	G	GIPC2	E115K	G	536	A	HADHB	L121I	C	465	A
F2	V515A	T	1600	C	FHDC1	D817N	G	2637	A	GIPC3	R225C	C	700	T	HADHB	G427*	G	1383	T
F2R	L423M	C	1532	A	FHDC1	L754V	T	2448	G	GIPR	L431M	C	1390	A	HADHB	L261I	C	885	A
F2RL2	F338V	A	1216	C	FHDC1	R1098C	C	3480	T	GIPR	L134S	T	500	C	HAGH	A87V	G	634	A
F2RL3	R219W	C	830	T	FHOD1	V321I	C	1209	T	GIT1	E404*	C	1381	A	HAL	T5M	G	311	A
F2RL3	A236T	G	881	A	FHOD1	F156C	A	715	C	GIT1	G200V	C	770	A	HAL	E421K	C	1558	T
F2RL3	R352W	C	1229	T	FHOD3	F134V	T	497	G	GIT1	D643E	G	2100	C	HAL	F496L	G	1785	T
F2RL3	A272V	C	990	T	FHOD3	R1353C	C	4154	T	GIT1	R564W	G	1861	A	HAL	R356Q	C	1364	T
F5	V1623A	A	5070	G	FHOD3	A68T	G	299	A	GIT2	L307P	A	1085	G	HAL	M273R	A	1115	C
F5	R652H	C	2157	T	FHOD3	S366L	C	1194	T	GIT2	G720V	C	2324	A	HAMP	R59*	C	246	T
F5	R1731W	G	5393	A	FHOD3	R1353C	C	4154	T	GIT2	R613G	T	2002	C	HAND1	G90S	C	524	T
F5	D497N	C	1691	T	FHOD3	R489G	A	1562	G	GIT2	T405A	T	1378	C	HAND1	A139T	C	671	T
F5	G1232S	C	3896	T	FHOD3	E1128K	G	3479	A	GIT2	Q196R	T	752	C	HAND2	T204A	T	1550	C
F5	K2093N	C	6481	A	FIBIN	Y43D	T	573	G	GJA1	M125I	G	532	A	HAO1	R84H	C	303	T
F5	R1626P	C	5079	G	FIBP	R360H	C	1200	T	GJA1	E227*	G	836	T	HAO1	D331Y	C	1043	A
F5	L1122F	G	3566	A	FIBP	Y173C	T	639	C	GJA10	Y526D	T	1576	G	HAO1	R84H	C	303	T
F5	A355D	G	1266	T	FIG4	Y510H	T	1652	C	GJA3	A276T	C	1003	T	HAO1	Y50H	A	200	G
F7	P189H	C	601	A	FIG4	R244H	G	855	A	GJA3	P126S	G	553	A	HAO2	R48W	C	425	T
F7	T143M	C	463	T	FIG4	G281D	G	966	A	GJA4	L127M	C	467	A	HAO2	R59H	G	459	A
F8	R2166*	G	6697	A	FIG4	F101S	T	426	C	GJA5	T56M	G	329	A	HAP1	P164L	G	491	A
F8	H1938N	G	6013	T	FIG4	R384I	G	1275	T	GJA5	F84L	G	414	T	HAP1	Q40*	G	118	A
F8	A1622T	C	5065	T	FIGF	R351Q	C	1482	T	GJA8	E249D	G	810	T	HAP1	-	C	0	A
F8	R2166*	G	6697	A	FIGN	S89R	T	580	G	GJA9	D416N	C	1527	T	HAP1	V192I	C	574	T
F8	A1311T	C	4132	T	FIGN	A557T	C	1984	T	GJA9	M368V	T	1383	C	HAPLN2	C290G	T	1275	G
F8	V1984I	C	6151	T	FIGN	L206F	G	931	A	GJA9	E361*	C	1362	A	HAPLN3	R110C	G	543	A
F8	W2089L	C	6467	A	FIGN	R684C	G	2365	A	GJB1	W44C	G	226	T	HAPLN3	R248S	G	957	T
F8	T2141A	T	6622	C	FIGN	P305L	G	1229	A	GJB3	G125R	G	988	A	HAPLN4	G231S	C	755	T
F8	A1551V	G	4853	A	FIGN	R641W	G	2236	A	GJB3	A114T	G	955	A	HAPLN4	E260*	C	842	A
F8	S921R	T	2962	G	FIGN	S619L	G	2171	A	GJB4	A96T	G	656	A	HAPLN4	A308T	C	986	T
F9	P324S	C	999	T	FIGN	P270L	G	1124	A	GJB4	F68L	C	574	A	HAPLN4	R60C	G	242	A

F9	V331I	G	1020	A	FIGNL1	S259Y	G	1106	T	GJB5	W129*	G	559	A	HARS	R375H	C	1844	T
F9	-	G	0	T	FIGNL1	V651M	C	2281	T	GJB5	R124W	C	543	T	HARS	R86C	G	976	A
FAAH2	R232Q	G	815	A	FIGNL1	R181P	C	872	G	GJB7	T177A	T	768	C	HARS2	R215Q	G	867	A
FAAH2	V70I	G	328	A	FILIP1	T1136M	G	3738	A	GJC1	K228N	C	958	A	HARS2	R138H	G	636	A
FABP1	E62K	C	283	T	FILIP1	L589S	A	2097	G	GJC1	F197V	A	863	C	HAS1	A209V	G	661	A
FABP12	S56R	T	229	G	FILIP1	E436D	C	1639	A	GJC1	P272L	G	1089	A	HAS1	A542V	G	1660	A
FABP3	Q96P	T	349	G	FILIP1	V241A	A	1053	G	GJC2	R101C	C	476	T	HAS1	R427H	C	1315	T
FABP4	F17V	A	120	C	FILIP1	R224H	C	1002	T	GJC2	R240*	C	893	T	HAS1	A510V	G	1564	A
FABP7	E102*	G	340	T	FILIP1L	L894Q	A	3152	T	GJC3	V81A	A	242	G	HAS2	R320W	G	1496	A
FADS1	K139T	T	478	G	FILIP1L	L722F	T	2637	G	GJD2	R246W	G	736	A	HAS2	T110A	T	866	C
FADS2	K251N	G	903	T	FILIP1L	E137D	C	882	A	GJD2	R278C	G	832	A	HAS2	K536T	T	2145	G
FADS2	R216H	G	797	A	FIP1L1	E256*	G	766	T	GJD4	A40V	C	277	T	HAS2	I534N	A	2139	T
FADS2	F85L	C	405	A	FIP1L1	D831N	G	2491	A	GJD4	A340T	G	1176	A	HAS2	E379K	C	1673	T
FADS6	H291R	T	879	C	FIS1	H86Y	G	481	A	GK	L174V	C	699	G	HAS2	K149N	C	985	A
FADS6	L120I	G	365	T	FITM1	G84C	G	539	T	GK	G296V	G	1066	T	HAS3	R152C	C	610	T
FAF1	-	A	0	G	FKBP10	E47K	G	243	A	GK	R505C	C	1692	T	HAS3	W350C	G	1206	T
FAF1	R554W	G	2112	A	FKBP11	K184R	T	670	C	GK2	R24H	C	164	T	HAS3	P82S	C	400	T
FAF1	G293*	C	1329	A	FKBP14	I81T	A	418	G	GK2	L61I	G	274	T	HAUS1	L185I	C	633	A
FAF2	F390L	C	1223	A	FKBP15	R1185H	C	3554	T	GK5	I138L	T	564	G	HAUS3	G354R	C	1290	T
FAF2	T425M	C	1327	T	FKBP15	P1140L	G	3419	A	GK5	C390R	A	1320	G	HAUS3	K85N	T	485	G
FAF2	D389N	G	1218	A	FKBP15	C287Y	C	860	T	GK5	S364R	T	1242	G	HAUS6	K359N	T	1545	G
FAH	A147V	C	595	T	FKBP1C	R19C	C	166	T	GK5	L53I	G	309	T	HAUS7	E60K	C	222	T
FAHD1	L148F	C	705	T	FKBP1C	R19C	C	166	T	GKN1	R157S	C	532	A	HAVCR1	T198P	T	1125	G
FAHD2A	K294N	G	1164	T	FKBP4	D63N	G	374	A	GKN1	K14R	A	104	G	HAVCR2	L192F	T	781	A
FAHD2B	K294N	C	1153	A	FKBP4	T143M	C	615	T	GKN1	K118N	G	417	T	HAX1	S66G	A	274	G
FAIM2	R281H	C	987	T	FKBP4	R373W	C	1304	T	GKN2	T41I	G	231	A	HBE1	V127A	A	725	G
FAM102A	-	C	0	T	FKBP4	V273A	T	1005	C	GKN2	S125Y	G	483	T	HBEGF	G190*	C	871	A
FAM102A	V354M	C	1436	T	FKBP6	L200F	C	667	T	GLA	D25G	T	96	C	HBEGF	-	T	0	C
FAM102B	T114S	A	680	T	FKBP8	S282L	G	958	A	GLB1	-	C	0	A	HBG2	A75V	G	307	A
FAM102B	-	G	0	T	FKBP9	P367H	C	1269	A	GLB1	W277R	A	974	T	HBM	A133V	C	418	T
FAM105B	P254Q	C	839	A	FKBP9	S275R	A	992	C	GLB1	D441N	C	1466	T	HBP1	A115T	G	425	A
FAM107A	P57L	G	786	A	FKBP9	E507*	G	1688	T	GLB1L	T326N	G	1291	T	HBQ1	G60D	G	213	A
FAM107B	D185Y	C	787	A	FKRP	R154H	G	810	A	GLB1L	R440C	G	1632	A	HBS1L	P234L	G	894	A
FAM108B1	R156I	C	768	A	FKRP	R390C	C	1517	T	GLB1L	S52I	C	469	A	HBS1L	V612I	C	2027	T
FAM108C1	I279T	T	955	C	FKRP	C191Y	G	921	A	GLB1L	-	C	0	T	HBS1L	R615Q	C	2037	T
FAM108C1	S27R	C	200	A	FKTN	L78V	T	356	G	GLB1L3	T57A	A	1340	G	HCCS	P110L	C	531	T
FAM108C1	R158C	C	591	T	FLAD1	R422M	G	1587	T	GLB1L3	R214H	G	1812	A	HCFC1	T295M	G	1228	A
FAM109A	A70T	C	657	T	FLAD1	R140H	G	741	A	GLB1L3	-	G	0	T	HCFC1	A907T	C	3063	T
FAM109A	L61P	A	631	G	FLAD1	R530C	C	1910	T	GLCCI1	R256C	C	1323	T	HCFC1	R374C	G	1464	A

FAM109A	A40V	G	568	A	FLCN	R17H	C	505	T	GLDC	D712N	C	2285	T	HCFC1	R630C	G	2232	A
FAM109B	Y11C	A	219	G	FLCN	E211D	C	1088	A	GLDC	G69D	C	357	T	HCFC2	E191*	G	674	T
FAM110A	R82H	G	579	A	FLG	S3864N	C	11627	T	GLDC	R884I	C	2802	A	HCFC2	I667V	A	2102	G
FAM110B	R337H	G	1890	A	FLG	A3925T	C	11809	T	GLDN	D225N	G	678	A	HCFC2	L166S	T	600	C
FAM110B	A160V	C	1359	T	FLG	Q1177K	G	3565	T	GLDN	F341S	T	1027	C	HCFC2	E191*	G	674	T
FAM110B	T168M	C	1383	T	FLG	R587C	G	1795	A	GLDN	R414Q	G	1246	A	HCFC2	G239V	G	819	T
FAM110B	V111M	G	1211	A	FLG	H684R	T	2087	C	GLE1	R227H	G	786	A	HCK	V389F	G	1336	T
FAM110B	S189P	T	1445	C	FLG	Q499*	G	1531	A	GLE1	E358D	G	1180	T	HCLS1	R467W	G	1491	A
FAM110B	A160T	G	1358	A	FLG	G441R	C	1357	T	GLE1	G508R	G	1628	A	HCLS1	D452N	C	1446	T
FAM110B	L116M	C	1226	A	FLG	G1034R	C	3136	T	GLG1	R1101Q	C	3352	T	HCN1	R458I	C	1431	A
FAM111A	K10N	G	257	T	FLG	T3579A	T	10771	C	GLG1	R933H	C	2848	T	HCN1	P734Q	G	2259	T
FAM111A	R209C	C	852	T	FLG	S1276N	C	3863	T	GLG1	Y497C	T	1540	C	HCN1	Y699H	A	2153	G
FAM111B	K135N	G	596	T	FLG	S673Y	G	2054	T	GLG1	-	C	0	T	HCN1	L111P	A	390	G
FAM113A	R426G	T	1779	C	FLG	S622R	G	1902	T	GLG1	R501*	G	1551	A	HCN2	P230Q	C	742	A
FAM113A	V239A	A	1219	G	FLG	D309E	G	963	T	GLI1	T320M	C	1037	T	HCN2	S251L	C	805	T
FAM113B	R300H	G	1630	A	FLG	R42W	G	160	A	GLI1	V107I	G	397	A	HCN3	L602M	C	1812	A
FAM114A1	V86M	G	432	A	FLG	A10V	G	65	A	GLI1	E572D	G	1794	T	HCN3	D354E	C	1070	G
FAM114A1	V260G	T	955	G	FLG2	G307*	C	992	A	GLI2	R806H	G	2477	A	HCN3	S293L	C	886	T
FAM114A2	E76D	T	228	G	FLG2	G1421R	C	4334	G	GLI2	R516L	G	1607	T	HCN4	R1154W	G	4454	A
FAM116A	R438H	C	1384	T	FLG2	H1406N	G	4289	T	GLI2	A151T	G	511	A	HCN4	R417H	C	2244	T
FAM116B	V330A	A	1061	G	FLG2	S941T	C	2895	G	GLI2	A188V	C	623	T	HCN4	P224H	G	1665	T
FAM116B	P195L	G	656	A	FLG2	T2383I	G	7221	A	GLI2	S662L	C	2045	T	HCN4	A412G	G	2229	C
FAM116B	R253G	T	829	C	FLI1	V225A	T	1015	C	GLI2	S1570P	T	4768	C	HCN4	R332W	G	1988	A
FAM116B	T49I	G	218	A	FLII	R1241W	G	3773	A	GLI3	S1461Y	G	4468	T	HCRTR1	A282T	G	1229	A
FAM117A	R437H	C	1390	T	FLII	G653W	C	2009	A	GLI3	G1168R	C	3588	T	HCRTR1	R260H	G	1164	A
FAM117B	A575P	G	1723	C	FLII	K958N	C	2926	A	GLI3	S1154R	G	3548	T	HCRTR1	G167C	G	884	T
FAM117B	P308Q	C	923	A	FLII	D1188G	T	3615	C	GLI3	D1088N	C	3348	T	HDAC10	A92T	C	627	T
FAM118A	E64K	G	1024	A	FLNA	R1959H	C	5914	T	GLI3	R1542Q	C	4711	T	HDAC2	S81R	G	243	C
FAM118A	N222S	A	1499	G	FLNA	G1023D	C	3106	T	GLI3	V1073I	C	3303	T	HDAC2	F245L	G	735	T
FAM118A	V210I	G	1462	A	FLNA	R496W	G	1524	A	GLI3	G264V	C	877	A	HDAC2	R499G	T	1495	C
FAM118B	A56V	C	350	T	FLNA	A818T	C	2490	T	GLI3	A57T	C	255	T	HDAC3	M24T	A	151	G
FAM119A	R192Q	C	751	T	FLNA	V1609M	C	4863	T	GLI3	P653L	G	2044	A	HDAC4	G623C	C	2659	A
FAM120A	L245M	C	758	A	FLNA	V456M	C	1404	T	GLI3	S191N	C	658	T	HDAC4	A235T	C	1495	T
FAM120A	P556T	C	1691	A	FLNA	S860N	C	2617	T	GLI3	A1337T	C	4095	T	HDAC4	T367M	G	1892	A
FAM120A	A619T	G	1880	A	FLNA	E1351K	C	4089	T	GLI3	N1530K	G	4676	T	HDAC4	A552T	C	2446	T
FAM120AOS	G132C	C	1277	A	FLNB	G756C	G	2431	T	GLI4	P155L	C	549	T	HDAC4	Q731*	G	2983	A

FAM120B	S516P	T	1654	C	FLNB	T116M	C	512	T	GLIPR1	R39*	C	263	T	HDAC4	P578L	G	2525	A
FAM120B	H864R	A	2699	G	FLNB	V2096M	G	6451	A	GLIPR1	P106S	C	464	T	HDAC4	K259R	T	1568	C
FAM120B	F314L	T	1048	C	FLNB	L1476F	G	4593	T	GLIPR1	L264I	C	938	A	HDAC4	-	C	0	A
FAM122A	S262I	G	853	T	FLNC	E2268K	G	7063	A	GLIPR1L1	E43K	G	173	A	HDAC5	R477H	C	1762	T
FAM122A	N168S	A	571	G	FLNC	D866N	G	2857	A	GLIPR1L2	L84V	T	287	G	HDAC5	T980A	T	3270	C
FAM122B	R56H	C	587	T	FLNC	D2479N	G	7696	A	GLIPR2	E147*	G	439	T	HDAC5	-	T	0	C
FAM123A	I384V	T	1818	C	FLNC	-	G	0	T	GLIS1	R238C	G	1279	A	HDAC5	F984V	A	3282	C
FAM123B	R177C	G	802	A	FLNC	R81C	C	502	T	GLIS1	D529N	C	2152	T	HDAC6	Q519P	A	1556	C
FAM123B	E384*	C	1423	A	FLNC	A1378V	C	4394	T	GLIS1	L399F	G	1762	A	HDAC6	A231T	G	691	A
FAM123B	G105D	C	587	T	FLNC	G973C	G	3178	T	GLIS2	A437T	G	2130	A	HDAC7	A146V	G	437	A
FAM123B	E244*	C	1003	A	FLNC	V215M	G	904	A	GLIS2	L328F	C	1803	T	HDAC7	E398K	C	1192	T
FAM123C	R463Q	G	1647	A	FLNC	R157H	G	731	A	GLIS3	A208V	G	623	A	HDAC7	G868V	C	2603	A
FAM123C	P438Q	C	1572	A	FLNC	D965Y	G	3154	T	GLIS3	R637C	G	1909	A	HDAC7	E119G	T	356	C
FAM123C	R90*	C	527	T	FLNC	D1950Y	G	6109	T	GLIS3	R394H	C	1181	T	HDAC9	H786Q	C	2399	G
FAM124A	L223I	C	798	A	FLRT1	A402V	C	1546	T	GLMN	Y401*	A	1285	C	HDAC9	D601H	G	1842	C
FAM124A	P364L	C	1222	T	FLRT1	R226H	G	1018	A	GLO1	-	C	0	T	HDAC9	R628H	G	1924	A
FAM124A	H489Q	C	1598	G	FLRT2	E151D	A	1220	C	GLP1R	R48C	C	185	T	HDAC9	P23H	C	109	A
FAM124A	R116W	C	477	T	FLRT2	A449V	C	2113	T	GLP2R	T287M	C	1373	T	HDAC9	V10M	G	69	A
FAM124B	G366A	C	1363	G	FLRT2	R583Q	G	2515	A	GLP2R	A487T	G	1972	A	HDAC9	K61N	G	224	T
FAM124B	G21D	C	328	T	FLRT2	R52Q	G	922	A	GLP2R	K241T	A	1235	C	HDAC9	K97N	A	332	C
FAM124B	F171S	A	778	G	FLRT2	E118*	G	1119	T	GLRA2	Y195H	T	915	C	HDAC9	E145D	A	476	C
FAM125A	L112M	C	423	A	FLRT3	R47H	C	397	T	GLRA3	Y261C	T	1285	C	HDAC9	R409Q	G	1267	A
FAM125A	S58Y	C	262	A	FLRT3	M343V	T	1284	C	GLRA3	F443V	A	1830	C	HDC	G201V	C	1005	A
FAM125B	A303V	C	989	T	FLRT3	Q69P	T	463	G	GLRA3	R351*	G	1554	A	HDC	-	A	0	G
FAM125B	K283T	A	929	C	FLT1	L757V	G	2521	C	GLRA4	E227*	C	1100	A	HDGF	D150N	C	533	T
FAM126A	P167H	G	733	T	FLT1	R1257H	C	4022	T	GLRA4	G375V	C	1545	A	HDGF	G168V	C	588	A
FAM126A	D262Y	C	1017	A	FLT1	N539T	T	1868	G	GLRB	D429Y	G	1555	T	HDGF	P185S	G	638	A
FAM129A	R221Q	C	856	T	FLT1	R183C	G	799	A	GLRX3	P157A	C	491	G	HDGFL1	P153L	C	585	T
FAM129A	R268I	C	997	A	FLT3	S976R	G	3010	T	GLRX3	K29N	A	109	C	HDGFL1	A149V	C	573	T
FAM129A	E75G	T	418	C	FLT3	R973*	G	2999	A	GLS2	L132I	G	673	T	HDGFL1	G67S	G	326	A
FAM129B	R618C	G	2066	A	FLT3	Q946H	C	2920	A	GLS2	R109Q	C	605	T	HDGFL1	R73C	C	344	T
FAM129B	P460H	G	1593	T	FLT3	F804C	A	2493	C	GLS2	F92L	G	555	T	HDHD1A	T103M	G	308	A
FAM129B	V631A	A	2106	G	FLT4	D1067E	G	3280	T	GLT1D1	E341D	A	1171	C	HDLBP	E564G	T	1919	C
FAM129B	E379K	C	1349	T	FLT4	R476W	G	1505	A	GLT25D1	E183D	G	612	T	HDLBP	E1107K	C	3547	T
FAM129C	G289A	G	1004	C	FLT4	R1031*	G	3170	A	GLT25D1	W261*	G	846	A	HDLBP	R529Q	C	1814	T
FAM129C	L669S	T	2144	C	FLT4	A761T	C	2360	T	GLT25D2	Y568H	A	2074	G	HDLBP	R1114G	T	3568	C
FAM131B	Q26H	T	222	G	FLT4	R1031*	G	3170	A	GLT25D2	V219I	C	1027	T	HDLBP	E936D	C	3036	A
FAM131B	S228L	G	827	A	FLT4	D105N	C	392	T	GLT6D1	S160R	A	734	C	HDLBP	R163C	G	715	A
FAM131B	R73Q	C	362	T	FLVCR2	L351P	T	1428	C	GLT8D1	Y221H	A	1015	G	HDX	D455G	T	1476	C

FAM134A	A143V	C	564	T	FLVCR2	C474R	T	1796	C	GLT8D2	K151E	T	857	C	HDX	E535D	C	1717	A
FAM134C	R245H	C	794	T	FLVCR2	E499D	A	1873	C	GLT8D2	R5Q	C	420	T	HEATR1	I707S	A	2235	C
FAM134C	F154S	A	521	G	FLYWCH1	E272K	G	1177	A	GLTPD2	R181H	G	595	A	HEATR1	R1336C	G	4121	A
FAM135A	N1474T	A	5035	C	FLYWCH1	E5K	G	376	A	GLTSCR1	H917N	C	2943	A	HEATR2	A233T	G	717	A
FAM135A	S1048R	T	3758	G	FLYWCH1	R439W	C	1678	T	GLTSCR1	P446H	C	1531	A	HEATR2	A683V	C	2068	T
FAM135B	A823D	G	2641	T	FLYWCH1	A308S	G	1285	T	GLTSCR1	T1075M	C	3418	T	HEATR3	R665Q	G	2136	A
FAM135B	P563H	G	1861	T	FLYWCH1	M335V	A	1366	G	GLTSCR1	Y1201H	T	3795	C	HEATR4	G76S	C	636	T
FAM135B	C495Y	C	1657	T	FMN1	E1102G	T	3305	C	GLTSCR1	R1474W	C	4614	T	HEATR4	I509M	T	1937	C
FAM135B	K905N	C	2888	A	FMN1	L951F	G	2851	A	GLTSCR1	V1095I	G	3477	A	HEATR5A	R352C	G	1054	A
FAM135B	R701Q	C	2275	T	FMN2	E1835K	G	5503	A	GLTSCR1	K1066N	A	3392	C	HEATR5A	Y834*	G	2502	C
FAM135B	R1211Q	C	3805	T	FMN2	A664T	G	1990	A	GLTSCR2	R391W	C	1180	T	HEATR5A	S1385R	T	4153	G
FAM135B	E1130D	T	3563	G	FMN2	P1076L	C	3227	T	GLTSCR2	V89M	G	274	A	HEATR5A	F1857C	A	5570	C
FAM135B	F1057L	G	3344	T	FMN2	P1244L	C	3731	T	GLTSCR2	E123D	G	378	T	HEATR5B	S688Y	G	2159	T
FAM136A	A61V	G	216	A	FMNL1	-	G	0	A	GLTSCR2	R454Q	G	1370	A	HEATR5B	K1744T	T	5327	G
FAM13A	D155Y	C	671	A	FMNL1	Y59H	T	375	C	GLUD1	M69I	C	304	A	HEATR5B	L939V	A	2911	C
FAM13A	G108S	C	530	T	FMNL1	E679K	G	2235	A	GLUD2	R34C	C	177	T	HEATR6	M1155V	T	3480	C
FAM13A	R989H	C	3174	T	FMNL1	A1018T	G	3252	A	GLUD2	A28V	C	160	T	HEATR6	S493Y	G	1495	T
FAM13A	S817N	C	2658	T	FMNL2	A792T	G	2741	A	GLUD2	S166Y	C	574	A	HEATR6	L847P	A	2557	G
FAM13A	Y629*	G	2095	T	FMNL2	A41T	G	488	A	GLUL	R324H	C	1512	T	HEATR6	V1008M	C	3039	T
FAM13A	E450K	C	1556	T	FMNL2	A521T	G	1928	A	GLYAT	P83H	G	403	T	HEATR7A	T402A	A	1261	G
FAM13B	G396S	C	1638	T	FMNL2	R738Q	G	2580	A	GLYATL1	T166M	C	497	T	HEATR7A	V367M	G	1156	A
FAM13B	F40L	G	572	T	FMNL2	G909*	G	3092	T	GLYATL1	A161S	G	481	T	HEATR7A	T180M	C	596	T
FAM13C	T56A	T	185	C	FMNL3	N877D	T	2863	C	GLYATL3	D51V	A	265	T	HEATR7A	A153T	G	514	A
FAM13C	A94V	G	300	A	FMNL3	G208V	C	857	A	GLYATL3	F267L	C	914	A	HEATR7A	Q233*	C	754	T
FAM13C	E601*	C	1820	A	FMNL3	A753V	G	2492	A	GLYCTK	F347L	C	1101	A	HEATR7B2	Q597*	G	2279	A
FAM13C	M23V	T	86	C	FMNL3	R302H	C	1139	T	GLYCTK	Q472H	G	1476	T	HEATR7B2	G1153D	C	3948	T
FAM149A	R655W	C	1963	T	FMO1	V463I	G	1509	A	GLYR1	A433T	C	1374	T	HEATR7B2	L337V	A	1499	C
FAM149B1	D497N	G	1663	A	FMO1	R291H	G	994	A	GLYR1	F46I	A	213	T	HEATR7B2	A914V	G	3231	A
FAM149B1	A504V	C	1685	T	FMO3	D76E	T	339	A	GM2A	L84F	A	577	C	HECA	R289H	G	1151	A
FAM149B1	M1R	T	176	G	FMO4	C440Y	G	1649	A	GMCL1L	Y428C	A	1534	G	HECA	R152C	C	739	T
FAM149B1	R367I	G	1274	T	FMO4	H513Y	C	1867	T	GMCL1L	R450M	G	1600	T	HECA	R150C	C	733	T
FAM149B2	E283*	G	847	T	FMO4	N320S	A	1289	G	GMEB2	R529W	G	2064	A	HECA	K456R	A	1652	G
FAM149B2	R262C	C	784	T	FMO4	W479G	T	1765	G	GMEB2	G112S	C	813	T	HECA	D112N	G	619	A
FAM149B2	L276P	T	827	C	FMO5	V343I	C	1108	T	GMIP	R391M	C	1289	A	HECTD1	R371Q	C	1601	T
FAM151A	R318W	G	1113	A	FMO5	D341Y	C	1102	A	GMIP	-	C	0	A	HECTD1	E2536A	T	8096	G
FAM151B	T200M	C	754	T	FMO6P	A16S	G	46	T	GML	A82T	G	334	A	HECTD1	N2413H	T	7726	G
FAM153A	H210N	C	685	A	FMR1	R611C	C	1959	T	GMPPA	Y341C	A	1093	G	HECTD1	R2373H	C	7607	T
FAM154A	R323Q	C	1248	T	FMR1NB	G10R	G	102	A	GMPR	R146H	G	555	A	HECTD1	S2283R	T	7336	G
FAM154A	D203N	C	887	T	FMR1NB	D150Y	G	522	T	GMPR	R39Q	G	234	A	HECTD1	N1368S	T	4592	C

FAM154B	R52Q	G	236	A	FMR1NB	-	T	0	C	GMPR2	K20R	A	128	G	HECTD1	K550Q	T	2137	G
FAM154B	S56L	C	248	T	FMR1NB	D215N	G	717	A	GMPR2	S312F	C	1004	T	HECTD2	T452A	A	1454	G
FAM154B	D78G	A	314	G	FN1	R1725H	C	5544	T	GNA11	V164G	T	733	G	HECTD2	K761N	G	2383	T
FAM155A	R197Q	C	729	T	FN1	R1493*	G	4847	A	GNA11	I56V	A	408	G	HECTD2	T158M	C	573	T
FAM155A	C376S	A	1265	T	FN1	A810V	G	2799	A	GNA13	I366V	T	1305	C	HECTD3	R395C	G	1255	A
FAM155A	A125T	C	512	T	FN1	R830C	G	2858	A	GNA13	S90I	C	478	A	HECTD3	I601V	T	1873	C
FAM155A	D54G	T	300	C	FN1	-	A	0	G	GNA13	R227K	C	889	T	HECW1	A644V	C	2536	T
FAM155A	Q82R	T	384	C	FN1	R2149G	T	6815	C	GNA14	G3D	C	522	T	HECW1	S1271L	C	4417	T
FAM155A	R39Q	C	255	T	FN1	V944I	C	3200	T	GNA15	R150C	C	706	T	HECW1	V1452M	G	4959	A
FAM158A	A24T	C	233	T	FN1	G1616R	C	5216	T	GNA15	K36N	G	366	T	HECW1	G18R	G	657	C
FAM160A1	A962T	G	3459	A	FN1	F1585L	G	5125	T	GNA15	V199M	G	853	A	HECW1	R1050Q	G	3754	A
FAM160A2	E223*	C	978	A	FN1	E888*	C	3032	A	GNA15	D158N	G	730	A	HECW1	E898K	G	3297	A
FAM160B1	V576A	T	2062	C	FN1	L256F	G	1136	A	GNAI1	E65G	A	567	G	HECW1	I90V	A	873	G
FAM160B1	R603*	C	2142	T	FN1	E855D	T	2935	G	GNAL	R296I	G	1185	T	HECW1	R296C	C	1491	T
FAM160B2	H641N	C	1950	A	FN3KRP	S242L	C	775	T	GNAO1	A12V	C	881	T	HECW1	S302L	C	1510	T
FAM161A	K710Q	T	2140	G	FNBP1	F539S	A	1803	G	GNAS	R16C	C	49	T	HECW1	A243T	G	1332	A
FAM161A	E253*	C	769	A	FNBP1	H17R	T	237	C	GNAS	R844H	G	2534	A	HECW1	I1250S	T	4354	G
FAM161A	I472N	A	1427	T	FNBP1L	R516H	G	1547	A	GNAS	R844C	C	2533	T	HECW2	R45W	G	316	A
FAM161A	N482T	T	1457	G	FNBP1L	R156I	G	467	T	GNAS	R844C	C	2533	T	HECW2	R739Q	C	2399	T
FAM161B	C415R	A	1631	G	FNBP4	R803M	C	2561	A	GNAS	G230*	G	691	T	HECW2	S1022N	C	3248	T
FAM161B	P433H	G	1686	T	FNDC1	D261V	A	982	T	GNAT2	K21N	C	250	A	HECW2	R1312M	C	4118	A
FAM164A	K75N	G	279	T	FNDC1	R1299C	C	4095	T	GNAT3	F223L	A	763	C	HECW2	H470Y	G	1591	A
FAM164A	R189*	C	619	T	FNDC1	L505F	C	1713	T	GNAZ	D201G	A	1268	G	HEG1	S646L	G	2005	A
FAM164C	E209V	A	799	T	FNDC1	P666H	C	2197	A	GNAZ	D94N	G	946	A	HEG1	S782I	C	2413	A
FAM164C	F125C	T	547	G	FNDC1	R1140*	C	3618	T	GNB1	G216D	C	979	T	HEG1	F766L	G	2366	T
FAM166A	E83K	C	302	T	FNDC1	T1057M	C	3370	T	GNB1	T47M	G	472	A	HELLS	N828H	A	2587	C
FAM166A	I120T	A	414	G	FNDC1	R564Q	G	1891	A	GNB2	R48W	C	624	T	HELLS	I116T	T	452	C
FAM167B	R57M	G	359	T	FNDC1	A1273T	G	4017	A	GNB2	A203T	G	1089	A	HELQ	R710C	G	2291	A
FAM168A	-	C	0	A	FNDC1	A1229T	G	3885	A	GNB2	R52H	G	637	A	HELQ	N101D	T	464	C
FAM168A	Y237H	A	988	G	FNDC1	P1853H	C	5758	A	GNB2	D228N	G	1164	A	HELT	N314D	A	940	G
FAM169A	M129I	C	478	A	FNDC1	R252Q	G	955	A	GNB2L1	T94I	G	374	A	HELZ	H1790N	G	5555	T
FAM170B	F231L	G	783	T	FNDC1	E364D	A	1292	C	GNB3	S74A	T	625	G	HELZ	A1670V	G	5196	A
FAM171A1	Y241C	T	729	C	FNDC1	R1346I	G	4237	T	GNB3	I171S	T	917	G	HELZ	F1431L	A	4480	C
FAM171A1	R706W	G	2123	A	FNDC1	P1446S	C	4536	T	GNB4	-	C	0	A	HELZ	K970N	C	3097	A
FAM171A1	L306I	G	923	T	FNDC1	D1521N	G	4761	A	GNE	D84Y	C	350	A	HELZ	I381L	T	1328	G
FAM171A2	R352H	C	1216	T	FNDC3A	A648V	C	2248	T	GNE	R39Q	C	216	T	HELZ	K56N	T	355	G
FAM171A2	R608H	C	1984	T	FNDC3A	R113H	G	643	A	GNE	D530E	G	1690	T	HEMGN	R43I	C	370	A
FAM171A2	V63A	A	349	G	FNDC3A	D788G	A	2668	G	GNG13	K61R	T	275	C	HEMGN	E38*	C	354	A
FAM173A	A101D	C	419	A	FNDC3A	R1122C	C	3669	T	GNGT2	A32V	G	185	A	HEMK1	A149T	G	741	A

FAM173B	R101H	C	315	T	FNDC3B	P595H	C	1956	A	GNL2	D228A	T	782	G	HEMK1	A60T	G	474	A
FAM174B	K157T	T	612	G	FNDC3B	R744S	G	2404	T	GNL2	Q452R	T	1454	C	HEMK1	V71A	T	508	C
FAM175B	Y391H	T	1216	C	FNDC3B	V221I	G	833	A	GNL3L	F199L	C	736	G	HEPACAM	R288H	C	1269	T
FAM175B	K64T	A	236	C	FNDC5	R59Q	C	224	T	GNL3L	R522C	C	1703	T	HEPACAM	M193I	C	985	A
FAM175B	E317*	G	994	T	FNDC7	S220Y	C	659	A	GNL3L	P410H	C	1368	A	HEPACAM	R92Q	C	681	T
FAM176A	A121T	C	786	T	FNIP1	R977*	G	2991	A	GNL3L	R495C	C	1622	T	HEPACAM2	W205*	C	638	T
FAM176A	M136I	C	833	T	FNIP2	G890S	G	2668	A	GNL3L	N8H	A	161	C	HEPH	V889M	G	2997	A
FAM178A	T818I	C	2585	T	FNTA	A70T	G	256	A	GNLY	G125R	G	501	A	HEPH	V113A	T	670	C
FAM178A	S841G	A	2653	G	FNTA	L295R	T	932	G	GNLY	R94W	C	408	T	HEPH	R729H	G	2518	A
FAM178A	R388C	C	1294	T	FNTB	F23V	T	67	G	GNPDA1	M215V	T	696	C	HEPH	R1144H	G	3763	A
FAM178B	R793H	C	2378	T	FNTB	G403S	G	1207	A	GNPDA2	E127*	C	536	A	HEPH	R319H	G	1288	A
FAM178B	R224H	C	671	T	FNTB	L416S	T	1247	C	GNPTAB	R1169M	C	3685	A	HEPHL1	A452V	C	1512	T
FAM178B	R604H	C	1811	T	FOLH1	E102*	C	565	A	GNPTAB	P1096S	G	3465	A	HEPHL1	L390F	C	1325	T
FAM178B	P537H	G	1610	T	FOLH1B	E313K	G	1463	A	GNPTAB	L303*	A	1087	C	HEPHL1	E797D	G	2548	T
FAM179A	A574T	G	2071	A	FOLR2	F208V	T	797	G	GNPTG	A114T	G	383	A	HEPHL1	F119C	T	513	G
FAM179A	S959N	G	3227	A	FOLR2	R119H	G	531	A	GNS	P266H	G	967	T	HEPHL1	F601C	T	1959	G
FAM179A	R955Q	G	3215	A	FOLR4	F90S	T	269	C	GOLGA1	D48N	C	476	T	HEPHL1	F687L	C	2218	A
FAM179A	A865T	G	2944	A	FOLR4	S191R	C	573	A	GOLGA1	R411C	G	1565	A	HERC1	A3805V	G	1156 2	A
FAM179A	E9K	G	376	A	FOSL1	-	T	1003	A	GOLGA2	R537C	G	1622	A	HERC1	R883I	C	2796	A
FAM179A	D716Y	G	2497	T	FOXA2	Y168C	T	688	C	GOLGA2B	R62Q	C	513	T	HERC1	R3453H	C	1050 6	T
FAM179B	G413V	G	1421	T	FOXA2	D447E	A	1526	T	GOLGA2B	D19N	C	383	T	HERC1	-	T	0	C
FAM179B	R524C	C	1753	T	FOXB1	A275V	C	1303	T	GOLGA3	A1049V	G	3705	A	HERC1	R106*	G	464	A
FAM181A	P238S	C	1019	T	FOXB1	Y128C	A	862	G	GOLGA3	R903C	G	3266	A	HERC1	Q3182R	T	9693	C
FAM182A	-	G	0	T	FOXB2	A271V	C	812	T	GOLGA3	F1347C	A	4599	C	HERC1	L662P	A	2133	G
FAM182B	G136V	C	786	A	FOXB2	L298P	T	893	C	GOLGA4	Y1617D	T	5148	G	HERC1	A4388V	G	1331 1	A
FAM183A	V39M	G	144	A	FOXB2	H142P	A	425	C	GOLGA4	M2202V	A	6903	G	HERC1	R258*	G	920	A
FAM183B	D57A	T	1105	G	FOXC1	T153M	C	458	T	GOLGA4	-	T	0	C	HERC1	R3248Q	C	9891	T
FAM184A	R932I	C	2890	A	FOXC1	D178N	G	532	A	GOLGA4	K354N	G	1361	T	HERC1	D4859G	T	1472 4	C
FAM184A	T723M	G	2263	A	FOXC2	A291G	C	957	G	GOLGA4	K374N	G	1421	T	HERC1	N3902D	T	1185 2	C
FAM184A	T730M	G	2284	A	FOXC2	D137N	G	494	A	GOLGA4	E1132*	G	3693	T	HERC1	P1074S	G	3368	A
FAM184A	-	C	0	A	FOXD2	G214D	G	2760	A	GOLGA4	E1358A	A	4372	C	HERC1	D2381Y	C	7289	A
FAM184A	L266F	C	893	A	FOXD2	P445H	C	3453	A	GOLGA5	S33G	A	279	G	HERC1	R455K	C	1512	T
FAM184A	R238I	C	808	A	FOXD2	P233S	C	2816	T	GOLGA5	E565K	G	1875	A	HERC1	R1448W	G	4490	A
FAM184B	A654T	C	2173	T	FOXD4L1	A68V	C	376	T	GOLGA5	E623K	G	2049	A	HERC2	A4806V	G	1452 6	A
FAM184B	H439Y	G	1528	A	FOXE1	A164V	C	1151	T	GOLGA5	F126C	T	559	G	HERC2	R577C	G	1838	A

FAM184B	V36M	C	319	T	FOXF1	A24V	C	103	T	GOLGA7	R118*	C	430	T	HERC2	G581S	C	1850	T
FAM184B	M868I	C	2817	A	FOXF1	D373Y	G	1149	T	GOLGA7	I127M	T	459	G	HERC2	E4709K	C	1423	T
FAM184B	R820W	G	2671	A	FOXF2	F216L	T	760	C	GOLGB1	E2021*	C	6172	A	HERC2	R746H	C	2346	T
FAM186A	G2201R	C	6739	T	FOXG1	G361S	G	1450	A	GOLGB1	E1852*	C	5665	A	HERC2	A4634V	G	1401	A
FAM186A	I792M	T	2514	C	FOXG1	R281W	C	1210	T	GOLGB1	E889D	C	2778	A	HERC2	V3665I	C	1110	T
FAM186A	E2010*	C	6166	A	FOXG1	A188T	G	931	A	GOLGB1	E750*	C	2359	A	HERC2	A1939T	C	5924	T
FAM186A	K1258T	T	3911	G	FOXG1	A436T	G	1675	A	GOLGB1	R2480C	G	7549	A	HERC2	V395D	A	1293	T
FAM186A	K931N	T	2931	G	FOXG1	A375T	G	1492	A	GOLGB1	L1723I	G	5278	T	HERC2	A3263D	G	9897	T
FAM186A	S203Y	G	746	T	FOXG1	A411V	C	1601	T	GOLGB1	A100T	C	409	T	HERC2	A4734T	C	1430	T
FAM186B	E495D	C	1647	A	FOXH1	Q19*	G	634	A	GOLGB1	E1929V	T	5897	A	HERC2	-	T	0	C
FAM186B	V230I	C	850	T	FOXH1	Y285C	T	1433	C	GOLGB1	S2980L	G	9050	A	HERC2	I2702F	T	8213	A
FAM186B	A64V	G	353	A	FOXI1	P68S	C	250	T	GOLGB1	N3027H	T	9190	G	HERC2	Q4330H	C	1309	A
FAM186B	E55*	C	325	A	FOXI2	G292D	G	914	A	GOLGB1	D1763N	C	5398	T	HERC2	R2784H	C	8460	T
FAM187B	E131K	C	440	T	FOXI2	R141C	C	460	T	GOLGB1	E1064D	T	3303	G	HERC2	G4433R	C	1340	T
FAM188A	C131F	C	613	A	FOXJ2	R256H	G	1852	A	GOLGB1	K951Q	T	2962	G	HERC2	T3098P	T	9401	G
FAM188B	L497M	C	1566	A	FOXJ3	P224T	G	939	T	GOLGB1	E902K	C	2815	T	HERC2	A2208V	G	6732	A
FAM188B	R48Q	G	220	A	FOXJ3	K134T	T	670	G	GOLGB1	K882Q	T	2755	G	HERC2	P278S	G	941	A
FAM188B	G630A	G	1966	C	FOXK1	I331N	T	992	A	GOLIM4	R284Q	C	1541	T	HERC2	H4355Y	G	1317	A
FAM189A2	L406R	T	1321	G	FOXK2	P478Q	C	1607	A	GOLIM4	R478Q	C	2123	T	HERC2	A4634V	G	1401	A
FAM189A2	R402I	G	1309	T	FOXK2	R631Q	G	2066	A	GOLM1	E341V	T	1165	A	HERC2	W627*	C	1990	T
FAM189A2	R164H	G	595	A	FOXK2	R351W	C	1225	T	GOLM1	E341*	C	1164	A	HERC2	R3906C	G	1182	A
FAM189B	R370C	G	1714	A	FOXK2	R544W	C	1804	T	GOLPH3	R269W	G	1121	A	HERC2	L3384I	G	1025	T
FAM189B	M1V	T	607	C	FOXN1	D263N	G	816	A	GOLPH3	R231H	C	1008	T	HERC2	I1071N	A	3321	T
FAM18A	L14P	A	148	G	FOXN1	A143T	G	456	A	GON4L	R2112I	C	6384	A	HERC2	R698H	C	2202	T
FAM18B2	S204Y	G	707	T	FOXN1	P219S	C	684	T	GON4L	V304M	C	959	T	HERC3	A532T	G	1833	A
FAM190A	R19I	G	344	T	FOXN2	D360E	T	1341	A	GON4L	V26I	C	125	T	HERC3	K575R	A	1963	G
FAM190A	V817I	G	2737	A	FOXN2	S83R	T	510	G	GORAB	E333Q	G	1017	C	HERC3	Q326H	A	1217	C
FAM190A	L662P	T	2273	C	FOXN2	R386Q	G	1418	A	GORAB	R251M	G	772	T	HERC4	V140A	A	667	G
FAM190A	L29V	C	373	G	FOXN3	S187L	G	576	A	GORASP1	V67M	C	1021	T	HERC4	R315Q	C	1192	T
FAM190A	L581*	T	2030	A	FOXN3	D364N	C	1106	T	GORASP2	R217H	G	650	A	HERC4	S294N	C	1129	T
FAM190A	R766C	C	2584	T	FOXN4	A450T	C	1453	T	GOT2	R287C	G	911	A	HERC5	S113*	C	491	A
FAM190A	K79T	A	524	C	FOXN4	P23H	G	173	T	GP1BA	T91M	C	272	T	HERC5	S640L	C	2072	T

FAM190A	R123Q	G	656	A	FOXO1	R316Q	C	1332	T	GP1BA	Y201H	T	601	C	HERC5	S664L	C	2144	T
FAM190B	R773Q	G	2512	A	FOXO1	A574D	G	2106	T	GP2	P487S	G	1609	A	HERC6	-	T	0	G
FAM190B	R805H	G	2608	A	FOXO4	R92Q	G	607	A	GP2	G32V	C	245	A	HERPUD1	A194G	C	701	G
FAM192A	G191R	C	830	T	FOXP1	Q196H	C	742	A	GP2	V252F	C	904	A	HES6	A122T	C	583	T
FAM193A	A1006S	G	3367	T	FOXP1	S450L	G	1503	A	GP5	A483T	C	1519	T	HESX1	R159W	G	802	A
FAM193A	Q627H	G	2232	T	FOXP1	R527*	G	1733	A	GP5	T512A	T	1606	C	HEXA	Y82C	T	452	C
FAM193B	E690K	C	2068	T	FOXP2	E379K	G	1509	A	GP5	R372C	G	1186	A	HEXB	R533H	G	1715	A
FAM194A	V48E	A	196	T	FOXP2	D727N	G	2553	A	GP5	G212R	C	706	T	HEXB	V39M	G	232	A
FAM194A	E54V	T	214	A	FOXP2	H435Y	C	1677	T	GP5	R15H	C	116	T	HEXDC	P557T	C	2085	A
FAM194A	-	A	0	G	FOXP2	K458N	G	1748	T	GP6	Q470H	T	1438	G	HEXDC	A425T	G	1689	A
FAM194A	A344V	G	1084	A	FOXP2	D738N	G	2586	A	GP6	E41D	C	151	A	HEXIM2	V160M	G	710	A
FAM194A	F140V	A	471	C	FOXP4	R337Q	G	1468	A	GP9	R112H	G	557	A	HEY2	A116T	G	543	A
FAM196B	R454Q	C	2743	T	FOXR1	R228*	C	907	T	GPA33	C261R	A	1125	G	HEY2	D120E	C	557	G
FAM196B	N460T	T	2761	G	FOXRED1	Y413H	T	1298	C	GPAM	-	A	0	G	HEYL	R148H	C	763	T
FAM196B	T468M	G	2785	A	FOXRED1	F119L	C	418	A	GPAM	G541E	C	1820	T	HFE	V343I	G	1149	A
FAM196B	F23L	A	1451	T	FPGS	R531*	C	1641	T	GPAT2	R693W	G	2246	A	HFE2	S206F	C	855	T
FAM198A	A27V	C	456	T	FPGS	G87W	G	309	T	GPAT2	P782S	G	2513	A	HFM1	K1308T	T	4022	G
FAM198B	A43V	G	535	A	FPGS	S518I	G	1603	T	GPATCH1	S251L	C	1066	T	HFM1	F1274V	A	3919	C
FAM198B	A65V	G	601	A	FPR1	V59L	C	270	G	GPATCH1	S760G	A	2592	G	HFM1	A907V	G	2819	A
FAM198B	R115C	G	750	A	FPR1	M55I	C	260	T	GPATCH1	K230Q	A	1002	C	HFM1	S31P	A	190	G
FAM198B	L38I	G	519	T	FPR1	P79S	G	330	A	GPATCH1	F623L	T	2183	G	HFM1	T48A	T	241	C
FAM19A1	S8P	T	512	C	FPR1	L252I	G	849	T	GPATCH1	P478S	C	1746	T	HFM1	S1174Y	G	3620	T
FAM19A2	K55T	T	170	G	FPR1	S181L	G	637	A	GPATCH3	E148D	C	468	A	HFM1	K677N	C	2130	A
FAM19A5	A84T	G	251	A	FPR1	H90Q	A	365	C	GPATCH3	R214Q	C	665	T	HFM1	-	C	0	A
FAM200B	S32I	G	933	T	FPR2	G185C	G	868	T	GPATCH8	Q1192P	T	3639	G	HGD	S106F	G	777	A
FAM200B	F355C	T	1902	G	FPR2	R238H	G	1028	A	GPATCH8	R859H	C	2640	T	HGD	S47L	G	600	A
FAM20B	P327T	C	1315	A	FPR3	A68T	G	381	A	GPATCH8	A126T	C	440	T	HGF	R234C	G	927	A
FAM20C	H204Y	C	841	T	FPR3	E270*	G	987	T	GPATCH8	A305G	G	978	C	HGF	R234H	C	928	T
FAM20C	R409C	C	1456	T	FPR3	L97I	C	468	A	GPATCH8	S1417Y	G	4314	T	HGF	I39S	A	343	C
FAM20C	Y370C	A	1340	G	FRA10AC1	S251A	A	949	C	GPATCH8	G58V	C	237	A	HGFAC	A327V	C	1007	T
FAM21A	A553V	C	1703	T	FRAS1	A2739T	G	8655	A	GPBP1	D368N	G	2376	A	HGFAC	V480M	G	1465	A
FAM21A	D85A	A	299	C	FRAS1	R926*	C	3216	T	GPBP1	R87Q	G	1534	A	HGFAC	G592S	G	1801	A
FAM21C	Q52H	G	238	T	FRAS1	R3654H	G	1140 1	A	GPBP1L1	K135R	T	1626	C	HGS	R328Q	G	1060	A
FAM25C	I54T	A	159	G	FRAS1	G3220C	G	1009 8	T	GPC1	R400H	G	1197	A	HGS	R518W	C	1629	T
FAM26D	T194N	C	625	A	FRAS1	A3904V	C	1215 1	T	GPC1	A328T	G	980	A	HGS	A562T	G	1761	A
FAM26E	L210P	T	680	C	FRAS1	R270H	G	1249	A	GPC1	D272Y	G	812	T	HGS	V607M	G	1896	A
FAM32A	P60S	C	198	T	FRAS1	G1499*	G	4935	T	GPC2	A317T	C	1117	T	HGSNAT	E149*	G	445	T

FAM35B	I122K	T	2238	A	FRAS1	E2900K	G	9138	A	GPC3	C265R	A	1239	G	HGSNAT	A643T	G	1927	A
FAM38A	A1836V	G	5507	A	FRAS1	F2172V	T	6954	G	GPC4	R174C	G	1045	A	HGSNAT	T258M	C	773	T
FAM38A	G1843R	C	5527	T	FRAS1	D3093E	T	9719	G	GPC5	L13I	C	409	A	HHATL	A150T	C	598	T
FAM38A	D1878G	T	5633	C	FRAS1	N3879S	A	12076	G	GPC5	G570R	G	2080	A	HHATL	D262N	C	934	T
FAM38A	R1766C	G	5296	A	FREM1	V498M	C	2276	T	GPC5	A104V	C	683	T	HHATL	F395V	A	1333	C
FAM38A	R936W	G	2806	A	FREM1	V586A	A	2541	G	GPC5	A81T	G	613	A	HHIP	R350I	G	1704	T
FAM38A	Y1137C	T	3410	C	FREM1	F474S	A	2205	G	GPC5	E161*	G	853	T	HHIP	G555R	G	2318	C
FAM38A	P58H	G	173	T	FREM1	D1506G	T	5301	C	GPC6	C254F	G	1376	T	HHIP	G538S	G	2267	A
FAM38A	P1279S	G	3835	A	FREM1	D447G	T	2124	C	GPC6	R126W	C	991	T	HHIP	A288T	G	1517	A
FAM38B	A153V	G	598	A	FREM1	V1525M	C	5357	T	GPC6	A477T	G	2044	A	HHIP	D513N	G	2192	A
FAM38B	I430T	A	1429	G	FREM1	N1944H	T	6614	G	GPCPD1	I607N	A	2033	T	HHIPL1	R714H	G	2206	A
FAM38B	K1114N	T	482	G	FREM1	K1313N	C	4723	A	GPCPD1	K528Q	T	1795	G	HHIPL1	E98K	G	357	A
FAM38B	L623I	G	2007	T	FREM1	E1077K	C	4013	T	GPCPD1	-	C	0	A	HHIPL2	K303N	C	968	A
FAM38B	I480M	A	1580	C	FREM2	D1562Y	G	4900	T	GPD1L	E333K	G	1198	A	HHIPL2	N480K	A	1499	C
FAM38B	-	C	0	A	FREM2	Y902C	A	2921	G	GPD2	P571H	C	2084	A	HHIPL2	R155H	C	523	T
FAM3B	A151D	C	518	A	FREM2	Q1486*	C	4672	T	GPD2	R557H	G	2042	A	HHIPL2	K303N	C	968	A
FAM3D	P37S	G	420	A	FREM2	Y2706C	A	8333	G	GPD2	R227L	G	1052	T	HHLA2	S197N	G	1004	A
FAM3D	R24*	G	381	A	FREM2	S3039G	A	9331	G	GPD2	E666*	G	2368	T	HIAT1	G178E	G	669	A
FAM40A	R785W	C	2375	T	FREM2	F259L	C	993	G	GPER	V270I	G	808	A	HIAT1	R218W	C	788	T
FAM40A	A80T	G	260	A	FREM2	V484A	T	1667	C	GPHA2	D122G	T	420	C	HIAT1	G407E	G	1356	A
FAM43A	A247V	C	1674	T	FREM2	K1540T	A	4835	C	GPHB5	E72*	C	214	A	HIBCH	L195I	G	878	T
FAM43A	R321C	C	1895	T	FREM2	E792Q	G	2590	C	GPHN	A454V	C	2482	T	HIC1	R604H	G	1811	A
FAM43A	M167I	G	1435	A	FREM2	A159V	C	692	T	GPHN	S604L	C	2932	T	HIC1	P441L	C	1322	T
FAM43B	D273E	C	1354	G	FREM2	W629L	G	2102	T	GPI	R457Q	G	1370	A	HIC1	G597S	G	1789	A
FAM43B	D273E	C	1354	G	FREM2	E2699*	G	8311	T	GPI	L287P	T	860	C	HIF1A	S15R	A	308	C
FAM43B	R51L	G	687	T	FREM2	-	T	0	C	GPI	R428Q	G	1283	A	HIF1A	E682D	A	2311	C
FAM46B	T365M	G	1260	A	FREM2	M434I	G	1518	T	GPKOW	R314Q	C	1020	T	HIF1A	I772L	A	2579	C
FAM46B	R105W	G	479	A	FREM2	V2270G	T	7025	G	GPLD1	-	T	0	A	HIF1AN	R338I	G	1013	T
FAM46B	R264H	C	957	T	FREM2	R2278C	C	7048	T	GPLD1	D712Y	C	2245	A	HIF1AN	A128D	C	383	A
FAM46B	R262Q	C	951	T	FREM3	R209W	G	625	A	GPM6A	K111T	T	378	G	HIF3A	Q298H	G	925	T
FAM46B	R299C	G	1061	A	FREM3	V971A	A	2912	G	GPM6A	I226L	T	722	G	HIF3A	L314M	C	971	A
HIF3A	E74V	A	252	T	INPP4B	Y401*	G	1548	T	KIAA0232	R538*	C	1991	T	LAMA2	R2710H	G	8234	A
HIF3A	E451*	G	1382	T	INPP4B	G548D	C	1988	T	KIAA0232	F761C	T	2661	G	LAMA2	S2263W	C	6893	G
HIF3A	E332D	G	1027	T	INPP5A	K115Q	A	620	C	KIAA0240	D56V	A	494	T	LAMA3	Y869*	C	2693	A
HIGD1A	P45S	G	384	A	INPP5A	V311A	T	1209	C	KIAA0240	R811H	G	2759	A	LAMA3	S1469N	G	4492	A
HIGD1A	V86A	A	508	G	INPP5B	G452*	C	1448	A	KIAA0284	R1541H	G	4850	A	LAMA3	E1903*	G	5793	T
HIGD1C	D52Y	G	154	T	INPP5B	M812I	C	2530	A	KIAA0284	G1290D	G	4097	A	LAMA3	A587S	G	1845	T
HINFP	E63*	G	259	T	INPP5B	L189S	A	660	G	KIAA0284	R348H	G	1271	A	LAMA3	A2099V	C	6382	T
HINT2	L76R	A	269	C	INPP5D	A416T	G	1246	A	KIAA0284	M588L	A	1990	T	LAMA3	A3173V	C	9604	T

HIP1	L779P	A	2363	G	INPP5D	V50I	G	148	A	KIAA0284	T180M	C	767	T	LAMA3	R1296W	C	3972	T
HIP1	T50M	G	176	A	INPP5D	P1134L	C	3401	T	KIAA0284	L134P	T	629	C	LAMA3	R3189C	C	9651	T
HIP1R	A469V	C	1465	T	INPP5D	R552*	C	1654	T	KIAA0317	R380Q	C	1644	T	LAMA3	I1704T	T	5197	C
HIP1R	T839M	C	2575	T	INPP5E	A463V	G	1791	A	KIAA0317	E285K	C	1358	T	LAMA3	E1177K	G	3615	A
HIP1R	T983I	C	3007	T	INPP5F	E250K	G	914	A	KIAA0319	R887Q	C	3185	T	LAMA3	R2149W	C	6531	T
HIPK1	V816I	G	2446	A	INPP5F	E353D	A	1225	C	KIAA0319L	V660M	C	2213	T	LAMA3	F464L	C	1478	A
HIPK1	S1079N	G	3236	A	INPP5F	K774N	G	2488	T	KIAA0319L	G243S	C	962	T	LAMA3	S1148L	C	3529	T
HIPK1	N220T	A	659	C	INPP5J	T529A	A	1634	G	KIAA0355	S654L	C	2820	T	LAMA3	C2462Y	G	7471	A
HIPK2	V686I	C	2151	T	INPP5J	R424Q	G	1320	A	KIAA0355	R849H	G	3405	A	LAMA4	D1739Y	C	5506	A
HIPK3	R38I	G	418	T	INPP5J	R346*	C	1085	T	KIAA0368	T1440M	G	4319	A	LAMA4	L1215P	A	3935	G
HIPK3	A140T	G	723	A	INPP5J	R781C	C	2390	T	KIAA0368	P1876L	G	5627	A	LAMA4	A1058V	G	3464	A
HIPK3	E1009A	A	3331	C	INPP5J	S622N	G	1914	A	KIAA0368	A1320V	G	3959	A	LAMA4	S967L	G	3191	A
HIPK4	R335C	G	1288	A	INPP5J	D420N	G	1307	A	KIAA0368	G358S	C	1072	T	LAMA4	T801M	G	2693	A
HIPK4	R603Q	C	2093	T	INPP5J	S501L	C	1551	T	KIAA0368	W1092C	C	3276	A	LAMA5	R1644H	C	4998	T
HIRA	Q405P	T	1471	G	INPP5K	-	C	0	A	KIAA0368	S1998N	C	5993	T	LAMA5	A2459T	C	7442	T
HIRA	A564T	C	1947	T	INPPL1	A973V	C	3122	T	KIAA0368	F1257C	A	3770	C	LAMA5	G3089D	C	9333	T
HIRA	F28L	A	339	G	INPPL1	E1132K	G	3598	A	KIAA0368	L1166I	G	3496	T	LAMA5	P792L	G	2442	A
HIRA	Q1001R	T	3259	C	INPPL1	R347Q	G	1244	A	KIAA0368	T752A	T	2254	C	LAMA5	I1232T	A	3762	G
HIRA	R407M	C	1477	A	INPPL1	K978N	G	3138	T	KIAA0406	E810K	C	2667	T	LAMA5	D104G	T	378	C
HIRIP3	R266W	G	1257	A	INSC	A531T	G	1637	A	KIAA0415	R1503H	G	4508	A	LAMA5	M1650I	C	5017	T
HIRIP3	R385H	C	1615	T	INSC	E13K	G	83	A	KIAA0415	T913M	C	2738	T	LAMA5	T703M	G	2175	A
HIST1H1B	A24T	C	122	T	INSM1	A392T	G	1321	A	KIAA0415	Q757*	C	2269	T	LAMA5	G3344E	C	1009 8	T
HIST1H1B	K154R	T	513	C	INSM1	C440Y	G	1466	A	KIAA0415	S1029F	C	3086	T	LAMA5	Y2877F	T	8697	A
HIST1H1C	K159N	C	520	A	INSM1	T206A	A	763	G	KIAA0415	T1439I	C	4316	T	LAMA5	T657S	T	2036	A
HIST1H1C	K212N	C	679	G	INSM2	M222T	T	876	C	KIAA0415	P921L	C	2762	T	LAMA5	L528F	G	1649	A
HIST1H1D	I45T	A	189	G	INSM2	R358Q	G	1284	A	KIAA0430	I1674S	A	5228	C	LAMA5	G1474R	C	4487	T
HIST1H1E	-	T	718	C	INSR	G582D	C	1854	T	KIAA0430	R534C	G	1807	A	LAMA5	V1173M	C	3584	T
HIST1H1E	G91C	G	331	T	INSR	A1204S	C	3719	A	KIAA0430	R434H	C	1508	T	LAMA5	P2938L	G	8880	A
HIST1H1T	G167W	C	542	A	INSR	D893N	C	2786	T	KIAA0430	S450*	G	1556	T	LAMA5	V2046M	C	6203	T
HIST1H1T	G167R	C	542	T	INSR	E390*	C	1277	A	KIAA0430	D82H	C	451	G	LAMA5	R3565W	G	1076 0	A
HIST1H2AD	I79S	A	236	C	INSRR	V179M	C	932	T	KIAA0430	G122C	C	571	A	LAMA5	T315M	G	1011	A
HIST1H2AE	T60A	A	216	G	INSRR	T460I	G	1776	A	KIAA0430	F495L	G	1692	T	LAMA5	R2314Q	C	7008	T
HIST1H2AE	L98I	C	330	A	INSRR	R1255C	G	4160	A	KIAA0430	G6E	C	224	T	LAMA5	D1983E	G	6016	T
HIST1H2AL	H124Y	C	469	T	INSRR	Q1230*	G	4085	A	KIAA0467	R823H	G	2930	A	LAMA5	G558D	C	1740	T
HIST1H2BL	Y84C	T	276	C	INSRR	M966T	A	3294	G	KIAA0467	R1980C	C	6400	T	LAMB1	L454F	T	1547	G
HIST1H2BL	Y43C	T	153	C	INSRR	Q1051R	T	3549	C	KIAA0467	K1463R	A	4850	G	LAMB1	N130D	T	573	C

HIST1H2BL	R93T	C	303	G	INSRR	L833R	A	2895	C	KIAA0467	R2042H	G	6587	A	LAMB2	-	C	0	T
HIST1H2BN	K12N	G	938	T	INTS1	-	C	0	T	KIAA0467	-	G	0	T	LAMB2	V526M	C	1741	T
HIST1H2BO	M63I	G	227	T	INTS1	L1692M	G	5074	T	KIAA0467	R2451C	C	7813	T	LAMB2	R246W	G	901	A
HIST1H3B	F105L	A	313	G	INTS1	R1594C	G	4780	A	KIAA0467	R1169H	G	3968	A	LAMB2	Q945R	T	2999	C
HIST1H3B	T33A	T	97	C	INTS1	A1583T	C	4747	T	KIAA0467	T1435A	A	4765	G	LAMB2	R107H	C	485	T
HIST1H3D	P44H	G	528	T	INTS1	P152L	G	455	A	KIAA0467	R1579H	G	5198	A	LAMB2	K87N	C	426	A
HIST1H3E	P67Q	C	200	A	INTS1	R205C	G	613	A	KIAA0467	P771L	C	2774	T	LAMB2	R853Q	C	2723	T
HIST1H3G	E106K	C	747	T	INTS1	M1453I	C	4359	T	KIAA0494	R4H	C	988	T	LAMB3	R430C	G	1678	A
HIST1H3J	F68L	A	202	G	INTS10	K539T	A	1843	C	KIAA0513	V103M	G	527	A	LAMB3	R1135W	G	3793	A
HIST1H3J	A32V	G	95	A	INTS2	R741Q	C	2222	T	KIAA0528	E264*	C	909	A	LAMB3	R439W	G	1705	A
HIST1H4D	G10D	C	29	T	INTS2	L74I	G	220	T	KIAA0528	S606P	A	1935	G	LAMB3	T1148S	T	3832	A
HIST1H4G	I67S	A	200	C	INTS2	R140C	G	418	A	KIAA0556	G761S	G	2305	A	LAMB3	A260T	C	1168	T
HIST1H4I	A16V	C	59	T	INTS3	A951V	C	3420	T	KIAA0556	L629P	T	1910	C	LAMB3	Y362C	T	1475	C
HIST1H4I	K45Q	A	145	C	INTS3	M131T	T	960	C	KIAA0556	G1238D	G	3737	A	LAMB3	R367H	C	1490	T
HIST1H4L	Q28R	T	84	C	INTS3	R440H	G	1887	A	KIAA0556	D1576N	G	4750	A	LAMB3	R367C	G	1489	A
HIST2H2AB	V115I	C	343	T	INTS4	F348V	A	1070	C	KIAA0556	D1122Y	G	3388	T	LAMB3	E858D	T	2964	G
HIST2H2BE	V42A	A	167	G	INTS4	R445*	G	1361	A	KIAA0562	V10I	C	353	T	LAMB3	R2S	T	396	A
HIST2H2BF	S15P	A	53	G	INTS5	A884T	C	2703	T	KIAA0562	R409Q	C	1551	T	LAMB4	R1624Q	C	4951	T
HIST3H3	G35S	C	103	T	INTS5	L301M	G	954	T	KIAA0562	R222Q	C	990	T	LAMB4	Q1194H	T	3662	A
HIST3H3	T46M	G	137	A	INTS5	L502F	G	1557	A	KIAA0562	S20G	T	383	C	LAMB4	L1685P	A	5134	G
HIVEP1	R3Q	G	340	A	INTS6	E603*	C	2280	A	KIAA0564	Y1824*	G	5541	T	LAMB4	R275H	C	904	T
HIVEP1	P435L	C	1636	T	INTS7	Q258*	G	877	A	KIAA0564	R116*	G	415	A	LAMB4	L1489V	A	4545	C
HIVEP1	V2705M	G	8445	A	INTS7	D933G	T	2903	C	KIAA0564	D1073N	C	3286	T	LAMB4	T41M	G	202	A
HIVEP1	P769L	C	2638	T	INTS7	V787G	A	2465	C	KIAA0564	-	C	0	T	LAMC1	V911M	G	2986	A
HIVEP1	R615M	G	2176	T	INTS8	L741S	T	2348	C	KIAA0564	R1714H	C	5210	T	LAMC1	G1261S	G	4036	A
HIVEP1	N1436S	A	4639	G	INTS8	-	A	0	G	KIAA0564	K1628N	C	4953	A	LAMC1	P327S	C	1234	T
HIVEP1	S1785L	C	5686	T	INTS8	A991T	G	3097	A	KIAA0564	F1825C	A	5543	C	LAMC1	R1011C	C	3286	T
HIVEP1	S1919Y	C	6088	A	INTS8	K779Q	A	2461	C	KIAA0564	L1391V	A	4240	C	LAMC1	A125T	G	628	A
HIVEP2	S2052Y	G	6795	T	INTS8	K984T	A	3077	C	KIAA0564	F915L	G	2814	T	LAMC1	Q611R	A	2087	G
HIVEP2	R1028*	G	3722	A	INTS9	Q437*	G	1608	A	KIAA0564	R664Q	C	2060	T	LAMC2	S848R	T	2609	A
HIVEP2	R1028*	G	3722	A	INTS9	A109V	G	625	A	KIAA0564	Q618H	T	1923	G	LAMC2	L1030M	T	3153	A
HIVEP2	R1028*	G	3722	A	INTS9	V617I	C	2148	T	KIAA0586	L803I	C	2634	A	LAMC2	R717W	C	2214	T
HIVEP2	V267A	A	1440	G	INTU	G880C	G	2741	T	KIAA0649	E1164D	G	4041	T	LAMC3	A1244T	G	3828	A
HIVEP2	S1253L	G	4398	A	INVS	V722I	G	2349	A	KIAA0649	A1190T	G	4117	A	LAMC3	C866F	G	2695	T
HIVEP2	S1354Y	G	4701	T	INVS	W155L	G	649	T	KIAA0664	R1264W	G	3790	A	LAMC3	D1493G	A	4576	G
HIVEP3	P153S	G	1343	A	IP6K1	G262D	C	1087	T	KIAA0664	D910N	C	2728	T	LAMC3	P382S	C	1242	T

HIVEP3	S576N	C	2613	T	IP6K1	R316W	G	1248	A	KIAA0664	Q213R	T	638	C	LAMC3	E509G	A	1624	G
HIVEP3	R990G	T	3854	C	IP6K2	R156H	C	714	T	KIAA0664	R276H	C	827	T	LAMC3	R1073W	C	3315	T
HIVEP3	H180P	T	1425	G	IP6K2	-	T	0	G	KIAA0748	R184Q	C	684	T	LAMC3	H1131Y	C	3489	T
HIVEP3	V461L	C	2267	A	IP6K3	A240V	G	1255	A	KIAA0748	R474C	G	1553	A	LAMC3	A318T	G	1050	A
HIVEP3	R18W	G	938	A	IP6K3	R168M	C	1039	A	KIAA0753	R50Q	C	508	T	LAMP1	V285I	G	1047	A
HIVEP3	R1762S	G	6170	T	IPCEF1	A139P	C	571	G	KIAA0776	R535C	C	1669	T	LAMP2	-	T	0	G
HIVEP3	D376N	C	2012	T	IPCEF1	N436H	T	1462	G	KIAA0776	F368C	T	1169	G	LAMP2	R144I	C	611	A
HJURP	A533T	C	1663	T	IPCEF1	K51R	T	308	C	KIAA0776	E774*	G	2386	T	LAMP2	R293Q	C	1058	T
HJURP	I411M	A	1299	C	IPCEF1	Q409H	C	1383	A	KIAA0802	R1573W	C	4717	T	LAMP2	K161N	C	663	A
HJURP	G333W	C	1063	A	IPMK	R411Q	C	1555	T	KIAA0802	A1203V	C	3608	T	LANCL2	G372V	G	1693	T
HK1	G449R	G	1345	A	IPO11	R533*	C	1727	T	KIAA0802	A848T	G	2542	A	LANCL2	C408Y	G	1801	A
HK1	G483C	G	1447	T	IPO11	V570A	T	1839	C	KIAA0802	V1518M	G	4552	A	LANCL3	P314L	C	1160	T
HK2	R42Q	G	725	A	IPO11	F548L	C	1774	A	KIAA0802	L505V	T	1513	G	LANCL3	K312N	G	1155	T
HK2	S155L	C	1064	T	IPO11	E741D	A	2353	C	KIAA0802	L1380I	C	4138	A	LANCL3	Y316S	A	1166	C
HK2	K146N	G	1038	T	IPO13	A18S	G	714	T	KIAA0831	G420R	C	1294	T	LAPTM4B	A174V	C	521	T
HK3	V439I	C	1407	T	IPO13	Y275H	T	1485	C	KIAA0831	N169T	T	542	G	LARGE	Q691H	C	2645	A
HK3	R730C	G	2280	A	IPO13	T508P	A	2184	C	KIAA0895	A282T	C	895	T	LARGE	R308W	G	1494	A
HK3	P170H	G	601	T	IPO13	R863H	G	3250	A	KIAA0895	D380Y	C	1189	A	LARGE	V341I	C	1593	T
HK3	R475C	G	1515	A	IPO13	R321Q	G	1624	A	KIAA0895	R285Q	C	905	T	LARGE	M223K	A	1240	T
HK3	E307D	C	1013	A	IPO4	R953*	G	2867	A	KIAA0895	A282T	C	895	T	LARP1	V135A	T	404	C
HKDC1	P520L	C	1692	T	IPO4	R434M	C	1311	A	KIAA0895	R339*	G	1066	A	LARP1	R366*	C	1096	T
HKDC1	A582T	G	1877	A	IPO4	A856V	G	2577	A	KIAA0895	F56L	G	219	T	LARP1	R285H	G	854	A
HKDC1	G151D	G	585	A	IPO4	A262V	G	795	A	KIAA0913	A1321T	G	4178	A	LARP1	R956*	C	2866	T
HKDC1	I565T	T	1827	C	IPO5	A1107T	G	3499	A	KIAA0913	A1369T	G	4322	A	LARP1	F974Y	T	2921	A
HKDC1	L484R	T	1584	G	IPO5	R294H	G	1061	A	KIAA0913	Y1241C	A	3939	G	LARP1B	R70H	G	420	A
HKDC1	T216A	A	779	G	IPO5	V441M	G	1501	A	KIAA0922	A504V	C	1560	T	LARP1B	R119Q	G	567	A
HKDC1	D471V	A	1545	T	IPO5	F456C	T	1547	G	KIAA0922	N791S	A	2421	G	LARP1B	E410*	G	1439	T
HKR1	R504*	C	1779	T	IPO5	E577*	G	1909	T	KIAA0922	E272*	G	863	T	LARP1B	K693M	A	2289	T
HKR1	S106L	C	586	T	IPO5	S790Y	C	2549	A	KIAA0947	T1836A	A	5728	G	LARP4	-	T	0	C
HKR1	K523T	A	1837	C	IPO7	D15G	A	186	G	KIAA0947	V1947I	G	6061	A	LARP4	N657H	A	2113	C
HKR1	R461M	G	1651	T	IPO7	H816N	C	2588	A	KIAA0947	A975V	C	3146	T	LARP4B	F276L	A	869	T
HLA-DRB5	G231A	C	755	G	IPO8	R771*	G	2481	A	KIAA0947	T550A	A	1870	G	LARP4B	-	A	0	G
HLCS	G57S	C	640	T	IPO8	E891A	T	2842	G	KIAA0947	D2021Y	G	6283	T	LARP4B	I558T	A	1714	G
HLCS	D571N	C	2182	T	IPO8	K411Q	T	1401	G	KIAA0947	A976V	C	3149	T	LARP6	E79D	C	308	A
HLF	L8H	T	548	A	IPO8	V257L	C	939	G	KIAA1009	R1251C	G	3866	A	LARP7	I322N	T	1268	A
HLTF	E396*	C	1380	A	IPO8	E650D	T	2120	G	KIAA1009	S544L	G	1746	A	LARS2	E29K	G	347	A
HLTF	R27C	G	273	A	IPO9	T759I	C	2345	T	KIAA1009	E179D	T	652	G	LARS2	A496T	G	1748	A
HLTF	A427V	G	1474	A	IPO9	R787C	C	2428	T	KIAA1012	G864*	C	2926	A	LARS2	K73T	A	480	C
HLTF	T346I	G	1231	A	IPO9	R935C	C	2872	T	KIAA1012	S973P	A	3253	G	LASS2	R53Q	C	544	T

HLX	G431S	G	1748	A	IPP	R333Q	C	1101	T	KIAA1012	F1198L	G	3930	T	LASS2	A152V	G	841	A
HLX	G459A	G	1833	C	IPP	R227*	G	782	A	KIAA1012	R172Q	C	851	T	LASS3	E95D	C	943	A
HLX	L237P	T	1167	C	IPPK	L237P	A	987	G	KIAA1024	R741C	C	2296	T	LASS3	R132Q	C	1053	T
HMCN1	R383Q	G	1377	A	IQCA1	L399I	G	1195	T	KIAA1024	V73A	T	293	C	LASS3	E95D	C	943	A
HMCN1	E3704*	G	1133 9	T	IQCA1	R436*	G	1306	A	KIAA1024	R816W	C	2521	T	LASS6	R121C	C	561	T
HMCN1	H4643N	C	1415 6	A	IQCA1	A171V	G	512	A	KIAA1024	S124L	C	446	T	LAT	C65Y	G	230	A
HMCN1	V720I	G	2387	A	IQCA1	K479E	T	1435	C	KIAA1024	R617H	G	1925	A	LAT	P112S	C	370	T
HMCN1	G5344*	G	1625 9	T	IQCA1	L397I	G	1189	T	KIAA1024	V73A	T	293	C	LAT	L169P	T	542	C
HMCN1	A3972V	C	1214 4	T	IQCE	Q302H	G	1090	T	KIAA1024	K578N	G	1809	T	LAT	-	T	0	C
HMCN1	T1647M	C	5169	T	IQCF2	Q51P	A	181	C	KIAA1024	K458N	G	1449	C	LAT2	G105E	G	1036	A
HMCN1	V3616M	G	1107 5	A	IQCF3	V49A	T	1311	C	KIAA1024	S464I	G	1466	T	LATS2	R415W	G	1649	A
HMCN1	T2549I	C	7875	T	IQCF5	E148*	C	495	A	KIAA1024	K722N	A	2241	C	LATS2	P208L	G	1029	A
HMCN1	P1950S	C	6077	T	IQCF5	R84H	C	304	T	KIAA1024	N728D	A	2257	G	LATS2	R391H	C	1578	T
HMCN1	P4846A	C	1476 5	G	IQCF5	E11*	C	84	A	KIAA1024	S855P	T	2638	C	LBP	E199K	G	756	A
HMCN1	E2697G	A	8319	G	IQCG	I168M	A	929	C	KIAA1033	R828Q	G	2570	A	LBP	F62S	T	346	C
HMCN1	L2715I	C	8372	A	IQCH	L15F	A	111	C	KIAA1033	R982Q	G	3032	A	LBP	R322*	C	1125	T
HMCN1	K3517T	A	1077 9	C	IQCH	C865Y	G	2660	A	KIAA1033	A126T	G	463	A	LBX1	A92T	C	419	T
HMCN1	E798*	G	2621	T	IQGAP1	A1511T	G	4655	A	KIAA1033	-	G	0	T	LBXCOR1	S55F	C	164	T
HMCN1	-	G	0	T	IQGAP1	P1157L	C	3594	T	KIAA1033	V582G	T	1832	G	LBXCOR1	R876H	G	2627	A
HMCN1	Y2664C	A	8220	G	IQGAP1	P1049H	C	3270	A	KIAA1045	I34V	A	182	G	LBXCOR1	S294L	C	881	T
HMCN1	K3141N	A	9652	C	IQGAP1	R803H	G	2532	A	KIAA1045	R161C	C	563	T	LBXCOR1	-	T	0	C
HMCN1	V3247G	T	9969	G	IQGAP2	E347K	G	1336	A	KIAA1107	F1016V	T	3046	G	LBXCOR1	F638C	T	1913	G
HMCN1	E4391*	G	1340 0	T	IQGAP2	A398T	G	1489	A	KIAA1107	N775H	A	2323	C	LBXCOR1	H810R	A	2429	G
HMCN1	F4892V	T	1490 3	G	IQGAP3	P1533H	G	4609	T	KIAA1107	K928T	A	2783	C	LCA5	-	C	0	T
HMCN1	T1647M	C	5169	T	IQGAP3	T1289M	G	3877	A	KIAA1107	K1195Q	A	3583	C	LCA5	E389*	C	1600	A
HMG20A	S322I	G	1323	T	IQSEC1	A644T	C	2033	T	KIAA1109	L3340M	C	10391	A	LCA5L	F15L	G	410	T
HMG20A	K21N	G	421	T	IQSEC1	R870L	C	2712	A	KIAA1109	R994H	G	3354	A	LCA5L	S597R	A	2156	T
HMG20A	R98*	C	650	T	IQSEC1	A130V	G	492	A	KIAA1109	Q1340R	A	4392	G	LCA5L	T268R	G	1168	C
HMG20A	R339*	C	1373	T	IQSEC1	R1055C	G	3266	A	KIAA1109	R4889*	C	15038	T	LCAT	T37M	G	520	A
HMGCL	T292M	G	919	A	IQSEC2	E569D	C	1908	A	KIAA1109	S4544R	A	14003	C	LCE1B	S78G	A	318	G
HMGCR	R641H	G	2234	A	IQSEC2	R85C	G	454	A	KIAA1109	R147C	C	812	T	LCE1C	M1V	T	52	C
HMGCR	R496Q	G	1799	A	IQSEC3	L974P	T	2921	C	KIAA1109	A2522V	C	7938	T	LCE1C	Q4H	C	63	A
HMGCS2	R506C	G	1566	A	IQSEC3	A288S	G	862	T	KIAA1109	T3355A	A	10436	G	LCE1F	G116C	G	346	T

HMGN5	E240*	C	1047	A	IQSEC3	P138S	C	412	T	KIAA1109	S3828F	C	11856	T	LCE1F	R89*	A	265	T
HMGXB3	G1317S	G	3949	A	IQSEC3	R316W	C	946	T	KIAA1109	-	T	0	G	LCE1F	G53V	G	158	T
HMGXB4	-	A	0	G	IQUB	E46*	C	713	A	KIAA1109	H4659R	A	14349	G	LCE3A	A86V	G	257	A
HMHA1	R165W	C	493	T	IQUB	R735H	C	2781	T	KIAA1109	R211H	G	1005	A	LCE3D	R67M	C	257	A
HMHA1	A521V	C	1562	T	IQUB	L418R	A	1830	C	KIAA1109	W1067C	G	3574	C	LCE4A	S27P	T	335	C
HMHA1	A205S	G	613	T	IQUB	R563I	C	2265	A	KIAA1109	A3784P	G	11723	C	LCK	R219Q	G	777	A
HMHA1	N830K	C	2490	A	IQUB	D513Y	C	2114	A	KIAA1109	E314K	G	1313	A	LCK	S451P	T	1472	C
HMHA1	R155C	C	463	T	IRAK1	T625A	T	2041	C	KIAA1109	K1417N	A	4624	C	LCK	-	G	0	T
HMOX1	R85C	C	592	T	IRAK1	T114A	T	508	C	KIAA1109	S2657*	C	8343	A	LCK	R417C	C	1370	T
HMOX1	R262S	C	1123	A	IRAK2	V446M	G	1426	A	KIAA1109	H2683N	C	8420	A	LCLAT1	A253T	G	966	A
HMX1	R196Q	C	587	T	IRAK2	P95L	C	374	T	KIAA1147	A149T	C	445	T	LCLAT1	A110V	C	538	T
HMX2	A42T	G	381	A	IRAK2	K122T	A	455	C	KIAA1147	N451S	T	1352	C	LCMT1	G289E	G	866	A
HMX2	W40*	G	377	A	IRAK2	F284L	C	942	A	KIAA1161	P526S	G	1802	A	LCMT2	S336L	G	1211	A
HMX2	A183T	G	804	A	IRAK3	A277T	G	931	A	KIAA1161	R264C	G	1016	A	LCN15	M75V	T	248	C
HMX3	Y109C	A	326	G	IRAK3	S574R	C	1824	A	KIAA1161	A460V	G	1605	A	LCN8	P322L	G	1618	A
HN1	-	A	0	G	IRAK3	-	G	0	T	KIAA1161	N364D	T	1316	C	LCN9	A143T	G	427	A
HNF1A	P153H	C	684	A	IRAK4	R183*	C	629	T	KIAA1161	A645T	C	2159	T	LCN9	G97V	G	290	T
HNF1B	R235W	G	1065	A	IRAK4	R12C	C	116	T	KIAA1161	R601C	G	2027	A	LCOR	A287V	C	1381	T
HNF1B	M402I	C	1568	A	IRAK4	F168C	T	585	G	KIAA1161	R528W	G	1808	A	LCOR	P34L	C	622	T
HNF4A	L84M	C	339	A	IREB2	T91I	C	421	T	KIAA1161	R374C	G	1346	A	LCOR	K341N	G	1544	T
HNRNPA2B1	S102A	A	473	C	IRF2	R9C	G	233	A	KIAA1199	P1045L	C	3422	T	LCORL	S272T	C	826	G
HNRNPA3	N195S	A	821	G	IRF3	D102V	T	687	A	KIAA1199	T1107M	C	3608	T	LCORL	T360I	G	1090	A
HNRNPAB	-	T	1254	G	IRF4	A222D	C	791	A	KIAA1199	R218C	C	940	T	LCORL	T568A	T	1713	C
HNRNPCL1	V55I	C	389	T	IRF4	A403T	G	1333	A	KIAA1199	V1174I	G	3808	A	LCORL	R141Q	C	433	T
HNRNPF	R116*	G	695	A	IRF6	A77G	G	403	C	KIAA1199	P884T	C	2938	A	LCP1	Q497*	G	1727	A
HNRNPF	T35M	G	453	A	IRF6	Q359P	T	1249	G	KIAA1199	R242Q	G	1013	A	LCP1	T399A	T	1433	C
HNRNPF	R81W	G	590	A	IRF7	P184H	G	961	T	KIAA1199	K342N	A	1314	C	LCP1	D260A	T	1017	G
HNRNPH1	G8R	C	57	T	IRF8	R11*	C	453	T	KIAA1199	N680S	A	2327	G	LCP1	V615M	C	2081	T
HNRNPH1	R192I	C	610	A	IRF8	L10I	C	450	A	KIAA1210	D1607N	C	4819	T	LCP2	-	C	0	T
HNRNPH1	K35N	T	140	G	IRF8	L14P	T	463	C	KIAA1210	R1141W	G	3421	A	LCP2	I513T	A	1745	G
HNRNPK	R86C	G	465	A	IRGC	L326M	C	1175	A	KIAA1210	S498R	T	1492	G	LCT	G754R	C	2271	T
HNRNPK	R69C	G	414	A	IRGC	R151H	G	651	A	KIAA1210	R209W	G	625	A	LCT	V397M	C	1200	T
HNRNPL	G462D	C	1396	T	IRGC	G375D	G	1323	A	KIAA1211	R461Q	G	1773	A	LCT	G1561D	C	4693	T
HNRNPM	V724I	G	2402	A	IRGC	R28H	G	282	A	KIAA1211	E272D	G	1207	T	LCT	D616G	T	1858	C
HNRNPM	E582K	G	1976	A	IRGQ	W502R	A	1660	T	KIAA1211	L1067R	T	3591	G	LCT	A694T	C	2091	T
HNRNPM	R485C	C	1685	T	IRGQ	R219H	C	812	T	KIAA1211	E330*	G	1379	T	LCT	P342S	G	1035	A
HNRNPM	L320M	C	1190	A	IRGQ	S489I	C	1622	A	KIAA1211	A157T	G	860	A	LCT	K970R	T	2920	C
HNRNPM	R60H	G	411	A	IRGQ	E371D	C	1269	A	KIAA1211	A1035V	C	3495	T	LCT	A694S	C	2091	A

HNRNPR	A604T	C	1969	T	IRS1	G669S	C	3026	T	KIAA1211	A568T	G	2093	A	LCT	R1916Q	C	5758	T
HNRNPR	G203S	C	766	T	IRS1	S383L	G	2169	A	KIAA1211	L75M	C	614	A	LCT	S991Y	G	2983	T
HNRNPU	S420L	G	1423	A	IRS1	P929S	G	3806	A	KIAA1211	V88I	G	653	A	LCT	S990R	G	2981	T
HNRNPU	R727H	C	2344	T	IRS1	A1228V	G	4704	A	KIAA1211	S888N	G	3054	A	LCT	I316S	A	958	C
HNRNPU	G245D	C	898	T	IRS1	K177N	C	1552	A	KIAA1211	L549I	C	2036	A	LCT	Y206D	A	627	C
HNRNPU	R572Q	C	1879	T	IRS2	S770P	A	2823	G	KIAA1211	A501V	C	1893	T	LCTL	A175T	C	655	T
HNRNPU	Q545H	T	1799	G	IRS2	A563V	G	2203	A	KIAA1217	R885H	G	2684	A	LCTL	T82M	G	377	A
HNRNPU	N294T	T	1045	G	IRS2	A293V	G	1393	A	KIAA1217	R1188Q	G	3593	A	LDB2	R38I	C	437	A
HNRNPUL 1	R138H	G	702	A	IRS4	P33L	G	175	A	KIAA1217	A233T	G	727	A	LDB3	I265T	T	817	C
HNRNPUL 2	R700Q	C	2292	T	IRS4	E271G	T	889	C	KIAA1217	G402R	G	1234	A	LDB3	R546*	C	1659	T
HNRPA1L3	R146K	G	541	A	IRS4	T620A	T	1935	C	KIAA1217	R818W	C	2482	T	LDB3	S550N	G	1672	A
HNRPA1L3	G110D	G	433	A	IRX1	A110S	G	380	T	KIAA1217	P1173S	C	3547	T	LDB3	R148L	G	466	T
HNRPDL	H60N	G	354	T	IRX2	A356E	G	1316	T	KIAA1217	I1445T	T	4364	C	LDB3	L43F	C	150	T
HOMER1	T341A	T	2464	C	IRX4	R61H	C	301	T	KIAA1217	R759H	G	2306	A	LDB3	P187L	C	583	T
HOMER2	T117M	G	536	A	IRX4	V289I	C	984	T	KIAA1217	S229L	C	716	T	LDB3	T350M	C	1072	T
HOOK2	Y177H	A	700	G	IRX4	N195S	T	703	C	KIAA1217	S1554L	C	4691	T	LDB3	L568M	C	1725	A
HOOK2	S665I	C	2165	A	IRX5	G107*	G	731	T	KIAA1239	L706V	T	2964	G	LDB3	A683V	C	2071	T
HOOK2	R714C	G	2311	A	IRX6	T154A	A	1792	G	KIAA1244	R923Q	G	2934	A	LDHA	R106H	G	590	A
HOOK2	A666V	G	2168	A	IRX6	S117N	G	1682	A	KIAA1244	L163P	T	654	C	LDHAL6A	G60D	G	440	A
HOOK2	L358P	A	1244	G	ISCA1	F36Y	A	107	T	KIAA1257	P155L	G	632	A	LDHB	A35V	G	202	A
HOOK2	R254G	T	931	C	ISG15	G37S	G	260	A	KIAA1257	T331P	T	1159	G	LDHB	G98*	C	390	A
HOOK2	D188G	T	734	C	ISL1	A267V	C	1348	T	KIAA1257	E287D	C	1029	A	LDHB	G30E	C	187	T
HOOK2	E126D	C	549	A	ISL1	I72F	A	762	T	KIAA1267	S1070I	C	3294	A	LDHB	E62*	C	282	A
HOOK3	T36M	C	349	T	ISL1	R112H	G	883	A	KIAA1267	E908K	C	2807	T	LDHD	R198Q	C	640	T
HOOK3	A263V	C	1030	T	ISL2	V234A	T	861	C	KIAA1267	S342N	C	1110	T	LDLR	S110T	T	496	A
HOOK3	Q133H	A	641	C	ISLR	D140N	G	775	A	KIAA1267	Q841*	G	2606	A	LDLR	N169S	A	674	G
HOOK3	K387N	G	1403	T	ISLR	S282T	G	1202	C	KIAA1267	A3V	G	93	A	LDLR	R26I	G	245	T
HORMAD1	N71D	T	317	C	ISLR	L134M	C	757	A	KIAA1267	R64Q	C	276	T	LDLRAD2	R47C	C	326	T
HORMAD2	R276I	G	1182	T	ISLR	D35N	G	460	A	KIAA1274	D502Y	G	1785	T	LDLRAD2	L148M	C	629	A
HOXA1	E305K	C	975	T	ISLR2	P317L	C	1735	T	KIAA1274	E384K	G	1431	A	LDLRAD2	L148M	C	629	A
HOXA13	R323G	T	996	C	ISLR2	V352I	G	1839	A	KIAA1274	V365A	T	1375	C	LDLRAD3	A250V	C	770	T
HOXA3	R73C	G	417	A	ISLR2	A314V	C	1726	T	KIAA1324	E490K	G	1604	A	LDLRAD3	D289N	G	886	A
HOXA3	A98T	C	492	T	ISLR2	R466W	C	2181	T	KIAA1324	R992M	G	3111	T	LECT1	I220T	A	738	G
HOXA5	R222H	C	902	T	ISM1	R258H	G	779	A	KIAA1324	R883Q	G	2784	A	LECT1	V75A	A	303	G
HOXA5	P14S	G	277	A	ISM1	D389N	G	1171	A	KIAA1324	T919A	A	2891	G	LEF1	H90P	T	924	G
HOXA5	N245H	T	970	G	ISM1	R366Q	G	1103	A	KIAA1324L	E180*	C	724	A	LEFTY1	C264R	A	870	G
HOXA7	C29*	G	219	T	ISM2	T302I	G	962	A	KIAA1324L	E114A	T	527	G	LEFTY2	Q298R	T	1242	C
HOXA9	C157Y	C	500	T	ISM2	G508S	C	1579	T	KIAA1328	M292I	G	898	A	LEKR1	Q248R	A	2078	G

HOXC10	A120V	C	473	T	ISM2	P334H	G	1058	T	KIAA1328	A525V	C	1596	T	LENG1	P135L	G	591	A
HOXC13	H68Q	C	346	G	ISOC1	E250K	G	764	A	KIAA1370	N621I	T	2015	A	LENG8	A254T	G	815	A
HOXC4	R158C	C	1079	T	ISX	P70H	C	1161	A	KIAA1370	R31Q	C	245	T	LENG8	T620M	C	1914	T
HOXC4	R208C	C	1229	T	ISX	R86H	G	1209	A	KIAA1370	I363M	T	1242	C	LENG8	A477V	C	1485	T
HOXC5	Y4C	A	281	G	ITCH	E818*	G	2588	T	KIAA1377	A26T	G	346	A	LENG9	G171R	C	630	G
HOXC9	P45S	C	231	T	ITCH	R639H	G	2052	A	KIAA1377	R68*	C	472	T	LENG9	G154D	C	580	T
HOXD10	S125L	C	629	T	ITCH	P442L	C	1461	T	KIAA1377	I757L	A	2539	C	LEO1	R532H	C	1650	T
HOXD11	P249L	C	816	T	ITFG1	R521H	C	1779	T	KIAA1383	Y620H	T	1985	C	LEP	S130N	G	440	A
HOXD12	T115A	A	415	G	ITFG1	K252N	T	973	G	KIAA1383	D927Y	G	2906	T	LEPR	M1I	G	188	T
HOXD12	A135D	C	476	A	ITFG1	W314C	C	1159	A	KIAA1407	K751E	T	2398	C	LEPRE1	N732S	T	2236	C
HOXD3	R198H	G	2014	A	ITFG2	D136N	G	545	A	KIAA1407	E526K	C	1723	T	LEPRE1	-	T	0	C
HOXD3	C90*	C	1691	A	ITFG2	A206V	C	756	T	KIAA1409	P1661T	C	4981	A	LEPRE1	R210*	G	669	A
HOXD3	P332L	C	2416	T	ITFG2	R141C	C	560	T	KIAA1409	A2603T	G	7807	A	LEPREL1	R136H	C	605	T
HOXD4	R158Q	G	885	A	ITFG2	R116H	G	486	A	KIAA1409	A1350E	C	4049	A	LEPREL1	Q406*	G	1414	A
HOXD4	G63R	G	599	A	ITFG2	R422C	C	1403	T	KIAA1409	R568C	C	1702	T	LEPREL2	G489V	G	1466	T
HOXD8	Y139H	T	1042	C	ITGA1	A823T	G	2925	A	KIAA1409	Y1340C	A	4019	G	LEPREL2	R320W	C	958	T
HP	R277C	C	873	T	ITGA1	A236V	C	1165	T	KIAA1409	R1517C	C	4549	T	LEPROT	P46S	C	274	T
HP1BP3	D4E	A	152	C	ITGA1	F222S	T	1123	C	KIAA1409	T1980M	C	5939	T	LEPROTL1	I8S	T	130	G
HPCAL1	A61T	G	562	A	ITGA1	Q539K	C	2073	A	KIAA1409	M2420I	G	7260	A	LETM1	P219L	G	953	A
HPCAL1	S6R	A	397	C	ITGA10	S476C	A	1601	T	KIAA1409	V1336I	G	4006	A	LETM2	W141C	G	524	T
HPCAL4	R139C	G	807	A	ITGA10	G92D	G	450	A	KIAA1409	I2056V	A	6166	G	LETMD1	K350N	A	1080	C
HPCAL4	R115H	C	736	T	ITGA10	C736R	T	2381	C	KIAA1409	G2423E	G	7268	A	LEUTX	A176V	C	527	T
HPD	V131A	A	432	G	ITGA11	R550*	G	1735	A	KIAA1409	N1049H	A	3145	C	LGALS1	S8I	G	118	T
HPD	A244V	G	771	A	ITGA11	G712R	C	2221	T	KIAA1409	K1081I	A	3242	T	LGALS12	R117C	C	690	T
HPDL	E245*	G	1009	T	ITGA11	R463Q	C	1475	T	KIAA1409	K1353T	A	4058	C	LGALS12	V68G	T	544	G
HPGDS	W148R	A	533	G	ITGA11	A1173V	G	3605	A	KIAA1409	E1488*	G	4462	T	LGALS14	R27S	C	520	A
HPN	G24R	G	315	A	ITGA11	L633M	G	1984	T	KIAA1429	R1622I	C	4878	A	LGALS4	G231W	C	905	A
HPN	R144H	G	676	A	ITGA11	T599I	G	1883	A	KIAA1429	R1571C	G	4724	A	LGALS8	V245I	G	933	A
HPRT1	K73T	A	385	C	ITGA11	F329L	G	1074	T	KIAA1429	S1301N	C	3915	T	LGALS8	D25N	G	273	A
HPS1	G685D	C	2288	T	ITGA11	S126Y	G	464	T	KIAA1429	L391V	A	1184	C	LGI1	N167H	A	759	C
HPS1	R690C	G	2302	A	ITGA2	R553Q	G	1801	A	KIAA1430	P245H	G	854	T	LGI2	R79Q	C	422	T
HPS1	S464F	G	1625	A	ITGA2	K192N	G	719	T	KIAA1430	V319D	A	1076	T	LGI3	G363D	C	1378	T
HPS3	L981I	C	3081	A	ITGA2	N894D	A	2823	G	KIAA1432	N922T	A	2765	C	LGI4	P376S	G	1646	A
HPS3	E134D	G	542	T	ITGA2B	A647V	G	1972	A	KIAA1432	R980Q	G	2939	A	LGI4	R124C	G	890	A
HPS3	R714Q	G	2281	A	ITGA2B	S427R	T	1311	G	KIAA1462	K1039N	C	3219	A	LGI4	E108K	C	842	T
HPS3	T591M	C	1912	T	ITGA2B	P605L	G	1846	A	KIAA1462	P1333L	G	4100	A	LGR4	E85*	C	697	A
HPS3	F989L	T	3107	G	ITGA3	L736V	C	2670	G	KIAA1462	V414I	C	1342	T	LGR4	E862K	C	3028	T
HPS4	A396V	G	1187	A	ITGA3	P357H	C	1534	A	KIAA1462	R73H	C	320	T	LGR4	G654V	C	2405	A
HPS5	T38M	G	391	A	ITGA4	D385N	G	1583	A	KIAA1462	Q182P	T	647	G	LGR5	H414N	C	1288	A

HPS5	R124*	G	648	A	ITGA4	A87V	C	690	T	KIAA1462	E1190G	T	3671	C	LGR5	R520C	C	1606	T
HPS5	K598N	T	2072	G	ITGA4	R565W	C	2123	T	KIAA1462	S694R	T	2182	G	LGR5	L113I	C	385	A
HPS6	L396F	G	1273	T	ITGA4	S426L	C	1707	T	KIAA1462	A473V	G	1520	A	LGR5	F110C	T	377	G
HPS6	R667*	C	2084	T	ITGA4	V587A	T	2190	C	KIAA1467	W554C	G	1685	T	LGR6	V734M	G	2289	A
HPSE	P10L	G	166	A	ITGA5	L187M	G	627	T	KIAA1467	I336T	T	1030	C	LGSN	E134*	C	434	A
HPSE	F386C	A	1294	C	ITGA6	T106M	C	520	T	KIAA1467	P393L	C	1201	T	LGSN	A81T	C	275	T
HPSE2	Y253H	A	817	G	ITGA7	G249R	C	965	T	KIAA1468	L745F	C	2448	T	LGTN	C489Y	C	1675	T
HPSE2	A249T	C	805	T	ITGA7	E596*	C	2006	A	KIAA1468	R789W	C	2580	T	LHCGR	R26C	G	98	A
HPSE2	A565V	G	1754	A	ITGA8	P194T	G	934	T	KIAA1468	K877N	G	2846	T	LHCGR	H684N	G	2072	T
HPSE2	R267Q	C	860	T	ITGA8	E702K	C	2458	T	KIAA1468	A99V	C	511	T	LHCGR	A449T	C	1367	T
HPSE2	R564W	G	1750	A	ITGA8	R895*	G	3037	A	KIAA1468	I661S	T	2197	G	LHCGR	A28V	G	105	A
HPSE2	Q541*	G	1681	A	ITGA8	I376M	G	1482	C	KIAA1486	P195L	C	997	T	LHCGR	W367S	C	1122	G
HPSE2	R494C	G	1540	A	ITGA9	D154N	G	716	A	KIAA1486	S350F	C	1462	T	LHFPL1	R48Q	C	383	T
HPX	R256C	G	867	A	ITGA9	E623D	G	2125	T	KIAA1486	T98P	A	705	C	LHFPL2	-	C	0	A
HR	A766V	G	3778	A	ITGA9	G438E	G	1569	A	KIAA1486	V387I	G	1572	A	LHFPL5	P57L	C	548	T
HRASLS	A149V	C	855	T	ITGA9	E752G	A	2511	G	KIAA1486	S648L	C	2356	T	LHFPL5	G82D	G	623	A
HRASLS5	K118T	T	513	G	ITGAD	V669I	G	2006	A	KIAA1522	R615H	G	1888	A	LHPP	R234H	G	729	A
HRASLS5	K118T	T	513	G	ITGAD	T807P	A	2420	C	KIAA1522	G261S	G	825	A	LHPP	A82T	G	272	A
HRC	H339R	T	1203	C	ITGAD	V669I	G	2006	A	KIAA1522	V254I	G	804	A	LHX1	E371K	G	1834	A
HRH1	R175H	G	866	A	ITGAD	E958G	A	2874	G	KIAA1529	-	A	0	G	LHX1	S383L	C	1871	T
HRH1	L86I	C	598	A	ITGAD	G338D	G	1014	A	KIAA1529	R32Q	G	1447	A	LHX1	R259W	C	1498	T
HRH2	V23M	G	718	A	ITGAD	S676R	A	2027	C	KIAA1530	A232T	G	1040	A	LHX1	E211K	G	1354	A
HRH2	F380L	T	1789	C	ITGAE	G696S	C	2192	T	KIAA1530	D2Y	G	350	T	LHX1	R184H	G	1274	A
HRH3	A32T	C	391	T	ITGAE	-	C	0	T	KIAA1539	A150T	C	448	T	LHX2	A185T	G	551	A
HRH3	R138*	G	709	A	ITGAE	V416A	A	1353	G	KIAA1539	G378R	C	1132	T	LHX2	L156R	T	465	G
HRH4	S11P	T	131	C	ITGAE	L378M	G	1238	T	KIAA1539	-	A	0	T	LHX3	S179R	G	656	T
HRH4	R49*	C	245	T	ITGAE	A358T	C	1178	T	KIAA1543	R742Q	G	2326	A	LHX3	V124I	C	489	T
HRH4	R236I	G	807	T	ITGAL	R520Q	G	1735	A	KIAA1543	R1000Q	G	3100	A	LHX5	R78C	G	806	A
HRH4	R341I	G	1122	T	ITGAL	I961T	T	3058	C	KIAA1543	V52M	G	255	A	LHX5	A6T	C	590	T
HRNR	G766C	C	2372	A	ITGAL	T417I	C	1426	T	KIAA1543	P209H	C	727	A	LHX6	R174W	G	580	A
HRNR	G989D	C	3042	T	ITGAM	A304T	G	1008	A	KIAA1543	K1179Q	A	3636	C	LHX8	A245D	C	1398	A
HRNR	R896C	G	2762	A	ITGAM	P543T	C	1725	A	KIAA1549	P711H	G	2181	T	LHX8	E44D	G	796	T
HRNR	R429C	G	1361	A	ITGAM	-	G	0	T	KIAA1549	P1446L	G	4386	A	LHX8	E200*	G	1262	T
HRNR	R571C	G	1787	A	ITGAM	R732H	G	2293	A	KIAA1549	I1151N	A	3501	T	LHX8	S58L	C	837	T
HRNR	A834D	G	2577	T	ITGAM	D1009N	G	3123	A	KIAA1549	R1901W	G	5750	A	LHX9	R269C	C	1230	T
HRNR	S225A	A	749	C	ITGAV	R540Q	G	1893	A	KIAA1549	F481S	A	1491	G	LHX9	R256Q	G	1192	A
HRNR	I88S	A	339	C	ITGAV	W209*	G	901	A	KIAA1549	A469T	C	1454	T	LHX9	M34I	G	527	A
HRSP12	R120Q	C	453	T	ITGAX	R571W	C	1778	T	KIAA1549	R1501H	C	4551	T	LHX9	R150Q	G	874	A
HS1BP3	S225L	G	700	A	ITGAX	E410K	G	1295	A	KIAA1549	P531S	G	1640	A	LIF	P90L	G	425	A

HS1BP3	S36F	G	133	A	ITGAX	V236M	G	773	A	KIAA1586	I476M	T	1635	G	LIFR	R508W	G	1685	A
HS1BP3	P181L	G	568	A	ITGAX	Q933H	A	2866	C	KIAA1614	P54H	C	216	A	LIFR	R1066Q	C	3360	T
HS1BP3	A286T	C	882	T	ITGAX	E1162D	G	3553	T	KIAA1614	D484N	G	1505	A	LIFR	R178C	G	695	A
HS3ST1	R205H	C	1789	T	ITGB1	R496H	C	1705	T	KIAA1614	G894R	G	2735	A	LIFR	K537N	C	1774	A
HS3ST2	A2T	G	438	A	ITGB1BP2	C218R	T	725	C	KIAA1614	A1105T	G	3368	A	LIFR	I444N	A	1494	T
HS3ST3A1	P245L	G	1532	A	ITGB1BP2	T47A	A	212	G	KIAA1632	V995I	C	3018	T	LIFR	R597*	G	1952	A
HS3ST4	A200V	C	991	T	ITGB2	V600I	C	1986	T	KIAA1632	R2320H	C	6994	T	LIFR	N59K	A	340	C
HS3ST4	R218H	G	1045	A	ITGB2	V439M	C	1503	T	KIAA1632	M2188V	T	6597	C	LIFR	-	C	0	T
HS3ST4	E452D	A	1748	C	ITGB3	D551N	G	1671	A	KIAA1632	L1086I	G	3291	T	LIG1	E785K	C	2473	T
HS3ST4	S42P	T	516	C	ITGB3BP	K61N	T	244	G	KIAA1632	E2241D	T	6758	G	LIG1	S163N	C	608	T
HS3ST5	A7V	G	20	A	ITGB4	P896L	C	2874	T	KIAA1632	E1742Q	C	5259	G	LIG1	A374T	C	1240	T
HS3ST6	T313M	G	938	A	ITGB4	E1311K	G	4118	A	KIAA1632	I1720V	T	5193	C	LIG1	A60V	G	299	A
HS3ST6	W274*	C	822	T	ITGB4	N205S	A	801	G	KIAA1632	R955*	G	2898	A	LIG1	P395Q	G	1304	T
HS6ST1	R214H	C	655	T	ITGB4	S1543Y	C	4815	A	KIAA1644	P173Q	G	651	T	LIG3	A685V	C	2158	T
HS6ST2	S188Y	G	563	T	ITGB6	K404N	C	1450	A	KIAA1644	S25P	A	206	G	LIG3	L381R	T	1246	G
HS6ST2	R478Q	C	1433	T	ITGB6	C511Y	C	1770	T	KIAA1671	V1599M	G	5502	A	LIG4	L328I	G	1112	T
HS6ST3	R163Q	G	512	A	ITGB6	E644*	C	2168	A	KIAA1683	K516N	C	1764	A	LIG4	S160Y	G	609	T
HS6ST3	F351S	T	1076	C	ITGB7	H214R	T	645	C	KIAA1683	R956W	G	3082	A	LIG4	S822L	G	2595	A
HS6ST3	R418C	C	1276	T	ITGB7	H487N	G	1463	T	KIAA1683	R1176H	C	3743	T	LILRA1	-	A	0	G
HS6ST3	L14F	C	64	T	ITGB7	A115D	G	348	T	KIAA1683	R19C	G	271	A	LILRA2	P218L	C	786	T
HS6ST3	W195*	G	609	A	ITGB7	R146C	G	440	A	KIAA1683	S510L	G	1745	A	LILRA3	D434N	C	1483	T
HSBP1	A53T	G	246	A	ITGB8	N497D	A	2173	G	KIAA1683	S1241C	T	3937	A	LILRA3	D162N	C	667	T
HSCB	R99H	G	361	A	ITGBL1	C96Y	G	506	A	KIAA1683	A32V	G	311	A	LILRA5	R268H	C	923	T
HSD11B1	M110I	G	499	T	ITGBL1	C185Y	G	773	A	KIAA1683	R1219H	C	3872	T	LILRB1	S486L	C	1790	T
HSD11B1L	A64V	C	441	T	ITGBL1	Q314H	G	1161	T	KIAA1704	D87E	T	364	G	LILRB1	V372E	T	1448	A
HSD11B1L	E220D	G	910	C	ITGBL1	D214Y	G	859	T	KIAA1712	S253L	C	1063	T	LILRB1	V81A	T	575	C
HSD11B1L	R169H	G	756	A	ITIH1	S30L	C	113	T	KIAA1715	E30K	C	336	T	LILRB2	R500Q	C	1659	T
HSD11B1L	H234R	A	951	G	ITIH1	G668D	G	2027	A	KIAA1715	S421T	C	1510	G	LILRB2	E390*	C	1328	A
HSD17B1	R137H	G	4130	A	ITIH2	F8L	C	190	A	KIAA1731	A280S	G	989	T	LILRB2	S220Y	G	819	T
HSD17B11	N69H	T	521	G	ITIH3	D829G	A	2492	G	KIAA1731	E1219*	G	3806	T	LILRB3	D536G	T	1609	C
HSD17B12	R302Q	G	1140	A	ITIH3	M372V	A	1120	G	KIAA1731	S1654L	C	5112	T	LILRB3	R542S	C	1628	G
HSD17B13	V243I	C	792	T	ITIH3	E437G	A	1316	G	KIAA1737	V323A	T	1147	C	LILRB3	A104T	C	312	T
HSD17B14	K70R	T	475	C	ITIH3	E576D	G	1734	T	KIAA1737	R341H	G	1201	A	LILRB4	Q50*	C	162	T
HSD17B14	D171N	C	777	T	ITIH3	T806M	C	2423	T	KIAA1751	V500I	C	1654	T	LILRB4	A362V	C	1099	T
HSD17B2	T140M	C	583	T	ITIH3	F217L	C	657	A	KIAA1755	V1017M	C	3321	T	LILRB5	R155M	C	542	A
HSD17B2	L354W	T	1225	G	ITIH4	Y157C	T	501	C	KIAA1755	R997H	C	3262	T	LIM2	A114V	G	372	A
HSD17B3	S184Y	G	599	T	ITIH4	R900H	C	2730	T	KIAA1755	R963C	G	3159	A	LIM2	Y203H	A	638	G
HSD17B3	S184Y	G	599	T	ITIH4	R439H	C	1347	T	KIAA1755	L666I	G	2268	T	LIMCH1	A754V	C	2695	T
HSD17B3	K119N	T	405	A	ITIH4	G434D	C	1332	T	KIAA1755	Q1020R	T	3331	C	LIMCH1	G985R	G	3387	A

HSD17B4	V376G	T	1311	G	ITIH4	R47Q	C	171	T	KIAA1755	D750N	C	2520	T	LIMCH1	R1206H	G	4051	A
HSD17B4	K285N	G	1039	T	ITIH4	R915C	G	2774	A	KIAA1797	R732K	G	2559	A	LIMD2	R26H	C	255	T
HSD17B6	A302S	G	1014	T	ITIH5	L205P	A	693	G	KIAA1797	S1048F	C	3507	T	LIMD2	-	T	0	G
HSD17B7	P245L	C	789	T	ITIH5	A195T	C	662	T	KIAA1797	S656I	G	2331	T	LIME1	L99M	C	382	A
HSD3B7	R179C	C	825	T	ITIH5	R459W	G	1454	A	KIAA1797	R1547I	G	5004	T	LIME1	E251D	A	840	C
HSD3B7	F205L	C	905	A	ITIH5	P682H	G	2124	T	KIAA1841	R447Q	G	1581	A	LIMK1	R575W	C	1825	T
HSDL1	Y11H	A	210	G	ITIH5	K117T	T	429	G	KIAA1841	V386A	T	1398	C	LIMK1	E405K	G	1315	A
HSDL1	R137*	G	588	A	ITIH5L	N878T	T	2663	G	KIAA1841	L168I	C	743	A	LIMK1	-	T	0	G
HSF1	H354Y	C	1230	T	ITIH5L	E618*	C	1882	A	KIAA1919	K180T	A	892	C	LIMK2	E252D	G	986	T
HSF1	P430S	C	1458	T	ITIH5L	L391I	G	1201	T	KIAA1919	-	T	0	C	LIMS2	P254L	G	919	A
HSF2BP	R312H	C	1267	T	ITLN2	M102T	A	363	G	KIAA1919	G330V	G	1342	T	LIMS2	F79V	A	393	C
HSF2BP	R84H	C	583	T	ITM2A	T8A	T	166	C	KIAA1919	I320L	A	1311	C	LIN28A	D33G	A	212	G
HSF2BP	A7T	C	351	T	ITPA	V24I	G	262	A	KIAA1919	T326A	A	1329	G	LIN28A	H147N	C	553	A
HSP90AA2	P38T	G	457	T	ITPKA	R281W	C	908	T	KIAA1958	T571M	C	2008	T	LIN28A	R192*	C	688	T
HSP90AA2	F434L	G	1647	T	ITPKA	R440C	C	1385	T	KIAA1958	E209K	G	753	A	LIN54	A104T	C	688	T
HSP90AB1	E232K	G	803	A	ITPKA	N165H	A	560	C	KIAA1967	G813E	G	2575	A	LIN9	Q590H	C	1770	A
HSP90B1	E487*	G	1593	T	ITPKB	G455D	C	1364	T	KIAA1967	P427L	C	1417	T	LINGO1	A92T	C	326	T
HSP90B1	E582K	G	1878	A	ITPKC	I591V	A	1804	G	KIAA1967	G28D	G	220	A	LINGO1	R122Q	C	417	T
HSP90B2P	D374G	A	1121	G	ITPR1	F1500L	C	4860	A	KIAA1984	R236C	C	741	T	LINGO1	Q488R	T	1515	C
HSPA12A	A392V	G	1280	A	ITPR1	F696L	T	2448	G	KIAA2013	L604I	G	2001	T	LINGO2	Q181K	G	995	T
HSPA12A	P107H	G	425	T	ITPR1	Q2168P	A	6863	C	KIAA2018	R2094Q	C	6692	T	LINGO2	A346V	G	1491	A
HSPA12A	V519I	C	1660	T	ITPR1	G2411V	G	7592	T	KIAA2018	Q1753H	T	5670	A	LINGO2	S398R	G	1648	T
HSPA12A	E228D	C	789	A	ITPR1	R2442C	C	7684	T	KIAA2018	A767V	G	2711	A	LINGO3	R386C	G	1284	A
HSPA12A	S190L	G	674	A	ITPR1	A1243V	C	4088	T	KIAA2018	R1776*	G	5737	A	LINGO3	P262S	G	912	A
HSPA12B	I374V	A	1122	G	ITPR1	A1597V	C	5150	T	KIAA2018	S1339Y	G	4427	T	LINGO3	H559Y	G	1803	A
HSPA14	A265T	G	1032	A	ITPR1	A1707V	C	5480	T	KIAA2022	S1454F	G	5013	A	LINGO4	S256N	C	1705	T
HSPA2	A180V	C	615	T	ITPR1	A1216V	C	4007	T	KIAA2022	K585E	T	2405	C	LINGO4	T98I	G	1231	A
HSPA2	E447K	G	1415	A	ITPR1	K1956R	A	6227	G	KIAA2022	G353W	C	1709	A	LINS1	S651F	G	2175	A
HSPA2	D161G	A	558	G	ITPR1	K2674E	A	8380	G	KIAA2026	R506W	G	1732	A	LINS1	E686*	C	2279	A
HSPA2	E579D	G	1813	T	ITPR1	S207F	C	980	T	KIAA2026	A306V	G	1133	A	LINS1	L308I	G	1145	T
HSPA2	A179S	G	611	T	ITPR1	R289W	C	1225	T	KIAA2026	G1864R	C	5806	T	LINS1	E10*	C	251	A
HSPA4	M301I	G	1192	T	ITPR1	F1860L	C	5940	A	KIAA2026	I1777M	A	5547	C	LINS1	T753N	G	2481	T
HSPA4	Y626F	A	2166	T	ITPR1	A1925T	G	6133	A	KIAA2026	R574C	G	1936	A	LIPC	E381D	G	1754	T
HSPA4L	A832V	C	2658	T	ITPR1	K221T	A	1022	C	KIAA2026	S347Y	G	1256	T	LIPE	G336S	C	1283	T
HSPA5	E358*	C	1276	A	ITPR2	L2266I	G	7213	T	KIDINS220	E1655K	C	5145	T	LIPE	V603I	C	2084	T
HSPA6	A181V	C	955	T	ITPR2	E1362D	C	4503	A	KIDINS220	A697T	C	2271	T	LIPE	P247L	G	1017	A
HSPA8	K458R	T	1451	C	ITPR2	E616*	C	2263	A	KIDINS220	I1458T	A	4555	G	LIPF	F156L	C	514	A
HSPA8	I216N	A	725	T	ITPR2	F1704C	A	5528	C	KIDINS220	R100H	C	481	T	LIPF	R274C	C	866	T
HSPA8	L391V	A	1249	C	ITPR2	R505H	C	1931	T	KIDINS220	D1540Y	C	4800	A	LIPH	D247Y	C	881	A

HSPA9	E649K	C	2071	T	ITPR2	Q2160R	T	6896	C	KIDINS220	R951Q	C	3034	T	LIPI	S317L	G	976	A
HSPB1	R127Q	G	549	A	ITPR2	A445D	G	1751	T	KIF11	R384C	C	1240	T	LIPK	K191N	G	573	T
HSPB8	G132C	G	917	T	ITPR2	P2512S	G	7951	A	KIF12	T221I	G	677	A	LIPK	E352D	A	1056	C
HSPBAP1	Y258C	T	917	C	ITPR3	V432M	G	2152	A	KIF13A	R426Q	C	1383	T	LIPK	L354V	T	1060	G
HSPBAP1	A240V	G	863	A	ITPR3	S752F	C	3113	T	KIF13A	A73T	C	323	T	LIPM	R139*	C	415	T
HSPBAP1	E31D	C	237	A	ITPR3	A1972T	G	6772	A	KIF13A	-	T	0	C	LIPN	T36A	A	106	G
HSPBP1	A128P	C	716	G	ITPR3	T1803M	C	6266	T	KIF13A	V1269A	A	3912	G	LIPN	M271I	G	813	T
HSPD1	K493E	T	1745	C	ITPR3	R2258H	G	7631	A	KIF13A	S852G	T	2660	C	LIPT2	L105M	G	320	T
HSPD1	K82Q	T	512	G	ITPR3	R1857C	C	6427	T	KIF13A	Q584*	G	1856	A	LITAF	G46W	C	188	A
HSPG2	A3343V	G	1010 8	A	ITPR3	R527C	C	2437	T	KIF13A	V683I	C	2153	T	LLGL1	G203R	G	703	A
HSPG2	T251M	G	832	A	ITPR3	R1455H	G	5222	A	KIF13B	V1716M	C	5205	T	LLGL1	A39T	G	211	A
HSPG2	R363C	G	1167	A	ITPR3	K1699E	A	5953	G	KIF13B	V914I	C	2799	T	LLGL1	H888N	C	2758	A
HSPG2	V529M	C	1665	T	ITPR3	K2547T	A	8498	C	KIF13B	P606L	G	1876	A	LLGL2	R891C	C	2825	T
HSPG2	T1115A	T	3423	C	ITPR3	R1849H	G	6404	A	KIF13B	M504I	C	1571	T	LLGL2	S464N	G	1545	A
HSPG2	R824T	C	2551	G	ITPRIP	A43V	G	300	A	KIF13B	R1117H	C	3409	T	LLGL2	A407T	G	1373	A
HSPG2	L3754M	G	1134 0	T	ITPRIPL1	Q563R	A	1687	G	KIF13B	-	C	0	A	LLGL2	S427R	A	1433	C
HSPG2	G1823D	C	5548	T	ITPRIPL1	S472F	C	1414	T	KIF13B	G745*	C	2292	A	LLPH	R109*	G	381	A
HSPG2	D227V	T	760	A	ITPRIPL2	A395T	G	1685	A	KIF14	Q1255H	C	4204	A	LMAN1	S153Y	G	485	T
HSPG2	R893H	C	2758	T	ITPRIPL2	A420G	C	1761	G	KIF14	S1102N	C	3744	T	LMAN1L	V93A	T	417	C
HSPG2	A946S	C	2916	A	ITPRIPL2	R400C	C	1700	T	KIF14	R731I	C	2631	A	LMAN1L	S253I	G	897	T
HSPH1	N409T	T	1226	G	ITPRIPL2	T265I	C	1296	T	KIF14	N627T	T	2319	G	LMAN1L	R288M	G	1002	T
HSPH1	Y742D	A	2224	C	ITSN1	Q416R	A	1535	G	KIF14	S272R	T	1253	G	LMAN2	R314H	C	1146	T
HTATIP2	A113T	G	406	A	ITSN1	F1669I	T	5293	A	KIF14	E159K	C	914	T	LMAN2L	N274S	T	845	C
HTR1A	K418T	T	1667	G	ITSN1	R312Q	G	1223	A	KIF15	M1132I	G	3545	T	LMBR1	R496*	G	1640	A
HTR1A	A50T	C	562	T	ITSN1	T349M	C	1334	T	KIF15	S233L	C	847	T	LMBR1	V433A	A	1452	G
HTR1A	A50V	G	563	A	ITSN1	F47Y	T	428	A	KIF16B	R1129H	C	3544	T	LMBR1	L155R	A	618	C
HTR1A	L74R	A	635	C	ITSN1	R434Q	G	1589	A	KIF16B	E853*	C	2715	A	LMBR1	R44I	C	285	A
HTR1A	R176H	C	941	T	ITSN1	R1123H	G	3656	A	KIF16B	E698*	C	2250	A	LMBR1L	A75V	G	567	A
HTR1B	Y211H	A	692	G	ITSN1	T6A	A	304	G	KIF17	R232W	G	1005	A	LMBRD1	T250M	G	979	A
HTR1D	R374Q	C	1164	T	ITSN1	H1403D	C	4495	G	KIF17	S124G	T	681	C	LMBRD1	K138E	T	642	C
HTR1E	A208V	C	1326	T	ITSN1	Y1479H	T	4723	C	KIF17	S210L	G	940	A	LMBRD2	Q130*	G	851	A
HTR1E	S337Y	C	1713	A	ITSN1	R1104Q	G	3599	A	KIF18A	K808N	C	2606	G	LMBRD2	K342T	T	1488	G
HTR1F	L4V	T	64	G	ITSN1	K1265Q	A	4081	C	KIF18A	L140R	A	601	C	LMBRD2	R32I	C	558	A
HTR2A	V324L	C	1102	A	ITSN2	K584Q	T	2194	G	KIF18B	G753D	C	2274	T	LMCD1	R92Q	G	507	A
HTR2A	E454D	T	1494	G	ITSN2	T1184M	G	3995	A	KIF18B	R663C	G	2003	A	LMF1	P546L	G	1641	A
HTR2A	P144L	G	563	A	ITSN2	R961W	G	3325	A	KIF19	R382M	G	1145	T	LMF1	R461H	C	1386	T
HTR2A	S219L	G	788	A	ITSN2	Y182H	A	988	G	KIF1A	A1609T	C	4853	T	LMF1	D229G	T	690	C
HTR2B	R434*	G	1813	A	ITSN2	F109L	A	771	C	KIF1A	R602L	C	1833	A	LMF2	W572R	A	1712	G

HTR2C	I225T	T	1493	C	ITSN2	A143S	C	871	A	KIF1A	A423T	C	1295	T	LMF2	Y341C	T	1020	C
HTR3A	E433D	G	1321	T	IVL	L540P	T	1683	C	KIF1A	R1710H	C	5157	T	LMF2	A320T	C	956	T
HTR3A	A39D	C	138	A	IVL	E247Q	G	803	C	KIF1A	P305L	G	942	A	LMLN	-	T	2077	C
HTR3A	Q371K	C	1133	A	IVNS1ABP	P544H	G	2254	T	KIF1A	R791C	G	2399	A	LMLN	T4A	A	10	G
HTR3A	L127I	C	401	A	IVNS1ABP	-	A	0	G	KIF1A	R1302H	C	3933	T	LMNA	R343W	C	1239	T
HTR3C	G148C	G	476	T	IVNS1ABP	H394R	T	1804	C	KIF1A	K802N	C	2434	A	LMNA	Q251R	A	964	G
HTR3D	V423L	G	1267	T	IVNS1ABP	V292I	C	1497	T	KIF1B	L1782I	C	5596	A	LMNB1	R336C	C	1367	T
HTR3D	V273I	G	817	A	IVNS1ABP	E632*	C	2517	A	KIF1B	D1095G	A	3536	G	LMNB1	D155G	A	825	G
HTR3D	A295V	C	884	T	IVNS1ABP	M545I	C	2258	A	KIF1C	D623N	G	2224	A	LMNB1	K156N	A	829	C
HTR3D	P370L	C	1109	T	IVNS1ABP	I157N	A	1093	T	KIF20A	R218*	C	878	T	LMNB2	A505T	C	1636	T
HTR3E	A459V	C	1376	T	IWS1	T651N	G	2212	T	KIF20A	T832A	A	2720	G	LMNB2	R244Q	C	854	T
HTR3E	A292T	G	874	A	IWS1	S621L	G	2122	A	KIF20A	R772C	C	2540	T	LMNB2	R138W	G	535	A
HTR3E	N46T	A	137	C	IWS1	D334N	C	1260	T	KIF20B	A919T	G	2827	A	LMNB2	R84W	G	373	A
HTR4	W46C	C	302	A	JAG1	A959V	G	3306	A	KIF20B	K955N	G	2937	T	LMO2	L156F	G	1296	A
HTR4	K174N	C	686	A	JAG1	K428T	T	1713	G	KIF20B	E1834D	G	5574	C	LMO7	R1250C	C	4019	T
HTR7	A200V	G	626	A	JAG1	E228K	C	1112	T	KIF21A	G911C	C	3151	A	LMO7	K85Q	A	1513	C
HTR7	A160T	C	505	T	JAG2	S1092G	T	3678	C	KIF21A	G911C	C	3151	A	LMO7	R627Q	G	2151	A
HTR7	N376H	T	1153	G	JAGN1	A113T	G	506	A	KIF21A	N649I	T	2366	A	LMOD2	T184A	A	707	G
HTR7	D142N	C	451	T	JAGN1	L170I	C	677	A	KIF21A	R825H	C	2894	T	LMOD3	E12*	C	214	A
HTRA2	A85V	C	884	T	JAK1	K736E	T	2455	C	KIF21A	V1533A	A	5018	G	LMOD3	K285N	T	1035	G
HTRA2	G261E	G	1412	A	JAK1	R532C	G	1843	A	KIF21A	G908*	C	3142	A	LMTK2	S600F	C	2092	T
HTRA4	A172V	C	630	T	JAK1	L531M	G	1840	T	KIF21A	K675Q	T	2443	G	LMTK2	A267V	C	1093	T
HTRA4	V345A	T	1149	C	JAK3	P181L	G	642	A	KIF21B	S1193L	G	3895	A	LMTK2	S439P	T	1608	C
HTT	A2694V	C	8226	T	JAK3	R944H	C	2931	T	KIF21B	A956T	C	3183	T	LMTK2	L342F	C	1317	T
HTT	A2285T	G	6998	A	JAK3	L1091R	A	3372	C	KIF21B	Q808*	G	2739	A	LMTK2	D276G	A	1120	G
HTT	Q2478H	G	7579	T	JAK3	Q630H	C	1990	A	KIF21B	R1619H	C	5173	T	LMTK2	F636L	T	2201	G
HTT	A653V	C	2103	T	JAK3	A343V	G	1128	A	KIF21B	T1214M	G	3958	A	LMTK3	R997M	C	2990	A
HTT	M633T	T	2043	C	JAKMIP1	C630F	C	2339	A	KIF21B	R958W	G	3189	A	LMTK3	A558T	C	1672	T
HTT	L2753P	T	8403	C	JAKMIP1	R321C	G	1411	A	KIF21B	K1134Q	T	3717	G	LMTK3	G1216R	C	3646	T
HTT	R1508H	G	4668	A	JAKMIP1	R774C	G	2770	A	KIF22	V307L	G	959	T	LMX1A	A102T	C	687	T
HTT	N1661D	A	5126	G	JAKMIP1	T440P	T	1768	G	KIF24	E580D	C	1929	A	LMX1B	F141L	T	428	C
HTT	Q2529*	C	7730	T	JAKMIP1	Q191R	T	1022	C	KIF24	D50N	C	337	T	LNP1	F89V	T	1127	G
HTT	R924L	G	2916	T	JAKMIP1	E13K	C	487	T	KIF24	R231C	G	880	A	LNP1	F124C	T	1233	G
HUS1B	V231A	A	711	G	JAKMIP2	E320K	C	1426	T	KIF24	R240H	C	908	T	LNX1	P347H	G	1355	T
HUWE1	E50K	C	550	T	JAKMIP2	T749M	G	2714	A	KIF24	-	T	0	C	LNX1	L65I	G	508	T
HUWE1	V2613G	A	8240	C	JAKMIP2	A18V	G	521	A	KIF24	R76C	G	415	A	LNX1	R682I	C	2360	A
HUWE1	A3007V	G	9422	A	JAKMIP2	E730*	C	2656	A	KIF24	F124L	G	561	T	LONP1	A817T	C	2482	T
HUWE1	R2603W	G	8209	A	JAKMIP2	R587Q	C	2228	T	KIF25	S221G	A	1052	G	LONP1	A94T	C	313	T
HUWE1	R3782C	G	1174 6	A	JAKMIP3	R343C	C	1165	T	KIF25	S52Y	C	546	A	LONP2	P247H	C	833	A

HUWE1	P4237L	G	13112	A	JAKMIP3	R58W	C	310	T	KIF26A	R627H	G	1880	A	LONP2	L476I	C	1519	A
HUWE1	K414E	T	1642	C	JAKMIP3	F364C	T	1229	G	KIF26A	A1331V	C	3992	T	LONRF2	V556I	C	2306	T
HUWE1	L4229V	A	13087	C	JARID2	T508M	C	1767	T	KIF26A	A1702T	G	5104	A	LONRF2	S300Y	G	1539	T
HUWE1	G913V	C	3140	A	JARID2	R753H	G	2502	A	KIF26A	V259I	G	775	A	LONRF2	-	C	0	A
HUWE1	R4239C	G	13117	A	JARID2	R387H	G	1404	A	KIF26A	R1227H	G	3680	A	LONRF3	E537G	A	1641	G
HUWE1	A3787V	G	11762	A	JARID2	R733C	C	2441	T	KIF26B	A776V	C	2327	T	LOX	R255S	T	1065	G
HUWE1	R2521C	G	7963	A	JARID2	G471D	G	1656	A	KIF26B	V1901M	G	5701	A	LOX	R337Q	C	1310	T
HUWE1	H4100Y	G	12700	A	JARID2	A49V	C	390	T	KIF26B	E1899K	G	5695	A	LOX	R281Q	C	1142	T
HVCN1	W45L	C	156	A	JARID2	S166Y	C	741	A	KIF26B	R456H	G	1367	A	LOXHD1	L1481I	G	4588	T
HYAL1	R240C	G	897	A	JAZF1	R203C	G	773	A	KIF26B	G1579V	G	4736	T	LOXHD1	R1380H	C	4286	T
HYAL2	T334A	T	3293	C	JDP2	G4D	G	204	A	KIF26B	R404Q	G	1211	A	LOXHD1	Q925H	C	2922	A
HYAL2	R116C	G	2639	A	JHDM1D	S848N	C	2641	T	KIF26B	R2024H	G	6071	A	LOXHD1	R722W	G	2311	A
HYAL2	G321S	C	3254	T	JKAMP	E254A	A	761	C	KIF27	E774K	C	2464	T	LOXHD1	W1677*	C	5178	T
HYAL3	A109V	G	599	A	JKAMP	F78C	T	233	G	KIF27	R623Q	C	2012	T	LOXHD1	M1603I	C	4956	A
HYAL3	R291I	C	1145	A	JKAMP	F312C	T	935	G	KIF27	R804C	G	2554	A	LOXHD1	A758V	G	2420	A
HYAL3	H255R	T	1037	C	JMJD1C	A2208V	G	6842	A	KIF27	E1136*	C	3550	A	LOXHD1	L297R	A	1037	C
HYAL4	K279N	A	1475	T	JMJD1C	N1545H	T	4852	G	KIF27	L1055I	G	3307	T	LOXHD1	G193D	C	725	T
HYDIN2	R163*	G	615	A	JMJD1C	F1473C	A	4637	C	KIF27	R623Q	C	2012	T	LOXHD1	A171D	G	510	T
HYDIN2	V2565I	C	7821	T	JMJD1C	S1714P	A	5359	G	KIF2A	E34*	G	121	T	LOXHD1	C844W	G	2679	C
HYI	R118Q	C	353	T	JMJD1C	R2309C	G	7144	A	KIF2A	D242Y	G	745	T	LOXL2	A133V	G	737	A
HYI	R118Q	C	353	T	JMJD1C	E1884*	C	5869	A	KIF2B	Y586*	T	1852	A	LOXL2	P773L	G	2657	A
HYI	K98N	T	294	G	JMJD6	R374M	C	1445	A	KIF2B	A112T	G	428	A	LOXL2	V229M	C	1024	T
HYOU1	R304C	G	979	A	JMJD6	G138D	C	737	T	KIF2B	T320M	C	1053	T	LOXL2	R189*	G	904	A
HYOU1	A690T	C	2137	T	JMJD7-PLA2G4B	L635F	C	1912	T	KIF2B	R293H	G	972	A	LOXL3	A305V	G	986	A
HYOU1	E654D	T	2031	G	JOSD1	-	T	1289	A	KIF2B	L499P	T	1590	C	LOXL3	V343M	C	1099	T
IAH1	V121M	G	398	A	JPH1	A653V	G	1998	A	KIF2B	L662*	T	2079	G	LOXL3	R579*	G	1807	A
IAPP	N47I	A	292	T	JPH1	A559T	C	1715	T	KIF2C	N186D	A	669	G	LOXL4	R593Q	C	1929	T
IARS	K1063N	C	3263	A	JPH1	R338H	C	1053	T	KIF3A	-	C	0	T	LPA	A1934T	C	5845	T
IARS	P543L	G	1702	A	JPH2	L695M	G	2956	T	KIF3B	S122*	C	532	A	LPA	-	C	0	T
IARS	W163*	C	563	T	JPH2	A277T	C	1702	T	KIF3C	R785C	G	2933	A	LPA	T1691M	G	5117	A
IARS2	P72H	C	330	A	JPH2	E315K	C	1816	T	KIF3C	R324L	C	1551	A	LPA	T1183I	G	3593	A
IARS2	P262H	C	900	A	JPH2	R232H	C	1568	T	KIF3C	H208Y	G	1202	A	LPA	F2029C	A	6131	C
IARS2	E772K	G	2429	A	JPH3	I737T	T	2452	C	KIF3C	R758Q	C	2853	T	LPA	T1699A	T	5140	C
IBSP	R24Q	G	138	A	JPH3	D180N	G	780	A	KIF4A	R806C	C	2498	T	LPAR1	S363F	G	1088	A
IBTK	M797V	T	2939	C	JPH3	Y61N	T	423	A	KIF4A	R265Q	G	876	A	LPAR2	R320C	G	1097	A

IBTK	I746N	A	2787	T	JPH3	G72D	G	457	A	KIF4B	Q906H	A	2718	C	LPAR3	R322C	G	1003	A
IBTK	L632V	A	2444	C	JPH3	A374T	G	1362	A	KIF4B	R762H	G	2285	A	LPAR3	P222L	G	704	A
IBTK	S486P	A	2006	G	JPH3	G513R	G	1779	A	KIF4B	G1100V	G	3299	T	LPAR5	R119H	C	356	T
ICA1	Q28H	C	271	A	JPH3	P149L	C	688	T	KIF4B	K74Q	A	220	C	LPAR5	S252N	C	755	T
ICA1L	S454P	A	1518	G	JPH3	R629H	G	2128	A	KIF4B	A368T	G	1102	A	LPAR5	A122T	C	364	T
ICA1L	R156H	C	625	T	JPH3	G290D	G	1111	A	KIF4B	E567*	G	1699	T	LPAR5	A206V	G	617	A
ICA1L	D256Y	C	924	A	JPH3	A491V	C	1714	T	KIF5A	T767I	C	2508	T	LPAR5	R52C	G	154	A
ICAM3	A492V	G	1530	A	JPH4	A600T	C	1798	T	KIF5A	E758K	G	2480	A	LPAR6	V290A	A	1668	G
ICAM3	R93Q	C	333	T	JPH4	R305H	C	914	T	KIF5A	G568R	G	1910	A	LPAR6	T157A	T	1268	C
ICAM4	R218L	G	692	T	JRKL	R510Q	G	1776	A	KIF5A	E137D	A	619	C	LPAR6	S253Y	G	1557	T
ICAM5	A230V	C	754	T	JRKL	E459G	A	1623	G	KIF5A	E486K	G	1664	A	LPAR6	F238C	A	1512	C
ICK	R151Q	C	799	T	JRKL	F162C	T	732	G	KIF5B	R868*	G	3060	A	LPCAT1	R104H	C	444	T
ICK	I250V	T	1095	C	JRKL	I269M	T	1054	G	KIF5B	D401G	T	1660	C	LPCAT1	-	C	0	A
ICK	S174F	G	868	A	JRKL	E469*	G	1652	T	KIF5C	Q474P	A	1789	C	LPCAT2	A110D	C	513	A
ICOS	R14H	G	108	A	JSRP1	D23G	T	101	C	KIF5C	N912I	A	3103	T	LPCAT2	L178M	C	716	A
ICOS	D64N	G	257	A	JSRP1	E248D	C	777	A	KIF5C	E311*	G	1299	T	LPCAT4	L405R	A	1308	C
ICT1	A112V	C	341	T	JUB	Q397R	T	1566	C	KIF5C	E764*	G	2658	T	LPGAT1	L119M	G	582	T
ID2	P51S	C	1011	T	JUN	A306V	G	1960	A	KIF6	R649K	C	2041	T	LPHN1	R1150W	G	3719	A
IDE	R824H	C	2528	T	JUN	L121P	A	1405	G	KIF6	T260I	G	874	A	LPHN1	R231H	C	963	T
IDE	Y609S	T	1883	G	JUNB	R250L	G	1025	T	KIF7	D332N	C	1071	T	LPHN1	R987H	C	3231	T
IDE	R839*	G	2572	A	JUP	R444H	C	1450	T	KIF7	R859Q	C	2653	T	LPHN1	K146N	C	709	A
IDE	E751D	T	2310	G	JUP	A620T	C	1977	T	KIF7	R841W	G	2598	A	LPHN1	R36C	G	377	A
IDH2	M248T	A	857	G	JUP	N309D	T	1044	C	KIF7	R841W	G	2598	A	LPHN2	R1150C	C	4093	T
IDH3A	R326I	G	1060	T	KAL1	R651W	G	2101	A	KIF7	T354M	G	1138	A	LPHN2	R179C	C	1180	T
IDH3B	V352A	A	1086	G	KAL1	R679I	C	2186	A	KIFAP3	L407I	G	1447	T	LPHN2	D571G	A	2357	G
IDH3B	K193R	T	609	C	KAL1	R262*	G	934	A	KIFAP3	D604Y	C	2038	A	LPHN2	V219I	G	1300	A
IDH3G	E173K	C	714	T	KALRN	V2585M	G	7853	A	KIFC3	A308V	G	1116	A	LPHN2	M1154I	G	4107	A
IDH3G	A195V	G	781	A	KALRN	R1125W	C	3473	T	KIFC3	R218*	G	845	A	LPHN2	T301M	C	1547	T
IDI2	R207W	G	684	A	KALRN	T352M	C	1155	T	KIFC3	R776S	C	2521	A	LPHN2	T424P	A	1915	C
IDO1	R77C	C	343	T	KALRN	E1427K	G	4379	A	KIFC3	R656Q	C	2160	T	LPHN2	Y1421*	C	4908	G
IDUA	R163C	C	575	T	KALRN	A1390V	C	4269	T	KIN	G295R	C	931	T	LPHN3	P1558H	C	4673	A
IDUA	D435N	G	1391	A	KALRN	R2962H	G	8985	A	KIN	R82K	C	293	T	LPHN3	M663L	A	1987	T
IER2	Q161*	C	809	T	KALRN	K1294N	G	3982	T	KIN	N74H	T	268	G	LPHN3	W1090S	G	3269	C
IER3IP1	L79V	A	332	C	KALRN	N2552D	A	7754	G	KIR2DL4	R54C	C	160	T	LPHN3	K132N	A	396	C
IER5L	Q308R	T	1132	C	KALRN	R2764Q	G	8391	A	KIR2DS4	H173Y	C	517	T	LPHN3	E1391*	G	4171	T
IFFO1	R83W	G	281	A	KALRN	L1304F	A	4012	C	KIR2DS4	N84S	A	251	G	LPIN1	V451A	T	1714	C
IFFO1	R408H	C	1257	T	KALRN	R302H	G	1005	A	KIR3DL1	L451I	C	1351	A	LPIN1	K342N	A	1388	C
IFFO1	W197*	C	625	T	KALRN	Q2541P	A	7722	C	KIR3DX1	T64P	A	228	C	LPIN1	Y837H	T	2871	C
IFFO1	R250Q	C	783	T	KALRN	-	T	0	C	KIRREL	R506*	C	1920	T	LPIN2	P373S	G	1356	A

IFFO2	D341N	C	1021	T	KANK1	E406K	G	1868	A	KIRREL	V6I	G	420	A	LPIN2	K553N	C	1898	A
IFI16	P405L	C	1474	T	KANK1	A849E	C	3198	A	KIRREL	K315T	A	1348	C	LPIN3	K799Q	A	2486	C
IFI27	A115V	C	467	T	KANK2	A644T	C	2245	T	KIRREL	P335T	C	1407	A	LPIN3	Y687H	T	2150	C
IFI27L1	M51L	A	359	T	KANK2	R133C	G	712	A	KIRREL	N463T	A	1792	C	LPIN3	G647D	G	2031	A
IFI27L1	A30V	C	297	T	KANK4	R471H	C	1412	T	KIRREL2	G621*	G	2073	T	LPIN3	G186C	G	647	T
IFI30	A190T	G	641	A	KANK4	A115T	C	343	T	KIRREL2	P702L	C	2317	T	LPIN3	R807W	C	2510	T
IFI35	R110W	C	524	T	KANK4	D821N	C	2461	T	KIRREL2	R361H	G	1294	A	LPIN3	S161Y	C	573	A
IFI35	R135Q	G	600	A	KANK4	R385*	G	1153	A	KIRREL3	P124S	G	443	A	LPO	R80Q	G	494	A
IFI44	R412*	C	1319	T	KARS	V99M	C	417	T	KIRREL3	V737I	C	2282	T	LPP	R568Q	G	1949	A
IFI44	A416T	G	1331	A	KAT2A	R251W	G	805	A	KIRREL3	-	T	0	C	LPP	V423I	G	1513	A
IFI44L	R427W	C	1458	T	KAT2A	F199V	A	649	C	KIRREL3	F267L	G	874	T	LPP	Q454*	C	1606	T
IFI44L	K389N	A	1346	C	KAT2B	R490H	G	1924	A	KIRREL3	S174F	G	594	A	LPP	P167L	C	746	T
IFI44L	A447V	C	1519	T	KATNA1	L33F	G	142	A	KIT	A616V	C	1944	T	LPXN	R330Q	C	989	T
IFI6	A62T	C	272	T	KATNA1	E482D	C	1491	A	KIT	R49C	C	242	T	LPXN	R215H	C	644	T
IFIH1	E642*	C	2320	A	KATNA1	D190H	C	613	G	KIT	D52G	A	252	G	LRAT	T88M	C	325	T
IFIH1	R806H	C	2813	T	KATNA1	R298*	G	937	A	KIT	T847M	C	2637	T	LRBA	D1657V	T	5214	A
IFIT1	E140*	G	585	T	KATNAL1	F298I	A	1060	T	KL	R920H	G	2767	A	LRBA	T1588M	G	5007	A
IFIT1B	R208*	C	702	T	KATNAL1	N168T	T	671	G	KL	A984V	C	2959	T	LRBA	R2144C	G	6674	A
IFIT2	R184H	G	720	A	KATNAL1	M33V	T	265	C	KL	Q586R	A	1765	G	LRBA	A901T	C	2945	T
IFIT2	R251H	G	921	A	KATNAL1	L389R	A	1334	C	KL	S996Y	C	2995	A	LRBA	T2307A	T	7163	C
IFIT3	F172L	C	696	A	KATNAL1	G251D	C	920	T	KLB	F369L	C	1204	A	LRBA	E2103K	C	6551	T
IFIT3	A155T	G	643	A	KATNAL2	E398*	G	1192	T	KLB	I769V	A	2402	G	LRBA	E757D	T	2515	G
IFIT3	A179V	C	716	T	KATNAL2	T115A	A	343	G	KLB	A619T	G	1952	A	LRCH1	R152Q	G	592	A
IFIT3	R245C	C	913	T	KATNAL2	A469V	C	1406	T	KLB	F53L	C	256	A	LRCH2	C307F	C	951	A
IFLTD1	R388L	C	1408	A	KATNAL2	G121V	G	362	T	KLB	K346N	G	1135	T	LRCH2	P68S	G	233	A
IFLTD1	S89Y	G	511	T	KATNAL2	I72L	A	214	C	KLC2	A266V	C	1040	T	LRCH2	A87T	C	290	T
IFLTD1	Q384H	C	1397	A	KATNAL2	S125L	C	374	T	KLC3	V472M	G	1516	A	LRCH3	P42Q	C	169	A
IFLTD1	E342G	T	1270	C	KATNAL2	L267I	C	799	A	KLC4	-	T	2265	C	LRCH3	D200Y	G	642	T
IFLTD1	R302C	G	1149	A	KATNB1	Q14*	C	432	T	KLF1	W318G	A	1015	C	LRCH3	R349*	C	1089	T
IFLTD1	S39Y	G	361	T	KATNB1	V150M	G	840	A	KLF10	S329*	G	1140	T	LRCH3	R91Q	G	316	A
IFNA13	E190K	C	634	T	KATNB1	A379T	G	1527	A	KLF10	A430V	G	1443	A	LRCH4	P23H	G	121	T
IFNA2	P27S	G	147	A	KBTBD10	R59C	C	252	T	KLF10	L178I	G	686	T	LRDD	R718W	G	2294	A
IFNA5	L80I	G	294	T	KBTBD10	L63V	T	264	G	KLF10	P278S	G	986	A	LRDD	S523N	C	1710	T
IFNAR1	K211N	A	785	C	KBTBD12	K395E	A	1650	G	KLF10	A12V	G	189	A	LRDD	L89M	G	407	T
IFNE	F60V	A	797	C	KBTBD12	H561N	C	2148	A	KLF11	M508T	T	1685	C	LRDD	K879*	T	2777	A
IFNG	K103E	T	435	C	KBTBD12	G321*	G	1428	T	KLF12	A136V	G	434	A	LRDD	R637Q	C	2052	T
IFNG	-	A	0	G	KBTBD12	E26*	G	543	T	KLF12	N59S	T	203	C	LRFN1	A742V	G	2225	A
IFNG	K110N	C	458	A	KBTBD13	R188H	G	563	A	KLF12	R396H	C	1214	T	LRFN1	A712V	G	2135	A
IFNGR1	Y172C	T	637	C	KBTBD13	L35F	C	103	T	KLF13	R219C	C	1013	T	LRFN1	A589T	C	1765	T

IFNGR1	L247I	G	861	T	KBTBD2	E131D	C	1093	A	KLF14	K208E	T	622	C	LRFN1	V92A	A	275	G
IFNGR1	E110*	C	450	A	KBTBD3	F190V	A	1208	C	KLF14	G221D	C	662	T	LRFN1	S731P	A	2191	G
IFNGR1	E38*	C	234	A	KBTBD3	R356Q	C	1707	T	KLF15	R343H	C	1259	T	LRFN1	D498N	C	1492	T
IFNK	K176N	G	551	T	KBTBD3	R356*	G	1706	A	KLF15	G302S	C	1135	T	LRFN2	S236C	G	1250	C
IFRD1	K357T	A	1540	C	KBTBD3	Q309K	G	1565	T	KLF15	R110G	T	559	C	LRFN2	D725N	C	2716	T
IFRD2	Q301H	T	903	G	KBTBD5	G205S	G	713	A	KLF17	P102H	C	363	A	LRFN2	R755C	G	2806	A
IFRD2	V114M	C	340	T	KBTBD5	R402H	G	1305	A	KLF17	T125M	C	432	T	LRFN3	A523V	C	2292	T
IFT122	A848T	G	2734	A	KBTBD5	V220I	G	758	A	KLF17	L132P	T	453	C	LRFN3	P12S	C	758	T
IFT122	A701V	C	2294	T	KBTBD6	R670H	C	2244	T	KLF2	G308S	G	1020	A	LRFN3	V470I	G	2132	A
IFT122	D899Y	G	2887	T	KBTBD6	R483*	G	1682	A	KLF3	P139L	C	721	T	LRFN3	T595M	C	2508	T
IFT140	L980P	A	3164	G	KBTBD6	S500G	T	1733	C	KLF3	H314R	A	1246	G	LRFN4	R81H	G	582	A
IFT140	R63L	C	413	A	KBTBD6	R670C	G	2243	A	KLF3	K105N	A	620	C	LRFN5	K420T	A	2457	C
IFT140	A284T	C	1075	T	KBTBD6	K579T	T	1971	G	KLF4	D441N	C	1795	T	LRFN5	I536F	A	2804	T
IFT140	T72M	G	440	A	KBTBD6	I25M	A	310	C	KLF5	D418G	A	1789	G	LRFN5	R681H	G	3240	A
IFT140	H57Y	G	394	A	KBTBD7	A175T	C	832	T	KLF5	T398A	A	1728	G	LRFN5	L77V	T	1427	G
IFT140	R1201C	G	3826	A	KBTBD7	E624K	C	2179	T	KLF6	G167R	C	760	T	LRFN5	T332A	A	2192	G
IFT140	D44G	T	356	C	KBTBD7	Y497H	A	1798	G	KLF8	P141T	C	709	A	LRFN5	P378H	C	2331	A
IFT140	D1324N	C	4195	T	KBTBD7	V265A	A	1103	G	KLF9	A222S	C	1925	A	LRFN5	R445H	G	2532	A
IFT172	S249N	C	850	T	KBTBD8	R92Q	G	324	A	KLHDC1	A382V	C	1235	T	LRFN5	K646N	G	3136	T
IFT172	T147I	G	544	A	KBTBD8	Q560H	A	1729	T	KLHDC10	D8Y	G	156	T	LRGUK	S633L	C	1967	T
IFT172	Y91H	A	375	G	KCMF1	R246W	C	736	T	KLHDC3	I281T	T	1011	C	LRGUK	P413H	C	1307	A
IFT172	G675S	C	2127	T	KCMF1	-	T	1147	G	KLHDC4	R432H	C	1402	T	LRGUK	N182S	A	614	G
IFT172	R1667C	G	5103	A	KCNA1	V486I	G	2561	A	KLHDC7A	R681H	G	2094	A	LRGUK	R443I	G	1397	T
IFT172	D605A	T	1918	G	KCNA1	V388M	G	2267	A	KLHDC7A	S163T	G	540	C	LRGUK	V498A	T	1562	C
IFT172	V211M	C	735	T	KCNA10	S54G	T	548	C	KLHDC7A	C573Y	G	1770	A	LRGUK	E710*	G	2197	T
IFT52	R274Q	G	951	A	KCNA10	R356C	G	1454	A	KLHDC7A	A346V	C	1089	T	LRIG1	V650A	A	2474	G
IFT57	K394N	C	1182	A	KCNA10	T61M	G	570	A	KLHDC7B	E444K	G	1464	A	LRIG1	P452A	G	1879	C
IFT57	E224*	C	670	A	KCNA2	P105S	G	809	A	KLHDC8B	A74V	C	430	T	LRIG1	A377T	C	1654	T
IFT74	Y97C	A	417	G	KCNA2	F241L	G	1219	T	KLHDC9	R318H	G	1095	A	LRIG1	G770D	C	2834	T
IFT74	A558V	C	1800	T	KCNA2	R73*	G	713	A	KLHL1	A319D	G	1716	T	LRIG1	N292T	T	1400	G
IFT80	K131Q	T	824	G	KCNA3	R516*	G	1770	A	KLHL10	R287H	G	1013	A	LRIG2	D81E	T	441	G
IFT81	K114N	A	890	C	KCNA3	R105H	C	538	T	KLHL10	K77T	A	383	C	LRIG3	R203*	G	853	A
IFT81	E322*	G	1512	T	KCNA3	R367H	C	1324	T	KLHL12	E491G	T	1691	C	LRIG3	R7H	C	266	T
IFT81	L546I	T	2184	A	KCNA3	R105H	C	538	T	KLHL13	E364D	T	2002	G	LRIG3	E982K	C	3190	T
IFT81	K528N	G	2132	T	KCNA3	Q271*	G	1035	A	KLHL14	R560*	G	2066	A	LRIG3	E266D	T	1044	G
IFT81	L642V	T	2472	G	KCNA4	E2*	C	1156	A	KLHL14	F393C	A	1566	C	LRIT1	R84H	C	273	T
IFT88	I731T	T	2519	C	KCNA4	S603Y	G	2960	T	KLHL14	D570G	T	2097	C	LRIT1	R429*	G	1307	A
IFT88	S612C	C	2162	G	KCNA5	P91L	C	501	T	KLHL15	G287E	C	1116	T	LRIT1	S38G	T	134	C
IFT88	E39K	G	442	A	KCNA5	R354Q	G	1290	A	KLHL17	R324M	G	1078	T	LRIT2	A447D	G	1346	T

IFT88	K749T	A	2573	C	KCNA5	R597Q	G	2019	A	KLHL18	R53Q	G	178	A	LRIT2	Q254H	C	768	A
IGBP1	K253R	A	1257	G	KCNA6	R524I	G	2437	T	KLHL2	R372C	C	1364	T	LRIT3	A278T	G	1025	A
IGBP1	R330M	G	1488	T	KCNA7	A183V	G	904	A	KLHL2	G589R	G	2015	A	LRIT3	A469V	C	1599	T
IGDCC3	A493T	C	1729	T	KCNA7	R293Q	C	1234	T	KLHL21	A179V	G	588	A	LRIT3	V529D	T	1779	A
IGDCC3	R132C	G	646	A	KCNAB1	I188S	T	627	G	KLHL21	V359M	C	1127	T	LRMP	R400G	A	2064	G
IGDCC3	R132C	G	646	A	KCNAB1	L271I	C	875	A	KLHL22	V351I	C	1208	T	LRMP	R216I	G	1513	T
IGDCC3	-	A	0	G	KCNAB3	A377T	C	1129	T	KLHL23	I100L	A	636	C	LRMP	V71M	G	1077	A
IGDCC4	P271S	G	1021	A	KCNB1	A238T	C	879	T	KLHL23	N332T	A	1333	C	LRP10	R561H	G	2269	A
IGDCC4	S553G	T	1867	C	KCNB1	T376A	T	1293	C	KLHL24	F77C	T	580	G	LRP11	A239T	C	721	T
IGDCC4	D473V	T	1628	A	KCNB1	D358N	C	1239	T	KLHL24	E108D	G	674	C	LRP11	D337A	T	1016	G
IGF1	F19L	G	239	T	KCNB1	L155R	A	631	C	KLHL24	K188N	A	914	C	LRP12	P129L	G	481	A
IGF1R	T500M	C	2110	T	KCNB1	A702V	G	2272	A	KLHL25	G450R	C	1623	T	LRP12	V229F	C	780	A
IGF1R	L181M	C	1152	A	KCNB1	K807N	C	2588	A	KLHL26	R305C	C	940	T	LRP12	E235K	C	798	T
IGF1R	D918Y	G	3363	T	KCNB1	K253N	C	926	A	KLHL26	A454T	G	1387	A	LRP1B	L2283P	A	7820	G
IGF1R	A943T	G	3438	A	KCNB2	N526D	A	1576	G	KLHL28	R577H	C	1934	T	LRP1B	L4509I	G	1449 7	T
IGF1R	R513Q	G	2149	A	KCNB2	T214M	C	641	T	KLHL29	G145V	G	1151	T	LRP1B	D1657Y	C	5941	A
IGF1R	N1049D	A	3756	G	KCNB2	Y248C	A	743	G	KLHL3	V507I	C	1963	T	LRP1B	R1815W	G	6415	A
IGF2	P158L	G	858	A	KCNB2	F261L	C	783	A	KLHL3	M273I	C	1263	A	LRP1B	I1460T	A	5351	G
IGF2	Q33H	C	484	A	KCNC1	A421V	C	1317	T	KLHL3	Q381*	G	1585	A	LRP1B	R3069C	G	1017 7	A
IGF2	V29I	C	470	T	KCNC1	V356M	G	1121	A	KLHL3	R240Q	C	1163	T	LRP1B	S3238G	T	1068 4	C
IGF2AS	R143*	C	427	T	KCNC2	A227D	G	1224	T	KLHL30	Q24*	C	177	T	LRP1B	N210Y	T	1600	A
IGF2BP1	E62*	G	518	T	KCNC2	I243S	A	1272	C	KLHL30	R202C	C	711	T	LRP1B	S3497N	C	1146 2	T
IGF2BP1	E352D	G	1390	T	KCNC2	R33H	C	642	T	KLHL30	V561I	G	1788	A	LRP1B	N1298K	A	4866	T
IGF2BP1	R199W	C	929	T	KCNC3	A326T	C	1140	T	KLHL31	R67W	G	340	A	LRP1B	D539N	C	2587	T
IGF2BP2	R256H	C	863	T	KCNC3	R435H	C	1468	T	KLHL31	R196W	G	727	A	LRP1B	G2038A	C	7085	G
IGF2BP3	G472*	C	1771	A	KCNC4	S335P	T	1030	C	KLHL32	Y371H	T	1474	C	LRP1B	G35D	C	1076	T
IGF2BP3	A14T	C	397	T	KCND1	G159D	C	1774	T	KLHL32	R477H	G	1793	A	LRP1B	R2075C	G	7195	A
IGF2BP3	T306I	G	1274	A	KCND1	R49W	G	1443	A	KLHL33	R246Q	C	737	T	LRP1B	N4223H	T	1363 9	G
IGF2BP3	E477*	C	1786	A	KCND1	E492*	C	2772	A	KLHL33	R263W	G	787	A	LRP1B	E3741*	C	1219 3	A
IGF2BP3	E235*	C	1060	A	KCND2	R247H	G	1705	A	KLHL34	R190W	G	1110	A	LRP1B	R3547I	C	1161 2	A
IGF2R	P79S	C	383	T	KCND2	E117K	G	1314	A	KLHL34	R415Q	C	1786	T	LRP1B	K2557E	T	8641	C
IGF2R	R1260W	C	3926	T	KCND2	D462G	A	2350	G	KLHL34	D148G	T	985	C	LRP1B	K2113N	C	7311	A
IGF2R	A1074T	G	3368	A	KCND2	R247C	C	1704	T	KLHL34	A166T	C	1038	T	LRP1B	S1772*	G	6287	T
IGF2R	R256C	C	914	T	KCND2	R539C	C	2580	T	KLHL34	R234W	G	1242	A	LRP1B	T1714I	G	6113	A

IGF2R	G1769C	G	5453	T	KCND2	R311H	G	1897	A	KLHL34	T406M	G	1759	A	LRP1B	R1072C	G	4186	A
IGF2R	-	G	0	A	KCND3	R308Q	C	1403	T	KLHL35	P333L	G	1002	A	LRP1B	K517R	T	2522	C
IGF2R	A1763V	C	5436	T	KCND3	R550H	C	2129	T	KLHL36	R614W	C	2005	T	LRP1B	E145*	C	1405	A
IGF2R	R1484M	G	4599	T	KCND3	R293H	C	1358	T	KLHL36	Y519C	A	1721	G	LRP1B	Q30H	C	1062	A
IGF2R	F1909L	C	5875	A	KCND3	T57M	G	650	A	KLHL36	R334W	C	1165	T	LRP1B	W3985*	C	1292 6	T
IGFBP1	Y158C	A	769	G	KCND3	P400L	G	1679	A	KLHL36	R528H	G	1748	A	LRP1B	R2597C	G	8761	A
IGFBP3	R150C	G	559	A	KCND3	S438L	G	1793	A	KLHL38	I537T	A	1634	G	LRP2	G2701D	C	8388	T
IGFBP3	K253E	T	868	C	KCNE4	S23P	T	551	C	KLHL38	A427T	C	1303	T	LRP2	T620I	G	2145	A
IGFBP3	S146L	G	548	A	KCNE4	R24H	G	555	A	KLHL38	R321W	G	985	A	LRP2	L2004M	G	6296	T
IGFL1	C81*	C	266	A	KCNF1	R417C	C	1739	T	KLHL38	S555F	G	1688	A	LRP2	R2095*	G	6569	A
IGFL2	W43*	G	420	A	KCNF1	S307T	T	1409	A	KLHL38	K468N	C	1428	A	LRP2	R2095*	G	6569	A
IGFL4	A33V	G	98	A	KCNF1	E426K	G	1766	A	KLHL4	M587I	G	1841	A	LRP2	D2054E	A	6448	C
IGFN1	R49Q	G	276	A	KCNG1	P48L	G	429	A	KLHL4	R288Q	G	943	A	LRP2	R3726H	C	1146 3	T
IGFN1	V540I	G	1748	A	KCNG1	E376K	C	1412	T	KLHL4	S369Y	C	1186	A	LRP2	R2505H	C	7800	T
IGHA2	A50V	G	149	A	KCNG1	R64W	G	476	A	KLHL4	G483*	G	1527	T	LRP2	R3726C	G	1146 2	A
IGHA2	A280V	G	839	A	KCNG2	A337V	C	1010	T	KLHL4	R694I	G	2161	T	LRP2	W2322*	C	7252	T
IGHD3-3	E6Q	C	16	G	KCNG2	A283V	C	848	T	KLHL5	A226T	G	751	A	LRP2	N4312S	T	1322 1	C
IGHE	S119L	G	356	A	KCNG2	W108C	G	324	T	KLHL5	-	A	0	G	LRP2	F4014I	A	1232 6	T
IGHE	R289Q	C	866	T	KCNG3	V77A	A	826	G	KLHL5	S171R	T	588	G	LRP2	R3765*	G	1157 9	A
IGHG2	R180H	C	539	T	KCNH1	S879L	G	2664	A	KLHL5	R644G	A	2005	G	LRP2	L2954I	G	9146	T
IGHG3	R170W	G	507	A	KCNH1	T698M	G	2121	A	KLHL5	S50Y	C	224	A	LRP2	K2380N	C	7426	A
IGHG4	K126N	T	378	G	KCNH1	S854Y	G	2589	T	KLHL5	E365K	G	1168	A	LRP2	S1816Y	G	5733	T
IGHM	T160M	G	1127	A	KCNH1	A816V	G	2475	A	KLHL5	D582G	A	1820	G	LRP2	F1154C	A	3747	C
IGHMBP2	A247T	G	841	A	KCNH1	R791H	C	2400	T	KLHL6	D37Y	C	145	A	LRP2	K1141N	C	3709	A
IGHMBP2	E7*	G	121	T	KCNH1	F648L	A	1970	G	KLHL6	G565R	C	1729	T	LRP2	H763R	T	2574	C
IGHV1-18	L83F	G	306	A	KCNH1	R520W	G	1586	A	KLHL6	A500V	G	1535	A	LRP2	G514*	C	1826	A
IGHV1-24	E29D	C	147	A	KCNH2	A561V	G	2084	A	KLHL6	L266M	G	832	T	LRP2	V285F	C	1139	A
IGHV1-45	A98T	C	350	T	KCNH2	A228T	C	1084	T	KLHL8	R404*	G	1552	A	LRP2	R2056Q	C	6453	T
IGHV1-45	R6I	C	75	A	KCNH2	L1136I	G	3808	T	KLHL8	D120E	G	702	T	LRP2	G3085E	C	9540	T
IGHV1-58	R63C	G	248	A	KCNH3	G104V	G	571	T	KLHL8	D112V	T	677	A	LRP2	R3835C	G	1178 9	A
IGHV2-70	Q35H	C	181	A	KCNH3	A368T	G	1362	A	KLHL8	A538T	C	1954	T	LRP3	L512V	C	1627	G
IGHV2-70	R59H	C	252	T	KCNH3	D680N	G	2298	A	KLHL8	I415V	T	1585	C	LRP3	T527M	C	1673	T
IGHV3-13	G107R	C	399	T	KCNH3	Y524C	A	1831	G	KLHL8	E62V	T	527	A	LRP3	R223C	C	760	T
IGHV3-21	V56G	A	246	C	KCNH3	A547E	C	1900	A	KLHL9	R221C	G	1232	A	LRP4	T467I	G	1643	A

IGHV3-38	V48I	C	220	T	KCNH3	K117N	G	611	T	KLHL9	T442R	G	1896	C	LRP4	R247C	G	982	A
IGHV3-7	L64M	G	269	T	KCNH3	F280V	T	1098	G	KLHL9	L349I	G	1616	T	LRP4	R524H	C	1814	T
IGHV3-74	T97M	G	526	A	KCNH3	V1033A	T	3358	C	KLK11	R26H	C	189	T	LRP4	L1019P	A	3299	G
IGHV3-74	S78R	G	470	T	KCNH3	R344H	G	1291	A	KLK11	W88*	C	376	T	LRP5	V580I	G	1813	A
IGHV3OR16-8	A80T	C	316	T	KCNH4	S251L	G	1085	A	KLK12	C186R	A	673	G	LRP5	G1276R	G	3901	A
IGHV4-28	V108M	C	394	T	KCNH4	A451V	G	1685	A	KLK13	R244Q	C	774	T	LRP5	V1410M	G	4303	A
IGHV4-34	S26T	A	107	T	KCNH5	A894D	G	2950	T	KLK14	R86H	C	476	T	LRP5	R1237Q	G	3785	A
IGHV4-39	P68S	G	252	A	KCNH5	L595M	A	2052	T	KLK15	E251D	T	784	G	LRP5	R752Q	G	2330	A
IGHV4-39	T114P	T	390	G	KCNH5	L709F	G	2394	A	KLK2	V60M	G	219	A	LRP5L	R237H	C	1234	T
IGHV7-81	D92G	T	329	C	KCNH6	R447C	C	1419	T	KLK2	A17V	C	91	T	LRP6	V700A	A	2241	G
IGKC	A37T	C	108	T	KCNH6	L239M	C	795	A	KLK2	-	G	0	T	LRP6	S1020G	T	3200	C
IGKV1-16	Q77K	G	256	T	KCNH6	A40V	C	199	T	KLK3	S11A	T	72	G	LRP6	F1502C	A	4647	C
IGKV1-16	K83N	C	276	G	KCNH7	R1082I	C	3345	A	KLK6	S212A	A	877	C	LRP8	G150R	C	550	T
IGKV1D-17	Q60*	C	359	T	KCNH7	I150T	A	549	G	KLK7	T214A	T	742	C	LRP8	R463C	G	1489	A
IGKV3D-11	E101D	A	400	C	KCNH7	D603N	C	1907	T	KLK7	Q26H	C	180	A	LRP8	R102W	G	406	A
IGKV3D-20	T25M	C	171	T	KCNH7	G901*	C	2801	A	KLK8	L28M	G	261	T	LRP8	A893V	G	2780	A
IGKV4-1	Q47H	G	316	C	KCNH7	L785V	A	2453	C	KLK9	R122C	G	451	A	LRP8	N655D	T	2065	C
IGLL1	E210K	C	728	T	KCNH7	S379A	A	1235	C	KLK9	-	T	0	C	LRPAP1	V216I	C	793	T
IGLL5	A176V	C	801	T	KCNH7	K346T	T	1137	G	KLRAQ1	G160S	G	635	A	LRRC10	R43H	C	452	T
IGLL5	A176V	C	801	T	KCNH8	T300I	C	1165	T	KLRAQ1	R548C	C	1799	T	LRRC10	V217A	A	974	G
IGLON5	N76T	A	227	C	KCNH8	A34T	G	366	A	KLRC2	E10*	C	35	A	LRRC14	G121D	G	508	A
IGLV1-50	C14Y	G	92	A	KCNH8	E89D	G	533	T	KLRC3	N189H	T	610	G	LRRC14B	R185W	C	581	T
IGLV2-18	R53C	C	170	T	KCNIP2	G209S	C	625	T	KLRC4	R151Q	C	634	T	LRRC15	R209Q	C	626	T
IGLV2-23	L99I	C	457	A	KCNIP2	D193V	T	578	A	KLRC4	K70N	C	392	A	LRRC15	A392T	C	1174	T
IGLV2-23	G78R	G	394	A	KCNIP3	K27R	A	215	G	KLRC4	E37K	C	291	T	LRRC16A	A712T	G	2502	A
IGLV2-33	G14D	G	99	A	KCNJ1	M1T	A	53	G	KLRD1	S166F	C	757	T	LRRC16A	K1061T	A	3550	C
IGLV2-33	K59R	A	234	G	KCNJ1	K336E	T	1057	C	KLRF1	E4K	G	74	A	LRRC16B	N936D	A	2963	G
IGLV2-8	K87R	A	422	G	KCNJ1	E52*	C	205	A	KLRK1	S151*	G	616	T	LRRC16B	V741M	G	2378	A
IGLV3-12	G99E	G	305	A	KCNJ11	T341R	G	1590	C	KNDC1	A1440V	C	4320	T	LRRC16B	R1008C	C	3179	T
IGLV3-16	A37V	C	148	T	KCNJ11	R192H	C	1143	T	KNDC1	G1453S	G	4358	A	LRRC16B	K58R	A	330	G
IGLV3-27	R79*	C	273	T	KCNJ12	R229C	C	1390	T	KNDC1	Q442H	G	1327	T	LRRC17	F331V	T	1286	G
IGLV4-3	G87D	G	292	A	KCNJ12	V163M	G	1192	A	KNDC1	S1024*	C	3072	A	LRRC18	R124H	C	448	T
IGLV4-3	D105N	G	345	A	KCNJ12	V168G	T	1208	G	KNDC1	K1569N	A	4708	T	LRRC18	L34V	A	177	C
IGLV4-3	E53K	G	189	A	KCNJ14	A120T	G	763	A	KNDC1	P1645S	C	4934	T	LRRC20	A30V	G	248	A
IGLV4-69	A54T	G	220	A	KCNJ14	G46C	G	541	T	KNDC1	P339L	C	1017	T	LRRC23	R187W	C	779	T
IGLV5-37	S85G	A	258	G	KCNJ14	G173S	G	922	A	KNG1	E209D	G	839	T	LRRC23	S166N	G	717	A
IGLV5-37	W118*	G	359	A	KCNJ14	V180I	G	943	A	KNG1	H439Y	C	1527	T	LRRC23	R312W	C	1154	T
IGLV5-45	R44H	G	159	A	KCNJ15	R334W	C	1303	T	KNG1	Y140C	A	631	G	LRRC23	G239D	G	936	A
IGLV5-45	S90C	C	297	G	KCNJ16	R176*	C	1012	T	KNTC1	R935Q	G	2967	A	LRRC23	E339K	G	1235	A

IGLV6-57	F82L	C	332	A	KCNJ16	E277D	G	1317	T	KNTC1	E1393*	G	4340	T	LRRC24	R147Q	C	564	T
IGLV7-43	T30A	A	122	G	KCNJ2	C76S	G	610	C	KNTC1	N1930T	A	5952	C	LRRC26	P310Q	G	1037	T
IGSF1	T375P	T	1203	G	KCNJ3	T456I	C	1844	T	KNTC1	-	G	0	T	LRRC27	R25M	G	179	T
IGSF1	A785V	G	2434	A	KCNJ3	E335Q	G	1480	C	KNTC1	T659I	C	2139	T	LRRC27	V136I	G	511	A
IGSF1	T1141A	T	3501	C	KCNJ4	S194L	G	840	A	KNTC1	E251D	G	916	T	LRRC27	L240P	T	824	C
IGSF1	V488I	C	1542	T	KCNJ4	T345A	T	1292	C	KNTC1	R570*	C	1871	T	LRRC3	A99T	G	612	A
IGSF1	A649S	C	2025	A	KCNJ4	V22I	C	323	T	KPNA1	S159Y	G	653	T	LRRC30	D65N	G	193	A
IGSF1	E732*	C	2274	A	KCNJ4	H2Y	G	263	A	KPNA1	R395W	G	1360	A	LRRC30	A261T	G	781	A
IGSF1	G235W	C	783	A	KCNJ5	E213K	G	951	A	KPNA2	S461N	G	1514	A	LRRC31	M202I	C	673	A
IGSF10	K471T	T	1412	G	KCNJ6	P276L	G	1417	A	KPNA2	R68H	G	335	A	LRRC32	T483M	G	1586	A
IGSF10	L227F	T	681	G	KCNJ6	R270H	C	1399	T	KPNA4	E469G	T	1712	C	LRRC32	G139D	C	554	T
IGSF10	V646M	C	1936	T	KCNJ6	R118W	G	942	A	KPNA4	K18N	T	360	G	LRRC32	R251W	G	889	A
IGSF10	I2080F	T	6238	A	KCNJ6	T258M	G	1363	A	KPNA5	L423S	T	1416	C	LRRC33	R280H	G	1042	A
IGSF10	A1078T	C	3232	T	KCNJ6	E378D	C	1724	G	KPNA5	V303A	T	1056	C	LRRC33	V578A	T	1936	C
IGSF10	M320T	A	959	G	KCNJ8	R383H	C	1486	T	KPNA6	L482I	C	1537	A	LRRC33	M521T	T	1765	C
IGSF10	D2599N	C	7795	T	KCNJ9	R303C	C	1149	T	KPNA7	A142T	C	464	T	LRRC33	R645Q	G	2137	A
IGSF10	R2378*	G	7132	A	KCNK10	I255V	T	1214	C	KPNA7	D461N	C	1421	T	LRRC34	G338D	C	1129	T
IGSF10	L1781I	G	5341	T	KCNK10	F252V	A	1205	C	KPNA7	L180I	G	578	T	LRRC36	T233A	A	716	G
IGSF10	R1032Q	C	3095	T	KCNK10	A111T	C	782	T	KPNA7	S146L	G	477	A	LRRC36	S389N	G	1185	A
IGSF11	R413Q	C	1544	T	KCNK10	A41T	C	572	T	KPNB1	E308D	G	1260	T	LRRC37A3	N1291T	T	4275	G
IGSF11	A20S	C	364	A	KCNK10	-	C	0	T	KPNB1	D599N	G	2131	A	LRRC37B	S625P	T	1915	C
IGSF11	I354M	T	1368	C	KCNK10	K490N	C	1921	A	KPNB1	Q596R	A	2123	G	LRRC39	Y309C	T	1125	C
IGSF11	Y321*	G	1269	T	KCNK10	N141T	T	873	G	KPNB1	G317E	G	1286	A	LRRC4	D406N	C	1474	T
IGSF21	P144L	C	814	T	KCNK13	S236G	A	1147	G	KPNB1	L499V	T	1831	G	LRRC4	R169W	G	763	A
IGSF21	R302C	C	1287	T	KCNK13	R308*	C	1363	T	KPRP	V18D	T	111	A	LRRC40	L231I	G	771	T
IGSF21	E405K	G	1596	A	KCNK13	P118L	C	794	T	KPRP	A136V	C	465	T	LRRC40	R347I	C	1120	A
IGSF22	R450C	G	1488	A	KCNK18	A195T	G	583	A	KPRP	R312H	G	993	A	LRRC41	W751*	C	2273	T
IGSF22	R1017H	C	3190	T	KCNK2	H87R	A	410	G	KPRP	G546E	G	1695	A	LRRC42	N234H	A	1221	C
IGSF22	K1320N	C	4100	A	KCNK2	F355L	C	1215	A	KPRP	R352H	G	1113	A	LRRC42	P395L	C	1705	T
IGSF22	T383M	G	1288	A	KCNK2	T153N	C	608	A	KPRP	E116D	G	406	T	LRRC43	K606N	G	1843	T
IGSF3	R999H	C	3701	T	KCNK2	T93S	C	428	G	KPTN	P268S	G	906	A	LRRC43	L108R	T	348	G
IGSF3	D472G	T	2120	C	KCNK2	V289M	G	1015	A	KPTN	R409*	G	1329	A	LRRC43	R132W	C	419	T
IGSF3	D1046N	C	3841	T	KCNK3	E37V	A	235	T	KRAS	G13D	C	219	T	LRRC43	R160Q	G	504	A
IGSF3	R922C	G	3469	A	KCNK3	S343N	G	1153	A	KRAS	G12D	C	216	T	LRRC43	G257E	G	795	A
IGSF3	L751M	G	2956	T	KCNK5	E484K	C	1789	T	KRAS	D57N	C	350	T	LRRC43	S510N	G	1554	A
IGSF3	S847L	G	3245	A	KCNK5	V368I	C	1441	T	KRAS	G12D	C	216	T	LRRC46	R318I	G	1231	T
IGSF5	R367I	G	1203	T	KCNK7	S225G	T	897	C	KRAS	G12V	C	216	A	LRRC47	G544R	C	1658	T
IGSF6	R201C	G	663	A	KCNK9	R137H	C	474	T	KRAS	G12A	C	216	G	LRRC47	R414W	G	1268	A
IGSF6	-	C	788	A	KCNK9	V374I	C	1184	T	KRAS	G13D	C	219	T	LRRC48	L46M	C	426	A

IGSF8	M381T	A	1359	G	KCNMA1	A1033S	C	3097	A	KRAS	G13D	C	219	T	LRRC48	R57C	C	459	T
IGSF8	G123D	C	585	T	KCNMA1	A664T	C	1990	T	KRAS	G12V	C	216	A	LRRC48	S333L	C	1288	T
IGSF9	P563H	G	1886	T	KCNMA1	R989H	C	2966	T	KRAS	G12D	C	216	T	LRRC48	E512K	G	1824	A
IGSF9	P351Q	G	1250	T	KCNMA1	R858Q	C	2573	T	KRAS	G12D	C	216	T	LRRC49	S520N	G	1806	A
IGSF9	F531L	A	1791	C	KCNMA1	S966F	G	2897	A	KRAS	G12V	C	216	A	LRRC4B	E171K	C	648	T
IGSF9B	L773M	G	2548	T	KCNMA1	-	T	0	C	KRAS	Y64H	A	371	G	LRRC4B	R600C	G	1935	A
IGSF9B	R251W	G	982	A	KCNMA1	R640*	G	1918	A	KRAS	G12V	C	216	A	LRRC4B	A129T	C	522	T
IGSF9B	E1018D	C	3285	A	KCNMA1	E669*	C	2005	A	KRAS	G12C	C	215	A	LRRC4B	T439A	T	1452	C
IGSF9B	G1133W	C	3628	A	KCNMA1	E604A	T	1811	G	KRAS	G12D	C	216	T	LRRC4B	F359S	A	1213	G
IGSF9B	V630A	A	2120	G	KCNMA1	D475A	T	1424	G	KRAS	G12S	C	215	T	LRRC4B	A227S	C	816	A
IGSF9B	R364C	G	1321	A	KCNMA1	F252L	G	756	T	KRAS	G12V	C	216	A	LRRC4B	T226M	G	814	A
IGSF9B	Q1086H	C	3489	A	KCNMA1	T362N	G	1085	T	KRAS	G12D	C	216	T	LRRC4B	F587L	G	1898	T
IGSF9B	P513L	G	1769	A	KCNMB1	F159V	A	886	C	KRAS	G12R	C	215	G	LRRC4B	R161W	G	618	A
IGSF9B	A317V	G	1181	A	KCNMB1	K4T	T	422	G	KRAS	G12D	C	216	T	LRRC4C	R68C	G	2166	A
IGSF9B	H502Q	G	1737	T	KCNMB2	K107*	A	970	T	KRAS	G12V	C	216	A	LRRC4C	V257M	C	2733	T
IHH	L20V	G	58	C	KCNMB2	V77M	G	880	A	KRAS	G12D	C	216	T	LRRC4C	Y399*	G	3161	T
IK	-	G	0	A	KCNMB2	D27V	A	731	T	KRAS	G12S	C	215	T	LRRC4C	T486I	G	3421	A
IK	Y445D	T	1472	G	KCNMB2	S122Y	C	1016	A	KRAS	G13D	C	219	T	LRRC50	A684V	C	2227	T
IK	R85H	G	393	A	KCNMB3	R18H	C	345	T	KRAS	G12A	C	216	G	LRRC50	Y277H	T	1005	C
IK	R356*	C	1205	T	KCNN1	R438Q	G	1572	A	KRAS	G12V	C	216	A	LRRC50	R288I	G	1039	T
IK	K398N	A	1333	C	KCNN1	H489Y	C	1724	T	KRAS	G12V	C	216	A	LRRC50	E458D	G	1550	T
IKBIP	D299G	T	1006	C	KCNN2	G183S	G	1004	A	KRAS	G12V	C	216	A	LRRC52	R90*	C	558	T
IKBIP	R226*	G	786	A	KCNN2	D136G	A	864	G	KRAS	G13D	C	219	T	LRRC52	L68V	T	492	G
IKBKAP	G342V	C	1333	A	KCNN2	H25R	A	531	G	KRAS	L19F	C	238	A	LRRC55	V307M	G	1066	A
IKBKAP	R478I	C	1741	A	KCNN2	A270V	C	1266	T	KRAS	G12D	C	216	T	LRRC55	R157H	G	617	A
IKBKB	R446W	C	1513	T	KCNN2	L241P	T	1179	C	KRAS	G12V	C	216	A	LRRC55	E178*	G	679	T
IKBKB	R144Q	G	608	A	KCNQ1	R591H	G	1880	A	KRAS	G12V	C	216	A	LRRC55	W53C	G	306	T
IKBKB	I598S	T	1970	G	KCNQ1	R192H	G	683	A	KRAS	A146T	C	617	T	LRRC57	K235N	C	1073	A
IKBKB	E707*	G	2296	T	KCNQ1	G589C	G	1873	T	KRAS	G12V	C	216	A	LRRC58	R215S	G	739	T
IKBKE	R27H	G	453	A	KCNQ1	A329T	G	1093	A	KRAS	G12V	C	216	A	LRRC59	P217H	G	886	T
IKBKE	R456Q	G	1740	A	KCNQ2	A715T	C	2320	T	KRAS	G12V	C	216	A	LRRC59	K249M	T	982	A
IKBKE	L316P	T	1320	C	KCNQ2	V718L	C	2329	G	KRBA1	P797S	C	2389	T	LRRC6	K282N	C	920	A
IKBKE	I222V	A	1037	G	KCNQ2	R749H	C	2423	T	KRBA1	P626S	C	1876	T	LRRC61	G106C	G	758	T
IKZF1	R213*	C	792	T	KCNQ2	R612L	C	2012	A	KRBA1	T241M	C	722	T	LRRC66	R518C	G	1559	A
IKZF1	T333M	C	1153	T	KCNQ2	K707N	C	2298	A	KRBA2	R211H	C	638	T	LRRC66	W188*	C	571	T
IKZF2	D380N	C	1289	T	KCNQ3	Q628H	C	2305	A	KRCC1	R223Q	C	1062	T	LRRC66	F458L	G	1381	T
IKZF3	T387M	G	1222	A	KCNQ3	-	C	0	T	KRCC1	R217Q	C	1044	T	LRRC66	V279A	A	843	G
IKZF3	S339R	G	1079	T	KCNQ4	-	T	0	C	KREMEN1	R309H	G	939	A	LRRC69	E245D	G	778	T
IKZF3	A8V	G	85	A	KCNQ4	I279V	A	917	G	KREMEN2	P98L	C	655	T	LRRC69	Y276C	A	870	G

IKZF3	F495L	G	1547	T	KCNQ4	P341L	C	1104	T	KRI1	A607V	G	1840	A	LRRC7	S720Y	C	2189	A
IKZF4	R255W	C	1352	T	KCNQ4	R433W	C	1379	T	KRI1	P618T	G	1872	T	LRRC7	P1222H	C	3695	A
IKZF4	V126M	G	965	A	KCNQ4	L345I	C	1115	A	KRIT1	V718M	C	2936	T	LRRC7	M180I	G	570	T
IKZF4	R204C	C	1199	T	KCNQ5	R178*	C	930	T	KRIT1	D259G	T	1560	C	LRRC7	E21D	A	93	C
IKZF4	R255Q	G	1353	A	KCNQ5	T712M	C	2533	T	KRIT1	R623C	G	2651	A	LRRC7	P1329A	C	4015	G
IL10	A107V	G	379	A	KCNQ5	R821H	G	2860	A	KRT1	R65Q	C	253	T	LRRC7	Y320*	C	990	A
IL10	V139M	C	474	T	KCNQ5	R457*	C	1767	T	KRT1	R239Q	C	775	T	LRRC7	Q1017K	C	3079	A
IL10RA	I536T	T	1684	C	KCNRG	P199H	C	836	A	KRT10	N353S	T	1068	C	LRRC7	G818C	G	2482	T
IL11RA	R257H	G	819	A	KCNRG	-	G	0	A	KRT10	L211I	G	641	T	LRRC7	R325W	C	1003	T
IL12B	-	C	0	A	KCNS1	A88V	G	660	A	KRT12	F101L	A	325	G	LRRC7	S799Y	C	2426	A
IL12B	S71P	A	253	G	KCNS1	A252V	G	1152	A	KRT12	R414Q	C	1265	T	LRRC70	E28*	G	321	T
IL12RB1	D487G	T	1524	C	KCNS2	R419C	C	1605	T	KRT12	A403V	G	1232	A	LRRC70	K218Q	A	891	C
IL12RB1	R484H	C	1515	T	KCNS2	V65I	G	543	A	KRT13	A124T	C	417	T	LRRC8A	T95P	A	537	C
IL12RB2	R256Q	G	1407	A	KCNS2	G398D	G	1543	A	KRT13	S153I	C	505	A	LRRC8A	T716M	C	2401	T
IL12RB2	G82D	G	885	A	KCNS3	D348Y	G	1493	T	KRT14	R201H	C	689	T	LRRC8A	R719Q	G	2410	A
IL12RB2	-	G	0	T	KCNT1	V92I	G	341	A	KRT15	R379*	G	4721	A	LRRC8B	Y759D	T	2635	G
IL13	Q144*	C	444	T	KCNT1	V332G	T	1062	G	KRT15	E347D	C	4627	A	LRRC8B	Q630*	C	2248	T
IL13RA1	N91S	A	339	G	KCNT1	R464S	C	1457	A	KRT17	R103C	G	375	A	LRRC8B	T787I	C	2720	T
IL13RA1	D229V	A	753	T	KCNT1	R780Q	G	2406	A	KRT17	R386H	C	1225	T	LRRC8B	T48M	C	503	T
IL13RA1	E56K	G	233	A	KCNT1	R365C	C	1160	T	KRT17	R385H	C	1222	T	LRRC8C	R344H	G	1286	A
IL15	G103R	G	678	A	KCNT2	I549T	A	1706	G	KRT19	T323K	G	1029	T	LRRC8D	H356Y	C	1460	T
IL15RA	H41R	T	220	C	KCNT2	A378T	C	1192	T	KRT20	V404M	C	1252	T	LRRC8D	R585*	C	2147	T
IL16	V919M	G	3131	A	KCNT2	K746N	C	2298	A	KRT20	L12M	G	76	T	LRRC8D	R588W	C	2156	T
IL16	V61A	T	558	C	KCNT2	I534M	A	1662	C	KRT20	T317A	T	991	C	LRRC8D	T209M	C	1020	T
IL16	V299M	G	1271	A	KCNU1	S1080*	C	3326	A	KRT222	S234Y	G	743	T	LRRC8D	R588Q	G	2157	A
IL16	Q948*	C	3218	T	KCNU1	T564M	C	1778	T	KRT222	V209I	C	667	T	LRRC8D	L567F	A	2095	C
IL16	E149*	G	821	T	KCNU1	-	G	0	A	KRT222	N239S	T	758	C	LRRC8E	A416T	G	1347	A
IL16	D755Y	G	2639	T	KCNU1	I267M	T	888	G	KRT23	L412I	G	1659	T	LRRFIP2	A36T	C	529	T
IL17B	K26T	T	128	G	KCNU1	F1050L	C	3237	A	KRT24	A319V	G	1013	A	LRRFIP2	R49H	C	569	T
IL17F	L22I	G	172	T	KCNV1	R448C	G	1684	A	KRT24	S51I	C	209	A	LRRFIP2	R257*	G	1192	A
IL17RA	R218H	G	786	A	KCNV1	S378R	T	1474	G	KRT25	A65V	G	255	A	LRRFIP2	-	C	0	A
IL17RA	G497C	G	1622	T	KCNV2	R27H	G	318	A	KRT25	T382A	T	1205	C	LRRIQ1	S1128A	T	3493	G
IL17RA	A690T	G	2201	A	KCNV2	R9Q	G	264	A	KRT26	G31W	C	140	A	LRRIQ1	R1212*	C	3745	T
IL17RC	W282R	T	1062	C	KCNV2	G34C	G	338	T	KRT27	-	C	0	A	LRRIQ1	E1420D	G	4371	T
IL17RC	E83K	G	465	A	KCNV2	S42N	G	363	A	KRT28	D295N	C	949	T	LRRIQ1	R827C	C	2590	T
IL17RC	R501H	G	1720	A	KCTD1	A259T	C	775	T	KRT28	E78K	C	298	T	LRRIQ1	Q872K	C	2725	A
IL17RD	-	A	0	G	KCTD1	R257H	C	770	T	KRT28	K148N	C	510	A	LRRIQ1	E245D	G	846	T
IL17RD	F384L	G	1241	T	KCTD1	G466A	C	1397	G	KRT3	R76Q	C	293	T	LRRIQ1	E273G	A	929	G
IL17RD	A78T	C	321	T	KCTD1	R398C	G	1192	A	KRT3	G580S	C	1804	T	LRRIQ1	K368N	G	1215	T

IL17RD	V478I	C	1521	T	KCTD10	N169I	T	594	A	KRT31	L192F	G	621	A	LRRIQ1	D1428N	G	4393	A
IL17RD	R442*	G	1413	A	KCTD11	M5I	G	1069	A	KRT31	A236T	C	753	T	LRRIQ3	E514D	C	1542	A
IL17RD	S264Y	G	880	T	KCTD12	F230L	A	930	G	KRT34	P410T	G	1259	T	LRRK1	R631Q	G	2211	A
IL17RE	L393I	C	1195	A	KCTD14	V199A	A	641	G	KRT34	T343M	G	1059	A	LRRK1	E551*	G	1970	T
IL18	L56I	G	386	T	KCTD14	I247S	A	785	C	KRT34	R335L	C	1035	A	LRRK1	G792C	G	2693	T
IL18R1	A301G	C	1025	G	KCTD16	R344H	G	1701	A	KRT35	R204H	C	654	T	LRRK1	R51W	C	470	T
IL18R1	E176K	G	649	A	KCTD16	K296N	A	1558	C	KRT35	K233N	C	742	A	LRRK2	L242F	C	782	T
IL18R1	S21A	T	184	G	KCTD16	R361W	C	1751	T	KRT35	N296D	T	929	C	LRRK2	E768*	G	2360	T
IL18R1	P215T	C	766	A	KCTD17	G74R	G	221	A	KRT36	C37G	A	109	C	LRRK2	E1790*	G	5426	T
IL18RAP	R61Q	G	771	A	KCTD18	R247H	C	1251	T	KRT36	E93K	C	277	T	LRRK2	R1693Q	G	5136	A
IL19	D90G	A	294	G	KCTD18	R256*	G	1277	A	KRT37	A94T	C	280	T	LRRK2	R1941C	C	5879	T
IL1A	V182M	C	700	T	KCTD18	V57A	A	681	G	KRT38	R200H	C	599	T	LRRK2	-	C	0	T
IL1A	-	A	0	G	KCTD19	L868F	C	2655	A	KRT38	C343F	C	1028	A	LRRK2	E2082V	A	6303	T
IL1B	F262L	G	997	T	KCTD19	E497D	C	1542	A	KRT39	A363V	G	1124	A	LRRK2	N928H	A	2840	C
IL1B	E221*	C	872	A	KCTD20	R371*	C	1502	T	KRT39	R331*	G	1027	A	LRRK2	-	G	0	T
IL1B	K204N	T	823	G	KCTD20	S289I	G	1257	T	KRT39	I461F	T	1417	A	LRRK2	R1538H	G	4671	A
IL1B	K181N	C	754	A	KCTD3	R117H	G	644	A	KRT4	L422P	A	1536	G	LRRK2	R1711Q	G	5190	A
IL1F8	R115*	T	451	A	KCTD3	E746*	G	2530	T	KRT4	E391D	C	1444	A	LRRK2	N2506H	A	7574	C
IL1F8	I128L	T	490	G	KCTD6	E187D	A	660	C	KRT4	D227N	C	950	T	LRRN1	V642I	G	2685	A
IL1R1	K315N	G	1263	T	KCTD6	R90W	C	367	T	KRT4	L19F	G	326	A	LRRN1	K477R	A	2191	G
IL1R1	R42H	G	443	A	KCTD7	A196V	C	587	T	KRT40	I150N	A	481	T	LRRN1	P372S	C	1875	T
IL1R1	E214*	G	958	T	KCTD8	P397H	G	1474	T	KRT40	S328Y	G	1015	T	LRRN2	R405C	G	1601	A
IL1R2	C28Y	G	312	A	KCTD8	S163N	C	772	T	KRT5	P217L	G	813	A	LRRN2	R378C	G	1520	A
IL1R2	V149L	G	674	T	KDELC1	G449D	C	1683	T	KRT5	G108S	C	485	T	LRRN2	R131W	G	779	A
IL1R2	L175I	C	752	A	KDELC1	Y101C	T	639	C	KRT6B	K424N	C	1320	A	LRRN2	S106L	G	705	A
IL1R2	T316A	A	1175	G	KDELC2	F217L	G	717	T	KRT7	A61V	C	309	T	LRRN2	P7T	G	407	T
IL1RAP	F483V	T	1653	G	KDELC2	P302S	G	970	A	KRT71	R410W	G	1298	A	LRRN3	I147N	T	1379	A
IL1RAP	K578T	A	1939	C	KDELC2	Y384H	A	1216	G	KRT71	R46Q	C	207	T	LRRN3	P68S	C	1141	T
IL1RAP	-	A	2270	C	KDELC2	L423V	A	1333	C	KRT71	S281R	T	911	G	LRRN3	R387*	C	2098	T
IL1RAP	A595S	G	1989	T	KDELR1	D112G	T	530	C	KRT72	S447N	C	1396	T	LRRN4	A340T	C	1243	T
IL1RAPL1	L607I	C	2492	A	KDELR2	R47C	G	324	A	KRT73	-	T	0	G	LRRN4	V651M	C	2176	T
IL1RAPL1	S102F	C	978	T	KDELR3	Q187H	A	717	C	KRT73	R75Q	C	259	T	LRRN4	R68C	G	427	A
IL1RAPL2	R339Q	G	1772	A	KDM1B	A720T	G	2399	A	KRT73	K240N	C	755	A	LRRN4	K553R	T	1883	C
IL1RL1	C468Y	G	1674	A	KDM1B	A30E	C	330	A	KRT74	R506*	G	1564	A	LRRN4	E464K	C	1615	T
IL1RL2	P332L	C	1121	T	KDM2B	A917T	C	2822	T	KRT75	R506H	C	1576	T	LRRN4	D259N	C	1000	T
IL1RL2	K391N	G	1299	T	KDM2B	C624Y	C	1944	T	KRT75	R200W	G	657	A	LRRN4CL	G201E	C	909	T
IL1RN	L95P	T	406	C	KDM2B	R996C	G	3059	A	KRT76	T452A	T	1384	C	LRRN4CL	A213T	C	944	T
IL20	V53A	T	521	C	KDM2B	R733C	G	2270	A	KRT77	G501R	C	1530	T	LRRTM1	L139M	G	1072	T
IL21R	R323Q	G	1238	A	KDM2B	A86T	C	329	T	KRT77	S242I	C	754	A	LRRTM1	A54V	G	818	A

IL21R	C499Y	G	1766	A	KDM3A	L18I	C	417	A	KRT78	Y201H	A	665	G	LRRTM1	A343G	G	1685	C
IL22RA1	P396L	G	1226	A	KDM3A	L477V	T	1794	G	KRT78	Y304H	A	974	G	LRRTM2	R318Q	C	1410	T
IL22RA1	S483N	C	1487	T	KDM3A	K490Q	A	1833	C	KRT79	E334K	C	1035	T	LRRTM3	D526G	A	2155	G
IL23R	Q211K	C	802	A	KDM3A	K901N	G	3068	T	KRT79	T104M	G	346	A	LRRTM3	L224P	T	1249	C
IL23R	D118Y	G	523	T	KDM3B	R954C	C	3060	T	KRT79	K359N	C	1112	A	LRRTM3	G149*	G	1023	T
IL23R	S121Y	C	533	A	KDM3B	I1313M	A	4139	G	KRT80	R114H	C	439	T	LRRTM3	S60F	C	757	T
IL23R	A201T	G	772	A	KDM3B	R1028W	C	3282	T	KRT84	R346M	C	1085	A	LRRTM3	E296D	G	1466	T
IL24	A14S	G	315	T	KDM3B	D1649G	A	5146	G	KRT84	E215K	C	691	T	LRRTM3	V324A	T	1549	C
IL25	D97Y	G	547	T	KDM3B	F1274V	T	4020	G	KRT85	V87M	C	379	T	LRRTM3	F330C	T	1567	G
IL26	K104N	T	347	G	KDM4A	T625A	A	2007	G	KRTAP1-1	C177W	A	595	C	LRRTM4	K470Q	T	1632	G
IL26	V93I	C	312	T	KDM4A	R839I	G	2650	T	KRTAP1-5	R165H	C	541	T	LRRTM4	R466G	T	1620	C
IL27RA	W115C	G	768	C	KDM4B	V508A	T	1749	C	KRTAP10-1	C262Y	C	830	T	LRRTM4	L69F	T	431	G
IL28A	T105M	C	366	T	KDM4B	A349V	C	1272	T	KRTAP10-11	V207F	G	645	T	LRSAM1	S433L	C	1902	T
IL28RA	R265Q	C	807	T	KDM4B	K334T	A	1227	C	KRTAP10-5	S157N	C	496	T	LRSAM1	V693I	G	2681	A
IL28RA	A496V	G	1500	A	KDM4B	Y693H	T	2303	C	KRTAP10-8	P63H	C	210	A	LRSAM1	R273C	C	1421	T
IL2RB	A239T	C	914	T	KDM4B	V853M	G	2783	A	KRTAP11-1	R161I	C	513	A	LRSAM1	L88I	C	866	A
IL2RB	P510H	G	1728	T	KDM4B	A293T	G	1103	A	KRTAP11-1	S154P	A	491	G	LRTM1	A307T	C	1082	T
IL2RG	R289Q	C	958	T	KDM4B	A685T	G	2279	A	KRTAP11-1	D54N	C	191	T	LRTM1	Q107H	C	484	A
IL3	A140V	C	597	T	KDM4C	R220*	C	1223	T	KRTAP12-2	C85G	A	294	C	LRTOMT	Y263C	A	1659	G
IL31RA	R234Q	G	766	A	KDM4C	T884M	C	3216	T	KRTAP12-3	V28M	G	130	A	LRWD1	R416W	C	1398	T
IL31RA	T11M	C	97	T	KDM4C	V723I	G	2732	A	KRTAP13-1	N33S	A	111	G	LRWD1	V511M	G	1683	A
IL31RA	V466M	G	1461	A	KDM4C	E268*	G	1367	T	KRTAP13-1	S37N	G	123	A	LRWD1	V313M	G	1089	A
IL31RA	A92T	G	339	A	KDM4D	H205Y	C	1445	T	KRTAP13-2	S114L	G	385	A	LRWD1	A452T	G	1506	A
IL31RA	I559L	A	1740	C	KDM4D	R129H	G	1218	A	KRTAP13-3	R54M	C	217	A	LSAMP	V38I	C	112	T
IL31RA	G723V	G	2233	T	KDM4DL	D192N	G	594	A	KRTAP19-2	G6V	C	105	A	LSAMP	E77D	T	231	G
IL31RA	R211H	G	697	A	KDM4DL	F268L	C	824	A	KRTAP19-3	F77L	G	259	T	LSG1	R517*	G	1864	A
IL33	A24V	C	126	T	KDM5A	R696W	G	2449	A	KRTAP19-3	S2N	C	33	T	LSG1	R502Q	C	1820	T
IL4	F136C	T	472	G	KDM5A	R1508W	G	4885	A	KRTAP19-	R33H	C	98	T	LSG1	A627T	C	2194	T

IL4I1	T27I	G	643	A	KDM5A	P469Q	G	1769	T	KRTAP19-6	G52D	C	155	T	LSM11	R224T	G	675	C
IL4I1	K197T	T	1153	G	KDM5A	N372T	T	1478	G	KRTAP19-8	R33H	C	131	T	LSM12	V139A	A	564	G
IL4I1	R245Q	C	1297	T	KDM5A	V181M	C	904	T	KRTAP21-1	G15S	C	93	T	LSM14A	R272C	C	1010	T
IL4I1	R119C	G	918	A	KDM5A	K1586N	T	5121	G	KRTAP22-1	G30V	G	115	T	LSM14A	R438H	G	1509	A
IL4I1	P373S	G	1680	A	KDM5B	L1181I	G	3654	T	KRTAP23-1	Q45K	G	136	T	LSM14A	R272C	C	1010	T
IL4I1	M225I	C	1238	A	KDM5B	C1217Y	C	3763	T	KRTAP24-1	Y187H	A	585	G	LSM3	R28Q	G	586	A
IL4I1	S200L	G	1162	A	KDM5B	P986L	G	3070	A	KRTAP24-1	N207K	A	647	C	LSM4	R55Q	C	335	T
IL4I1	E173K	C	1080	T	KDM5B	R1570H	C	4822	T	KRTAP25-1	S5Y	G	38	T	LSM4	R88C	G	433	A
IL4I1	K57E	T	732	C	KDM5B	P30H	G	202	T	KRTAP26-1	G121D	C	616	T	LSM6	R4Q	G	148	A
IL4R	V568I	G	1943	A	KDM5B	R1277H	C	3943	T	KRTAP27-1	T153I	G	484	A	LSP1	I337T	T	1118	C
IL4R	T73M	C	459	T	KDM5B	L1406V	A	4329	C	KRTAP27-1	V85F	C	279	A	LSR	A310V	C	1152	T
IL4R	P755T	C	2504	A	KDM5B	R1281C	G	3954	A	KRTAP3-1	G76R	C	266	T	LSS	A354T	C	1137	T
IL5RA	F202C	A	1180	C	KDM5B	K1152N	C	3569	A	KRTAP4-2	R219H	C	656	T	LSS	G122R	C	441	T
IL5RA	D305G	T	1489	C	KDM5B	E1116D	C	3461	A	KRTAP4-3	C150F	C	449	A	LSS	R438H	C	1390	T
IL6	R106Q	G	317	A	KDM5C	E158K	C	1005	T	KRTAP5-10	P52S	C	199	T	LSS	A245V	G	811	A
IL6R	Y408*	C	1661	A	KDM5C	G591E	C	2305	T	KRTAP5-10	G189E	G	611	A	LSS	R347H	C	1117	T
IL6ST	-	C	0	T	KDM5C	R1453W	G	4890	A	KRTAP5-11	S21C	T	61	A	LSS	K65T	T	271	G
IL6ST	S754L	G	2525	A	KDM5C	G604S	C	2343	T	KRTAP5-11	G20S	C	58	T	LTA4H	V586I	C	1824	T
IL7R	E446*	G	1465	T	KDM5C	C618Y	C	2386	T	KRTAP5-6	C53F	G	209	T	LTA4H	E349K	C	1113	T
ILDR1	G151E	C	579	T	KDM5C	C1188S	C	4096	G	KRTAP9-1	C249Y	G	746	A	LTB4R	A232T	G	1015	A
ILDR1	R442C	G	1451	A	KDM5C	Q813*	G	2970	A	KRTAP9-1	T152A	A	454	G	LTB4R	G319D	G	1277	A
ILDR1	D363V	T	1215	A	KDM5C	R378L	C	1666	A	KRTCAP2	G67D	C	231	T	LTB4R2	G11R	G	1648	A
ILDR1	E134*	C	527	A	KDM5D	R159H	C	748	T	KSR1	S758N	G	2538	A	LTBP1	A248T	G	742	A
ILDR2	L11F	G	87	A	KDM5D	L1393F	G	4449	A	KSR1	N583S	A	2013	G	LTBP1	T736M	C	2207	T
ILDR2	-	C	0	T	KDM5D	P1412H	G	4507	T	KSR1	R687Q	G	2325	A	LTBP1	C186R	T	556	C
ILDR2	S410P	A	1284	G	KDM6A	K1018*	A	3093	T	KSR2	G775V	C	2324	A	LTBP1	M408I	G	1224	A
ILF2	Q71H	C	339	A	KDM6A	R1213Q	G	3679	A	KSR2	Y489*	A	1467	T	LTBP1	G1651V	G	4952	T
ILF3	E636K	G	2223	A	KDM6B	R586W	C	2145	T	KSR2	L443V	A	1327	C	LTBP1	F1408V	T	4222	G

ILF3	M670T	T	2326	C	KDM6B	E687K	G	2448	A	KTELC1	C54Y	G	245	A	LTBP1	L1715V	T	5143	G
ILF3	A153D	C	775	A	KDM6B	S119P	T	744	C	KTELC1	-	G	0	T	LTBP2	P302L	G	1292	A
ILF3	D804N	G	2727	A	KDM6B	F1396V	T	4575	G	KTN1	R368S	A	1172	T	LTBP2	A1421V	G	4649	A
ILK	R323C	C	1151	T	KDR	E407D	C	1517	A	KTN1	R452H	G	1423	A	LTBP2	R1565C	G	5080	A
ILK	F342L	C	1210	A	KDR	G893D	C	2974	T	KY	G288S	C	924	T	LTBP2	T1796A	T	5773	C
ILK	R349H	G	1230	A	KDR	R1032*	G	3390	A	KY	K600E	T	1860	C	LTBP2	A1690T	C	5455	T
ILKAP	K174T	T	697	G	KDR	V542A	A	1921	G	KY	R509W	G	1587	A	LTBP2	R409H	C	1613	T
ILKAP	R114W	G	516	A	KDR	R819*	G	2751	A	KYNU	G112E	G	593	A	LTBP2	P118H	G	740	T
ILVBL	L168P	A	624	G	KDR	Q645H	T	2231	G	KYNU	M189V	A	823	G	LTBP2	G1738D	C	5600	T
ILVBL	V535I	C	1724	T	KDR	S1037L	G	3406	A	KYNU	R399Q	G	1454	A	LTBP3	G646S	C	2205	T
ILVBL	V46M	C	257	T	KDSR	E227D	T	1073	G	KYNU	R28K	G	341	A	LTBP3	R269W	G	1074	A
ILVBL	R591W	G	1892	A	KEAP1	A191D	G	728	T	KYNU	P56T	C	424	A	LTBP4	R1290W	C	3868	T
IMMP2L	I100V	T	741	C	KEAP1	T142M	G	581	A	L1CAM	A1253T	C	3947	T	LTBP4	A176T	G	526	A
IMMP2L	R73H	C	661	T	KERA	K333T	T	1617	G	L1CAM	Y784H	A	2540	G	LTF	A481T	C	1737	T
IMMP2L	S43L	G	571	A	KERA	R279Q	C	1455	T	L1CAM	R575H	C	1914	T	LTF	S327L	G	1276	A
IMMT	R623H	C	2256	T	KERA	N101H	T	920	G	L1CAM	R1109H	C	3516	T	LTF	A169V	G	802	A
IMMT	R525C	G	1961	A	KHDC1L	P12L	G	79	A	L1CAM	R407C	G	1409	A	LTK	P492L	G	1626	A
IMMT	K270N	T	1198	A	KHDC1L	E18K	C	96	T	L1CAM	V1217A	A	3840	G	LTK	R810I	C	2580	A
IMPA2	A50T	G	390	A	KHDRBS1	E381K	G	1308	A	L1CAM	-	C	0	T	LTV1	S244L	C	865	T
IMPACT	G98S	G	433	A	KHDRBS1	A247V	C	907	T	L1CAM	R473C	G	1607	A	LTV1	R377*	C	1263	T
IMPACT	F37L	T	252	G	KHDRBS2	Q92H	C	555	A	L1TD1	R745*	C	2528	T	LTV1	R401I	G	1336	T
IMPACT	E168*	G	643	T	KHDRBS3	P7S	C	429	T	L1TD1	T677A	A	2324	G	LUC7L	R267C	G	910	A
IMPACT	K292N	G	1017	T	KHDRBS3	F67V	T	609	G	L1TD1	E131D	A	688	C	LUC7L3	R350*	C	1182	T
IMPAD1	A303D	G	1191	T	KHK	P162L	C	998	T	L1TD1	G448D	G	1638	A	LUC7L3	D134G	A	535	G
IMPDH2	L227P	A	720	G	KHK	D82G	A	758	G	L1TD1	R789I	G	2661	T	LUM	R315H	C	1333	T
IMPDH2	R203H	C	648	T	KHNYN	R438H	G	1515	A	L2HGDH	K246N	C	817	A	LUZP1	S1000P	A	3316	G
IMPDH2	Q478H	T	1474	G	KHSRP	P537A	G	1719	C	L2HGDH	V330I	C	1067	T	LUZP1	L45M	G	451	T
IMPG1	T465I	G	1584	A	KHSRP	G312R	C	1044	T	L3MBTL	R478Q	G	1565	A	LUZP1	P479L	G	1754	A
IMPG1	E232D	C	886	A	KHSRP	G697S	C	2199	T	L3MBTL	R356C	C	1198	T	LUZP1	G490V	C	1787	A
IMPG2	L1003F	G	3210	A	KHSRP	Q166H	T	608	G	L3MBTL	R374H	G	1253	A	LUZP2	M203V	A	607	G
IMPG2	M965I	C	3098	A	KIAA0020	E640*	C	2125	A	L3MBTL2	K416N	G	1406	T	LUZP2	M87I	G	261	T
IMPG2	E272*	C	1017	A	KIAA0090	R724H	C	2214	T	L3MBTL3	V663I	G	2157	A	LUZP4	R73W	C	224	T
IMPG2	R80W	G	441	A	KIAA0090	R513L	C	1581	A	L3MBTL3	A552T	G	1824	A	LY6H	R103Q	C	437	T
IMPG2	R672I	C	2218	A	KIAA0090	R385Q	C	1197	T	L3MBTL4	I474V	T	1580	C	LY6K	F168L	C	745	A
IMPG2	D189V	T	769	A	KIAA0090	L934V	A	2843	C	L3MBTL4	K596N	C	1948	A	LY6K	K192N	A	817	C
IMPG2	K344T	T	1234	G	KIAA0100	E1875*	C	5722	A	L3MBTL4	K159T	T	636	G	LY6K	P71L	C	453	T
IMPG2	D23Y	C	270	A	KIAA0100	T300I	G	998	A	L3MBTL4	E30K	C	248	T	LY75	F1205S	A	3642	G
IMPG2	K666T	T	2200	G	KIAA0100	R347H	C	1139	T	LACRT	A15V	G	98	A	LY75	A387V	G	1188	A
INADL	E869*	G	2719	T	KIAA0100	D149E	A	546	T	LAD1	R374Q	C	1180	T	LY75	W1336R	A	4034	G

INCENP	R577C	C	1931	T	KIAA0100	N804T	T	2510	G	LAD1	V79M	C	294	T	LY75	Y906C	T	2745	C
INCENP	R451H	G	1554	A	KIAA0100	Q2175H	C	6624	A	LAG3	D322N	G	1313	A	LY75	Y1222C	T	3693	C
INE2	R263W	C	923	T	KIAA0100	L644I	G	2029	T	LAG3	R57*	C	518	T	LY75	S605Y	G	1842	T
INF2	V159M	G	618	A	KIAA0100	R2092C	G	6373	A	LAGE3	R143H	C	770	T	LY75	R487I	C	1488	A
INF2	R660W	C	2121	T	KIAA0141	R274C	C	954	T	LAMA1	R1133*	G	3491	A	LY9	A496V	C	1517	T
ING1	G368D	G	1565	A	KIAA0141	R172Q	G	649	A	LAMA1	S1916L	G	5841	A	LY9	V339A	T	1046	C
ING5	A102V	C	331	T	KIAA0141	M1I	G	137	A	LAMA1	G1503C	C	4601	A	LYG2	A99T	C	316	T
ING5	R98*	C	318	T	KIAA0146	R585C	C	1762	T	LAMA1	A208T	C	716	T	LYPD3	A55T	C	271	T
INHA	R247C	C	919	T	KIAA0146	R355C	C	1072	T	LAMA1	V2403D	A	7302	T	LYPD4	H43N	G	1339	T
INHBA	K235Q	T	950	G	KIAA0146	-	A	0	C	LAMA1	I738T	A	2307	G	LYPD5	A17V	G	131	A
INHBA	A41V	G	369	A	KIAA0146	G350C	G	1057	T	LAMA1	G2159S	C	6569	T	LYPD6	E100D	A	589	C
INHBC	C316*	C	1075	A	KIAA0182	R345C	C	1209	T	LAMA1	L2779I	G	8429	T	LYPD6B	Q112R	A	736	G
INHBE	W127*	G	605	A	KIAA0182	P542L	C	1801	T	LAMA1	V1529I	C	4679	T	LYPLA1	A66V	G	361	A
INHBE	R250Q	G	973	A	KIAA0182	S710L	C	2305	T	LAMA1	E3061K	C	9275	T	LYPLA1	T195M	G	748	A
INMT	E222K	G	680	A	KIAA0182	-	A	0	G	LAMA1	T1171A	T	3605	C	LYPLA2	K93N	G	586	T
INMT	R132W	C	410	T	KIAA0182	P410S	C	1404	T	LAMA1	C279*	G	931	T	LYSMD1	R215Q	C	1305	T
INO80	D1312G	T	4252	C	KIAA0182	G994S	G	3156	A	LAMA1	G2210A	C	6723	G	LYSMD1	P205H	G	1275	T
INO80	Q655R	T	2281	C	KIAA0195	E534G	A	1804	G	LAMA2	L2272I	C	6919	A	LYSMD2	D140G	T	934	C
INO80B	K37N	G	205	T	KIAA0195	M893I	G	2882	A	LAMA2	L2477P	T	7535	C	LYST	A3655V	G	1113 9	A
INO80D	R553C	G	2062	A	KIAA0195	V1259M	G	3978	A	LAMA2	V2911I	G	8836	A	LYST	L566S	A	1872	G
INPP1	R283C	C	1547	T	KIAA0195	E530K	G	1791	A	LAMA2	W2686*	G	8162	A	LYST	G3587S	C	1093 4	T
INPP4A	R829W	C	2878	T	KIAA0195	S674L	C	2224	T	LAMA2	A2877G	C	8735	G	LYST	D15N	C	218	T
INPP4A	E524K	G	1963	A	KIAA0196	R864H	C	2853	T	LAMA2	H326Q	T	1083	A	LYST	R1352I	C	4230	A
INPP4A	R901H	G	3095	A	KIAA0196	E547*	C	1901	A	LAMA2	E1764G	A	5396	G	LYST	I3404T	A	1038 6	G
INPP4A	D124Y	G	763	T	KIAA0226	D596Y	C	1786	A	LAMA2	R2787C	C	8464	T	LYVE1	F206V	A	902	C
INPP4A	D675Y	G	2416	T	KIAA0226	R256Q	C	767	T	LAMA2	F1329L	C	4092	A	LYVE1	S98Y	G	579	T
INPP4A	N831H	A	2884	C	KIAA0226	L541I	G	1621	T	LAMA2	Q2035*	C	6208	T	LYZ	L12I	C	89	A
INPP4B	A693T	C	2422	T	KIAA0226	P45H	G	134	T	LAMA2	I2271S	T	6917	G	LYZL1	A127V	C	437	T
INPP4B	H352Y	G	1399	A	KIAA0226	F702V	A	2104	C	LAMA2	S2454Y	C	7466	A	LYZL1	A4T	G	67	A
LYZL4	R79H	C	512	T	MMP25	K264T	A	1028	C	MYOF	-	A	0	G	NPAT	S422N	C	1367	T
LYZL6	G38V	C	305	A	MMP27	T403S	T	1230	A	MYOM1	Q219*	G	989	A	NPAT	S1422L	G	4367	A
LYZL6	V53L	C	349	A	MMP27	V137A	A	433	G	MYOM1	V791M	C	2705	T	NPAT	E1282*	C	3946	A
LZTFL1	R272*	G	989	A	MMP28	V77M	C	488	T	MYOM1	R246*	G	1070	A	NPAT	K269Q	T	907	G
LZTR1	G675R	G	2382	A	MMP3	S252P	A	797	G	MYOM2	A314T	G	1081	A	NPAT	R112Q	C	437	T
LZTR1	R267H	G	1159	A	MMP3	D47Y	C	182	A	MYOM2	-	A	0	T	NPBWR1	A37V	C	1585	T
LZTS1	R300W	G	1256	A	MMP7	F65L	G	222	T	MYOM2	R1314H	G	4082	A	NPBWR1	A95T	G	1758	A
LZTS2	R479W	C	1640	T	MMP9	P658H	C	1992	A	MYOM2	S268P	T	943	C	NPBWR2	R240Q	C	1059	T

LZTS2	T180M	C	744	T	MMP9	A333D	C	1017	A	MYOM2	E215D	G	786	T	NPC1	E229K	C	824	T
LZTS2	R367Q	G	1305	A	MMRN1	L577I	C	2048	A	MYOM3	R284C	G	1013	A	NPC1	P48S	G	281	A
LZTS2	R577Q	G	1935	A	MMRN1	G883S	G	2966	A	MYOM3	R810Q	C	2592	T	NPC1	F842S	A	2664	G
M6PR	I118V	T	522	C	MMRN1	V998A	T	3312	C	MYOT	G287V	G	1234	T	NPC1	A286T	C	995	T
MAB21L1	W291*	C	1430	T	MMRN1	S155Y	C	783	A	MYOT	D147G	A	814	G	NPC1L1	R770Q	C	2365	T
MAB21L2	Q48R	A	1248	G	MMRN1	K631T	A	2211	C	MYOT	G126D	G	751	A	NPC1L1	G1159D	C	3532	T
MAB21L2	S39L	C	1221	T	MMRN1	A1102S	G	3623	T	MYOZ2	P109H	C	539	A	NPC1L1	A19T	C	111	T
MAB21L2	D91N	G	1376	A	MMRN2	T441M	G	1396	A	MYOZ3	A123T	G	954	A	NPC1L1	I641T	A	1978	G
MACC1	P50S	G	457	A	MMS19	L264P	A	791	G	MYOZ3	P198L	C	1180	T	NPC1L1	S1033N	C	3154	T
MACC1	S436Y	G	1616	T	MN1	A562T	C	2639	T	MYPN	S1029G	A	3573	G	NPC1L1	R968H	C	2959	T
MACF1	A1092V	C	3327	T	MN1	S609N	C	2781	T	MYPN	K655R	A	2452	G	NPC1L1	A296T	C	942	T
MACF1	T907I	C	2851	T	MN1	A1091T	C	4226	T	MYPN	G511E	G	2020	A	NPEPL1	A92T	G	322	A
MACF1	E1713D	G	5270	T	MN1	S814N	C	3396	T	MYPN	S831G	A	2979	G	NPEPPS	L557V	C	1892	G
MACF1	R5277*	C	1596 0	T	MN1	R458H	C	2328	T	MYPN	G970E	G	3397	A	NPFFR1	R363Q	C	1088	T
MACF1	V4125E	T	1250 5	A	MN1	P448H	G	2298	T	MYPN	-	G	0	T	NPFFR2	R293*	C	975	T
MACF1	R415Q	G	1296	A	MN1	G74S	C	1175	T	MYPN	K1170N	A	3998	C	NPFFR2	K503N	A	1607	C
MACF1	L3955I	C	1199 4	A	MNAT1	R295K	G	985	A	MYPOP	R86C	G	343	A	NPHP1	R458G	T	1446	C
MACF1	K4542R	A	1375 6	G	MND1	Y71C	A	301	G	MYPOP	R248Q	C	830	T	NPHP1	S630L	G	1963	A
MACF1	K1210N	G	3682	T	MND1	-	G	0	A	MYPOP	A126V	G	464	A	NPHP1	-	C	0	T
MACF1	K3857N	A	1170 2	C	MNDA	M72I	G	477	A	MYPOP	A42E	G	212	T	NPHP1	R347*	G	1113	A
MACF1	T4343A	A	1315 8	G	MNDA	E301K	G	1162	A	MYPOP	R161Q	C	569	T	NPHP3	S404G	T	1314	C
MACROD1	D107G	T	439	C	MNDA	E258D	G	1035	T	MYSM1	D224Y	C	710	A	NPHP3	R93Q	C	382	T
MACROD2	E226K	G	676	A	MNDA	N399S	A	1457	G	MYSM1	E519*	C	1595	A	NPHP3	L1127I	G	3483	T
MACROD2	K340Q	A	1018	C	MNS1	R311Q	C	1097	T	MYSM1	D92Y	C	314	A	NPHP4	R229Q	C	952	T
MAD1L1	L463M	G	1397	T	MNT	P416L	G	1653	A	MYSM1	L280P	A	879	G	NPHP4	A1110T	C	3594	T
MAD1L1	R412W	G	1244	A	MNT	Q556P	T	2073	G	MYSM1	N565D	T	1733	C	NPHP4	P165L	G	760	A
MAD1L1	R102H	C	315	T	MNT	A177V	G	936	A	MYST1	A7D	C	36	A	NPHP4	P776L	G	2593	A
MAD1L1	V355I	C	1073	T	MNX1	D366G	T	1292	C	MYST1	V406A	T	1233	C	NPHP4	A1059T	C	3441	T
MAD1L1	R576H	C	1737	T	MOBKL2A	V90I	C	621	T	MYST1	R136H	G	423	A	NPHP4	F805V	A	2679	C
MAD1L1	R528W	G	1592	A	MOBKL2C	P140L	G	476	A	MYST2	G101D	G	582	A	NPHP4	R682Q	C	2311	T
MAD1L1	W317*	C	961	T	MOBKL2C	G105R	C	370	T	MYST2	A133V	C	678	T	NPHS1	G153R	C	457	T
MAD2L2	T206M	G	694	A	MOBP	T68A	A	351	G	MYST2	R127Q	G	660	A	NPHS1	R207W	G	619	A
MADCAM1	S77G	A	239	G	MOCOS	V155I	G	484	A	MYST2	E262D	A	1066	T	NPHS1	C101*	A	303	T
MADCAM1	R190Q	G	579	A	MOCOS	M617V	A	1870	G	MYST3	I699T	A	2508	G	NPHS1	R864H	C	2591	T
MADCAM1	L15F	C	53	T	MOCOS	R441M	G	1343	T	MYST3	R1087H	C	3672	T	NPHS1	T798M	G	2393	A

MADCAM1	L13M	C	47	A	MOCOS	D256N	G	787	A	MYST3	P1298L	G	4305	A	NPHS2	R13H	C	107	T
MADD	R162W	C	649	T	MOCS1	A508V	G	1527	A	MYST4	I32V	A	583	G	NPLOC4	E89D	C	267	G
MADD	E774K	G	2485	A	MOCS1	V599M	C	1799	T	MYST4	P862S	C	3073	T	NPM2	R120C	C	1373	T
MADD	R699C	C	2260	T	MOCS1	R413S	T	1243	G	MYST4	P1445S	C	4822	T	NPNT	R80*	C	238	T
MADD	A1035T	G	3268	A	MOCS2	F82S	A	919	G	MYST4	T1787M	C	5849	T	NPNT	C151Y	G	452	A
MADD	R967C	C	3064	T	MOCS3	I60L	A	195	C	MYST4	E1373G	A	4607	G	NPPA	T6S	T	115	A
MADD	M1526V	A	4741	G	MOGAT1	P288Q	C	911	A	MYST4	T575A	A	2212	G	NPPB	D2N	C	106	T
MADD	R764H	G	2456	A	MOGAT1	E191*	G	619	T	MYST4	A930V	C	3278	T	NPPB	P88L	G	365	A
MAEA	R357H	G	1097	A	MOGAT2	L273*	T	864	G	MYST4	S797G	A	2878	G	NPR1	L520I	C	2030	A
MAEL	A303V	C	1152	T	MOGAT3	H116R	T	405	C	MYST4	G343E	G	1517	A	NPR1	G1036V	G	3579	T
MAF	P78L	G	1045	A	MOGS	R535Q	C	1767	T	MYST4	R1137C	C	3898	T	NPR1	R1035Q	G	3576	A
MAFB	S74R	G	612	C	MON1A	R431C	G	1550	A	MYT1	R965Q	G	3258	A	NPR2	R945C	C	3088	T
MAFK	R57H	G	399	A	MON1A	T462M	G	1644	A	MYT1	T503M	C	1872	T	NPR2	L565M	C	1948	A
MAFK	T2M	C	234	T	MON1A	G303C	C	1166	A	MYT1	E662D	G	2350	C	NPR2	Y136H	T	661	C
MAG	R576H	G	1886	A	MON1B	R445Q	G	1681	A	MYT1	A386T	G	1520	A	NPR2	V102M	G	559	A
MAG	P269L	C	965	T	MON1B	R219H	G	1003	A	MYT1	A567T	G	2063	A	NPR2	S434L	C	1556	T
MAG	R51W	C	310	T	MON2	R808Q	G	2814	A	MYT1	E665K	G	2357	A	NPR3	R199C	C	938	T
MAG	R624Q	G	2030	A	MON2	A687V	C	2451	T	MYT1L	S776R	G	3076	T	NPR3	W302R	T	1247	C
MAG	A422T	G	1423	A	MON2	H96Q	T	679	G	MYT1L	S971P	A	3659	G	NPRL2	E353K	C	1496	T
MAG	Y60H	T	337	C	MON2	Y233H	T	1088	C	MYT1L	K76E	T	974	C	NPRL3	T441M	G	1608	A
MAG	E574K	G	1879	A	MON2	R1081*	C	3632	T	MYT1L	T1035M	G	3852	A	NPRL3	E493K	C	1763	T
MAG	V338I	G	1171	A	MON2	L1365V	T	4484	G	MYT1L	D1013N	C	3785	T	NPRL3	S369F	G	1392	A
MAGEA11	N255K	T	867	A	MORC1	V397M	C	1272	T	MYT1L	K753T	T	3006	G	NPRL3	E249A	T	1032	G
MAGEA4	D243N	G	921	A	MORC1	E844*	C	2613	A	MYT1L	L200P	A	1347	G	NPS	E54*	G	180	T
MAGEA6	F201V	T	826	G	MORC1	F709C	A	2209	C	MYT1L	T63A	T	935	C	NPSR1	F85L	C	259	A
MAGEB1	E167D	A	822	C	MORC1	A676V	G	2110	A	MYT1L	G44D	C	879	T	NPSR1	R125H	G	378	A
MAGEB1	R275K	G	1145	A	MORC1	D113Y	C	420	A	MZF1	G94S	C	523	T	NPTN	L305M	G	1111	T
MAGEB10	Q272K	C	1059	A	MORC2	R110C	G	737	A	MZF1	P126L	G	620	A	NPTN	A230T	C	886	T
MAGEB18	K233T	A	885	C	MORC2	G869R	C	3014	T	MZF1	R46H	C	380	T	NPTX1	G190D	C	727	T
MAGEB18	D247Y	G	926	T	MORC3	D592Y	G	1850	T	MZF1	G57W	C	412	A	NPTX1	E339D	C	1175	A
MAGEB2	A310V	C	1030	T	MORC3	T869M	C	2682	T	MZF1	S424G	T	1513	C	NPTX2	S261A	T	946	G
MAGEB3	-	A	1776	G	MORC3	R110H	G	405	A	MZF1	R432I	C	1538	A	NPTX2	L429R	T	1451	G
MAGEB4	R12H	G	119	A	MORC4	L550R	A	1924	C	N4BP1	S562Y	G	1922	T	NPY	V20M	G	171	A
MAGEB6	K34E	A	249	G	MORN2	D55V	A	471	T	N4BP1	F10L	G	267	T	NPY1R	R72I	C	747	A
MAGEC1	G105W	G	599	T	MORN4	G133R	C	397	T	N4BP1	E306G	T	1154	C	NPY2R	R187W	C	1048	T
MAGEC1	S1138R	C	3700	A	MORN4	R181*	G	541	A	N4BP2	N1316Y	A	4362	T	NPY2R	D347N	G	1528	A
MAGEC1	S658Y	C	2259	A	MORN5	A56T	G	228	A	N4BP2	V1556M	G	5082	A	NPY5R	A136V	C	589	T
MAGEC1	K1046N	A	3424	C	MORN5	G5V	G	76	T	N4BP2	F476V	T	1842	G	NPY5R	R364*	C	1272	T
MAGEC2	L141I	G	769	T	MOS	R319H	C	956	T	N4BP2	F476L	T	1844	G	NQO2	A143V	C	1140	T

MAGEC2	G64C	C	538	A	MOS	C24*	G	72	T	N4BP2	K749N	A	2663	C	NR0B1	D424N	C	1505	T
MAGEC3	G110E	G	329	A	MOSC2	K229N	G	885	T	N6AMT2	K38T	T	161	G	NR0B1	R124W	G	605	A
MAGEC3	A158V	C	473	T	MOSPD1	M1T	A	189	G	NAA11	A104T	C	483	T	NR0B2	P228L	G	709	A
MAGEC3	E332K	G	994	A	MOSPD3	R97C	C	491	T	NAA16	E780D	G	2664	T	NR1D1	F439L	G	1948	T
MAGEC3	L467R	T	1400	G	MOV10	R730L	G	2579	T	NAA25	S572F	G	1735	A	NR1D1	R215W	G	1274	A
MAGEC3	E234*	G	700	T	MOV10	P997L	C	3380	T	NAA25	Y466C	T	1417	C	NR1D2	E273*	G	1136	T
MAGEC3	P108L	C	323	T	MOV10	Y944*	T	3222	G	NAA25	I972S	A	2935	C	NR1D2	E502D	G	1825	T
MAGEC3	P412T	C	1234	A	MOV10L1	N673H	A	2100	C	NAA25	R728C	G	2202	A	NR1D2	L305P	T	1233	C
MAGED1	R505C	C	1666	T	MOXD1	V212L	C	753	A	NAA30	P17H	C	204	A	NR1D2	D73E	T	538	A
MAGED1	T63M	C	341	T	MOXD1	A71V	G	331	A	NAA40	T79M	C	363	T	NR1D2	K230E	A	1007	G
MAGED2	E319K	G	1188	A	MOXD1	L427I	G	1398	T	NAAA	A168T	C	604	T	NR1H2	P187L	C	836	T
MAGEE1	A300T	G	1105	A	MPDU1	A245T	G	733	A	NAALAD2	S40Y	C	228	A	NR1H2	R357W	C	1345	T
MAGEE1	R9C	C	232	T	MPDU1	P254L	C	761	T	NAALAD2	E693*	G	2186	T	NR1H2	A23T	G	343	A
MAGEE1	P490H	C	1676	A	MPDZ	H863R	T	2602	C	NAALADL2	Q27K	C	207	A	NR1H2	A301T	G	1177	A
MAGEE1	L55I	C	370	A	MPDZ	P1449H	G	4360	T	NAALADL2	E607K	G	1947	A	NR1H3	Q157*	C	469	T
MAGEE2	R446I	C	1522	A	MPDZ	F1545C	A	4648	C	NAALADL2	F604L	T	1940	G	NR1H4	L212S	T	635	C
MAGI1	H1239R	T	3716	C	MPDZ	L1511*	A	4546	C	NAB1	R121Q	G	672	A	NR1H4	S248L	C	743	T
MAGI1	V971M	C	2911	T	MPDZ	N1367S	T	4114	C	NAB1	V56M	G	476	A	NR1I2	R420Q	G	1307	A
MAGI1	E353K	C	1057	T	MPDZ	S1016Y	G	3061	T	NAB2	V122I	G	742	A	NR1I3	E29D	C	290	A
MAGI1	R1372W	G	4114	A	MPEG1	L121F	G	447	A	NAB2	A226T	G	1054	A	NR2C1	S193L	G	834	A
MAGI1	G1219S	C	3655	T	MPEG1	V448M	C	1428	T	NAB2	R254W	C	1138	T	NR2C2	Q475H	G	1642	T
MAGI1	E1271K	C	3811	T	MPEG1	E64K	C	276	T	NAB2	A489T	G	1843	A	NR2E3	T333M	C	1188	T
MAGI1	S255F	G	764	A	MPG	A37T	G	340	A	NACA2	T853M	G	2840	A	NR2E3	D52Y	G	344	T
MAGI1	I837M	A	2511	C	MPHOSPH 10	T570A	A	2060	G	NACA2	A1769V	G	5588	A	NR2F1	R373*	C	2804	T
MAGI2	D91G	T	526	C	MPHOSPH 9	L312R	A	1042	C	NACAD	G145R	C	433	T	NR2F1	M296V	A	2573	G
MAGI2	A963V	G	3142	A	MPHOSPH 9	S657Y	G	2077	T	NACAD	A1480T	C	4438	T	NR2F1	R392C	C	2861	T
MAGI2	I79T	A	490	G	MPHOSPH 9	E546*	C	1743	A	NACAD	G1187V	C	3560	A	NR3C1	E285K	C	1136	T
MAGI2	R215W	G	897	A	MPI	A141T	G	473	A	NACAD	M602I	C	1806	A	NR3C1	Y393H	A	1460	G
MAGI2	R130C	G	642	A	MPL	P85S	C	295	T	NACC1	A71V	C	380	T	NR3C1	R470*	G	1691	A
MAGI2	E124G	T	625	C	MPND	V303I	G	942	A	NACC1	V319A	T	1124	C	NR3C2	K442T	T	1659	G
MAGI2	G102*	C	558	A	MPND	A365T	G	1128	A	NADSYN1	R411C	C	1357	T	NR3C2	R537*	G	1943	A
MAGI2	V82M	C	498	T	MPND	R372W	C	1149	T	NADSYN1	V162A	T	611	C	NR4A1	P193L	C	578	T
MAGI3	R856L	G	2642	T	MPO	R531C	G	1768	A	NADSYN1	R96C	C	412	T	NR4A2	D499N	C	1858	T
MAGI3	R808W	C	2497	T	MPO	C638Y	C	2090	T	NADSYN1	E154D	A	588	C	NR4A2	D434N	C	1663	T
MAGI3	A845T	G	2608	A	MPO	Q642*	G	2101	A	NAE1	A40T	C	195	T	NR4A2	R344C	G	1393	A
MAGI3	R766Q	G	2372	A	MPO	G627S	C	2056	T	NAIF1	G116S	C	566	T	NR4A3	E562*	G	1728	T

MAGIX	H94Q	C	329	A	MPO	P17H	G	227	T	NAIF1	V202M	C	824	T	NR4A3	V87M	G	303	A
MAGIX	L97I	T	336	A	MPP1	K299N	C	1045	A	NAIF1	A95V	G	504	A	NR5A1	R114W	G	537	A
MAGOH	R47I	C	302	A	MPP2	R452Q	C	1401	T	NAIF1	V284I	C	1070	T	NR5A1	A340V	G	1216	A
MAGOHB	R122Q	C	417	T	MPP2	E502K	C	1550	T	NALCN	P573S	G	1799	A	NRAP	R1510Q	C	4682	T
MAGOHB	S108Y	G	375	T	MPP2	R432C	G	1340	A	NALCN	R1495W	G	4565	A	NRAP	L577F	G	1882	A
MAK	Y165H	A	876	G	MPP3	R257H	C	1031	T	NALCN	E128A	T	465	G	NRAP	R809C	G	2578	A
MAK	R272*	G	1197	A	MPP3	A215T	C	904	T	NALCN	N1274H	T	3902	G	NRAP	E1684G	T	5204	C
MAK	N245H	T	1116	G	MPP3	R257H	C	1031	T	NALCN	R1127H	C	3462	T	NRAP	K1598N	C	4947	A
MAK	K36N	C	491	A	MPP4	R387H	C	1368	T	NALCN	H569Q	A	1789	T	NRAP	E1007*	C	3172	A
MAK16	E284G	A	891	G	MPP4	A560V	G	1887	A	NALCN	R297S	G	971	T	NRAP	D88G	T	416	C
MALT1	L246V	T	994	G	MPP4	D524G	T	1779	C	NALCN	R164M	C	573	A	NRAP	P80T	G	391	T
MAMDC2	R568H	G	2320	A	MPP4	R422H	C	1473	T	NALCN	Y102H	A	386	G	NRAS	Q61L	T	436	A
MAMDC2	G380V	G	1756	T	MPP4	R290Q	C	1077	T	NALCN	A1157V	G	3552	A	NRAS	G12A	C	289	G
MAMDC4	R914C	C	2790	T	MPP4	I217T	A	858	G	NAMPT	E258*	C	1080	A	NRCAM	P1007H	G	3491	T
MAMDC4	W503*	G	1558	A	MPP4	M113L	T	545	G	NAMPTL	G198A	C	593	G	NRCAM	V633I	C	2368	T
MAMDC4	R288Q	G	913	A	MPP5	D313N	G	1403	A	NAMPTL	G42E	C	125	T	NRCAM	I1183S	A	4019	C
MAMDC4	A1197V	C	3640	T	MPP5	E260*	G	1244	T	NAMPTL	S256Y	G	767	T	NRCAM	R1135*	G	3874	A
MAMDC4	R389H	G	1216	A	MPP5	T641M	C	2388	T	NAMPTL	E70*	C	208	A	NRD1	A98V	G	483	A
MAMDC4	G797S	G	2439	A	MPP6	A197V	C	675	T	NANOGP8	N156T	A	683	C	NRD1	R1120H	C	3549	T
MAMDC4	R664W	C	2040	T	MPP6	Q2R	A	90	G	NANOGP8	S65N	G	410	A	NRD1	K975T	T	3114	G
MAMDC4	G174W	G	570	T	MPP7	D260E	A	1040	C	NANOGP8	E33*	G	313	T	NRD1	L903V	A	2897	C
MAMDC4	V196A	T	637	C	MPPE1	G201R	C	930	T	NANOS3	Y10H	T	141	C	NRD1	E717K	C	2339	T
MAMDC4	Q393K	C	1227	A	MPPE1	E270G	T	1138	C	NANP	T119A	T	582	C	NRD1	C637Y	C	2100	T
MAML1	L49M	C	408	A	MPPED1	T102M	C	749	T	NANP	T131M	G	619	A	NRF1	T324M	C	1088	T
MAML1	A914T	G	3003	A	MPPED1	N269H	A	1249	C	NANS	A187T	G	629	A	NRF1	V518A	T	1670	C
MAML1	H106R	A	580	G	MPPED2	K268N	T	1267	G	NAP1L2	R353Q	C	1414	T	NRF1	T340M	C	1136	T
MAML3	R669H	C	2863	T	MPRIP	T383M	C	1204	T	NAP1L2	N436T	T	1663	G	NRG1	Y63C	A	188	G
MAML3	N548S	T	2500	C	MPRIP	K278N	G	914	T	NAP1L3	P353H	G	1363	T	NRG1	A336T	G	1498	A
MAML3	R193*	G	1434	A	MPRIP	Y1192C	A	3573	G	NAP1L3	E426*	C	1581	A	NRG1	T535M	C	2096	T
MAMLD1	D163Y	G	553	T	MPST	A303T	G	1083	A	NAP1L5	A10V	G	147	A	NRG1	E418*	G	1744	T
MAMSTR	A256V	G	831	A	MPV17L	G173D	G	662	A	NAP1L5	A62V	G	303	A	NRG2	D122N	C	589	T
MAMSTR	P162T	G	548	T	MPV17L2	P227T	C	923	A	NAP1L5	K85E	T	371	C	NRG3	S617F	C	1850	T
MAMSTR	P46H	G	201	T	MPZ	R108C	G	335	A	NAPA	V263A	A	1088	G	NRG3	T681A	A	2041	G
MAN1A1	A440V	G	1761	A	MPZ	G249R	C	758	T	NAPRT1	E471D	C	1434	A	NRG3	V457A	T	1370	C
MAN1B1	G239R	G	1062	A	MPZ	R46G	T	149	C	NAPRT1	Q343H	C	1050	A	NRG3	R157C	C	469	T
MAN1C1	E278D	G	1164	T	MPZL2	A106T	C	457	T	NAPRT1	-	C	0	A	NRIP3	R77Q	C	344	T
MAN2A1	A119V	C	1408	T	MR1	Q115L	A	349	T	NARF	T335M	C	1144	T	NRIP3	A135V	G	518	A
MAN2A1	E160*	G	1530	T	MRAP	R126*	C	563	T	NARF	R371I	G	1252	T	NRIP3	R202Q	C	719	T
MAN2A1	F1035L	C	4157	A	MRAP2	A129V	C	521	T	NARG2	M335V	T	1238	C	NRN1	G112S	C	552	T

MAN2A2	-	T	0	C	MRC1L1	Q242R	A	828	G	NARG2	S519Y	G	1791	T	NRP1	E784K	C	2722	T
MAN2A2	A246V	C	755	T	MRC2	G1445R	G	4735	A	NARG2	V109L	C	560	G	NRP1	R463H	C	1760	T
MAN2A2	D355G	A	1082	G	MRC2	R82Q	G	647	A	NARS	T175M	G	752	A	NRP1	F652C	A	2327	C
MAN2B1	W1006R	A	3057	G	MRC2	R114W	C	742	T	NAT1	L239R	T	889	G	NRP1	R235*	G	1075	A
MAN2B1	A559V	G	1717	A	MRC2	A1446T	G	4738	A	NAT10	R847H	G	2784	A	NRP1	H223R	T	1040	C
MAN2B2	R374*	C	1156	T	MRC2	Y681H	T	2443	C	NAT10	R810W	C	2672	T	NRP1	L119I	G	727	T
MAN2B2	R740W	C	2254	T	MRC2	N1333K	C	4401	G	NAT10	A436T	G	1550	A	NRP1	A537V	G	1982	A
MAN2B2	P219L	C	692	T	MRFAP1	P30S	C	741	T	NAT10	V510A	T	1773	C	NRP2	R466C	C	2187	T
MAN2B2	Y746C	A	2273	G	MRGPRD	A69V	G	206	A	NAT14	D14Y	G	120	T	NRP2	P575L	C	2515	T
MAN2B2	D433G	A	1334	G	MRGPRD	F167L	G	501	T	NAT14	D29V	A	166	T	NRP2	E612Q	G	2625	C
MAN2B2	H965R	A	2930	G	MRGPRE	R283W	G	1154	A	NAT15	T149A	A	530	G	NRP2	E576D	G	2519	T
MAN2B2	R70H	G	245	A	MRGPRX2	R141H	C	510	T	NAT15	A103T	G	392	A	NRXN1	A219V	G	1996	A
MAN2C1	R183Q	C	565	T	MRGPRX3	F273L	C	1180	A	NAT2	E136*	G	513	T	NRXN1	S173L	G	1858	A
MAN2C1	R208H	C	640	T	MRGPRX4	R95C	C	703	T	NAT8B	R166W	G	646	A	NRXN1	R61C	G	1521	A
MANBA	A461V	G	1482	A	MRGPRX4	A140V	C	839	T	NAT8B	T89R	G	416	C	NRXN1	G1330D	C	5329	T
MANBA	R26C	G	176	A	MRGPRX4	T31M	C	512	T	NAT8L	R140H	G	419	A	NRXN1	C931R	A	4131	G
MANEA	R393H	G	1312	A	MRI1	A65V	C	260	T	NAV1	R1614W	C	5260	T	NRXN1	R635H	C	3244	T
MANEA	F20L	C	194	A	MRM1	L211V	T	870	G	NAV1	-	G	0	A	NRXN1	R896Q	C	4027	T
MANEAL	E397K	G	1502	A	MRO	R203I	C	757	A	NAV1	A210T	G	1048	A	NRXN1	R1207Q	C	4960	T
MAOA	R291I	G	995	T	MRPL1	R223Q	G	997	A	NAV1	F1442L	C	4746	A	NRXN1	R856W	G	3906	A
MAOA	R297Q	G	1013	A	MRPL1	A151V	C	781	T	NAV1	R1756Q	G	5687	A	NRXN1	-	C	0	T
MAP1A	G517C	G	1580	T	MRPL10	R93H	C	731	T	NAV2	A883T	G	2746	A	NRXN1	A165V	G	1834	A
MAP1A	T1035I	C	3135	T	MRPL12	T194A	A	705	G	NAV2	L850M	C	2647	A	NRXN1	T550I	G	2989	A
MAP1A	P2097S	C	6320	T	MRPL15	Q139H	G	480	T	NAV2	R1062*	C	3283	T	NRXN1	L665I	G	3333	T
MAP1A	E211*	G	662	T	MRPL15	K169N	A	570	C	NAV2	R2384H	G	7250	A	NRXN1	K539N	C	2957	A
MAP1A	K646N	G	1969	T	MRPL17	F15V	A	148	C	NAV2	F1644C	T	5030	G	NRXN1	-	C	0	T
MAP1A	S1088F	C	3294	T	MRPL18	R108H	G	445	A	NAV2	R1967Q	G	5999	A	NRXN1	I892L	T	4014	G
MAP1A	G1358R	G	4103	A	MRPL18	R108H	G	445	A	NAV3	M2257I	G	6944	A	NRXN2	S333L	G	1210	A
MAP1A	R3003H	G	9039	A	MRPL19	K214N	A	667	C	NAV3	V1481A	T	4615	C	NRXN2	R1085H	C	3466	T
MAP1B	K1217T	A	3948	C	MRPL2	R130H	C	814	T	NAV3	G1294S	G	4053	A	NRXN2	A1322V	G	4177	A
MAP1B	V2205M	G	6911	A	MRPL21	G150*	C	466	A	NAV3	D843N	G	2700	A	NRXN2	A275T	C	1035	T
MAP1B	K781N	A	2641	C	MRPL21	T164A	T	508	C	NAV3	E714D	G	2315	T	NRXN2	R651W	G	2163	A
MAP1B	E1001K	G	3299	A	MRPL21	A245T	C	751	T	NAV3	I1096T	T	3460	C	NRXN2	A1146V	G	3649	A
MAP1B	E1009D	G	3325	T	MRPL22	R63G	A	228	G	NAV3	A1225S	G	3846	T	NRXN2	G1618V	C	5065	A
MAP1B	D1370Y	G	4406	T	MRPL24	S28F	G	220	A	NAV3	E552D	G	1829	T	NRXN2	A804T	C	2622	T
MAP1LC3A	A100T	G	434	A	MRPL27	P119S	G	355	A	NAV3	E679A	A	2209	C	NRXN2	R868W	G	2814	A
MAP1LC3B	K65E	A	821	G	MRPL28	R163*	G	564	A	NAV3	P947T	C	3012	A	NRXN3	E549K	G	1645	A
MAP1LC3C	R46G	T	201	C	MRPL28	D160G	T	556	C	NAV3	E1583*	G	4920	T	NRXN3	D6N	G	16	A
MAP1S	A623V	C	1889	T	MRPL3	F347L	A	1201	G	NAV3	K1695N	G	5258	T	NRXN3	E981K	G	2941	A

MAP2	R905*	C	3219	T	MRPL30	R33C	C	295	T	NAV3	T349S	A	1218	T	NRXN3	V328A	T	983	C
MAP2	R1583C	C	5253	T	MRPL35	R100I	G	333	T	NBAS	R304S	C	938	A	NRXN3	T752S	A	2254	T
MAP2	I1287V	A	4365	G	MRPL37	R27K	G	157	A	NBAS	A995S	C	3009	A	NRXN3	T965M	C	2894	T
MAP2	V1390A	T	4675	C	MRPL37	R326W	C	1053	T	NBAS	D2060A	T	6205	G	NRXN3	A53V	C	158	T
MAP2	R905*	C	3219	T	MRPL37	A311V	C	1009	T	NBAS	Q990R	T	2995	C	NRXN3	E224K	G	670	A
MAP2	S886G	A	3162	G	MRPL38	P131L	G	930	A	NBAS	Q2322R	T	6991	C	NRXN3	R574H	G	1721	A
MAP2K1	F53L	T	690	G	MRPL4	A267T	G	953	A	NBAS	E778K	C	2358	T	NSA2	R11H	G	401	A
MAP2K1	A132V	C	926	T	MRPL40	R73Q	G	871	A	NBAS	R456L	C	1393	A	NSD1	R1171H	G	3557	A
MAP2K1	V258I	G	1303	A	MRPL40	R164Q	G	1144	A	NBAS	K379T	T	1162	G	NSD1	G1929W	G	5830	T
MAP2K1	K35N	G	636	T	MRPL44	F195L	T	652	C	NBAS	E225D	T	701	G	NSD1	R1587H	G	4805	A
MAP2K1	-	T	1711	C	MRPL44	F271L	T	882	G	NBEA	F1903V	T	5913	G	NSD1	R2633W	C	7942	T
MAP2K2	P291H	G	1126	T	MRPL45	R96H	G	447	A	NBEA	R2219H	G	6862	A	NSD1	E1569D	G	4752	T
MAP2K3	R46W	C	136	T	MRPL47	K229N	C	717	A	NBEA	R203*	C	813	T	NSD1	K2067E	A	6244	G
MAP2K3	K247T	A	740	C	MRPL49	P53L	C	249	T	NBEA	-	T	0	C	NSD1	C342Y	G	1070	A
MAP2K4	-	G	0	C	MRPL52	G39D	G	146	A	NBEA	V1379A	T	4342	C	NSD1	E1248K	G	3787	A
MAP2K4	E152*	G	517	T	MRPL54	A55T	G	197	A	NBEA	R203*	C	813	T	NSFL1C	A3V	G	102	A
MAP2K5	R20H	G	686	A	MRPS11	R118W	C	617	T	NBEA	R2756W	C	8472	T	NSL1	K259N	C	796	A
MAP2K7	-	A	0	G	MRPS12	R44W	C	440	T	NBEA	E2002G	A	6211	G	NSMAF	E639*	C	1976	A
MAP2K7	E258K	G	772	A	MRPS14	R112H	C	352	T	NBEA	V2229A	T	6892	C	NSMAF	N220H	T	719	G
MAP2K7	R195L	G	584	T	MRPS18A	R247H	C	752	T	NBEA	R696Q	G	2293	A	NSMCE1	C194G	A	661	C
MAP2K7	R195L	G	584	T	MRPS18A	-	A	0	G	NBEA	R46G	A	342	G	NSUN2	V216M	C	958	T
MAP3K1	V1274A	T	3821	C	MRPS2	-	T	0	C	NBEA	G1309R	G	4131	A	NSUN2	R687*	G	2371	A
MAP3K10	P627H	C	2168	A	MRPS21	R43Q	G	190	A	NBEA	G2881W	G	8847	T	NSUN2	P474Q	G	1733	T
MAP3K10	-	G	0	T	MRPS22	C231Y	G	1124	A	NBEA	F2297L	C	7097	A	NSUN2	A722T	C	2476	T
MAP3K11	R208Q	C	1116	T	MRPS22	K203N	A	1041	C	NBEA	E103*	G	513	T	NSUN3	R99Q	G	507	A
MAP3K11	R147C	G	932	A	MRPS23	D62Y	C	221	A	NBEA	S304*	C	1117	A	NSUN3	Y29C	A	297	G
MAP3K11	R757H	C	2763	T	MRPS25	T71M	G	353	A	NBEA	S760R	A	2484	C	NSUN3	R255H	G	975	A
MAP3K11	Y322C	T	1458	C	MRPS26	A69T	G	329	A	NBEA	R1001*	C	3207	T	NSUN5	R85*	G	279	A
MAP3K11	R203Q	C	1101	T	MRPS27	S164Y	G	501	T	NBEA	V1895F	G	5889	T	NSUN7	N446H	A	1831	C
MAP3K11	P675L	G	2517	A	MRPS27	Q275*	G	833	A	NBEA	S2621R	C	8069	A	NSUN7	R279Q	G	1331	A
MAP3K12	R572Q	C	1715	T	MRPS28	F80V	A	261	C	NBEA	-	G	0	T	NT5C2	R456H	C	1455	T
MAP3K12	S847N	C	2540	T	MRPS35	D203Y	G	655	T	NBEA	E2298K	G	7098	A	NT5C3L	R47*	G	452	A
MAP3K12	G167W	C	499	A	MRPS35	R164W	C	538	T	NBEAL1	A152T	G	787	A	NT5DC1	-	G	0	A
MAP3K12	R744*	G	2230	A	MRPS5	A385V	G	1363	A	NBEAL1	V429A	T	1619	C	NT5DC2	D552G	T	1695	C
MAP3K12	S678G	T	2032	C	MRPS5	A233V	G	907	A	NBEAL1	N2622S	A	8198	G	NT5DC3	R156W	G	507	A
MAP3K12	Q773R	T	2318	C	MRPS6	A114T	G	518	A	NBEAL1	A1195S	G	3916	T	NT5E	E357*	G	1118	T
MAP3K12	R656Q	C	1967	T	MRPS7	R180H	G	772	A	NBEAL1	N1367S	A	4433	G	NT5M	A119T	G	571	A
MAP3K12	V212A	A	635	G	MRPS7	R178H	G	766	A	NBEAL1	E2153*	G	6790	T	NT5M	K99N	G	513	T
MAP3K13	R592*	C	2029	T	MRPS9	H318R	A	1063	G	NBEAL2	V2715A	T	8163	C	NTAN1	R204C	G	703	A

MAP3K13	G262*	G	1039	T	MRS2	R314C	C	1062	T	NBEAL2	E1616K	G	4865	A	NTF6B	W213C	C	639	A
MAP3K15	A327V	G	980	A	MRS2	V181I	G	663	A	NBEAL2	A1832T	G	5513	A	NTHL1	A11S	C	50	A
MAP3K15	R1302G	T	3904	C	MRS2	E372D	G	1238	T	NBEAL2	A2199V	C	6615	T	NTN1	A457V	C	1477	T
MAP3K2	Y452C	T	1638	C	MRS2	S228Y	C	805	A	NBEAL2	R2584H	G	7770	A	NTN1	Y77C	A	337	G
MAP3K3	G532E	G	1914	A	MRS2	S368A	T	1224	G	NBEAL2	R1759H	G	5295	A	NTN3	R332H	G	1198	A
MAP3K3	T106I	C	636	T	MRVI1	E291K	C	950	T	NBEAL2	P2453L	C	7377	T	NTN3	D440N	G	1521	A
MAP3K3	L138S	T	732	C	MRVI1	R553H	C	1737	T	NBEAL2	A2716T	G	8165	A	NTN3	N405K	C	1418	A
MAP3K4	Y668H	T	2144	C	MRVI1	P517H	G	1629	T	NBEAL2	R424Q	G	1290	A	NTN3	D360Y	G	1281	T
MAP3K4	L766S	T	2439	C	MRVI1	G389S	C	1244	T	NBEAL2	V680M	G	2057	A	NTN3	G401D	G	1405	A
MAP3K4	T1365A	A	4235	G	MRVI1	E282*	C	923	A	NBEAL2	P2679L	C	8055	T	NTN4	M1T	A	451	G
MAP3K4	S87N	G	402	A	MRVI1	K281N	C	922	A	NBEAL2	V1931L	G	5810	T	NTN4	A407V	G	1669	A
MAP3K4	M577V	A	1871	G	MRVI1	P517H	G	1629	T	NBEAL2	G702D	G	2124	A	NTN4	R45Q	C	583	T
MAP3K4	G1475V	G	4566	T	MRVI1	Q844K	G	2609	T	NBEAL2	R265H	G	813	A	NTN4	A179T	C	984	T
MAP3K4	G411D	G	1374	A	MRVI1	A71T	C	290	T	NBEAL2	E1959K	G	5894	A	NTN4	K32R	T	544	C
MAP3K5	R1272Q	C	4176	T	MS4A1	T41M	C	275	T	NBN	L302I	G	1014	T	NTN5	R386W	G	1252	A
MAP3K5	R1370Q	C	4470	T	MS4A1	K50N	G	303	T	NBPF15	C443F	G	1817	T	NTN5	A379V	G	1232	A
MAP3K5	G81S	C	602	T	MS4A10	E48K	G	238	A	NBPF3	Q144K	C	780	A	NTNG2	A6V	C	793	T
MAP3K5	L246I	G	1097	T	MS4A12	N232K	T	753	A	NBR1	R347*	C	1179	T	NTRK1	M671T	T	2068	C
MAP3K6	R428C	G	1522	A	MS4A12	-	G	0	A	NBR1	Q558H	G	1814	T	NTRK1	R347C	C	1095	T
MAP3K6	R923Q	C	3008	T	MS4A14	E20K	G	623	A	NBR1	T800M	C	2539	T	NTRK2	D385G	A	2092	G
MAP3K6	P604H	G	2051	T	MS4A14	K258N	G	1339	T	NBR1	R937W	C	2949	T	NTRK3	K602R	T	1967	C
MAP3K6	A199S	C	835	A	MS4A2	F173C	T	620	G	NBR1	N569S	A	1846	G	NTRK3	K9N	C	189	A
MAP3K6	Q165H	C	735	A	MS4A4A	V99M	G	385	A	NBR2	L82I	C	521	A	NTRK3	D75G	T	386	C
MAP3K6	P228H	G	923	T	MS4A6E	I48S	T	208	G	NCAM1	D266G	A	797	G	NTRK3	A830S	C	2650	A
MAP3K6	R651W	G	2191	A	MS4A7	R237W	C	854	T	NCAM1	T316A	A	946	G	NTRK3	E287D	C	1023	A
MAP3K6	F1081L	A	3481	G	MS4A7	S85P	T	398	C	NCAM1	G725C	G	2173	T	NTS	D25Y	G	182	T
MAP3K7	A7S	C	181	A	MS4A7	E152*	G	599	T	NCAM1	H800N	C	2398	A	NTSR2	R109H	C	361	T
MAP3K7	A61S	C	343	A	MS4A8B	S55L	C	367	T	NCAM1	F37L	C	111	A	NTSR2	A60V	G	214	A
MAP3K7	Y585C	T	1916	C	MSC	D43G	T	446	C	NCAM1	H696N	C	2086	A	NTSR2	A65V	G	229	A
MAP3K7	Q537*	G	1771	A	MSC	A118V	G	671	A	NCAM2	L174I	C	769	A	NUAK1	R410H	C	2609	T
MAP3K8	T316M	C	1636	T	MSGN1	G85S	G	276	A	NCAM2	R66W	A	445	T	NUAK1	I656V	T	3346	C
MAP3K9	E38A	T	113	G	MSGN1	A141T	G	444	A	NCAM2	K450N	G	1599	T	NUAK1	E233A	T	2078	G
MAP3K9	G933V	C	2798	A	MSH2	Q337*	C	1232	T	NCAM2	E767*	G	2548	T	NUAK1	D187N	C	1939	T
MAP3K9	A39E	G	116	T	MSH2	E530*	G	1811	T	NCAN	L602M	C	1903	A	NUAK2	R385C	G	1153	A
MAP4	P157S	G	557	A	MSH2	E580*	G	1961	T	NCAN	T871M	C	2711	T	NUAK2	R15S	G	43	T
MAP4	C552W	A	1744	C	MSH3	K860Q	A	2658	C	NCAN	R71Q	G	311	A	NUB1	G330E	G	1049	A
MAP4	K521N	C	1651	A	MSH4	T927N	C	2884	A	NCAN	R1282*	C	3943	T	NUBP1	T293M	C	921	T
MAP4	-	A	0	G	MSH4	V930D	T	2893	A	NCAN	R637C	C	2008	T	NUBP1	G280S	G	881	A
MAP4	A2258V	G	6861	A	MSH4	R352H	G	1159	A	NCAN	R1194C	C	3679	T	NUBP2	T133M	C	518	T

MAP4K1	R589C	G	1873	A	MSH4	I183V	A	651	G	NCAN	P728L	C	2282	T	NUBP2	V121M	G	481	A
MAP4K1	S797P	A	2497	G	MSH4	L204V	T	714	G	NCAPD2	R126H	G	1176	A	NUBP2	A268T	G	922	A
MAP4K2	T443M	G	1420	A	MSH4	R822I	G	2569	T	NCAPD2	R519H	G	2355	A	NUBP2	G186R	G	676	A
MAP4K2	P299H	G	988	T	MSH4	E881D	G	2747	T	NCAPD2	L170I	C	1307	A	NUCB1	V312M	G	1268	A
MAP4K3	A179V	G	861	A	MSH5	M839T	T	2595	C	NCAPD2	K456Q	A	2165	C	NUCB1	R377Q	G	1464	A
MAP4K3	S893I	C	3003	A	MSH6	R1076H	G	3379	A	NCAPD3	R1235*	G	4309	A	NUCB1	R348M	G	1377	T
MAP4K3	E416G	T	1572	C	MSH6	R577H	G	1882	A	NCAPG	E800*	G	2574	T	NUCB1	R381C	C	1475	T
MAP4K4	T47M	C	214	T	MSH6	R961I	G	3034	T	NCAPG	I793L	A	2553	C	NUCB2	K281T	A	1087	C
MAP4K4	R425C	C	1347	T	MSI2	V52G	T	328	G	NCAPG2	L457S	A	1484	G	NUDC	E126D	G	501	T
MAP4K4	A196V	C	661	T	MSL1	E380*	G	1138	T	NCAPG2	A701T	C	2215	T	NUDCD1	R521H	C	1673	T
MAP4K4	-	G	0	A	MSL2	I534T	A	2334	G	NCAPH	E147D	A	484	C	NUDCD1	R521H	C	1673	T
MAP4K4	G729V	G	2260	T	MSL2	R537C	G	2342	A	NCAPH	G321R	G	1004	A	NUDCD1	L566V	A	1807	C
MAP4K4	T684A	A	2124	G	MSL2	R466C	G	2129	A	NCAPH	D612H	G	1877	C	NUDCD1	E451*	C	1462	A
MAP4K4	K74N	G	296	T	MSL2	P146S	G	1169	A	NCAPH	R696M	G	2130	T	NUDT11	V72A	A	367	G
MAP4K4	R1114I	G	3415	T	MSLN	G439V	G	1360	T	NCAPH2	E46K	G	214	A	NUDT12	K453E	T	1454	C
MAP4K4	F1139C	T	3490	G	MSLN	A247T	G	783	A	NCAPH2	T565I	C	1772	T	NUDT13	R11K	G	150	A
MAP4K5	R172*	G	834	A	MSLN	A503T	G	1551	A	NCAPH2	A264T	G	868	A	NUDT14	V45I	C	133	T
MAP4K5	E705Q	C	2433	G	MSLN	S20N	G	103	A	NCBP1	K707N	G	2377	T	NUDT16L1	F62V	T	193	G
MAP4K5	R172*	G	834	A	MSLN	D431Y	G	1335	T	NCBP1	F152C	T	711	G	NUDT17	P119S	G	367	A
MAP4K5	S670I	C	2329	A	MSLNL	R736H	C	2207	T	NCDN	V316M	G	1073	A	NUDT18	T104R	G	430	C
MAP4K5	K571T	T	2032	G	MSLNL	T437M	G	1310	A	NCDN	R610Q	G	1956	A	NUDT18	A122T	C	483	T
MAP4K5	L493M	G	1797	T	MSLNL	R415C	G	1243	A	NCEH1	H404R	T	1349	C	NUDT21	R66C	G	369	A
MAP7	L371W	A	1230	C	MSLNL	T78I	G	233	A	NCF2	A219T	C	846	T	NUDT22	S185R	A	603	C
MAP7D1	S733I	G	2418	T	MSLNL	R90H	C	269	T	NCF4	D234G	A	885	G	NUDT22	S65A	T	243	G
MAP7D1	Q690H	G	2290	T	MSLNL	T656R	G	1967	C	NCF4	R105Q	G	498	A	NUDT6	R269M	C	840	A
MAP7D1	P743S	C	2447	T	MSMB	E64K	G	277	A	NCK2	P228S	C	1124	T	NUDT8	R42C	G	134	A
MAP7D2	E546*	C	1655	A	MSMP	S26F	G	217	A	NCKAP1	R393H	C	1937	T	NUDT9	K222T	A	989	C
MAP7D2	K465N	C	1414	A	MSN	R81H	G	414	A	NCKAP1	H595Q	A	2544	T	NUF2	A149V	C	598	T
MAP7D2	R41W	G	140	A	MSN	E185*	G	725	T	NCKAP1	G972R	C	3673	T	NUF2	R19C	C	207	T
MAP7D2	C595Y	C	1803	T	MSN	D166G	A	669	G	NCKAP1	-	T	4164	G	NUFIP1	R423Q	C	1315	T
MAP7D2	E546*	C	1655	A	MSN	I97T	T	462	C	NCKAP1L	R223S	C	746	A	NUFIP1	G267*	C	846	A
MAP7D3	R607C	G	2040	A	MSR1	R44C	G	130	A	NCKAP1L	L487M	C	1538	A	NUMA1	E526*	C	1730	A
MAP9	S392L	G	1439	A	MSR1	T454A	T	1360	C	NCKAP1L	M812I	G	2515	T	NUMA1	A2097T	C	6443	T
MAP9	R21I	C	326	A	MSR1	E235K	C	703	T	NCKAP1L	Q446P	A	1416	C	NUMA1	M259T	A	930	G
MAPK1	L244I	G	919	T	MSR1	S18R	T	52	G	NCKAP1L	A746T	G	2315	A	NUMB	N405D	T	1231	C
MAPK10	S50C	T	675	A	MSRA	G154D	G	710	A	NCKAP5	F651V	A	2325	C	NUMB	R33H	C	116	T
MAPK12	G184W	C	866	A	MSRB2	G182C	G	544	T	NCKAP5	P1037L	G	3484	A	NUMBL	R292W	G	1042	A
MAPK14	R73Q	G	665	A	MSRB2	R158C	C	472	T	NCKAP5	R1513Q	C	4912	T	NUMBL	R62C	G	352	A
MAPK15	E187D	G	680	T	MSRB3	S161L	C	543	T	NCKAP5	R877S	C	3005	A	NUMBL	K204R	T	779	C

MAPK4	E554K	G	2660	A	MST1	R374H	C	1483	T	NCKAP5	H1433R	T	4672	C	NUMBL	P28L	G	251	A
MAPK4	A422V	C	2265	T	MST1	A367T	C	1461	T	NCKAP5	R762M	C	2659	A	NUMBL	K315N	C	1113	A
MAPK4	D538N	G	2612	A	MST1	M448V	T	1704	C	NCKAP5	Q1805R	T	5788	C	NUP107	E792*	G	2489	T
MAPK6	D179E	T	1325	A	MST1	P153R	G	820	C	NCKAP5	S20R	G	434	T	NUP133	A587T	C	1851	T
MAPK7	R543W	C	2013	T	MST1R	R1248H	C	3771	T	NCKAP5	E1905A	T	6088	G	NUP133	R775*	G	2415	A
MAPK7	R369C	C	1491	T	MST1R	R1118H	C	3381	T	NCKAP5	S1702Y	G	5479	T	NUP153	R133W	G	597	A
MAPK7	A579T	G	2121	A	MST1R	R308H	C	951	T	NCKAP5	E150K	C	822	T	NUP153	E850D	C	2750	A
MAPK7	R326H	G	1363	A	MST1R	P863L	G	2616	A	NCKAP5	D27N	C	453	T	NUP153	P554S	G	1860	A
MAPK8	R189G	C	746	G	MST1R	I1186F	T	3584	A	NCKAP5L	R1171C	G	3713	A	NUP155	T272M	G	1019	A
MAPK8IP1	R259W	C	945	T	MSTN	-	C	0	T	NCKAP5L	G723V	C	2370	A	NUP155	S399Y	G	1400	T
MAPK8IP1	A495T	G	1653	A	MSTN	R52I	C	288	A	NCKIPSD	R191C	G	665	A	NUP155	D485G	T	1658	C
MAPK8IP2	R674W	C	2020	T	MSTO1	A334T	G	1024	A	NCLN	-	G	0	A	NUP155	R1389W	G	4369	A
MAPK8IP2	D77N	G	229	A	MSX2	G262D	G	912	A	NCLN	P463L	C	1542	T	NUP155	I1254M	A	3966	C
MAPK8IP2	M83I	G	249	T	MSX2	P225T	C	800	A	NCOA1	K1015N	A	3697	C	NUP155	F823V	A	2671	C
MAPK8IP3	D818N	G	2599	A	MSX2	T257M	C	897	T	NCOA1	S137A	T	1061	G	NUP160	R1136H	C	3492	T
MAPK8IP3	A768T	G	2449	A	MSX2	Y264C	A	918	G	NCOA1	F300V	T	1550	G	NUP160	R1133*	G	3482	A
MAPK8IP3	S282L	C	992	T	MT1G	R55W	G	233	A	NCOA2	T281M	G	1004	A	NUP160	D384N	C	1235	T
MAPK8IP3	F413L	C	1386	A	MT1G	F82V	A	314	C	NCOA2	R338C	G	1174	A	NUP160	A17T	C	134	T
MAPKAP1	Q55H	C	234	A	MT1G	D81N	C	311	T	NCOA2	G637W	C	2071	A	NUP188	E1241K	G	3742	A
MAPKAP1	F289L	G	936	T	MT1M	C48Y	G	253	A	NCOA2	W954R	A	3022	G	NUP188	-	G	0	T
MAPKAPK 2	I54L	A	353	C	MT1X	P61S	C	196	T	NCOA2	E96*	C	448	A	NUP188	R1385Q	G	4175	A
MAPKAPK 5	A197T	G	848	A	MTA1	A536V	C	1821	T	NCOA2	A1046V	G	3299	A	NUP188	E216*	G	667	T
MAPKAPK 5	N305S	A	1173	G	MTA1	R633H	G	2112	A	NCOA2	H449P	T	1508	G	NUP188	L1013V	T	3058	G
MAPKBP1	W371C	G	1349	T	MTA1	A71V	C	426	T	NCOA3	R36Q	G	298	A	NUP188	M1667V	A	5020	G
MAPKBP1	A846T	G	2772	A	MTA1	E135K	G	617	A	NCOA3	T194P	A	771	C	NUP205	V190A	T	595	C
MAPKBP1	R303C	C	1143	T	MTA1	D715Y	G	2357	T	NCOA4	-	T	0	C	NUP205	R980H	G	2965	A
MAPKBP1	G754S	G	2496	A	MTA3	R490W	C	1468	T	NCOA4	V641I	G	2173	A	NUP205	D102Y	G	330	T
MAPRE2	V130A	T	559	C	MTAP	I31L	A	91	C	NCOA4	L10I	C	280	A	NUP205	F1826L	C	5504	A
MAPT	V368I	G	1422	A	MTBP	T386A	A	1201	G	NCOA4	-	G	0	T	NUP205	R154W	C	486	T
MAPT	E176G	A	847	G	MTBP	K528T	A	1628	C	NCOA5	R61W	G	346	A	NUP205	R1808L	G	5449	T
MARCH1	T34P	T	588	G	MTBP	T689S	C	2111	G	NCOA6	S1490L	G	7040	A	NUP205	V1645A	T	4960	C
MARCH1	R20*	G	546	A	MTCH2	G254R	C	949	T	NCOA6	P1326S	G	6547	A	NUP205	F531S	T	1618	C
MARCH10	R660C	G	2263	A	MTCP1	A54V	G	875	A	NCOA6	R143Q	C	2999	T	NUP205	A1207V	C	3646	T
MARCH10	E638D	C	2199	A	MTERF	E347K	C	1133	T	NCOA6	S1709Y	G	7697	T	NUP210	I1042S	A	3208	C
MARCH10	S450Y	G	1634	T	MTERFD1	L195I	G	682	T	NCOA6	Q709H	C	4698	A	NUP210	R1321C	G	4044	A
MARCH4	G244D	C	2498	T	MTF1	R260W	G	919	A	NCOR1	E354*	C	1300	A	NUP210	P670H	G	2092	T
MARCH4	R33H	C	1865	T	MTF1	D63G	T	329	C	NCOR1	R66Q	C	437	T	NUP210	K265N	C	878	A

MARCH5	A244V	C	1063	T	MTF1	G68R	C	343	T	NCOR1	G972S	C	3154	T	NUP210	S94G	T	363	C
MARCH6	R592Q	G	1907	A	MTF2	Y525*	T	1864	A	NCOR1	V1474A	A	4661	G	NUP210L	T67A	T	271	C
MARCH6	A596T	G	1918	A	MTF2	R347Q	G	1329	A	NCOR1	R310H	C	1169	T	NUP210L	S145L	G	506	A
MARCH6	R48Q	G	275	A	MTFMT	K284T	T	877	G	NCOR2	T2315M	G	7100	A	NUP210L	Q1236*	G	3778	A
MARCH7	C99G	T	555	G	MTFMT	S125*	G	400	T	NCOR2	P1112L	G	3491	A	NUP210L	Y1697*	A	5163	C
MARCH8	C248*	G	742	T	MTFR1	P193H	C	689	A	NCOR2	P796S	G	2542	A	NUP210L	S1359Y	G	4148	T
MARCH8	E251G	T	750	C	MTG1	L105Q	T	364	A	NCOR2	R2474Q	C	7577	T	NUP210L	S1308Y	G	3995	T
MARCH8	R286G	G	854	C	MTHFD1L	A442T	G	1598	A	NCOR2	A1976T	C	6082	T	NUP210L	Q729H	T	2259	G
MARCO	S230G	A	823	G	MTHFD1L	K909N	G	3001	T	NCOR2	D776N	C	2482	T	NUP210L	N129H	T	457	G
MARCO	P34T	C	235	A	MTHFD2	L116V	T	426	G	NCOR2	E459K	C	1531	T	NUP214	A255T	G	874	A
MARK1	P697S	C	2355	T	MTHFR	L270P	A	809	G	NCR1	P86L	C	295	T	NUP214	E344D	G	1143	T
MARK1	R722Q	G	2431	A	MTHFR	R92Q	C	275	T	NCR2	W54*	G	250	A	NUP214	S1752G	A	5365	G
MARK1	R309*	C	1191	T	MTHFS	I179F	T	596	A	NCS1	E84K	G	336	A	NUP214	K716E	A	2257	G
MARK1	S699Y	C	2362	A	MTHFSD	R335Q	C	1055	T	NCSTN	P421H	C	1387	A	NUP35	R52Q	G	258	A
MARK2	P569T	C	1917	A	MTHFSD	L26V	A	127	C	NDE1	R275Q	G	1650	A	NUP35	G278E	G	936	A
MARK2	R328W	C	1194	T	MTIF2	T194M	G	730	A	NDE1	Q167K	C	1325	A	NUP37	L218F	T	719	A
MARK2	M34V	A	312	G	MTIF2	E402K	C	1353	T	NDEL1	E101*	G	301	T	NUP43	D58G	T	230	C
MARK2	L361M	C	1293	A	MTIF2	R168M	C	652	A	NDN	R265Q	C	880	T	NUP43	I4M	A	69	C
MARK3	R682C	C	2710	T	MTIF2	Q250R	T	898	C	NDNL2	W278C	C	958	A	NUP85	E263K	G	1047	A
MARK4	R420H	G	1264	A	MTIF2	I519T	A	1705	G	NDNL2	A287V	G	984	A	NUP88	S87G	T	289	C
MARK4	G368S	G	1107	A	MTL5	K401N	T	1343	G	NDOR1	S569*	C	1789	A	NUP88	R467*	G	1429	A
MARK4	R418H	G	1258	A	MTM1	E305K	G	967	A	NDOR1	F523L	C	1652	A	NUP93	R376H	G	1228	A
MARS	R727W	C	2202	T	MTM1	R207H	G	674	A	NDP	C95Y	C	692	T	NUP93	R77*	C	330	T
MARS	Q843H	A	2552	C	MTM1	N428S	A	1337	G	NDRG1	L160I	G	667	T	NUP93	R44C	C	231	T
MARVELD 2	-	G	0	A	MTM1	T138M	C	467	T	NDRG1	A108T	C	511	T	NUP93	R77*	C	330	T
MAS1	R185*	C	567	T	MTM1	R520Q	G	1613	A	NDRG2	R62H	C	268	T	NUP98	R995C	G	3400	A
MASP1	V643I	C	2153	T	MTM1	L119P	T	410	C	NDRG3	S264L	G	848	A	NUP98	Y493H	A	1894	G
MASP1	E636G	T	2297	C	MTM1	R174K	G	575	A	NDRG3	R23I	C	125	A	NUP98	E1585D	C	5172	A
MASP1	D513E	G	1929	T	MTMR1	Q344P	A	1188	C	NDRG4	R75W	C	336	T	NUP98	R204C	G	1027	A
MASP2	A360T	C	1094	T	MTMR1	N345K	C	1192	G	NDRG4	A129V	C	499	T	NUP98	R817S	G	2866	T
MASP2	G634R	C	1916	T	MTMR1	G52*	G	311	T	NDST2	S624G	T	2427	C	NUPL1	P332L	C	1245	T
MASP2	R555I	C	1680	A	MTMR10	T516M	G	1645	A	NDST3	P118T	C	755	A	NUPL1	S102P	T	554	C
MASP2	C142R	A	440	G	MTMR10	G722S	C	2262	T	NDST3	D415Y	G	1646	T	NVL	R798*	G	2652	A
MAST1	E486*	G	1495	T	MTMR10	R575Q	C	1822	T	NDST3	K250E	A	1151	G	NVL	L776V	A	2586	C
MAST1	R540*	C	1657	T	MTMR11	A397V	G	1410	A	NDST4	F720L	G	2839	T	NVL	E527D	T	1841	G
MAST1	P368L	C	1142	T	MTMR11	A171T	C	731	T	NDST4	L598I	G	2471	T	NVL	E79D	T	497	G
MAST1	R561C	C	1720	T	MTMR12	T473I	G	1589	A	NDST4	S382N	C	1824	T	NWD1	A1219T	G	3663	A
MAST2	R530W	C	1871	T	MTMR12	N600H	T	1969	G	NDST4	Q332H	T	1675	G	NWD1	S1397N	G	4198	A
MAST2	E941G	A	3105	G	MTMR14	T560M	C	1801	T	NDST4	L184F	G	1229	A	NWD1	S526I	G	1585	T

MAST3	F367L	T	1099	C	MTMR14	R600L	G	1921	T	NDUFA10	V251I	C	774	T	NXF1	I397M	A	1327	C
MAST3	T1004A	A	3010	G	MTMR15	K482N	G	1706	T	NDUFA10	F275L	A	846	G	NXNL1	H184Q	G	599	T
MAST3	I953V	A	2857	G	MTMR15	A332T	G	1254	A	NDUFA12	F108C	A	378	C	NXNL1	A192V	G	622	A
MAST3	P929L	C	2786	T	MTMR15	C954R	T	3120	C	NDUFA4	A26V	G	276	A	NXPH1	K116N	G	1259	T
MAST4	R199H	G	893	A	MTMR15	R824C	C	2730	T	NDUFA6	R131W	G	453	A	NXPH2	R188H	C	670	T
MAST4	R1503W	C	4804	T	MTMR15	I205M	T	875	G	NDUFA9	A364V	C	1101	T	NXPH2	C187Y	C	667	T
MAST4	R1675*	C	5320	T	MTMR15	R697I	G	2350	T	NDUFA9	R222W	C	674	T	NXPH3	P215H	C	742	A
MAST4	A2051V	C	6449	T	MTMR2	A629S	C	2226	A	NDUFA9	P268L	C	813	T	NXPH3	A208T	G	720	A
MAST4	R874W	C	2917	T	MTMR2	K610Q	T	2169	G	NDUFA9	A372T	G	1124	A	NXPH4	R244C	C	905	T
MAST4	R917*	C	3046	T	MTMR2	M180I	C	881	A	NDUFAF1	A161T	C	879	T	NYNRIN	P8H	C	341	A
MASTL	S684L	C	2108	T	MTMR3	P309L	C	1268	T	NDUFAF1	R179Q	C	934	T	NYNRIN	P1867S	C	5917	T
MASTL	P371L	C	1169	T	MTMR3	R356W	C	1408	T	NDUFAF1	P275L	G	1222	A	NYNRIN	R1855Q	G	5882	A
MASTL	R650I	G	2006	T	MTMR3	R797*	C	2731	T	NDUFAF4	E89K	C	345	T	NYNRIN	P547S	C	1957	T
MAT2A	A157T	G	592	A	MTMR4	R156C	G	576	A	NDUFB10	R16C	C	153	T	NYNRIN	R827Q	G	2798	A
MAT2A	R84H	G	374	A	MTMR4	Q794H	C	2492	A	NDUFB10	Y62C	A	292	G	NYNRIN	E991*	G	3289	T
MAT2A	I266T	T	920	C	MTMR6	C72Y	C	977	T	NDUFB4	R12H	G	86	A	NYX	E157K	G	925	A
MAT2B	E190D	A	686	C	MTMR6	R594C	G	2542	A	NDUFB5	V108G	T	322	G	OAS1	S376Y	C	1233	A
MAT2B	R312*	C	1050	T	MTMR7	I545F	T	1668	A	NDUFB5	I138S	T	412	G	OAS2	K197N	G	731	T
MATK	S435L	G	1304	A	MTMR7	R73H	C	253	T	NDUFB7	R56Q	C	241	T	OAS3	K207T	A	799	C
MATK	A393V	G	1178	A	MTMR9	T454M	C	1775	T	NDUFC2	R59C	G	650	A	OAS3	P224T	C	849	A
MATN1	G403S	C	1243	T	MTMR9	K8N	G	438	T	NDUFS1	R552Q	C	1655	T	OAS3	T673M	C	2197	T
MATN1	A340V	G	1055	A	MTMR9	R77*	C	643	T	NDUFS1	R422H	C	1265	T	OASL	R352Q	C	1326	T
MATN1	E289D	C	903	A	MTNR1A	R225H	C	876	T	NDUFS1	R36*	G	106	A	OASL	D333G	T	1269	C
MATN2	G412D	G	1466	A	MTNR1B	A28V	C	186	T	NDUFS5	R16Q	G	134	A	OAT	A404T	C	1303	T
MATN2	D175N	G	754	A	MTNR1B	T157I	C	573	T	NDUFS8	Y104C	A	418	G	OAZ2	V176G	A	527	C
MATN2	Y884F	A	2882	T	MTNR1B	F102L	C	409	A	NDUFV1	R449Q	G	1499	A	OBFC1	H317Y	G	1117	A
MATN3	K477N	T	1494	G	MTNR1B	R316H	G	1050	A	NDUFV2	N62H	A	301	C	OBFC1	-	A	0	G
MATN4	V178M	C	541	T	MTO1	-	G	0	C	NDUFV3	M407L	A	1288	T	OBSCN	A983V	C	2992	T
MATN4	L358I	G	1081	T	MTO1	Q643H	G	2053	T	NDUFV3	K62N	G	255	T	OBSCN	R2408W	C	7266	T
MATN4	A619V	G	1865	A	MTOR	R403Q	C	1285	T	NEB	S6547N	C	19843	T	OBSCN	A5481V	C	1648 6	T
MAX	R60Q	C	310	T	MTOR	A1792V	G	5452	A	NEB	E5904*	C	17913	A	OBSCN	E7801K	G	2344 5	A
MBD2	Y196H	A	815	G	MTOR	R491Q	C	1549	T	NEB	K3562N	C	10889	A	OBSCN	W7577L	G	2277 4	T
MBD2	G198*	C	821	A	MTOR	N1899D	T	5772	C	NEB	-	C	0	A	OBSCN	G813V	G	2482	T
MBD3	R65C	G	193	A	MTOR	T1844A	T	5607	C	NEB	E2594D	C	7985	A	OBSCN	S4833N	G	1454 2	A
MBD4	-	C	0	A	MTOR	G716S	C	2223	T	NEB	S6213A	A	18840	C	OBSCN	R6749H	G	2029 0	A
MBD4	R251M	C	928	A	MTOR	V2417M	C	7326	T	NEB	V1155M	C	3666	T	OBSCN	G7107E	G	2136	A

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MBD5	T720A	A	2287	G	MTOR	R628H	C	1960	T	NEB	R6013Q	C	18241	T	OBSCN	A5808T	G	17466	A
MBD5	A897T	G	2818	A	MTOR	I2457M	A	7448	C	NEB	-	C	0	A	OBSCN	Y6412C	A	19279	G
MBD5	I521N	T	1691	A	MTOR	L783R	A	2425	C	NEB	D4825N	C	14676	T	OBSCN	N6638I	A	19957	T
MBD5	A1320V	C	4088	T	MTPAP	L422I	G	1264	T	NEB	V3031I	C	9294	T	OBSCN	E1261A	A	3826	C
MBD5	H330Q	C	1119	A	MTPAP	-	C	0	A	NEB	Q2660R	T	8182	C	OBSCN	R231H	G	736	A
MBD5	H113N	C	466	A	MTR	L1192I	C	3968	A	NEB	G2554D	C	7864	T	OBSCN	L3795I	C	11427	A
MBD5	S550Y	C	1778	A	MTR	W1150*	G	3844	A	NEB	S4529R	T	13788	G	OBSCN	A255T	G	807	A
MBD6	R374Q	G	1345	A	MTRF1	F55C	A	164	C	NEB	-	A	0	G	OBSCN	R245C	C	777	T
MBD6	I37T	T	334	C	MTRR	Q359*	C	1105	T	NEB	V2883I	C	8850	T	OBSCN	G5240D	G	15763	A
MBL2	V234I	C	765	T	MTRR	L451F	G	1383	T	NEB	R3538W	G	10815	A	OBSCN	R1397*	C	4233	T
MBL2	G51E	C	217	T	MTRR	R621S	A	1893	T	NEB	R2799H	C	8599	T	OBSCN	E3049D	G	9191	T
MBLAC2	R242Q	C	1201	T	MTRR	L370F	G	1140	T	NEB	E1957G	T	6073	C	OBSCN	H3860N	C	11622	A
MBNL1	R29Q	G	1928	A	MTSS1	A127T	C	697	T	NEB	R6172G	T	18717	C	OBSCN	S4542Y	C	13669	A
MBNL1	Q44R	A	1973	G	MTSS1L	A189V	G	826	A	NEB	A5408T	C	16425	T	OBSCN	K5773N	G	17363	T
MBNL3	E227D	C	760	A	MTSS1L	G560S	C	1938	T	NEB	E4640*	C	14121	A	OBSCN	E6132K	G	18438	A
MBOAT7	A346T	C	1517	T	MTSS1L	A562T	C	1944	T	NEB	E4152*	C	12657	A	OBSCN	D6221N	G	18705	A
MBOAT7	G385W	C	1634	A	MTTP	M456I	G	1381	T	NEB	E3454A	T	10564	G	OBSCN	R465C	C	1437	T
MBP	E129D	C	651	A	MTTP	M499I	G	1510	A	NEB	K3302N	C	10109	A	OBSCN	Y5141C	A	15466	G
MBP	A135V	G	668	A	MTTP	L624M	C	1883	A	NEB	K823Q	T	2670	G	OBSL1	V1820I	C	5515	T
MBP	K28N	T	348	G	MTUS1	L641V	G	2395	C	NEB	D733V	T	2401	A	OBSL1	A1619T	C	4912	T
MBTPS1	T242M	G	1258	A	MTUS1	A587D	G	2234	T	NEB	L4010V	G	12231	C	OBSL1	R415W	G	1300	A
MBTPS1	L562M	G	2217	T	MTUS2	E754*	G	2318	T	NEBL	L406I	G	1613	T	OBSL1	A1480G	G	4496	C
MC1R	G43R	G	127	A	MTUS2	G1130S	G	3446	A	NEBL	G91D	C	669	T	OBSL1	D1644N	C	4987	T
MC1R	S485L	C	1454	T	MTUS2	R252C	C	812	T	NEBL	F594C	A	2178	C	OBSL1	T1436M	G	4364	A
MC2R	L55I	G	340	T	MTUS2	A920V	C	2817	T	NECAB1	C285*	C	1132	A	OBSL1	F816L	A	2503	G
MC3R	V330I	G	988	A	MTUS2	P758H	C	2331	A	NECAB1	S289Y	C	1143	A	OC90	-	T	0	C
MC3R	H190Y	C	568	T	MTUS2	P608H	C	1881	A	NECAB2	R385Q	G	1177	A	OC90	V74M	C	320	T
MC4R	C138F	C	832	A	MTUS2	E390D	G	1228	T	NECAB3	R369C	G	1161	A	OC90	E422D	T	1366	G
MC4R	R18C	G	471	A	MTUS2	A1238E	C	3771	A	NECAB3	S361T	A	1137	T	OC90	N268T	T	903	G
MC4R	K73T	T	637	G	MTUS2	L1271I	C	3869	A	NECAB3	E93K	C	333	T	OC90	P44H	G	131	T
MC5R	V202G	T	827	G	MTX2	V186I	G	767	A	NECAP1	D87A	A	338	C	OC90	R371*	G	1211	A

MC5R	R303Q	G	1130	A	MTX3	F72L	A	235	G	NEDD1	F14S	T	187	C	OC90	I122M	A	366	C
MC5R	V75M	G	445	A	MUC1	L108M	G	388	T	NEDD1	I493M	A	1625	G	OC90	N142S	T	425	C
MC5R	G165S	G	715	A	MUC12	A493V	C	1478	T	NEDD1	E539D	G	1763	T	OCA2	R566C	G	1852	A
MCAM	R127H	C	409	T	MUC12	S4960Y	C	1487 9	A	NEDD4	V549I	C	1945	T	OCA2	D372N	C	1270	T
MCAM	D476Y	C	1455	A	MUC13	F227L	A	718	G	NEDD4	V761A	A	2582	G	OCA2	K613N	T	1995	G
MCART6	A35T	C	284	T	MUC13	E456D	C	1407	A	NEDD4	A822V	G	2765	A	OCA2	A339T	C	1171	T
MCART6	S194Y	G	762	T	MUC13	T450M	G	1388	A	NEDD4	E632*	C	2194	A	OCA2	-	T	0	C
MCC	R65H	C	610	T	MUC16	I5936M	T	1780 8	C	NEDD4L	G247D	G	740	A	OCEL1	L126P	T	379	C
MCC	D237G	T	1126	C	MUC16	S3128Y	G	9383	T	NEDD4L	L230P	T	689	C	OCEL1	K140R	A	421	G
MCC	S22G	T	480	C	MUC16	V7888I	C	2366 2	T	NEDD9	P109Q	G	493	T	OCIAD1	D219N	G	845	A
MCC	E619K	C	2271	T	MUC16	P4164H	G	1249 1	T	NEDD9	T764A	T	2457	C	OCIAD2	D148N	C	675	T
MCC	S24G	T	486	C	MUC16	A3135V	G	9404	A	NEFH	R323H	G	1001	A	OCLN	R162I	G	921	T
MCCC1	A195T	C	730	T	MUC16	A273V	G	818	A	NEFH	A70T	G	241	A	OCLN	R268Q	G	1239	A
MCCC1	R281*	G	988	A	MUC16	T2565A	T	7693	C	NEFH	A68T	G	235	A	OCM2	K29T	T	178	G
MCF2	T911I	G	2763	A	MUC16	T6502I	G	1950 5	A	NEFH	S801Y	C	2435	A	OCRL	E899K	G	2860	A
MCF2	R139W	G	446	A	MUC16	A6156T	C	1846 6	T	NEFL	G32D	C	690	T	OCRL	S78F	C	398	T
MCF2	-	C	0	T	MUC16	L1474I	G	4420	T	NEFL	K499T	T	2091	G	ODC1	R183W	G	1058	A
MCF2	Q340R	T	1050	C	MUC16	E6809*	C	2042 5	A	NEFL	-	C	0	T	ODC1	E7D	T	532	G
MCF2	R176H	C	558	T	MUC16	A3749T	C	1124 5	T	NEFM	E123*	G	1149	T	ODF1	R34Q	G	209	A
MCF2L	A154T	G	482	A	MUC16	P7257Q	G	2177 0	T	NEFM	A213V	C	1420	T	ODF1	R63C	C	295	T
MCF2L2	T219M	G	954	A	MUC16	T8509A	T	2552 5	C	NEFM	T889N	C	3448	A	ODF1	E30K	G	196	A
MCF2L2	P619T	G	2153	T	MUC16	A5410T	C	1622 8	T	NEFM	R196C	C	1368	T	ODF1	R242Q	G	833	A
MCF2L2	R406G	T	1514	C	MUC16	T6622I	G	1986 5	A	NEFM	R137Q	G	1192	A	ODF2	L458P	T	1684	C
MCF2L2	R926Q	C	3075	T	MUC16	S2768P	A	8302	G	NEFM	P673Q	C	2800	A	ODF2	-	G	0	A
MCHR1	G264S	G	1486	A	MUC16	G667W	C	1999	A	NEFM	K793N	G	3161	T	ODF2	E577D	G	2042	T
MCHR2	W9C	C	118	A	MUC16	L8512W	A	2553 5	C	NEFM	F452V	T	2136	G	ODF2	R271Q	G	1123	A
MCHR2	F208S	A	714	G	MUC16	K8082N	T	2424 6	G	NEGR1	I345T	A	1274	G	ODF2L	T31A	T	438	C
MCHR2	A265D	G	885	T	MUC16	T6901I	G	2070 2	A	NEGR1	G324E	C	1211	T	ODF2L	L488R	A	1810	C
MCHR2	F207L	A	712	C	MUC16	S6881F	G	2064	A	NEIL1	A111T	G	837	A	ODF2L	K387T	T	1507	G

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MCL1	G148R	C	502	T	MUC16	S6863I	C	20588	A	NEIL3	F589V	T	1883	G	ODF2L	E141A	T	769	G
MCM10	R259Q	G	880	A	MUC16	S6623F	G	19868	A	NEK1	R742C	G	2804	A	ODF3	R14H	G	358	A
MCM10	N772S	A	2419	G	MUC16	T7023A	T	21067	C	NEK1	D128Y	C	962	A	ODF3L1	S210P	T	851	C
MCM2	D221N	G	905	A	MUC16	N6782S	T	20345	C	NEK1	R630C	G	2468	A	ODF3L1	T52M	C	378	T
MCM2	T158M	C	717	T	MUC16	M6087I	C	18261	A	NEK10	L308I	G	1196	T	ODF3L2	Q173H	C	755	A
MCM2	A452V	C	1599	T	MUC16	S6021Y	G	18062	T	NEK10	C639Y	C	2190	T	ODF3L2	R98H	C	529	T
MCM2	T666S	C	2241	G	MUC16	S5348Y	G	16043	T	NEK10	S781L	G	2616	A	ODF4	N165T	A	682	C
MCM2	R33W	C	341	T	MUC16	V5214F	C	15640	A	NEK10	S618F	G	2127	A	ODZ1	F2276L	G	6889	T
MCM3	L344P	A	1031	G	MUC16	V4753A	A	14258	G	NEK10	E382D	T	1420	G	ODZ1	A231T	C	752	T
MCM3	G809D	C	2426	T	MUC16	A4548S	C	13642	A	NEK10	F347C	A	1314	C	ODZ1	F161L	G	544	C
MCM3AP	E659K	C	2230	T	MUC16	I4528M	T	13584	C	NEK10	N96K	A	562	C	ODZ1	V94I	C	341	T
MCM3AP	S680L	G	2294	A	MUC16	F4459L	G	13377	T	NEK10	K17T	T	324	G	ODZ1	Y1573C	T	4779	C
MCM3AP	A17V	G	305	A	MUC16	S3993Y	G	11978	T	NEK11	L397F	A	1484	C	ODZ1	I2363V	T	7148	C
MCM3AP	L1518M	G	4807	T	MUC16	S3711Y	G	11132	T	NEK11	Q33H	A	392	C	ODZ1	-	C	0	T
MCM3AP	E421K	C	1516	T	MUC16	T3159K	G	9476	T	NEK11	K258Q	A	1065	C	ODZ1	F2366C	A	7158	C
MCM3AP	A867T	C	2854	T	MUC16	E2683*	C	8047	A	NEK11	E377*	G	1422	T	ODZ1	Q2216K	G	6707	T
MCM4	Q594*	C	1875	T	MUC16	E2346A	T	7037	G	NEK5	R96W	G	426	A	ODZ1	S1272Y	G	3876	T
MCM4	H420N	C	1353	A	MUC16	I1488M	A	4464	C	NEK5	R443I	C	1468	A	ODZ1	S1137Y	G	3471	T
MCM4	D655G	A	2059	G	MUC16	T837N	G	2510	T	NEK5	G140R	C	558	T	ODZ1	T455A	T	1424	C
MCM5	G203E	G	762	A	MUC16	D713E	G	2139	T	NEK5	K49N	C	287	A	ODZ1	I450S	A	1410	C
MCM6	V376I	C	1187	T	MUC16	A282V	G	845	A	NEK7	R282Q	G	1159	A	ODZ1	E621K	C	1922	T
MCM6	R722Q	C	2226	T	MUC17	A1263T	G	3851	A	NEK7	T199M	C	910	T	ODZ2	R59K	G	176	A
MCM7	R611H	C	2478	T	MUC17	R4318W	C	13016	T	NEK7	L222R	T	979	G	ODZ2	T1701A	A	5101	G
MCM7	R590Q	C	2415	T	MUC17	I1445T	T	4398	C	NEK8	Q53H	G	159	T	ODZ2	S1780N	G	5339	A
MCM7	R396*	G	1832	A	MUC17	G4228R	G	12746	A	NEK8	P689L	C	2066	T	ODZ2	R2164C	C	6490	T
MCM7	L356F	G	1712	A	MUC17	P1407L	C	4284	T	NEK9	K199N	C	751	A	ODZ2	R358S	G	1074	T
MCM8	T205A	A	990	G	MUC17	R4422W	C	1332	T	NEK9	V240I	C	872	T	ODZ2	R2141W	C	6421	T

MCOLN1	R486C	C	1579	T	MUC17	G3151C	G	9515	T	NEK9	V468M	C	1556	T	ODZ2	M2218V	A	6652	G					
MCOLN2	R217W	G	890	A	MUC17	V3529M	G	10649	A	NEK9	T250M	G	903	A	ODZ2	P182T	C	544	A					
MCOLN3	S374G	T	1171	C	MUC17	L1280*	T	3903	G	NELF	F279I	A	1067	T	ODZ2	A876V	C	2627	T					
MCPH1	P367L	C	1168	T	MUC17	V2186A	T	6621	C	NELL1	W149*	G	600	A	ODZ2	R2086W	C	6256	T					
MCPH1	S834P	T	2568	C	MUC2	C574Y	G	1748	A	NELL1	-	A	0	T	ODZ2	E1559K	G	4675	A					
MCRS1	R439H	C	1316	T	MUC2	A216T	G	673	A	NELL1	D206A	A	770	C	ODZ3	V690I	G	2191	A					
MCTP1	L482P	A	1445	G	MUC2	R1385H	G	4181	A	NELL2	V766F	C	2421	A	ODZ3	P2449S	C	7468	T					
MCTP1	K604R	T	1811	C	MUC2	N770D	A	2335	G	NELL2	S513Y	G	1663	T	ODZ3	D72Y	G	337	T					
MCTP1	N960K	G	2880	C	MUC2	R2308H	G	6950	A	NELL2	H682R	T	2170	C	ODZ3	V2596M	G	7909	A					
MCTP1	L813F	G	2437	A	MUC2	P2549S	C	7672	T	NELL2	R244I	C	856	A	ODZ3	T209A	A	748	G					
MCTP1	R699Q	C	2096	T	MUC2	R486H	G	1484	A	NELL2	K220T	T	784	G	ODZ3	N1136T	A	3530	C					
MCTP1	F523C	A	1568	C	MUC2	A249T	G	772	A	NELL2	L28I	G	207	T	ODZ3	S1338R	C	4137	G					
MCTP2	K827T	A	2829	C	MUC2	K454N	G	1389	T	NENF	T92M	C	332	T	ODZ3	A2490T	G	7591	A					
MCTS1	G36D	G	640	A	MUC2	G1362E	G	4112	A	NES	A962V	G	3018	A	ODZ3	A1177V	C	3653	T					
MDGA1	E248K	C	742	T	MUC4	A1870T	C	5680	T	NETO1	R261H	C	1440	T	ODZ3	Y1187H	T	3682	C					
MDGA1	R327*	G	979	A	MUC4	A4685T	C	14125	T	NETO1	R5C	G	671	A	ODZ3	S127P	T	502	C					
MDGA1	T862M	G	2585	A	MUC4	A760T	C	2350	T	NETO1	A75T	C	881	T	ODZ3	F328V	T	1105	G					
MDGA1	S745Y	G	2234	T	MUC4	R2432H	C	7367	T	NETO1	K249T	T	1404	G	ODZ3	L1296*	T	4010	G					
MDGA2	R30C	G	249	A	MUC4	G870S	C	2680	T	NETO1	Y215*	G	1303	T	ODZ3	K1794T	A	5504	C					
MDGA2	I502S	A	1666	C	MUC4	-	C	0	T	NETO1	D105Y	C	971	A	ODZ3	S2071Y	C	6335	A					
MDH1B	F416L	A	1524	C	MUC4	S4133N	C	12470	T	NETO2	R273*	G	1202	A	ODZ4	D2218N	C	7115	T					
MDM1	K660Q	T	2114	G	MUC4	S4133G	T	12469	C	NETO2	G356W	C	1451	A	ODZ4	S1902Y	G	6168	T					
MDM1	E338*	C	1148	A	MUC5B	S3751N	G	11378	A	NETO2	T430A	T	1673	C	ODZ4	R2238W	G	7175	A					
MDM1	F238V	A	848	C	MUC5B	T3267M	C	9926	T	NETO2	V205I	C	998	T	ODZ4	A1165T	C	3956	T					
MDM1	R236I	C	843	A	MUC5B	V5398I	G	16318	A	NEU2	R283H	G	848	A	ODZ4	A1962V	G	6348	A					
MDM2	V234A	T	1003	C	MUC5B	A799V	C	2522	T	NEU3	R278W	C	1759	T	ODZ4	L2162F	G	6947	A					
MDM2	R189C	C	867	T	MUC5B	R3985W	C	12079	T	NEU3	P122S	C	1291	T	ODZ4	V1023I	C	3530	T					
MDN1	Q3186H	C	9674	A	MUC5B	P3737L	C	11336	T	NEU4	A212T	G	1063	A	ODZ4	L1412V	A	4697	C					
MDN1	V3293I	C	9993	T	MUC5B	T897M	C	2816	T	NEU4	R399C	C	1624	T	ODZ4	V122A	A	828	G					
MDN1	R3240C	G	9834	A	MUC5B	G1558V	G	4799	T	NEU4	R143S	C	856	A	ODZ4	R1816H	C	5910	T					
MDN1	R892I	C	2791	A	MUC5B	A966T	G	3022	A	NEU4	F213S	T	1067	C	ODZ4	A346T	C	1499	T					
MDN1	G4048S	C	12258	T	MUC5B	V5240M	G	15844	A	NEURL	R132C	C	803	T	ODZ4	C1057Y	C	3633	T					

MDN1	G2262R	C	6900	T	MUC5B	L840P	T	2645	C	NEURL	S501L	C	1911	T	ODZ4	A2496V	G	7950	A
MDN1	R3240C	G	9834	A	MUC5B	V5359I	G	16201	A	NEURL	R548H	G	2052	A	ODZ4	R973W	G	3380	A
MDN1	S3878P	A	11748	G	MUC5B	R5466H	G	16523	A	NEURL1B	V69I	G	339	A	ODZ4	T513A	T	2000	C
MDN1	M703T	A	2224	G	MUC5B	P2303L	C	7034	T	NEURL1B	A496V	C	1621	T	OFCC1	V111A	A	381	G
MDN1	V628L	C	1998	A	MUC5B	F1309L	T	4051	C	NEURL2	S136G	T	702	C	OFD1	E490K	G	1795	A
MDN1	R66H	C	313	T	MUC5B	E2157K	G	6595	A	NEURL4	R1016C	G	3053	A	OFD1	R344Q	G	1358	A
MDN1	R984H	C	3067	T	MUC5B	F5274L	C	15948	A	NEURL4	R366H	C	1104	T	OGDH	T205A	A	666	G
MDN1	T4798A	T	14508	C	MUC6	T2342M	G	7076	A	NEURL4	K198T	T	600	G	OGDH	R275Q	G	877	A
MDN1	V3254I	C	9876	T	MUC6	T1245I	G	3785	A	NEUROD1	R113H	C	796	T	OGDH	R994C	C	3033	T
MDN1	A1911V	G	5848	A	MUC6	E1144K	C	3481	T	NEUROD1	R144H	C	889	T	OGDHL	V428I	C	1368	T
MDN1	V35A	A	220	G	MUC6	G839E	C	2567	T	NEUROD2	P301T	G	1122	T	OGDHL	R758W	G	2358	A
MDN1	C666Y	C	2113	T	MUCL1	P84L	C	319	T	NEUROD6	C123*	A	692	T	OGDHL	D810G	T	2515	C
MDN1	-	T	16906	A	MUCL1	V80A	T	307	C	NEUROD6	E66*	C	519	A	OGDHL	R629C	G	1971	A
MDN1	D4864G	T	14707	C	MUDENG	C325*	C	1402	A	NEUROG1	A111S	C	590	A	OGDHL	R958H	C	2959	T
MDN1	D4565E	A	13811	C	MUDENG	L149I	C	872	A	NEUROG1	P120S	G	617	A	OGFOD1	H451R	A	1470	G
MDN1	S4427R	T	13395	G	MUL1	H118N	G	489	T	NEUROG2	S232F	G	1022	A	OGFOD2	K82R	A	245	G
MDN1	K3972T	T	12031	G	MUL1	A342V	G	1162	A	NEXN	R127H	G	564	A	OGFR	P105S	C	338	T
MDN1	S3763R	A	11405	C	MUL1	R73W	G	354	A	NEXN	S243Y	C	912	A	OGFRL1	R122H	G	499	A
MDN1	I3588S	A	10879	C	MUL1	C62S	C	322	G	NEXN	K454Q	A	1544	C	OGFRL1	R218Q	G	787	A
MDN1	R2012C	G	6150	A	MUM1	V433I	G	1396	A	NEXN	I613L	A	2021	C	OGG1	R97C	C	632	T
ME1	E227K	C	796	T	MUM1	L39V	C	214	G	NF1	R1695W	C	5466	T	OGN	I142M	T	619	C
ME2	R225*	C	945	T	MUM1	K452E	A	1453	G	NF1	A1858T	G	5955	A	OGT	R557H	G	1887	A
ME2	P370S	C	1380	T	MUM1	I517L	A	1648	C	NF1	L104S	T	694	C	OGT	Q106R	A	534	G
ME3	A556V	G	1769	A	MUM1L1	P251S	C	1400	T	NF1	R416*	C	1629	T	OIT3	R506H	G	1735	A
ME3	L238I	G	814	T	MUM1L1	G435D	G	1953	A	NF2	Q459H	G	1818	T	OIT3	R506H	G	1735	A
ME3	R547K	C	1742	T	MUM1L1	S200L	C	1248	T	NFASC	V662I	G	2271	A	OLA1	F407V	A	1850	C
MEAF6	S136I	C	424	A	MURC	V147L	G	504	C	NFASC	A1224V	C	3958	T	OLAH	F106C	T	504	G
MEAF6	G181D	C	559	T	MURC	S146Y	C	502	A	NFASC	V663I	G	2274	A	OLAH	F150C	T	636	G
MECOM	E729*	C	2283	A	MUS81	W182C	G	899	T	NFASC	A1074T	G	3507	A	OLFM1	-	T	1707	C
MECOM	G498S	C	1590	T	MUS81	V305I	G	1266	A	NFASC	A1046V	C	3424	T	OLFM3	R129W	G	385	A
MECP2	R97H	C	345	T	MUSK	L571F	G	1847	T	NFASC	G456V	G	1654	T	OLFM3	A358V	G	1073	A
MECR	F250L	G	776	T	MUSK	R842H	G	2659	A	NFASC	A253V	C	1045	T	OLFM3	R267C	G	799	A

MECR	R139W	G	441	A	MUSK	E831D	G	2627	T	NFASC	F1218L	C	3941	A	OLFM3	T107N	G	320	T
MECR	G121R	C	387	T	MUSK	R842H	G	2659	A	NFAT5	K634Q	A	3108	C	OLFM4	E452D	G	1434	T
MECR	T163I	G	514	A	MUT	E564*	C	1818	A	NFATC1	V318I	G	1018	A	OLFM4	G297R	G	967	A
MED1	T998I	G	3199	A	MUT	R467Q	C	1528	T	NFATC1	S297L	C	956	T	OLFM4	L109I	C	403	A
MED1	V452A	A	1561	G	MUT	Q383R	T	1276	C	NFATC1	Q610*	C	1894	T	OLFML1	I148K	T	837	A
MED1	K1501N	T	4709	G	MUTYH	S346L	G	1253	A	NFATC1	T926A	A	2842	G	OLFML2A	L501P	T	1502	C
MED1	S1290Y	G	4075	T	MUTYH	N279T	T	1052	G	NFATC1	R670I	G	2075	T	OLFML2A	R611H	G	1832	A
MED1	S1124R	T	3576	G	MUTYH	Q527H	T	1797	G	NFATC1	R920Q	G	2825	A	OLFML2A	L550P	T	1649	C
MED12	R815W	C	2642	T	MUTYH	S6A	A	232	C	NFATC2	R754Q	C	2481	T	OLFML2B	E311D	C	1357	A
MED12	R540C	C	1817	T	MVD	S251N	C	782	T	NFATC2	V750I	C	2468	T	OLFML2B	V679I	C	2459	T
MED12	L272M	T	1013	A	MVK	S135L	C	597	T	NFATC2	T533M	G	1818	A	OLFML2B	V679I	C	2459	T
MED12	V1119G	T	3555	G	MVP	D615N	G	1981	A	NFATC2	R572Q	C	1935	T	OLFML2B	K179N	T	961	A
MED12L	S718Y	C	2191	A	MVP	E412K	G	1372	A	NFATC3	V192M	G	598	A	OLFML2B	E261K	C	1205	T
MED12L	D1030N	G	3126	A	MVP	R49H	G	284	A	NFATC3	D547N	G	1663	A	OLFML2B	R203Q	C	1032	T
MED12L	S919*	C	2794	G	MX1	R522C	C	2589	T	NFATC3	V678E	T	2057	A	OLIG1	R113S	C	440	A
MED12L	E449*	G	1383	T	MX1	R655C	C	2988	T	NFATC3	E139D	A	441	C	OLIG1	A138V	C	516	T
MED12L	Q1490H	G	4508	T	MX2	I223V	A	851	G	NFATC3	A1001V	C	3026	T	OLIG2	A53V	C	402	T
MED12L	L1569I	C	4743	A	MX2	Y21C	A	246	G	NFATC4	E958D	G	2990	T	OLIG3	P116L	G	571	A
MED12L	A1917V	C	5788	T	MX2	G125R	G	557	A	NFATC4	S44N	G	247	A	OLR1	W148*	C	557	T
MED13	R1836S	T	5585	G	MX2	I249V	A	929	G	NFATC4	S280L	C	955	T	OMA1	Y381S	T	1256	G
MED13	P1698H	G	5170	T	MX2	V123I	G	551	A	NFATC4	P190L	C	685	T	OMA1	V99A	A	410	G
MED13	R471C	G	1488	A	MX2	F495V	T	1667	G	NFATC4	S732A	T	2310	G	OMG	K302T	T	1087	G
MED13	F1963L	A	5964	G	MX2	F634L	C	2086	A	NFE2	R323H	C	1241	T	ONECUT1	E291D	C	1001	G
MED13L	S365L	G	1301	A	MX2	F647C	T	2124	G	NFE2L2	R502C	G	2059	A	ONECUT1	R35C	G	231	A
MED13L	V531M	C	1798	T	MX2	R695I	G	2268	T	NFE2L2	A124V	G	926	A	ONECUT2	R314Q	G	973	A
MED13L	R440*	G	1525	A	MXD1	R69W	C	465	T	NFE2L3	M395I	G	1444	C	ONECUT2	W378L	G	1165	T
MED13L	A1278V	G	4040	A	MXD3	R225H	C	739	T	NFE2L3	S297Y	C	1149	A	ONECUT3	S338N	G	1013	A
MED13L	-	A	0	G	MXD4	A98T	C	606	T	NFIA	R83Q	G	330	A	ONECUT3	G310C	G	928	T
MED13L	K1873T	T	5825	G	MXRA5	R2224Q	C	6798	T	NFIA	A432D	C	1377	A	OPA1	R766*	C	2530	T
MED13L	R1283W	G	4054	A	MXRA5	R2147H	C	6567	T	NFIA	L176I	C	608	A	OPA1	I938T	T	3047	C
MED15	-	G	0	A	MXRA5	T2672M	G	8142	A	NFIA	D221N	G	743	A	OPA1	-	A	0	G
MED16	R456S	G	1517	T	MXRA5	V503M	C	1634	T	NFIA	P19L	C	138	T	OPA3	R26H	C	177	T
MED16	-	C	0	A	MXRA5	G674A	C	2148	G	NFIB	L151P	A	1460	G	OPALIN	E113K	C	743	T
MED17	K235Q	A	978	C	MXRA5	P1841S	G	5648	A	NFIL3	V9I	C	602	T	OPCML	V31A	T	92	C
MED18	F117L	C	560	A	MXRA5	R682H	C	2172	T	NFIX	I148T	T	443	C	OPCML	S11Y	C	361	A
MED20	R136Q	C	488	T	MXRA5	A1485V	G	4581	A	NFIX	E182*	G	544	T	OPCML	I138M	T	414	G
MED20	Y117H	A	430	G	MXRA5	T586A	T	1883	C	NFKB1	E931K	G	3258	A	OPLAH	L980P	A	3021	G
MED23	L577S	A	1904	G	MXRA5	K234Q	T	827	G	NFKB1	K105N	A	782	T	OPLAH	T242M	G	807	A
MED23	D901N	C	2875	T	MXRA5	L162I	G	611	T	NFKB1	A219T	G	1122	A	OPLAH	R615W	G	1925	A

MED24	E473*	C	1521	A	MXRA5	Y2395S	T	7311	G	NFKB2	T732M	C	2396	T	OPLAH	R1198C	G	3674	A
MED24	A457T	C	1473	T	MXRA7	G193A	C	606	G	NFKBIB	D318N	G	1010	A	OPLAH	M1114T	A	3423	G
MED24	C359R	A	1179	G	MYADM	R93H	G	426	A	NFKBIB	P236L	C	765	T	OPLAH	L916M	G	2828	T
MED24	R672C	G	2118	A	MYBBP1A	G750R	C	2310	T	NFKBIB	D184N	G	608	A	OPLAH	V1086M	C	3338	T
MED25	R132H	G	448	A	MYBBP1A	T1229A	T	3747	C	NFKBIB	S108Y	C	381	A	OPN1LW	E20D	G	120	T
MED25	-	G	0	T	MYBL1	R454*	G	1360	A	NFKBIB	R275C	C	881	T	OPN1SW	K321E	T	961	C
MED26	R279Q	C	1097	T	MYBL1	I230N	A	689	T	NFKBIL2	H91Y	G	301	A	OPN3	V190M	C	675	T
MED26	R26W	G	337	A	MYBL1	P485Q	G	1454	T	NFKBIL2	E453K	C	1387	T	OPN4	Q454*	C	1527	T
MED26	A108T	C	583	T	MYBL1	F224L	A	672	C	NFKBIL2	R550G	T	1678	C	OPN4	G284R	G	1017	A
MED27	A150T	C	512	T	MYBL2	K93Q	A	404	C	NFKBIL2	A1166V	G	3527	A	OPN4	P241L	C	889	T
MED28	S38R	C	114	A	MYBPC1	E458D	A	1476	C	NFKBIL2	F340V	A	1048	C	OPN4	R387C	C	1326	T
MED30	R140Q	G	570	A	MYBPC1	Q315R	A	1046	G	NFKBIL2	R339C	G	1045	A	OPN5	E232D	A	781	C
MED4	M229I	C	713	A	MYBPC1	E40K	G	220	A	NFKBIZ	R11H	G	147	A	OPN5	Y159H	T	560	C
MED8	R282C	G	888	A	MYBPC1	H160Y	C	580	T	NFRKB	S1171Y	G	3633	T	OPRK1	R342W	G	1259	A
MEF2C	I138N	A	819	T	MYBPC1	E676*	G	2128	T	NFRKB	A611T	C	1952	T	OPRK1	P215T	G	878	T
MEF2C	D445N	C	1739	T	MYBPC2	V575I	G	1774	A	NFRKB	R37C	G	230	A	OPRL1	A178T	G	896	A
MEF2D	P236H	G	1188	T	MYBPC2	V1058M	G	3223	A	NFRKB	A1082S	C	3365	A	OPTN	A99V	C	969	T
MEF2D	V148L	C	923	A	MYBPC2	R403H	G	1259	A	NFS1	T92I	G	346	A	OPTN	R96H	G	960	A
MEFV	F748L	G	2284	T	MYBPC2	S161F	C	533	T	NFS1	R434Q	C	1372	T	OPTN	T145N	C	1107	A
MEFV	R239*	G	755	A	MYBPC2	K301N	G	954	T	NFS1	R119C	G	426	A	OR10A3	R306Q	C	917	T
MEFV	E230*	C	728	A	MYBPC2	A324V	C	1022	T	NFU1	P29L	G	292	A	OR10A3	N137S	T	410	C
MEGF10	R177H	G	776	A	MYBPC2	E643*	G	1978	T	NFX1	R235Q	G	766	A	OR10A7	R261Q	G	782	A
MEGF10	Y1030C	A	3335	G	MYBPC3	G1134D	C	3456	T	NFX1	R895I	G	2746	T	OR10A7	R261W	C	781	T
MEGF10	R799H	G	2642	A	MYBPC3	V790A	A	2424	G	NFX1	S742R	T	2288	A	OR10A7	I288V	A	862	G
MEGF11	Q1040R	T	3292	C	MYBPC3	R272H	C	870	T	NFX1	K698Q	A	2154	C	OR10AG1	L176F	G	526	A
MEGF11	V547I	C	1812	T	MYBPC3	T885M	G	2709	A	NFX1	F982V	T	3006	G	OR10AG1	L85V	A	253	C
MEGF11	W471*	C	1586	T	MYBPH	E380*	C	1196	A	NFXL1	R144Q	C	500	T	OR10G3	A11V	G	32	A
MEGF6	R683H	C	2050	T	MYBPH	D240N	C	776	T	NFXL1	R435*	G	1372	A	OR10G3	F104L	G	312	T
MEGF6	F766V	A	2298	C	MYBPHL	A335V	G	1054	A	NFXL1	A77V	G	299	A	OR10G3	L64F	G	190	A
MEGF8	R797Q	G	3025	A	MYCBP	E68K	C	1002	T	NFXL1	G540V	C	1688	A	OR10G8	Y176C	A	527	G
MEGF8	G604C	G	2445	T	MYCBP	R66H	C	997	T	NFYA	A307D	C	1121	A	OR10G9	R290S	A	870	C
MEGF8	A1699V	C	5731	T	MYCBP2	I67M	A	292	C	NFYA	R274C	C	1021	T	OR10H4	T149N	C	446	A
MEI1	L915I	C	2783	A	MYCBP2	P181Q	G	633	T	NFYA	T98A	A	493	G	OR10H5	E270D	A	908	C
MEI1	V84A	T	291	C	MYCBP2	S3056L	G	9258	A	NFYB	T75M	G	425	A	OR10H5	F12C	T	133	G
MEI1	E491D	G	1513	T	MYCBP2	S962N	C	2976	T	NFYC	G450R	G	1654	A	OR10J1	K318T	A	953	C
MEIS1	R224H	G	1128	A	MYCBP2	T4245A	T	1282 4	C	NGDN	F52L	C	183	A	OR10J1	F28L	C	84	A
MEIS1	D69Y	G	662	T	MYCBP2	Q2017R	T	6141	C	NGEF	E190*	C	847	A	OR10J1	S173Y	C	518	A
MEIS2	E133K	C	816	T	MYCBP2	Q1968*	G	5993	A	NGEF	V458I	C	1651	T	OR10J1	S227Y	C	680	A
MEIS2	D222N	C	1083	T	MYCBP2	A4602V	G	1389	A	NGEF	R259W	G	1054	A	OR10J5	P209T	G	625	T

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MEIS3P2	P405L	G	1661	A	MYCBP2	H3513N	G	10628	T	NGEF	T139M	G	695	A	OR10K1	K263N	G	869	T
MELK	Q512E	C	1718	G	MYCBP2	S2762Y	G	8376	T	NGEF	C400F	C	1478	A	OR10P1	L246M	C	768	A
MELK	I58T	T	357	C	MYCBP2	Y1277H	A	3920	G	NGFR	P202L	C	730	T	OR10R2	E216K	G	646	A
MELK	E289*	G	1049	T	MYCBP2	L1466M	A	4487	T	NGFR	F73L	C	344	A	OR10S1	A170T	C	508	T
MEMO1P2	R75Q	C	281	T	MYCBPAP	D750H	G	2410	C	NGLY1	S446A	A	1497	C	OR10S1	S37F	G	110	A
MEMO1P2	G173R	C	574	T	MYCBPAP	Y425C	A	1436	G	NGLY1	G144V	C	592	A	OR10T2	K263E	T	787	C
MEOX1	A5T	C	42	T	MYCBPAP	G448V	G	1505	T	NGLY1	C484R	A	1611	G	OR10T2	L213M	G	637	T
MEOX1	L196P	A	616	G	MYCN	S64G	A	487	G	NGLY1	T137P	T	570	G	OR11H6	R311*	C	931	T
MEP1A	E502*	G	1513	T	MYCT1	K11T	A	32	C	NGRN	L50P	T	157	C	OR11H6	A137V	C	410	T
MEP1A	S185T	T	562	A	MYCT1	F156C	T	467	G	NHEDC2	Q257H	C	933	A	OR11H6	F119L	C	357	A
MEP1A	S630L	C	1898	T	MYEF2	E63D	C	313	A	NHEDC2	L438M	G	1474	T	OR11H6	R252*	C	754	T
MEP1B	S363A	T	1134	G	MYEOV	L144M	C	880	A	NHEDC2	I395M	A	1347	C	OR11L1	Y290H	A	868	G
MEP1B	E328G	A	1030	G	MYEOV	H300L	A	1349	T	NHEDC2	S182P	A	706	G	OR13A1	V212I	C	943	T
MEP1B	C124R	T	417	C	MYF5	R91C	C	406	T	NHEDC2	Y123D	A	529	C	OR13C2	S270L	G	809	A
MEPCE	R518*	C	1940	T	MYF5	R129H	G	521	A	NHEJ1	L115I	G	343	T	OR13C3	K119Q	T	398	G
MEPCE	Y604C	A	2199	G	MYF5	C163Y	G	623	A	NHLH1	R85C	C	699	T	OR13C4	L66I	G	196	T
MERTK	S661F	C	2239	T	MYF5	R93W	C	412	T	NHLH2	V35M	C	619	T	OR13C5	T288A	T	862	C
MERTK	N548K	T	1901	G	MYF5	A41V	C	257	T	NHLRC1	P41L	G	136	A	OR13C5	F256V	A	766	C
MESDC1	A165T	G	1811	A	MYF5	E136G	A	542	G	NHLRC2	G535R	G	1815	A	OR13C8	E11D	A	33	T
MESDC1	R152H	G	1773	A	MYF5	Q239H	G	852	T	NHLRC2	L168P	T	715	C	OR13D1	S277P	T	872	C
MESDC1	A136V	C	1725	T	MYF6	S57N	G	217	A	NHLRC2	D84G	A	463	G	OR13D1	F44L	C	175	A
MEST	T51A	A	372	G	MYH1	V1429A	A	4381	G	NHLRC2	E544K	G	1842	A	OR13F1	L285F	G	944	T
MEST	L156I	C	687	A	MYH1	E1380D	C	4235	A	NHLRC3	R226Q	G	999	A	OR13F1	Q281K	C	930	A
MET	R1184*	C	3737	T	MYH1	-	C	0	T	NHS	R373*	C	1455	T	OR13F1	Q143H	G	518	T
MET	F192L	C	763	A	MYH1	R1140C	G	3513	A	NHS	T1151M	C	3790	T	OR13F1	R234*	C	789	T
MET	Y666C	A	2184	G	MYH1	P31H	G	187	T	NHS	R562C	C	2022	T	OR13G1	E193D	C	579	A
MET	R1188*	C	3749	T	MYH1	P378S	G	1227	A	NHS	F661L	C	2321	A	OR13H1	F68C	T	301	G
METAP1	Y186*	T	692	G	MYH1	R1564H	C	4786	T	NHS	-	G	0	T	OR13H1	M257V	A	867	G
METAP1	R289Q	G	1000	A	MYH1	E1068*	C	3297	A	NHSL1	R129H	C	386	T	OR13J1	L154F	G	660	A
METAP2	K188E	A	696	G	MYH1	-	C	0	A	NHSL1	G697R	C	2089	T	OR13J1	L55M	G	363	T
METRNL	A178V	C	658	T	MYH10	I588M	T	1903	C	NHSL1	S720T	C	2159	G	OR13J1	R122H	C	565	T
METT10D	R397*	G	1337	A	MYH10	A1896V	G	5826	A	NHSL1	A1553T	C	4657	T	OR14A16	K305Q	T	913	G
METT11D1	E367*	G	1122	T	MYH10	Y857C	T	2709	C	NHSL2	E792G	A	2441	G	OR14C36	S237Y	C	710	A
METT5D1	A220V	C	1011	T	MYH10	R1696C	G	5225	A	NID1	T512A	T	1617	C	OR14C36	A123S	G	367	T
METTL1	-	A	0	G	MYH11	R778Q	C	2440	T	NID1	V937M	C	2892	T	OR14I1	V166I	C	496	T
METTL10	K74T	T	226	G	MYH11	R1511W	G	4638	A	NID1	K437N	C	1394	A	OR14K1	D269Y	G	805	T
METTL11B	E214*	G	701	T	MYH11	R1138W	G	3519	A	NID1	Y1079C	T	3319	C	OR14K1	L27W	T	80	G
METTL12	R205Q	G	873	A	MYH11	Q949*	G	2952	A	NID2	E489*	C	1465	A	OR14K1	E190*	G	568	T

METTL12	P49L	C	405	T	MYH11	A1568V	G	4810	A	NID2	P1103H	G	3308	T	OR1A1	R300W	C	898	T
METTL13	R641Q	G	2188	A	MYH11	L1654I	G	5067	T	NID2	A1089T	C	3265	T	OR1A1	R293W	C	877	T
METTL13	S218P	T	918	C	MYH11	-	C	0	A	NID2	K1297T	T	3890	G	OR1A1	R54H	G	161	A
METTL14	E325*	G	1140	T	MYH11	K1711T	T	5239	G	NID2	R1357Q	C	4070	T	OR1C1	Y132H	A	394	G
METTL14	R408Q	G	1390	A	MYH11	A831T	C	2598	T	NID2	S370Y	G	1109	T	OR1C1	S171P	A	511	G
METTL14	S399L	C	1363	T	MYH11	D795N	C	2490	T	NIF3L1	C213Y	G	729	A	OR1D2	C189S	A	565	T
METTL3	S193L	G	670	A	MYH11	K640N	C	2027	A	NIN	C807G	A	2610	C	OR1D2	R122H	C	365	T
METTL4	V283A	A	1647	G	MYH13	R707Q	C	2210	T	NIN	T662M	G	2176	A	OR1D2	T281I	G	842	A
METTL4	K316T	T	1746	G	MYH13	K1000N	C	3090	A	NIN	P1987L	G	6151	A	OR1E1	K270N	C	810	A
METTL5	F220L	A	794	G	MYH13	R1680H	C	5129	T	NIN	R413W	G	1428	A	OR1F1	C189Y	G	566	A
METTL6	L267I	G	1040	T	MYH13	R1648H	C	5033	T	NIN	N1434T	T	4492	G	OR1G1	F181V	A	541	C
METTL6	-	C	0	A	MYH13	V651M	C	2041	T	NIN	P1375S	G	4314	A	OR1I1	F238L	C	800	A
METTL6	S3Y	G	249	T	MYH13	T1410M	G	4319	A	NINL	L262V	G	858	C	OR1I1	A257V	C	856	T
METTL8	R72*	G	430	A	MYH13	R1400M	C	4289	A	NINL	R1366C	G	4170	A	OR1I1	A349S	G	1131	T
MEX3B	T145M	G	870	A	MYH13	E435K	C	1393	T	NINL	A796T	C	2460	T	OR1I1	A43V	C	214	T
MEX3B	G20S	C	494	T	MYH13	A1781T	C	5431	T	NINL	F527C	A	1654	C	OR1I1	S156Y	C	553	A
MEX3B	S48N	C	579	T	MYH13	A375V	G	1214	A	NIP7	S149Y	C	836	A	OR1J2	C127Y	G	394	A
MEX3B	E219D	C	1093	A	MYH13	R109H	C	416	T	NIPA2	R5H	C	627	T	OR1K1	R166H	G	529	A
MEX3B	D251N	C	1187	T	MYH13	E1820D	C	5550	A	NIPAL3	A199T	G	963	A	OR1K1	S39R	C	149	A
MEX3C	P312H	G	935	T	MYH13	E1227K	C	3769	T	NIPAL4	T366M	C	1213	T	OR1K1	F179L	C	569	A
MEX3C	D111E	G	333	C	MYH13	E1114*	C	3430	A	NIPAL4	P324L	C	1087	T	OR1L1	R100H	G	299	A
MFAP3	Q361R	A	1301	G	MYH13	E962*	C	2974	A	NIPAL4	V136I	G	522	A	OR1L1	Y85C	A	254	G
MFF	R48S	G	585	T	MYH14	R410H	G	1276	A	NIPAL4	K312N	G	1052	T	OR1L3	F130S	T	483	C
MFF	A261T	G	1222	A	MYH14	R1920Q	G	5806	A	NIPBL	L471F	G	1912	T	OR1L4	L131V	T	391	G
MFF	E216G	A	1088	G	MYH14	E1068K	G	3249	A	NIPBL	R1682*	C	5543	T	OR1L4	T3A	A	7	G
MFGE8	F171L	A	646	G	MYH14	R1958H	G	5920	A	NIPBL	R308*	C	1421	T	OR1L8	V127I	C	379	T
MFGE8	W255R	A	898	G	MYH14	R1453C	C	4404	T	NIPBL	S604T	T	2309	A	OR1M1	G260D	G	836	A
MFHAS1	D939N	C	3378	T	MYH14	R98H	G	340	A	NIPBL	S1739N	G	5715	A	OR1M1	H175N	C	580	A
MFHAS1	L308H	A	1486	T	MYH14	R1436W	C	4353	T	NIPBL	R1894C	C	6179	T	OR1M1	Y38C	A	170	G
MFHAS1	G711S	C	2694	T	MYH14	A1756T	G	5313	A	NIPSNAP1	R247*	G	994	A	OR1M1	R223H	G	725	A
MFHAS1	A771T	C	2874	T	MYH14	R54C	C	207	T	NIPSNAP1	P3L	G	263	A	OR1S1	N13T	A	38	C
MFHAS1	N329D	T	1548	C	MYH14	A319T	G	1002	A	NIPSNAP3 A	R224W	C	775	T	OR1S1	I322M	T	966	G
MFI2	-	C	0	T	MYH14	R1325W	C	4020	T	NIPSNAP3 B	R224W	C	741	T	OR1S1	G216A	G	647	C
MFI2	G584S	C	1864	T	MYH15	E1508D	C	4581	A	NIPSNAP3 B	S113Y	C	409	A	OR1S2	I286T	A	857	G
MFI2	Q411K	G	1345	T	MYH15	Y734C	T	2258	C	NISCH	R1260W	C	3850	T	OR2A14	A260T	G	833	A
MFN1	E450D	G	1476	T	MYH15	R1688W	G	5119	A	NISCH	T1256M	C	3839	T	OR2A2	A200T	G	667	A
MFN1	H262Y	C	910	T	MYH15	R1356*	G	4123	A	NISCH	T913M	C	2810	T	OR2A25	A71T	G	249	A

MFN2	V78I	G	540	A	MYH15	A1440S	C	4375	A	NISCH	R963Q	G	2960	A	OR2A25	L39S	T	154	C
MFN2	R468C	C	1710	T	MYH15	F585V	A	1810	C	NISCH	K65N	G	267	T	OR2A25	Q234H	G	740	T
MFNG	R4W	G	234	A	MYH15	K582T	T	1802	G	NISCH	F773S	T	2390	C	OR2AE1	F28L	G	108	T
MFNG	H177N	G	753	T	MYH15	F353C	A	1115	C	NKAIN3	I26M	A	78	G	OR2AE1	K80Q	T	262	G
MFNG	A162T	C	708	T	MYH2	A546T	C	1764	T	NKAIN4	R110C	G	416	A	OR2AK2	Q115P	A	443	C
MFRP	S332L	G	1142	A	MYH2	R18Q	C	181	T	NKAIN4	R110C	G	416	A	OR2AK2	A315T	G	1042	A
MFRP	C542Y	C	1772	T	MYH2	D1714N	C	5268	T	NKAPL	K395N	G	1237	T	OR2AK2	V118A	T	452	C
MFRP	C34*	G	249	T	MYH2	A1764V	G	5419	A	NKAPL	R317Q	G	1002	A	OR2AT4	F33L	A	97	G
MFRP	-	C	0	T	MYH2	K1581R	T	4870	C	NKD1	R84W	C	474	T	OR2B11	R126C	G	376	A
MFRP	V236I	C	853	T	MYH2	R445H	C	1462	T	NKD2	R232Q	G	924	A	OR2B11	Q104*	G	310	A
MFRP	G145*	C	580	A	MYH2	-	C	0	T	NKD2	P377T	C	1358	A	OR2B11	G90R	C	268	G
MFSD1	A72V	C	356	T	MYH2	L1811P	A	5560	G	NKG7	L165V	A	664	C	OR2C1	R235*	C	755	T
MFSD2A	R199W	C	738	T	MYH2	R445C	G	1461	A	NKIRAS1	E67G	T	521	C	OR2C3	F274L	G	1184	T
MFSD2A	L138M	C	555	A	MYH2	D1456N	C	4494	T	NKPD1	P165S	G	493	A	OR2D2	R122H	C	365	T
MFSD2A	E33*	G	240	T	MYH2	E1320K	C	4086	T	NKPD1	G716D	C	2147	T	OR2D2	V140A	A	419	G
MFSD2B	G379A	G	1136	C	MYH2	D1236Y	C	3834	A	NKPD1	L659I	G	1975	T	OR2D2	R122C	G	364	A
MFSD5	L348I	C	1233	A	MYH2	D1183Y	C	3675	A	NKPD1	R211H	C	632	T	OR2D3	V119A	T	384	C
MFSD5	A237T	G	900	A	MYH2	E659D	C	2105	A	NKRF	K222Q	T	1317	G	OR2F1	I92N	T	312	A
MFSD6	V385I	G	1477	A	MYH2	K640N	C	2048	A	NKTR	N670H	A	2196	C	OR2G3	L157P	T	502	C
MFSD6	A548T	G	1966	A	MYH2	M442I	C	1454	T	NKX2-1	P78L	G	315	A	OR2G6	T4A	A	42	G
MFSD6L	A70T	C	356	T	MYH2	F315I	A	1071	T	NKX2-1	A345T	C	1115	T	OR2L13	D120N	G	695	A
MFSD6L	R543Q	C	1776	T	MYH2	N81Y	T	369	A	NKX2-3	L70S	T	388	C	OR2L13	L156S	T	804	C
MFSD6L	S540T	A	1766	T	MYH2	E986K	C	3084	T	NKX2-3	R362L	G	1264	T	OR2L13	F176L	C	865	A
MFSD6L	A120T	C	506	T	MYH3	N1165S	T	3561	C	NKX2-4	T293M	G	888	A	OR2L2	F199L	T	691	C
MFSD6L	G114S	C	488	T	MYH3	E1688D	C	5131	G	NKX2-4	E203K	C	617	T	OR2L3	R306K	G	937	A
MFSD6L	S192L	G	723	A	MYH3	S1746N	C	5304	T	NKX2-5	A302V	G	1081	A	OR2L3	V247L	G	759	T
MFSD7	A163T	C	503	T	MYH3	L1011I	G	3098	T	NKX2-5	R156C	G	642	A	OR2L5	R138I	G	413	T
MFSD7	A535T	C	1619	T	MYH3	K1860N	C	5647	A	NKX2-5	I184S	A	727	C	OR2L8	Q6H	A	99	C
MFSD7	V328A	A	999	G	MYH3	E1836*	C	5573	A	NKX2-5	K110N	C	506	A	OR2L8	R21I	G	143	T
MFSD8	-	C	0	G	MYH3	K1588R	T	4830	C	NKX2-6	G111S	C	331	T	OR2M2	V78A	T	233	C
MFSD8	M454T	A	1489	G	MYH3	D1085Y	C	3320	A	NKX2-6	A199V	G	596	A	OR2M2	I199M	T	597	G
MFSD8	F53L	A	285	G	MYH4	E1585*	C	4864	A	NKX3-1	R176C	G	574	A	OR2M3	L73F	C	255	T
MFSD9	R235Q	C	748	T	MYH4	W511*	C	1643	T	NKX3-1	R126C	G	424	A	OR2M4	T267M	C	800	T
MGA	R2445*	C	7514	T	MYH4	Y837H	A	2620	G	NKX3-1	H156Y	G	514	A	OR2M4	L68R	T	203	G
MGA	G1447D	G	4521	A	MYH4	A572T	C	1825	T	NKX3-2	R287C	G	935	A	OR2M4	A254V	C	761	T
MGA	A1436T	G	4487	A	MYH4	R1617M	C	4961	A	NKX6-1	G351S	C	1901	T	OR2M5	F257L	C	771	A
MGA	R1867*	C	5780	T	MYH4	K1000T	T	3110	G	NKX6-1	T340M	G	1869	A	OR2M7	V281I	C	841	T
MGA	N2122K	T	6547	G	MYH4	V828A	A	2594	G	NKX6-1	E309G	T	1776	C	OR2M7	C202*	G	606	T
MGA	I2251L	A	6932	C	MYH4	R1753H	C	5369	T	NLE1	R229W	G	713	A	OR2S2	V38M	C	168	T

MGA	G2339V	G	7197	T	MYH4	K1077T	T	3341	G	NLGN1	R93C	C	706	T	OR2T10	A163T	C	487	T
MGA	R866*	C	2777	T	MYH4	E525K	C	1684	T	NLGN1	E743D	A	2658	C	OR2T11	Y215H	A	643	G
MGAM	L1794V	T	5434	G	MYH4	R1348W	G	4153	A	NLGN2	G95S	G	356	A	OR2T12	R227H	C	680	T
MGAM	L1666V	C	5050	G	MYH6	R714C	G	2194	A	NLGN3	L721I	C	2464	A	OR2T12	E194K	C	580	T
MGAM	R369W	C	1159	T	MYH6	A1819V	G	5510	A	NLGN4X	R730C	G	2652	A	OR2T4	M304I	G	912	A
MGAM	N1345T	A	4088	C	MYH6	A1704V	G	5165	A	NLGN4X	K722T	T	2629	G	OR2T4	V108F	G	322	T
MGAM	R1570C	C	4762	T	MYH6	A212V	G	689	A	NLGN4X	D181Y	C	1005	A	OR2T6	R139Q	G	416	A
MGAM	F436C	T	1361	G	MYH6	Q1706E	G	5170	C	NLGN4X	E748D	C	2708	A	OR2T6	M184T	T	551	C
MGAM	L905I	C	2767	A	MYH6	K1900N	C	5754	A	NLK	G19S	G	773	A	OR2W3	E196K	G	617	A
MGAM	K2239M	A	6770	T	MYH6	M824V	T	2524	C	NLK	P384S	C	1868	T	OR2W3	R223M	G	699	T
MGAT1	R427H	C	1953	T	MYH6	R34C	G	154	A	NLN	K159N	A	655	C	OR2W3	R122Q	G	396	A
MGAT2	W235*	G	1202	A	MYH7	R869C	G	2683	A	NLN	K343R	A	1206	G	OR2W3	L37P	T	141	C
MGAT2	W362R	T	1582	C	MYH7	R1114H	C	3419	T	NLN	A3S	G	185	T	OR2W3	R165H	G	525	A
MGAT2	W348*	G	1541	A	MYH7	A100T	C	376	T	NLRC3	R562C	G	1684	A	OR2Z1	T77I	C	305	T
MGAT3	Q385R	A	1369	G	MYH7	A13T	C	115	T	NLRC3	A210T	C	628	T	OR3A1	G217C	C	649	A
MGAT3	P55L	C	379	T	MYH7	Q1704R	T	5189	C	NLRC3	I341M	G	1023	C	OR3A2	I265V	T	832	C
MGAT3	V109M	G	540	A	MYH7	R1689C	G	5143	A	NLRC3	A170T	C	508	T	OR3A2	Y268D	A	841	C
MGAT4A	Y24D	A	384	C	MYH7	V125I	C	451	T	NLRC3	L913M	G	2737	T	OR3A3	R318*	C	952	T
MGAT4A	H111P	T	646	G	MYH7	D382N	C	1222	T	NLRC4	I227T	A	944	G	OR4A15	L244I	C	730	A
MGAT4B	E556K	C	2430	T	MYH7	R1053Q	C	3236	T	NLRC4	Y585*	A	2019	C	OR4A15	R167*	C	499	T
MGAT4C	R178H	C	533	T	MYH7B	R1534W	C	4692	T	NLRC4	R181Q	C	806	T	OR4A15	S252Y	C	755	A
MGAT4C	E463G	T	1388	C	MYH7B	R1840C	C	5610	T	NLRC5	T1578A	A	4957	G	OR4A16	S50I	G	199	T
MGAT4C	I85L	T	253	A	MYH7B	V1262A	T	3877	C	NLRC5	L526P	T	1802	C	OR4A16	A74V	C	271	T
MGAT5	A74T	G	472	A	MYH7B	D45N	G	225	A	NLRC5	P664H	C	2216	A	OR4A16	F249V	T	795	G
MGAT5B	W692C	G	2179	C	MYH7B	A202T	G	696	A	NLRC5	A186T	G	781	A	OR4A47	V244L	G	730	T
MGAT5B	R79C	C	338	T	MYH8	Q805H	C	2488	A	NLRC5	R771Q	G	2537	A	OR4A47	K224N	G	672	T
MGEA5	R914W	G	3136	A	MYH8	K637N	C	1984	A	NLRC5	G1703D	G	5333	A	OR4A5	A185T	C	553	T
MGEA5	E734*	C	2596	A	MYH8	E348D	C	1117	A	NLRC5	G1030W	G	3313	T	OR4A5	R120H	C	359	T
MGLL	A233T	C	1237	T	MYH8	K408M	T	1296	A	NLRC5	R386W	C	1381	T	OR4A5	L141I	G	421	T
MGLL	V107I	C	859	T	MYH8	R1563H	C	4761	T	NLRC5	S1507R	A	4744	C	OR4A5	S162I	C	485	A
MGMT	R159*	C	477	T	MYH8	R1478H	C	4506	T	NLRP10	C227*	G	843	T	OR4B1	T36M	C	107	T
MGRN1	R330Q	G	1125	A	MYH8	G1666D	C	5070	T	NLRP10	P141S	G	583	A	OR4B1	L210I	C	628	A
MGST3	R13H	G	101	A	MYH8	V1410A	A	4302	G	NLRP10	C357F	C	1232	A	OR4B1	D266Y	G	796	T
MGST3	R13H	G	101	A	MYH8	D1624Y	C	4943	A	NLRP10	D524Y	C	1732	A	OR4C11	S50T	C	149	G
MIA	L14M	C	188	A	MYH8	L1300S	A	3972	G	NLRP11	A188D	G	1274	T	OR4C13	V27F	G	111	T
MIA	R3L	G	156	T	MYH8	K368N	C	1177	A	NLRP11	T956A	T	3577	C	OR4C15	C260Y	G	779	A
MIA2	R252W	C	953	T	MYH8	D299Y	C	968	A	NLRP11	V55M	C	874	T	OR4C15	P337T	C	1009	A
MIA2	E65D	G	394	T	MYH8	Q216H	C	721	A	NLRP11	Q490K	G	2179	T	OR4C15	P337H	C	1010	A
MIA3	M1320I	G	3985	T	MYH9	D539N	C	1846	T	NLRP12	R206H	C	837	T	OR4C15	F221V	T	661	G

MIA3	A2D	C	30	A	MYH9	E1884G	T	5882	C	NLRP12	R656C	G	2186	A	OR4C16	I305V	A	913	G
MIA3	L328M	T	1007	A	MYH9	Y650C	T	2180	C	NLRP12	R656H	C	2187	T	OR4C6	L30R	T	118	G
MIA3	G546R	G	1661	A	MYH9	T1504A	T	4741	C	NLRP12	R352H	C	1275	T	OR4D1	N42D	A	124	G
MIA3	K269Q	A	830	C	MYH9	T638M	G	2144	A	NLRP12	A235V	G	924	A	OR4D11	R64H	G	191	A
MIB1	T129A	A	649	G	MYH9	A363V	G	1319	A	NLRP12	L630M	G	2108	T	OR4D11	N202I	A	605	T
MIB1	T923A	A	3031	G	MYL1	F47L	G	289	T	NLRP12	A218T	C	872	T	OR4D5	S67Y	C	274	A
MIB2	V67M	G	326	A	MYL12B	R104I	G	655	T	NLRP13	F588L	G	1789	T	OR4D5	L214R	T	715	G
MIB2	A811T	G	2558	A	MYL2	G162R	C	555	T	NLRP13	E622*	C	1889	A	OR4D6	A43V	C	151	T
MIB2	M45I	G	262	A	MYL4	V158I	G	600	A	NLRP13	F460V	A	1403	C	OR4D9	L33V	T	97	G
MICAL1	R910H	C	3041	T	MYL5	K171N	G	618	T	NLRP14	I726T	T	2500	C	OR4D9	L85I	C	253	A
MICAL1	P626T	G	2188	T	MYL7	R70C	G	208	A	NLRP14	C563R	T	2010	C	OR4D9	V173A	T	518	C
MICAL2	D285Y	G	1141	T	MYLIP	S53R	A	355	C	NLRP14	E1084*	G	3573	T	OR4F15	S207Y	C	644	A
MICALCL	R66W	C	487	T	MYLK	A350T	C	1330	T	NLRP2	R752*	C	2317	T	OR4F15	Q24H	G	96	C
MICALCL	S97N	G	581	A	MYLK	A1300T	C	4180	T	NLRP2	R467Q	G	1463	A	OR4F15	F47L	C	165	A
MICALCL	K523N	G	1860	T	MYLK	K1376T	T	4409	G	NLRP2	R467*	C	1462	T	OR4F15	S229Y	C	710	A
MICALL1	H187R	A	686	G	MYLK	K936N	C	3090	A	NLRP2	K45E	A	196	G	OR4K1	H105Q	C	374	A
MICALL1	S116L	C	473	T	MYLK	E917D	C	3033	A	NLRP2	T220P	A	721	C	OR4K1	V153I	G	516	A
MICALL1	P468H	C	1529	A	MYLK	K608T	T	2105	G	NLRP2	C914*	C	2805	A	OR4K1	R89C	C	324	T
MICALL1	-	T	0	C	MYLK	D522Y	C	1846	A	NLRP3	A809T	G	2563	A	OR4K1	N202S	A	664	G
MICALL2	G379R	C	1311	T	MYLK	A292T	C	1156	T	NLRP3	R178W	C	670	T	OR4K14	Q24H	T	72	G
MID1	H178Q	A	810	T	MYLK2	G75D	G	497	A	NLRP3	G895D	G	2822	A	OR4K14	V258F	C	772	A
MID1	L8P	A	299	G	MYLK2	G241E	G	995	A	NLRP3	P352L	C	1193	T	OR4K14	K81N	C	243	A
MID1	T481A	T	1717	C	MYLK3	A109T	C	441	T	NLRP3	S752Y	C	2393	A	OR4K14	N25T	T	74	G
MID1	H178Q	A	810	T	MYLK3	A72V	G	331	A	NLRP4	Q258*	C	1194	T	OR4K15	R261H	G	857	A
MIDN	R381Q	G	1657	A	MYLK3	V592M	C	1890	T	NLRP4	I219F	A	1077	T	OR4K2	D180E	C	576	G
MIER1	F280L	T	910	G	MYLK3	I563T	A	1804	G	NLRP4	G442R	G	1746	A	OR4K2	L195M	C	619	A
MIER1	V368I	G	1172	A	MYLK3	F132L	A	510	G	NLRP4	E234K	G	1122	A	OR4K2	F250L	C	786	A
MIER1	R202C	C	674	T	MYLK4	E346D	C	1335	A	NLRP4	G823*	G	2889	T	OR4K2	F103C	T	344	G
MIER2	A503D	G	1517	T	MYLK4	D144G	T	728	C	NLRP5	E184K	G	550	A	OR4K5	R319G	A	980	G
MIER2	G415R	C	1252	T	MYO10	T1214A	T	4108	C	NLRP5	R392H	G	1175	A	OR4K5	L214F	G	667	T
MIER2	P234S	G	709	A	MYO10	A756V	G	2735	A	NLRP5	G286R	G	856	A	OR4K5	L62I	C	209	A
MIER2	A523T	C	1576	T	MYO10	A986T	C	3424	T	NLRP5	Q827R	A	2480	G	OR4K5	L115R	T	369	G
MIER3	R348G	T	1058	C	MYO10	D1101N	C	3769	T	NLRP5	C774*	C	2322	A	OR4L1	T192K	C	575	A
MIER3	Q435H	T	1321	G	MYO10	A1152V	G	3923	A	NLRP5	E187*	G	559	T	OR4L1	A145V	C	434	T
MIF4GD	S194A	A	660	C	MYO10	A210V	G	1097	A	NLRP5	K1092N	G	3276	T	OR4L1	N291I	A	872	T
MINA	R287W	G	1442	A	MYO10	R1545*	G	5101	A	NLRP5	A1052T	G	3154	A	OR4M2	C141*	C	521	A
MINK1	R521*	C	1757	T	MYO10	F632L	G	2364	T	NLRP6	R399H	G	1196	A	OR4M2	S50G	A	246	G
MINK1	V871I	G	2807	A	MYO10	R1166K	C	3965	T	NLRP6	A771V	C	2312	T	OR4N2	R260C	C	778	T
MINPP1	A310V	C	970	T	MYO15A	A1685T	G	5391	A	NLRP6	A344T	G	1030	A	OR4N2	R80W	C	238	T

MIOS	L486*	T	1878	G	MYO15A	R2588W	C	8100	T	NLRP6	A25V	C	74	T	OR4N2	F279C	T	836	G
MIP	F189I	A	597	T	MYO15A	R3247H	G	10078	A	NLRP6	E605D	G	1815	T	OR4N4	R290H	G	960	A
MIPEP	P519H	G	1655	T	MYO15A	S2841N	G	8860	A	NLRP6	E167D	A	501	C	OR4N4	R290H	G	960	A
MIPEP	Y370H	A	1207	G	MYO15A	E1698G	A	5431	G	NLRP7	E556D	C	2071	A	OR4N4	R290H	G	960	A
MIPEP	W356*	C	1167	T	MYO15A	F174L	C	860	A	NLRP7	V616L	C	2249	G	OR4P4	L195F	C	583	T
MIPEP	R340*	G	1117	A	MYO15A	A1300T	G	4236	A	NLRP7	L876M	G	3029	T	OR4Q3	P168S	C	502	T
MIPOL1	R279W	C	1301	T	MYO15A	A2884V	C	8989	T	NLRP7	D725G	T	2577	C	OR4Q3	K270T	A	809	C
MIR1279	S467L	C	1447	T	MYO15A	R2071M	G	6550	T	NLRP7	F166S	A	900	G	OR4S1	G239D	G	716	A
MIR1279	S539*	C	1663	A	MYO15A	P817S	C	2787	T	NLRP7	A98V	G	696	A	OR4S1	R120C	C	358	T
MIR198	L121F	G	718	A	MYO15A	A441V	C	1660	T	NLRP7	M841I	C	2926	A	OR4X1	G14R	G	40	A
MIR198	I202N	A	962	T	MYO15A	R3374H	G	10459	A	NLRP8	R540C	C	1689	T	OR51A4	R166*	T	496	A
MIR2277	T320A	T	1101	C	MYO15A	L137F	C	747	T	NLRP8	R824I	G	2542	T	OR51A7	S152N	G	492	A
MIS12	R61H	G	735	A	MYO15A	R1120C	C	3696	T	NLRP8	E1012*	G	3105	T	OR51B2	G225D	C	729	T
MITD1	T155A	T	540	C	MYO15A	F3414L	T	10578	C	NLRP9	A943V	G	2856	A	OR51B6	A188D	C	563	A
MITF	R60C	C	305	T	MYO15A	G1104D	G	3649	A	NLRX1	T221M	C	877	T	OR51B6	A115S	G	343	T
MITF	P256S	C	893	T	MYO15A	A545V	C	1972	T	NMBR	R361H	C	1223	T	OR51B6	R168*	C	502	T
MITF	E373*	G	1244	T	MYO16	E821*	G	2587	T	NMBR	R103H	C	449	T	OR51B6	F214L	C	642	A
MKI67	T1775M	G	5700	A	MYO16	A1658T	G	5098	A	NMBR	G273C	C	958	A	OR51D1	R67*	C	275	T
MKI67	A1778V	G	5709	A	MYO16	R747C	C	2365	T	NMD3	R276*	C	948	T	OR51D1	Q183H	A	625	C
MKI67	E247*	C	1115	A	MYO16	A1317T	G	4075	A	NMD3	W68R	T	324	C	OR51E2	S88F	G	503	A
MKI67	R2727C	G	8555	A	MYO16	P1487L	C	4586	T	NMD3	E210K	G	750	A	OR51E2	R272C	G	1054	A
MKI67	F1068L	A	3580	C	MYO16	D1241N	G	3847	A	NME1-NME2	M141T	T	598	C	OR51E2	T7P	T	259	G
MKI67	V729A	A	2562	G	MYO16	T268A	A	928	G	NME1-NME2	A286S	G	1032	T	OR51E2	F154L	A	702	C
MKI67	F489V	A	1841	C	MYO16	M303R	T	1034	G	NME6	-	C	0	A	OR51F1	M68V	T	202	C
MKI67IP	R288*	G	935	A	MYO16	-	G	0	A	NME7	Q81H	T	500	A	OR51F2	M186T	T	622	C
MKI67IP	H282R	T	918	C	MYO16	F946L	C	2964	A	NMNAT1	E249*	G	889	T	OR51F2	A156V	C	532	T
MKKS	Q391H	C	1173	G	MYO18A	R960Q	C	2879	T	NMNAT2	D294N	C	1215	T	OR51G1	T79A	T	235	C
MKKS	S504N	C	1511	T	MYO18A	R237H	C	710	T	NMNAT2	S244F	G	1066	A	OR51G1	F64L	G	192	T
MKL2	G611C	G	1831	T	MYO18A	R1875Q	C	5624	T	NMNAT3	E248D	C	1126	A	OR51G2	L225M	G	673	T
MKL2	P1084L	C	3251	T	MYO18A	R1747W	G	5239	A	NMNAT3	H152R	T	837	C	OR51G2	T82A	T	244	C
MKL2	R873C	C	2617	T	MYO18A	R1059H	C	3176	T	NMRAL1	R233C	G	1073	A	OR51G2	F256L	A	766	G
MKLN1	E451D	G	1393	T	MYO18A	K1018N	C	3054	A	NMRAL1	V236M	C	1082	T	OR51I1	L138I	G	412	T
MKLN1	A586V	C	1797	T	MYO18B	K1480T	A	4439	C	NMS	R112*	C	341	T	OR51I1	S121I	C	362	A
MKLN1	E593G	A	1818	G	MYO18B	M1522V	A	4564	G	NMT1	G392R	G	1192	A	OR51I2	L103I	C	388	A
MKLN1	R337W	C	1049	T	MYO18B	R2154H	G	6461	A	NMT2	R291Q	C	956	T	OR51I2	R122H	G	446	A
MKLN1	K107N	G	361	T	MYO18B	A2396V	C	7187	T	NMT2	S289L	G	950	A	OR51M1	I171M	T	535	G

MKLN1	F238L	T	752	C	MYO18B	R115H	G	344	A	NMUR1	R175Q	C	658	T	OR51M1	S145L	C	456	T
MKNK1	D337G	T	1174	C	MYO18B	R1801Q	G	5402	A	NMUR1	M319I	C	1091	T	OR51Q1	G43S	G	217	A
MKNK2	E144*	C	675	A	MYO18B	G844S	G	2530	A	NMUR2	R260I	C	945	A	OR51Q1	C153Y	G	548	A
MKNK2	F149L	A	690	G	MYO18B	D2036N	G	6106	A	NMUR2	R108H	C	489	T	OR51Q1	R52C	C	244	T
MKRN3	R477Q	G	1906	A	MYO18B	P1140H	C	3419	A	NMUR2	R108H	C	489	T	OR51T1	R168M	G	503	T
MKRN3	P76Q	C	703	A	MYO18B	E209D	G	627	T	NNAT	G15D	G	161	A	OR51T1	T253A	A	757	G
MKRN3	D483Y	G	1923	T	MYO18B	R1024H	G	3071	A	NNAT	V21M	G	178	A	OR51T1	S268N	G	803	A
MKRN3	D267N	G	1275	A	MYO18B	R1720H	G	5159	A	NNMT	E80D	G	984	C	OR51V1	F112L	G	336	T
MKRN9P	R415*	G	1468	A	MYO18B	R2385Q	G	7154	A	NOB1	R269H	C	822	T	OR52B4	Q102R	T	305	C
MKRN9P	E345K	C	1258	T	MYO19	R364Q	C	2062	T	NOBOX	R449Q	C	1346	T	OR52B4	R195Q	C	584	T
MKS1	G119D	C	431	T	MYO19	E477Q	C	2400	G	NOBOX	R303*	G	907	A	OR52B4	L47F	G	139	A
MKS1	V299I	C	970	T	MYO1A	M575T	A	1975	G	NOC2L	A517V	G	1600	A	OR52B4	S30Y	G	89	T
MKX	R278H	C	1025	T	MYO1A	R152H	C	706	T	NOC2L	R297I	C	940	A	OR52D1	F65S	T	216	C
MKX	G69W	C	397	A	MYO1A	R639*	G	2166	A	NOC3L	A722T	C	2265	T	OR52E2	S55N	C	164	T
MLEC	K126T	A	528	C	MYO1A	-	C	0	A	NOD1	V698I	C	2618	T	OR52E2	N108S	T	323	C
MLF1	R131C	C	529	T	MYO1A	S501G	T	1752	C	NOD2	K953N	G	2964	T	OR52E2	Y272H	A	814	G
MLF1IP	S50A	A	219	C	MYO1A	R654L	C	2212	A	NOD2	G879R	G	2740	A	OR52E2	A192V	G	575	A
MLH1	W714*	G	2357	A	MYO1A	R621*	G	2112	A	NODAL	T74M	G	221	A	OR52E4	Y219C	A	678	G
MLH1	I630S	T	2105	G	MYO1B	F77L	T	478	G	NOL10	R208*	G	728	A	OR52E4	R167H	G	522	A
MLH3	R637H	C	2126	T	MYO1B	R96*	C	533	T	NOL10	L258R	A	879	C	OR52E4	P32L	C	117	T
MLH3	D918G	T	2969	C	MYO1C	A380T	C	1352	T	NOL10	S548L	G	1749	A	OR52E6	H317N	G	949	T
MLH3	K628T	T	2099	G	MYO1C	G1040S	C	3332	T	NOL11	E240*	G	723	T	OR52E8	Y67C	T	200	C
MLKL	R306H	C	1358	T	MYO1C	P164H	G	705	T	NOL11	R385*	C	1158	T	OR52E8	H62Y	G	184	A
MLL	P1314L	C	3964	T	MYO1C	A663V	G	2202	A	NOL11	K47N	G	146	T	OR52H1	R178G	T	532	C
MLL	R2618C	C	7875	T	MYO1D	K375E	T	1135	C	NOL11	I143L	A	432	C	OR52H1	R180H	C	539	T
MLL	R933W	C	2820	T	MYO1D	K366N	C	1110	A	NOL4	L568M	G	2000	T	OR52H1	T261I	G	782	A
MLL	T953I	C	2881	T	MYO1D	T921M	G	2774	A	NOL4	R100*	G	596	A	OR52J3	R167H	G	500	A
MLL	N2275K	T	6848	A	MYO1D	R622C	G	1876	A	NOL4	G76A	C	525	G	OR52K1	R268H	G	825	A
MLL	R933Q	G	2821	A	MYO1D	R782G	T	2356	C	NOL4	R344G	G	1328	C	OR52K1	S76Y	C	249	A
MLL	D3876N	G	1164 9	A	MYO1D	M546V	T	1648	C	NOL6	R694C	G	2168	A	OR52K2	L63I	C	232	A
MLL	E1361*	G	4104	T	MYO1D	V378A	A	1145	G	NOL6	A880V	G	2727	A	OR52L1	L116M	G	346	T
MLL	R2619C	C	7878	T	MYO1D	E246K	C	748	T	NOL6	S547Y	G	1728	T	OR52L2P	P36L	G	107	A
MLL	N3084S	A	9274	G	MYO1D	E187*	C	571	A	NOL7	-	G	0	A	OR52L2P	P147S	G	439	A
MLL2	Y5472C	T	1641 5	C	MYO1E	M95I	C	656	T	NOL7	K254T	A	793	C	OR52N1	S190C	G	569	C
MLL2	L4107M	G	1231 9	T	MYO1E	R207Q	C	991	T	NOL8	T517I	G	1887	A	OR52N4	L9I	C	73	A
MLL2	Q5170R	T	1550 9	C	MYO1E	H10Q	G	401	T	NOL8	E1145D	C	3772	A	OR52N4	V251I	G	799	A

MLL2	V149I	C	445	T	MYO1E	V716I	C	2517	T	NOL8	K762R	T	2622	C	OR52N5	R310C	G	928	A
MLL2	R5323C	G	1596 7	A	MYO1E	L530R	A	1960	C	NOL8	R1156*	G	3803	A	OR52R1	Q387K	G	1159	T
MLL2	Q2514H	C	7542	A	MYO1F	R751C	G	2384	A	NOL9	L496P	A	1520	G	OR52W1	I131V	A	469	G
MLL2	G1636D	C	4907	T	MYO1F	R839Q	C	2649	T	NOL9	A686V	G	2090	A	OR56A3	L103F	C	307	T
MLL2	G3189R	C	9565	T	MYO1F	A399S	C	1328	A	NOLC1	K470E	A	1643	G	OR56A3	E302*	G	904	T
MLL2	C1424W	A	4272	C	MYO3A	N727K	T	2347	A	NOM1	A829T	G	2500	A	OR56A3	A184V	C	551	T
MLL2	E1738D	C	5214	A	MYO3A	T1606A	A	4982	G	NOMO2	M494I	C	1554	T	OR56B4	K272R	A	910	G
MLL2	R1258W	G	3772	A	MYO3A	E259*	G	941	T	NONO	A122V	C	570	T	OR56B4	I141M	A	518	G
MLL2	S1398L	G	4193	A	MYO3A	N847H	A	2705	C	NOP14	R329H	C	1052	T	OR5AC2	L144F	G	432	T
MLL5	R219I	G	1201	T	MYO3B	R996C	C	3129	T	NOP14	R537W	G	1675	A	OR5AN1	A41V	C	169	T
MLL5	R409W	C	1770	T	MYO3B	P902L	C	2848	T	NOP14	R808H	C	2489	T	OR5AP2	A207T	C	619	T
MLL5	S638N	G	2458	A	MYO3B	F292C	T	1018	G	NOP2	E186K	C	668	T	OR5AP2	R267H	C	800	T
MLL5	R227I	G	1225	T	MYO3B	A640S	G	2061	T	NOP58	K487N	G	1687	T	OR5AR1	R122H	G	389	A
MLL5	D902N	G	3249	A	MYO3B	E1022D	G	3209	T	NOP58	K99N	G	523	T	OR5B12	S62G	T	184	C
MLLT1	D449N	C	1509	T	MYO5A	R984W	G	3194	A	NOS1	K474E	T	1425	C	OR5B17	V295A	A	884	G
MLLT1	R204W	G	774	A	MYO5A	S693G	T	2321	C	NOS1	A1199V	G	3601	A	OR5B2	L209I	G	625	T
MLLT10	R770Q	G	2487	A	MYO5A	G1500W	C	4742	A	NOS1	T320S	T	963	A	OR5B21	L302F	G	904	A
MLLT11	L13I	C	2839	A	MYO5A	H138Y	G	656	A	NOS1	L1167I	G	3504	T	OR5B21	F175L	G	525	T
MLLT11	L22M	C	2866	A	MYO5A	L1329F	C	4231	A	NOS1	T1184A	T	3555	C	OR5B3	F10L	A	28	G
MLLT3	-	C	0	T	MYO5A	T654I	G	2205	A	NOS1	E508D	C	1529	A	OR5C1	R265H	G	856	A
MLLT3	W32*	C	382	T	MYO5A	H424N	G	1514	T	NOS1	K118N	C	359	A	OR5C1	F181L	C	605	A
MLLT4	M741I	G	2223	A	MYO5B	-	C	0	A	NOS1AP	R159W	C	877	T	OR5D13	S192L	C	575	T
MLLT4	R1661Q	G	4982	A	MYO5B	R999C	G	3216	A	NOS1AP	V335M	G	1405	A	OR5D14	L34V	C	100	G
MLLT4	R991C	C	2971	T	MYO5B	R776Q	C	2548	T	NOS2	D556E	G	1902	T	OR5D14	F170V	T	508	G
MLLT4	N778D	A	2332	G	MYO5B	A1345S	C	4254	A	NOS3	P232L	C	1052	T	OR5D14	E85D	G	255	T
MLLT4	L1542I	C	4624	A	MYO5B	R219H	C	877	T	NOS3	R474C	C	1777	T	OR5D16	F222V	T	664	G
MLLT4	R914C	C	2740	T	MYO5B	R1461L	C	4603	A	NOS3	R875Q	G	2981	A	OR5D18	R237C	C	723	T
MLLT6	A327T	G	1070	A	MYO5B	P60L	G	400	A	NOS3	R782H	G	2702	A	OR5D18	R237C	C	723	T
MLLT6	V635I	G	1994	A	MYO5C	R752*	G	2391	A	NOSIP	R112W	G	377	A	OR5F1	D191Y	C	571	A
MLNR	T72A	A	214	G	MYO5C	R890S	C	2807	A	NOSIP	V209M	C	668	T	OR5F1	E111K	C	331	T
MLNR	R376M	G	1127	T	MYO5C	R879*	G	2772	A	NOSTRIN	P460L	C	2134	T	OR5F1	L85S	A	254	G
MLPH	A582V	C	2039	T	MYO5C	Q1605*	G	4950	A	NOTCH1	E1525G	T	4650	C	OR5H14	L62F	C	184	T
MLST8	T108I	C	397	T	MYO5C	L1380I	G	4275	T	NOTCH1	R1761W	G	5357	A	OR5H2	L155S	T	464	C
MLST8	A223T	G	741	A	MYO5C	S184L	G	688	A	NOTCH1	S836N	C	2583	T	OR5H2	V213I	G	637	A
MLX	R202H	G	670	A	MYO6	N349S	A	1325	G	NOTCH1	C1045Y	C	3210	T	OR5H6	V224D	T	712	A
MLXIP	P879L	C	2744	T	MYO6	R980C	C	3217	T	NOTCH1	A465T	C	1469	T	OR5H6	K40T	A	160	C
MLXIP	R214C	C	748	T	MYO7A	V843M	G	2799	A	NOTCH1	T349I	G	1122	A	OR5H6	E155*	G	504	T
MLXIPL	R820C	G	2506	A	MYO7A	A1437T	G	4581	A	NOTCH1	C987*	G	3037	T	OR5H6	R251Q	G	793	A
MLXIPL	G334W	C	1048	A	MYO7A	D1387N	G	4431	A	NOTCH2	R1895C	G	5903	A	OR5H6	S323I	G	1009	T

MLYCD	Q210R	A	649	G	MYO7A	H460Y	C	1650	T	NOTCH2	A422S	C	1484	A	OR5I1	L101M	G	301	T
MLYCD	F288L	T	884	G	MYO7A	R1696Q	G	5359	A	NOTCH2	-	T	0	C	OR5I1	K305N	T	915	G
MMD	N12S	T	320	C	MYO7A	L322P	T	1237	C	NOTCH2	R2019L	C	6276	A	OR5K2	F257V	T	846	G
MMD	R14Q	C	326	T	MYO7A	K1270N	G	4082	T	NOTCH2	G1531V	C	4812	A	OR5K3	Y218D	T	652	G
MMD2	R165H	C	689	T	MYO7B	L1799P	T	5449	C	NOTCH3	C1484Y	C	4527	T	OR5K4	R143W	C	427	T
MME	D591N	G	1982	A	MYO7B	P1353S	C	4110	T	NOTCH3	A1775T	C	5399	T	OR5K4	L182I	C	544	A
MME	K667*	A	2210	T	MYO7B	V950I	G	2901	A	NOTCH3	C1004Y	C	3087	T	OR5L1	T153M	C	547	T
MMEL1	R402H	C	1367	T	MYO7B	Y1284D	T	3903	G	NOTCH3	V1641I	C	4997	T	OR5L1	F101L	C	392	A
MMP1	F70L	G	278	T	MYO7B	G1317D	G	4003	A	NOTCH3	D217N	C	725	T	OR5L1	S146Y	C	526	A
MMP10	S207L	G	657	A	MYO7B	G1789S	G	5418	A	NOTCH3	R1231H	C	3768	T	OR5L2	L222I	C	664	A
MMP11	R318H	G	1005	A	MYO7B	R733W	C	2250	T	NOTCH3	A906T	C	2792	T	OR5M3	G202S	C	604	T
MMP11	V212A	T	687	C	MYO7B	L968M	C	2955	A	NOTCH3	G1511S	C	4607	T	OR5M8	F208L	A	622	G
MMP11	A375T	G	1175	A	MYO7B	Q632H	G	1949	C	NOTCH3	R1785H	C	5430	T	OR5M8	K88N	C	264	A
MMP11	T65M	C	246	T	MYO9A	R2370W	G	7581	A	NOTCH3	R1526C	G	4652	A	OR5M9	V23A	A	68	G
MMP11	R116W	C	398	T	MYO9A	R1992W	G	6447	A	NOTCH3	S1594L	G	4857	A	OR5P2	D265G	T	794	C
MMP13	T87A	T	287	C	MYO9A	S1657P	A	5442	G	NOTUM	R453*	G	1741	A	OR5P2	V170I	C	508	T
MMP14	Y164C	A	746	G	MYO9A	R1441I	C	4795	A	NOVA1	E148D	T	444	G	OR5P2	F174L	G	522	T
MMP15	R381C	C	1926	T	MYO9A	S1369*	G	4579	T	NOVA1	A357T	C	1069	T	OR5R1	V248A	A	743	G
MMP15	R126W	C	1161	T	MYO9A	I1142S	A	3898	C	NOX3	R288Q	C	966	T	OR5R1	D121N	C	361	T
MMP15	E181D	G	1328	T	MYO9A	E68G	T	676	C	NOX3	G371*	C	1214	A	OR5T1	F322L	T	1050	C
MMP16	A244S	C	1012	A	MYO9B	S762G	A	2346	G	NOX3	F24L	A	175	C	OR5T1	S276F	C	913	T
MMP16	N371T	T	1394	G	MYO9B	A258T	G	834	A	NOX4	G225S	C	912	T	OR5T3	L215I	C	643	A
MMP16	N370I	T	1391	A	MYO9B	R874C	C	2682	T	NOX4	R525Q	C	1813	T	OR5T3	K120E	A	358	G
MMP17	R125C	C	475	T	MYO9B	V1006M	G	3078	A	NOX5	R486C	C	1497	T	OR5T3	I188R	T	563	G
MMP17	A482T	G	1546	A	MYO9B	P1128S	C	3444	T	NOXA1	P399S	C	1375	T	OR5W2	F101L	G	303	T
MMP17	A304V	C	1013	T	MYO9B	D82N	G	306	A	NOXA1	R241I	G	902	T	OR5W2	N19S	T	56	C
MMP17	P587L	C	1862	T	MYO9B	I253L	A	819	C	NOXO1	F24L	A	74	G	OR6B1	C109R	T	393	C
MMP17	R473M	G	1520	T	MYO9B	V882M	G	2706	A	NPAS1	R351C	C	1247	T	OR6C1	E68D	A	242	C
MMP17	A593T	G	1879	A	MYO9B	R1352H	G	4117	A	NPAS1	A102T	G	500	A	OR6C1	L104I	C	348	A
MMP17	V388M	G	1264	A	MYO9B	A2031T	G	6153	A	NPAS1	L42Q	T	321	A	OR6C4	S278L	C	861	T
MMP17	V413I	G	1339	A	MYOC	A427T	C	1339	T	NPAS2	R824*	C	2755	T	OR6C6	L12I	G	34	T
MMP17	R442M	G	1427	T	MYOC	A108V	G	383	A	NPAS2	S122L	C	650	T	OR6C65	F10L	C	129	A
MMP19	R408Q	C	1344	T	MYOC	I432V	T	1354	C	NPAS2	F168L	T	789	G	OR6C65	L104I	C	409	A
MMP19	R345Q	C	1155	T	MYOCD	F890L	C	2870	A	NPAS2	F237V	T	994	G	OR6C68	S164I	G	491	T
MMP19	R130C	G	509	A	MYOCD	R103Q	G	508	A	NPAS3	L863F	C	2587	T	OR6C68	F35C	T	104	G
MMP2	D324N	G	1479	A	MYOCD	A667V	C	2200	T	NPAS4	L591I	C	1947	A	OR6C74	L80I	C	328	A
MMP2	R482C	C	1953	T	MYOCD	P829S	C	2685	T	NPAS4	A319V	C	1132	T	OR6C76	T288N	C	863	A
MMP2	G299D	G	1405	A	MYOCD	R384*	C	1350	T	NPAS4	G338V	G	1189	T	OR6C76	Q229H	G	687	T
MMP20	S162T	A	497	T	MYOD1	D32N	G	314	A	NPAS4	E396D	A	1364	T	OR6F1	T291M	G	872	A

MMP20	R35M	C	117	A	MYOF	-		A	0	G	NPAS4	S554T	G	1837	C	OR6F1	R234W	G	700	A
MMP20	Q267R	T	813	C	MYOF	-		T	0	A	NPAS4	A654V	C	2137	T	OR6F1	I213V	T	637	C
MMP24	I429V	A	1370	G	MYOF	-		A	0	G	NPAT	S857R	T	2671	G	OR6F1	P18T	G	52	T
MMP25	D173N	G	754	A	MYOF	R790*		G	2368	A	NPAT	G209S	C	727	T	OR6K3	A315V	G	944	A
OR6K3	E247*	C	739	A	PDE8B	H615R		A	1889	G	PLTP	R385H	C	1234	T	PSMF1	P182S	C	712	T
OR6K6	T144I	C	527	T	PDE8B	R714*		C	2185	T	PLTP	R372H	C	1195	T	PSMG2	N130D	A	1070	G
OR6K6	L94I	C	376	A	PDE9A	R468H		G	1463	A	PLUNC	P41S	C	192	T	PSMG4	D73N	G	288	A
OR6K6	K325T	A	1070	C	PDE9A	Q322R		A	1025	G	PLXDC2	E109G	A	1167	G	PSMG4	L14M	C	111	A
OR6M1	A248V	G	743	A	PDGFB	R46H		C	925	T	PLXNA1	R618H	G	1853	A	PSMG4	A144T	G	501	A
OR6M1	T313I	G	938	A	PDGFD	W232L		C	1067	A	PLXNA1	I365T	T	1094	C	PSMG4	-	A	0	C
OR6M1	L105M	G	313	T	PDGFD	A28T		C	454	T	PLXNA1	D545G	A	1634	G	PSPC1	R290H	C	1029	T
OR6N1	R307I	C	920	A	PDGFD	I91M		T	645	C	PLXNA1	R544W	C	1630	T	PSPC1	V111F	C	491	A
OR6N2	R261W	G	781	A	PDGFD	R359*		G	1447	A	PLXNA1	R825C	C	2473	T	PSTK	T264I	C	790	T
OR6P1	P79H	G	236	T	PDGFRA	V140M		G	749	A	PLXNA1	R1082W	C	3244	T	PSTK	E216D	G	647	T
OR6P1	L201R	A	602	C	PDGFRA	E109D		G	658	T	PLXNA1	R1384C	C	4150	T	PSTPIP1	E159D	G	927	T
OR6P1	L201R	A	602	C	PDGFRL	A107V		C	533	T	PLXNA1	V491I	G	1471	A	PTAFR	R133C	G	1032	A
OR6P1	D199A	T	596	G	PDGFRL	S115A		T	556	G	PLXNA1	D214N	G	640	A	PTAR1	A129S	C	407	A
OR6P1	S254F	G	761	A	PDGFRL	F167V		T	712	G	PLXNA2	Y1037C	T	3868	C	PTAR1	L111Q	A	354	T
OR6P1	G307V	C	920	A	PDHA1	R342Q		G	1101	A	PLXNA2	A1683V	G	5806	A	PTAR1	A173V	G	540	A
OR6Q1	A185V	C	577	T	PDHA2	V340M		G	1150	A	PLXNA2	G1208R	C	4380	T	PTAR1	D85Y	C	275	A
OR6T1	E133D	C	399	A	PDHA2	R300H		G	1031	A	PLXNA2	E1480K	C	5196	T	PTBP1	A295V	C	990	T
OR6X1	L210I	G	628	T	PDHA2	A32T		G	226	A	PLXNA2	D1025N	C	3831	T	PTBP1	D455G	A	1470	G
OR6Y1	F109V	A	325	C	PDHA2	Q168*		C	634	T	PLXNA2	A61V	G	940	A	PTBP2	T177A	A	529	G
OR6Y1	P317S	G	949	A	PDHA2	M255R		T	896	G	PLXNA2	T865M	G	3352	A	PTBP2	E29K	G	85	A
OR6Y1	I214S	A	641	C	PDHA2	L318I		C	1084	A	PLXNA2	A553V	G	2416	A	PTBP2	I420S	T	1259	G
OR7A10	Y120C	T	359	C	PDIA2	P118H		C	353	A	PLXNA3	R464*	C	1565	T	PTCD1	E85D	C	255	A
OR7A17	Y235H	A	703	G	PDIA2	T129M		C	386	T	PLXNA3	N1499D	A	4670	G	PTCD1	R411Q	C	1232	T
OR7A5	R165W	G	581	A	PDIA2	R495H		G	1484	A	PLXNA4	P1170L	G	3738	A	PTCD1	K200N	C	600	A
OR7C1	K186E	T	556	C	PDIA3	K271N		G	961	T	PLXNA4	V101I	C	530	T	PTCH1	V1361M	C	4269	T
OR7C1	K80R	T	239	C	PDIA3	K288N		G	1012	T	PLXNA4	R370W	G	1337	A	PTCH1	A563T	C	1875	T
OR7C2	C150R	T	448	C	PDIA4	M358V		T	1305	C	PLXNA4	R420C	G	1487	A	PTCH1	-	C	0	T
OR7D4	C97R	A	289	G	PDIA4	L624V		G	2103	C	PLXNA4	A48T	C	371	T	PTCH1	V1065G	A	3382	C
OR7D4	S229P	A	685	G	PDIA5	C465Y		G	1489	A	PLXNA4	R870W	G	2837	A	PTCH2	R561H	C	1813	T
OR7D4	A274T	C	820	T	PDIA5	R492H		G	1570	A	PLXNA4	Y1860C	T	5808	C	PTCH2	W193C	C	710	A
OR7E24	R157H	G	584	A	PDIA5	A384V		C	1246	T	PLXNA4	C1504R	A	4739	G	PTCHD1	Q290H	G	1730	T
OR7E24	K313N	G	1053	T	PDIA5	-		A	0	G	PLXNA4	R859H	C	2805	T	PTCHD1	L717M	C	3009	A
OR7E24	G114D	G	455	A	PDIA5	D445Y		G	1428	T	PLXNA4	V575M	C	1952	T	PTCHD2	C1167Y	G	3638	A
OR7E87P	F116V	T	346	G	PDIA5	K92T		A	370	C	PLXNA4	L33M	G	326	T	PTCHD2	D1040N	G	3256	A
OR7E8P	A94T	C	280	T	PDIA6	R190C		G	568	A	PLXNA4	I1864V	T	5819	C	PTCHD2	R456C	C	1504	T

OR7E9P	V142A	A	425	G	PDIK1L	A43T	G	414	A	PLXNA4	R888C	G	2891	A	PTCHD2	V558I	G	1810	A
OR7G1	F64C	A	191	C	PDILT	R233H	C	947	T	PLXNB1	T2059I	G	6279	A	PTCHD2	R1287W	C	3997	T
OR7G2	A146V	G	437	A	PDILT	L66I	G	445	T	PLXNB1	P1424T	G	4373	T	PTCHD2	V972M	G	3052	A
OR7G3	V151I	C	451	T	PDILT	V11L	C	280	G	PLXNB1	V1947M	C	5942	T	PTCHD2	R294H	G	1019	A
OR7G3	L185P	A	554	G	PDILT	K251R	T	1001	C	PLXNB1	R1305H	C	4017	T	PTCHD2	A896V	C	2825	T
OR8A1	T133A	A	469	G	PDK1	V343I	G	1171	A	PLXNB1	P2032L	G	6198	A	PTCHD3	T101I	G	420	A
OR8A1	L238I	C	784	A	PDK3	H243P	A	957	C	PLXNB1	R1338H	C	4116	T	PTCHD3	A256V	G	885	A
OR8A1	T246I	C	809	T	PDK4	V242M	C	922	T	PLXNB1	A705D	G	2217	T	PTCHD3	L450I	G	1466	T
OR8B12	A116V	G	347	A	PDK4	R166H	C	695	T	PLXNB1	E611G	T	1935	C	PTDSS1	I369M	A	1212	G
OR8B12	G43D	C	128	T	PDK4	S189N	C	764	T	PLXNB1	R1832H	C	5598	T	PTDSS1	A248V	C	848	T
OR8B4	Y60H	A	178	G	PDLIM1	R69I	C	315	A	PLXNB2	L1142P	A	3566	G	PTDSS1	P98S	C	397	T
OR8D1	S171P	A	511	G	PDLIM1	P210L	G	738	A	PLXNB2	R820H	C	2600	T	PTDSS2	E343D	G	1205	T
OR8D4	L245V	C	763	G	PDLIM3	R241W	G	795	A	PLXNB2	R531Q	C	1733	T	PTDSS2	V103A	T	484	C
OR8H2	L211I	C	631	A	PDLIM3	K328T	T	1057	G	PLXNB2	S996I	C	3128	A	PTEN	R233*	C	2054	T
OR8H3	L222I	C	664	A	PDLIM3	-	C	0	T	PLXNB2	G689D	C	2207	T	PTEN	A3D	C	1365	A
OR8H3	C112Y	G	335	A	PDLIM4	V5M	G	77	A	PLXNB2	T1096A	T	3427	C	PTEN	I28M	T	1441	G
OR8H3	L198M	C	592	A	PDLIM5	T74I	C	265	T	PLXNB3	M326V	A	1090	G	PTEN	K125T	A	1731	C
OR8I2	S164N	G	522	A	PDLIM7	V362M	C	1151	T	PLXNB3	R1505H	G	4628	A	PTEN	R130Q	G	1746	A
OR8I2	L29W	T	117	G	PDLIM7	A143V	G	495	A	PLXNB3	A1464T	G	4504	A	PTEN	H93Y	C	1634	T
OR8I2	F28L	C	115	A	PDP1	G354S	G	1060	A	PLXNB3	V1435M	G	4417	A	PTER	E76D	G	406	T
OR8I2	L66V	T	227	G	PDP1	R550H	G	1649	A	PLXNB3	R1121W	C	3475	T	PTF1A	G272D	G	1019	A
OR8I2	V11I	G	62	A	PDP1	E588A	A	1763	C	PLXNC1	D202G	A	605	G	PTGDR	R310Q	G	1031	A
OR8J1	S171F	C	544	T	PDP2	V341I	G	1183	A	PLXNC1	L1086R	T	3257	G	PTGER3	R175C	G	754	A
OR8J3	Y60H	A	178	G	PDS5A	M1005I	C	3555	T	PLXNC1	N895Y	A	2683	T	PTGER4	Q313*	C	1961	T
OR8K3	K297E	A	889	G	PDS5A	P998S	G	3532	A	PLXNC1	K1077N	G	3231	T	PTGES	A138T	C	447	T
OR8K5	E196*	C	586	A	PDS5A	E504K	C	2050	T	PLXNC1	E1134K	G	3400	A	PTGES2	R136S	G	1151	T
OR8K5	V173A	A	518	G	PDS5A	R377C	G	1669	A	PLXND1	A1793T	C	5556	T	PTGFR	I83T	T	443	C
OR8S1	A237T	G	709	A	PDS5B	R289H	G	1024	A	PLXND1	P259L	G	955	A	PTGFR	G224*	G	865	T
OR8S1	F61L	C	183	A	PDS5B	V1222I	G	3822	A	PLXND1	C702G	A	2283	C	PTGFR	K339N	A	1212	C
OR8S1	R352C	C	1054	T	PDS5B	-	T	0	C	PLXND1	R1370C	G	4287	A	PTGFRN	A733V	C	2345	T
OR9A2	V97A	A	353	G	PDSS1	S216C	C	700	G	PMEPA1	R224H	C	991	T	PTGFRN	R214H	G	788	A
OR9A2	K223N	C	732	A	PDXDC1	R203C	C	831	T	PMFBP1	T965M	G	3026	A	PTGFRN	R654H	G	2108	A
OR9A4	F31L	C	152	A	PDXDC1	N273D	A	1041	G	PMFBP1	E921K	C	2893	T	PTGFRN	L9P	T	173	C
OR9G4	R106H	C	317	T	PDXDC2	-	T	0	C	PMFBP1	D923G	T	2900	C	PTGIR	A90T	C	381	T
OR9I1	C189R	A	565	G	PDYN	R232H	C	921	T	PMFBP1	N952S	T	2987	C	PTGIR	A98T	C	405	T
OR9K2	A142T	G	512	A	PDZD11	R46Q	C	270	T	PML	R872H	G	2711	A	PTGIR	S345N	C	1147	T
OR9K2	M70T	T	297	C	PDZD2	E1596D	G	5176	T	PML	Q483P	A	1544	C	PTGIS	V460A	A	1409	G
OR9K2	F281L	T	931	G	PDZD2	A2659V	C	8364	T	PMM2	R141C	C	487	T	PTGR2	S270T	T	1008	A
OR9Q1	V223M	G	983	A	PDZD2	V806I	G	2804	A	PMM2	S246C	C	803	G	PTGS1	L534I	C	1605	A

OR9Q2	A249T	G	802	A	PDZD2	A372T	G	1502	A	PMP22	V119A	A	551	G	PTGS1	R179H	G	541	A
ORAI1	S92G	A	467	G	PDZD2	T1093I	C	3666	T	PMPCA	R516H	G	1556	A	PTGS2	R600H	C	1932	T
ORAI1	A279V	C	1029	T	PDZD2	P2038L	C	6501	T	PMS1	V791A	T	2605	C	PTGS2	R600H	C	1932	T
ORAI2	R180H	G	774	A	PDZD2	G1606C	G	5204	T	PMS1	A145D	C	667	A	PTH1R	S333F	C	998	T
ORAI2	S49L	C	381	T	PDZD2	L73I	C	605	A	PMS1	G125D	G	607	A	PTH1R	D266G	A	797	G
ORAI3	R145H	G	658	A	PDZD2	R2083H	G	6636	A	PMS2	I611M	A	1939	C	PTH2	L22V	G	166	C
ORC1L	V90A	A	488	G	PDZD2	R1117M	G	3738	T	PMS2	Q342H	T	1132	G	PTH2R	-	G	0	T
ORC1L	V518A	A	1772	G	PDZD2	A400V	C	1587	T	PNCK	G10R	C	214	T	PTH2R	S499N	G	1913	A
ORC1L	R608*	G	2041	A	PDZD2	P1476S	C	4814	T	PNCK	A196T	C	772	T	PTH2R	D38N	G	529	A
ORC1L	A205T	C	832	T	PDZD2	R309H	G	1314	A	PNKD	R377W	C	1180	T	PTHLH	R94Q	C	603	T
ORC1L	R134W	G	619	A	PDZD3	D410N	G	1228	A	PNKD	R222Q	G	716	A	PTHLH	R56*	G	488	A
ORC2L	R39*	G	365	A	PDZD4	R693W	G	2346	A	PNKD	R222Q	G	716	A	PTHLH	R94L	C	603	A
ORC4L	S310I	C	1066	A	PDZD4	P571S	G	1980	A	PNKP	R293C	G	983	A	PTHLH	R142*	G	746	A
ORC4L	W435G	A	1440	C	PDZD4	E243D	C	998	A	PNKP	W402*	C	1312	T	PTK2	G904S	C	2710	T
ORC5L	P288L	G	1006	A	PDZD4	A201V	G	871	A	PNLDC1	L492M	C	1508	A	PTK2	-	A	0	G
ORM1	A47T	G	217	A	PDZD7	R293Q	C	1104	T	PNLDC1	W53*	G	192	A	PTK2	D811G	T	2432	C
OS9	S65F	C	253	T	PDZD7	N137S	T	636	C	PNLIP	P464L	C	1419	T	PTK2	A25T	C	73	T
OSBP	R514Q	C	2021	T	PDZD8	R415Q	C	1484	T	PNLIP	G325C	G	1001	T	PTK2B	P666S	C	2804	T
OSBP	L294P	A	1361	G	PDZD8	E1102*	C	3544	A	PNLIP	D96G	A	315	G	PTK6	R223Q	C	696	T
OSBPL10	G211R	C	754	T	PDZD8	M1091V	T	3511	C	PNLIP	L110M	C	356	A	PTK6	R85C	G	281	A
OSBPL10	D356N	C	1189	T	PDZD8	R382C	G	1384	A	PNLIPRP1	G169C	G	539	T	PTK7	G1001S	G	3071	A
OSBPL11	I293F	T	1167	A	PDZRN3	A947T	C	2954	T	PNLIPRP1	Q84H	A	286	C	PTMAP5	E73*	G	374	T
OSBPL11	R143*	G	717	A	PDZRN3	R971C	G	3026	A	PNLIPRP1	S129F	C	420	T	PTMS	R30Q	G	420	A
OSBPL11	Q704R	T	2401	C	PDZRN3	E686D	C	2173	A	PNLIPRP3	F241V	T	867	G	PTN	K146T	T	865	G
OSBPL11	F539C	A	1906	C	PDZRN3	R971H	C	3027	T	PNMA1	K334T	T	1787	G	PTOV1	R392C	C	1344	T
OSBPL11	M224V	T	960	C	PDZRN4	S581Y	C	1742	A	PNMA2	R332W	G	994	A	PTP4A2	Y149H	A	1442	G
OSBPL11	K101Q	T	591	G	PDZRN4	P577S	C	1729	T	PNMA5	S252P	A	1176	G	PTP4A2	A108V	G	1320	A
OSBPL1A	T353M	G	1265	A	PDZRN4	R958C	C	2872	T	PNMAL1	R126H	C	683	T	PTPDC1	V13M	G	37	A
OSBPL1A	R835*	G	2710	A	PDZRN4	A469T	G	1405	A	PNMAL1	S328N	C	1289	T	PTPDC1	R39Q	G	116	A
OSBPL2	E99G	A	498	G	PDZRN4	T748A	A	2242	G	PNMAL1	P429H	G	1592	T	PTPDC1	R721*	C	2161	T
OSBPL5	R813W	G	2553	A	PDZRN4	N500D	A	1498	G	PNMAL1	G155E	C	770	T	PTPLA	P195S	G	621	A
OSBPL5	R684Q	C	2167	T	PDZRN4	R907Q	G	2720	A	PNMAL2	R167I	C	500	A	PTPLA	P28S	G	120	A
OSBPL5	P396L	G	1303	A	PEAR1	S983N	G	3173	A	PNMT	R73H	G	440	A	PTPLAD1	E2D	G	151	T
OSBPL5	L864F	G	2706	A	PEAR1	R190S	C	793	A	PNN	E465*	G	1452	T	PTPLAD1	K147T	A	585	C
OSBPL5	A817V	G	2566	A	PECI	A2V	G	41	A	PNN	R247K	G	799	A	PTPLAD1	K358N	G	1219	T
OSBPL6	E71K	G	755	A	PECI	Q20*	G	94	A	PNN	R123H	G	427	A	PTPLAD2	S140F	G	465	A
OSBPL6	L762P	T	2829	C	PEG10	A263S	G	1266	T	PNO1	R84I	G	342	T	PTPLAD2	V100A	A	345	G
OSBPL6	R180W	C	1082	T	PEG3AS	E122D	C	366	A	PNPLA1	R228S	G	684	T	PTPLB	R62Q	C	343	T
OSBPL6	A348T	G	1586	A	PEG3AS	R324H	C	971	T	PNPLA1	N288T	A	863	C	PTPLB	V125I	C	531	T

OSBPL6	I604V	A	2354	G	PEG3AS	R179C	G	535	A	PNPLA2	V184M	G	752	A	PTPN11	V181I	G	694	A
OSBPL6	K711Q	A	2675	C	PEG3AS	G1544D	C	4631	T	PNPLA2	V143A	T	630	C	PTPN11	E76G	A	380	G
OSBPL7	P497S	G	1692	A	PEG3AS	G1065D	C	3194	T	PNPLA3	A325V	C	1147	T	PTPN11	E225D	A	828	C
OSBPL7	R382H	C	1348	T	PEG3AS	R604H	C	1811	T	PNPLA5	V75F	C	353	A	PTPN11	K325T	A	1127	C
OSBPL7	R808W	G	2625	A	PEG3AS	G385D	C	1517	T	PNPLA6	N20S	A	337	G	PTPN12	W118R	T	624	C
OSBPL7	P180L	G	742	A	PEG3AS	K677T	T	2030	G	PNPLA6	S635L	C	2182	T	PTPN13	L1590I	C	5248	A
OSBPL7	R150S	G	651	T	PEG3AS	K569N	C	1707	A	PNPLA6	A655T	G	2241	A	PTPN13	K224R	A	1151	G
OSBPL7	R525H	C	1777	T	PEG3AS	F562L	G	1686	T	PNPLA6	G698S	G	2370	A	PTPN13	R1422H	G	4745	A
OSBPL8	W639*	C	2396	T	PEG3AS	F467C	A	1400	C	PNPLA6	A627V	C	2158	T	PTPN13	S1462F	C	4865	T
OSBPL8	A696D	G	2567	T	PEG3AS	E112D	C	336	A	PNPLA7	T638M	G	2250	A	PTPN13	P1235L	C	4184	T
OSBPL8	F294V	A	1360	C	PELI1	Q101H	C	746	A	PNPLA7	R911C	G	3068	A	PTPN13	R2371C	C	7591	T
OSBPL9	F132C	T	393	G	PELI2	V115I	G	629	A	PNPLA7	R348W	G	1379	A	PTPN13	S1245N	G	4214	A
OSCP1	G223C	C	749	A	PELI2	S110N	G	615	A	PNPLA7	R1324Q	C	4308	T	PTPN13	P2329S	C	7465	T
OSCP1	S245Y	G	816	T	PELI3	V334M	G	1164	A	PNPLA7	R1005W	G	3350	A	PTPN13	F662C	T	2465	G
OSGEP	G177R	C	913	G	PELI3	R269Q	G	970	A	PNPLA7	R910C	G	3065	A	PTPN13	I2141M	T	6903	G
OSGIN1	E161K	G	864	A	PELI3	R224Q	G	835	A	PNPLA7	-	T	0	C	PTPN14	Y119C	T	551	C
OSGIN1	A94T	G	663	A	PELP1	F804S	A	2637	G	PNPLA7	S159L	G	813	A	PTPN14	A192T	C	769	T
OSGIN2	V150I	G	708	A	PENK	A20V	G	140	A	PNPLA8	A255T	C	1058	T	PTPN14	R672W	G	2209	A
OSGIN2	-	T	0	C	PEPD	R314H	C	1076	T	PNPT1	G604*	C	1863	A	PTPN14	R24Q	C	266	T
OSM	Q97*	G	330	A	PER1	S523N	C	1806	T	PNPT1	P90H	G	322	T	PTPN14	E1066*	C	3391	A
OSM	S182L	G	586	A	PER1	-	C	0	T	POC1A	A63D	G	228	T	PTPN14	E832A	T	2690	G
OSMR	V25A	T	476	C	PER1	G24D	C	309	T	POC1A	T191A	T	611	C	PTPN18	R443C	C	1428	T
OSMR	I657M	A	2373	G	PER2	V19M	C	335	T	POC1B	N181S	T	647	C	PTPN18	T236A	A	807	G
OSMR	M947L	A	3241	C	PER2	A1049T	C	3425	T	POC1B	L325R	A	1079	C	PTPN18	R321W	C	1062	T
OSR1	A88T	C	607	T	PER2	G1055S	C	3443	T	POC1B	H227N	G	784	T	PTPN2	K122R	T	423	C
OSR1	H94R	T	626	C	PER2	A1049T	C	3425	T	POC1B	F191C	A	677	C	PTPN21	L502P	A	1710	G
OSR2	A202V	C	605	T	PER2	P27Q	G	360	T	POC1B	F95L	G	390	T	PTPN21	R11H	C	237	T
OSR2	H327R	A	980	G	PES1	D303N	C	1014	T	PODN	A374T	G	1127	A	PTPN21	F1077C	A	3435	C
OSTF1	I155V	A	613	G	PES1	R336*	G	1113	A	PODN	A113T	G	344	A	PTPN22	K548N	C	1780	A
OSTF1	P62S	C	334	T	PET112L	V275I	C	864	T	PODN	R22C	C	71	T	PTPN22	S588Y	G	1899	T
OSTM1	N216K	A	734	T	PET112L	A232V	G	736	A	POF1B	P538T	G	1732	T	PTPN22	V236A	A	843	G
OSTM1	A92V	G	361	A	PET112L	A64S	C	231	A	POF1B	A451T	C	1471	T	PTPN23	D317N	G	1026	A
OTOA	S403Y	C	1209	A	PET112L	A251V	G	793	A	POFUT2	-	C	0	T	PTPN23	R1158W	C	3549	T
OTOA	A650T	G	1949	A	PEX1	R1193I	C	3674	A	POFUT2	S390Y	G	1196	T	PTPN23	R1459H	G	4453	A
OTOF	T1600I	G	4926	A	PEX1	C382Y	C	1241	T	POGK	A53V	C	308	T	PTPN23	L338F	G	1091	T
OTOF	R1589H	C	4893	T	PEX1	D694Y	C	2176	A	POGZ	V71I	C	526	T	PTPN3	S372F	G	1227	A
OTOF	D1798N	C	5519	T	PEX1	E451D	C	1449	A	POGZ	R1177K	C	3845	T	PTPN3	R786*	G	2468	A
OTOG	L2332M	C	6994	A	PEX10	R83W	G	275	A	POGZ	R374W	G	1435	A	PTPN3	T744M	G	2343	A
OTOG	R2365H	G	7094	A	PEX11A	G226C	C	826	A	POGZ	R1039H	C	3431	T	PTPN3	T854A	T	2672	C

OTOP1	D390G	T	1194	C	PEX11B	D100N	G	447	A	POGZ	R979*	G	3250	A	PTPN3	R106*	G	428	A
OTOP1	H117N	G	374	T	PEX11G	L151P	A	461	G	POGZ	F822C	A	2780	C	PTPN3	F70V	A	320	C
OTOP1	D510A	T	1554	G	PEX12	I62L	T	718	G	POLA1	-	T	4448	C	PTPN4	K665E	A	2764	G
OTOP1	D487Y	C	1484	A	PEX12	A235T	C	1237	T	POLA2	P424L	C	1605	T	PTPN5	V162M	C	915	T
OTOP1	E376D	C	1153	A	PEX13	T365M	C	1132	T	POLA2	R167Q	G	834	A	PTPN5	E292*	C	1305	A
OTOP1	V181I	C	566	T	PEX13	K232Q	A	732	C	POLA2	H369Y	C	1439	T	PTPN6	R277C	C	964	T
OTOP1	P36L	G	132	A	PEX16	T318M	G	1265	A	POLB	E86G	A	391	G	PTPN6	A515T	G	1678	A
OTOP2	A73T	G	309	A	PEX19	E68D	C	226	A	POLD1	R423H	G	1312	A	PTPN7	G161V	C	1256	A
OTOP2	D224N	G	762	A	PEX2	G284D	C	1277	T	POLD1	L22F	C	108	T	PTPN7	P460S	G	2152	A
OTOP2	V301M	G	993	A	PEX26	A202T	G	604	A	POLD1	S905P	T	2757	C	PTPN7	E205*	C	1387	A
OTOP2	S497Y	C	1582	A	PEX3	L292I	C	937	A	POLD2	V165M	C	1143	T	PTPN9	T446M	G	1850	A
OTOP3	R222W	C	664	T	PEX3	E372D	G	1179	T	POLD3	E51*	G	226	T	PTPN9	F151C	A	965	C
OTOP3	L118M	C	352	A	PEX5	G59D	G	176	A	POLD3	E297D	A	966	C	PTPRA	T179A	A	928	G
OTOS	A32V	G	326	A	PEX5L	E529D	C	1918	A	POLD3	E378K	G	1207	A	PTPRA	R583W	C	2140	T
OTP	P59H	G	324	T	PEX5L	H485Y	G	1784	A	POLDIP3	E288D	C	945	A	PTPRB	-	A	0	G
OTUB2	G66V	G	357	T	PEX5L	S54P	A	491	G	POLDIP3	A344V	G	1112	A	PTPRB	R86H	C	292	T
OTUD1	K289T	A	1055	C	PEX5L	E489*	C	1796	A	POLE	P286R	G	901	C	PTPRB	R1046C	G	3171	A
OTUD4	T624I	G	1871	A	PEX5L	K418N	C	1585	A	POLE	F104L	G	356	T	PTPRB	Y2043H	A	6162	G
OTUD4	D431G	T	1292	C	PEX5L	S205*	G	945	T	POLE	R266*	G	840	A	PTPRB	K1455*	T	4398	A
OTUD4	E889*	C	2665	A	PEX5L	R186*	G	887	A	POLE	A969V	G	2950	A	PTPRB	-	C	0	A
OTUD5	A437V	G	1371	A	PEX5L	R543Q	C	1959	T	POLE	L1350P	A	4093	G	PTPRB	D2149G	T	6481	C
OTUD6A	H59R	A	210	G	PEX6	R969Q	C	2976	T	POLE	Q2282*	G	6888	A	PTPRB	I1565M	A	4730	C
OTUD7A	R89*	G	358	A	PEX7	A259T	G	856	A	POLE	P286R	G	901	C	PTPRB	R1541C	G	4656	A
OTUD7A	S563L	G	1781	A	PEX7	A218V	C	734	T	POLE2	R360C	G	1092	A	PTPRB	F5L	A	50	C
OTUD7A	V77E	A	323	T	PEX7	K186N	G	639	T	POLE2	K105T	T	328	G	PTPRB	G569S	C	1740	T
OTUD7A	L212V	A	727	C	PFAS	N995S	A	3108	G	POLE3	R61W	G	270	A	PTPRC	I321M	T	1104	G
OTUD7B	R832W	G	2789	A	PFAS	R1201C	C	3725	T	POLG	R807C	G	2753	A	PTPRC	K600T	A	1940	C
OTUD7B	-	T	0	C	PFAS	A1251V	C	3876	T	POLG	-	T	0	G	PTPRC	A1267V	C	3941	T
OTX1	D315N	G	1219	A	PFAS	R610I	G	1953	T	POLG	E105K	C	647	T	PTPRC	R859C	C	2716	T
OTX2	S245P	A	1010	G	PFDN1	K10N	C	78	A	POLG2	M314I	C	1025	T	PTPRC	I905L	A	2854	C
OVCA2	A90T	G	333	A	PFDN6	V43A	T	534	C	POLG2	K477R	T	1513	C	PTPRC	F582Y	T	1886	A
OVCH1	P854S	G	2560	A	PFKFB1	R29Q	C	157	T	POLH	R377C	C	1424	T	PTPRC	A182V	C	686	T
OVCH1	C373R	A	1117	G	PFKFB2	F149L	T	569	C	POLH	Q464H	G	1687	T	PTPRC	L583M	C	1888	A
OVCH1	F1075C	A	3224	C	PFKFB3	A390T	G	1563	A	POLI	V44A	T	155	C	PTPRC	R890*	C	2809	T
OVCH1	-	A	0	C	PFKFB4	V114A	A	454	G	POLI	V433A	T	1322	C	PTPRC	A1189V	C	3707	T
OVCH1	I124S	A	371	C	PFKFB4	T464M	G	1504	A	POLK	S735Y	C	2376	A	PTPRD	A1656S	C	5722	A
OVCH1	I119S	A	356	C	PFKFB4	V247M	C	852	T	POLK	A113V	C	510	T	PTPRD	M1164I	C	4248	T
OVCH1	R28C	G	82	A	PFKFB4	A440T	C	1431	T	POLM	R230H	C	736	T	PTPRD	R139H	C	1172	T
OVCH2	R51C	G	151	A	PFKL	T659M	C	1976	T	POLN	A879S	C	2635	A	PTPRD	P187A	G	1315	C

OVCH2	Q41*	G	121	A	PFKL	C569Y	G	1706	A	POLQ	E701*	C	2101	A	PTPRD	S504P	A	2266	G
OVCH2	S22Y	G	65	T	PFKL	R470Q	G	1409	A	POLQ	T418A	T	1252	C	PTPRD	R733H	C	2954	T
OVGP1	R670S	C	2010	A	PFKL	R612S	C	1834	A	POLQ	R2305H	C	6914	T	PTPRD	Y1361H	A	4837	G
OXA1L	A34V	C	101	T	PFKP	R575Q	G	1800	A	POLQ	R2583H	C	7748	T	PTPRD	G1719W	C	5911	A
OXA1L	R394W	C	1180	T	PFKP	A445T	G	1409	A	POLQ	G2581R	C	7741	T	PTPRE	R374H	G	1400	A
OXCT1	T471A	T	1572	C	PGA5	R369H	G	1136	A	POLQ	R421C	G	1261	A	PTPRF	R407C	C	1559	T
OXCT1	-	C	0	G	PGAM1	-	T	0	C	POLQ	K2541T	T	7622	G	PTPRF	R1451W	C	4691	T
OXCT1	R110H	C	490	T	PGAM5	R118H	G	380	A	POLQ	R2377Q	C	7130	T	PTPRF	H1122R	A	3705	G
OXCT1	I264V	T	951	C	PGAM5	A65T	G	594	A	POLQ	V1444A	A	4331	G	PTPRF	R216C	C	986	T
OXCT2	V261I	C	874	T	PGAM5	R214C	C	667	T	POLR1A	F298C	A	1272	C	PTPRF	P440H	C	1659	A
OXGR1	G323R	C	1211	T	PGAM5	A120T	G	423	A	POLR1A	R565C	G	2072	A	PTPRG	G784V	G	2728	T
OXGR1	A312T	C	1178	T	PGAP1	N94H	T	395	G	POLR1A	R1598C	G	5171	A	PTPRH	R390I	C	1210	A
OXGR1	V252I	C	998	T	PGAP2	R149H	G	559	A	POLR1A	R1501W	G	4880	A	PTPRH	M1055T	A	3205	G
OXNAD1	R34H	G	566	A	PGAP2	R171H	G	625	A	POLR1A	A1609T	C	5204	T	PTPRH	R977C	G	2970	A
OXNAD1	E221K	G	1126	A	PGAP2	V80I	G	238	A	POLR1A	P927L	G	3159	A	PTPRH	S662F	G	2026	A
OXR1	R88Q	G	524	A	PGAP2	F90C	T	382	G	POLR1A	T662K	G	2364	T	PTPRH	A477T	C	1470	T
OXR1	V159I	G	736	A	PGAP3	H284R	T	894	C	POLR1A	P1474L	G	4800	A	PTPRH	E1098D	T	3335	G
OXR1	E66K	G	457	A	PGAP3	V296I	C	929	T	POLR1A	R1385G	T	4532	C	PTPRJ	L738P	T	2568	C
OXR1	E275*	G	1084	T	PGAP3	C64Y	C	234	T	POLR1B	R351Q	G	1632	A	PTPRJ	P653S	C	2312	T
OXSR1	A163T	G	859	A	PGBD1	K634R	A	2306	G	POLR1B	D809N	G	3005	A	PTPRJ	A670T	G	2363	A
OXSR1	-	T	0	C	PGBD1	K569T	A	2111	C	POLR1C	G20V	G	147	T	PTPRJ	P598L	C	2148	T
OXTR	T273A	T	1442	C	PGBD3	R402Q	C	1407	T	POLR1E	L306R	T	1205	G	PTPRK	N927K	G	3036	T
OXTR	L331P	A	1617	G	PGBD3	Y165H	A	695	G	POLR2A	T1184M	C	3769	T	PTPRK	R1107*	G	3574	A
OXTR	P108L	G	948	A	PGBD4	D423E	T	1728	G	POLR2B	E346*	G	1449	T	PTPRK	I1097T	A	3545	G
P2RX1	G391C	C	1612	A	PGBD5	V471M	C	1411	T	POLR2B	R834H	G	2914	A	PTPRK	E845D	C	2790	A
P2RX2	P101S	C	301	T	PGBD5	T256S	T	766	A	POLR2B	A1154T	G	3873	A	PTPRK	Q1299H	C	4152	A
P2RX2	R286Q	G	857	A	PGD	F42L	C	164	A	POLR2B	V237F	G	1122	T	PTPRK	V129A	A	641	G
P2RX2	K207N	A	621	T	PGD	F84L	C	290	A	POLR2D	E106Q	C	373	G	PTPRK	P1441L	G	4577	A
P2RX3	S272I	G	891	T	PGD	R324W	C	1008	T	POLR2E	V105M	C	390	T	PTPRK	F1028L	G	3339	T
P2RX3	W253R	T	833	C	PGF	R127H	C	380	T	POLR2H	R111C	C	390	T	PTPRK	I961M	A	3138	C
P2RX3	R52Q	G	231	A	PGGT1B	N296D	T	907	C	POLR3A	P777S	G	2467	A	PTPRK	C864Y	C	2846	T
P2RX3	L32I	C	170	A	PGGT1B	D318Y	C	973	A	POLR3A	H33R	T	236	C	PTPRM	P586H	C	1757	A
P2RX3	E161D	A	559	C	PGK1	-	G	0	T	POLR3A	F558L	G	1812	T	PTPRM	A12V	C	35	T
P2RX6	V339I	G	1163	A	PGK2	A347V	G	1040	A	POLR3A	T280A	T	976	C	PTPRM	S669G	A	2005	G
P2RX6	-	T	0	C	PGK2	F244S	A	731	G	POLR3B	I20T	T	228	C	PTPRM	S67Y	C	200	A
P2RX6	S207N	G	768	A	PGLS	E121A	A	412	C	POLR3B	V191M	G	740	A	PTPRM	K766T	A	2297	C
P2RX7	G290D	G	965	A	PGLYRP1	G180V	C	564	A	POLR3B	I138T	T	582	C	PTPRM	-	G	0	A
P2RX7	E305D	G	1011	T	PGLYRP2	R233Q	C	1179	T	POLR3B	S1119Y	C	3525	A	PTPRN	R776Q	C	2568	T
P2RY1	N11S	A	54	G	PGLYRP2	Q437*	G	1790	A	POLR3B	D375Y	G	1292	T	PTPRN	P427H	G	1521	T

P2RY10	-	G	0	A	PGLYRP2	L90P	A	750	G	POLR3B	R550Q	G	1818	A	PTPRN	D923N	C	3008	T
P2RY12	E215*	C	943	A	PGLYRP3	E163D	C	542	A	POLR3B	A775T	G	2492	A	PTPRN	A340T	C	1259	T
P2RY13	E326D	T	998	G	PGLYRP4	R201Q	C	667	T	POLR3C	L271F	G	972	A	PTPRN	A913V	G	2979	A
P2RY13	T93A	T	297	C	PGLYRP4	P318H	G	1018	T	POLR3E	G541D	G	1789	A	PTPRN2	-	C	0	T
P2RY14	S226L	G	990	A	PGLYRP4	S69I	C	271	A	POLR3E	R186C	C	723	T	PTPRN2	R545H	C	1634	T
P2RY2	G134S	G	867	A	PGM2L1	K245N	C	1031	A	POLR3E	W640*	G	2087	A	PTPRN2	F1020S	A	3059	G
P2RY2	A208T	G	1089	A	PGM3	M193T	A	578	G	POLR3E	M247I	G	908	T	PTPRN2	R545H	C	1634	T
P2RY2	V45M	G	600	A	PGM3	V172A	A	515	G	POLR3F	I22V	A	444	G	PTPRO	S1137I	G	3584	T
P2RY4	S177G	T	709	C	PGM5	V147D	T	669	A	POLR3G	E187*	G	759	T	PTPRQ	E626*	G	1876	T
P2RY6	V271I	G	1216	A	PGP	L194M	G	624	T	POLR3GL	I129V	T	492	C	PTPRQ	C1453Y	G	4358	A
P2RY6	A281V	C	1247	T	PGPEP1	R128*	C	477	T	POLR3GL	H188R	T	670	C	PTPRQ	R1716*	C	5146	T
P2RY6	A133T	G	802	A	PGPEP1L	A142T	C	630	T	POLR3H	-	A	673	G	PTPRQ	I918F	A	2752	T
P2RY6	P298H	C	1298	A	PGR	R740Q	C	2962	T	POLR3K	N33I	T	140	A	PTPRQ	D389Y	G	1165	T
P4HA1	R362Q	C	1202	T	PGR	P547L	G	2383	A	POLRMT	P294L	G	937	A	PTPRQ	E706K	G	2116	A
P4HA1	N367T	T	1217	G	PGR	P307H	G	1663	T	POLRMT	R458C	G	1428	A	PTPRQ	K1538N	G	4614	T
P4HA2	R498Q	C	2062	T	PGR	L727I	G	2922	T	POLRMT	M109T	A	382	G	PTPRQ	R2263I	G	6788	T
P4HA2	F525L	A	2142	G	PGR	S99N	C	1039	T	POLRMT	A875T	C	2679	T	PTPRQ	I2274T	T	6821	C
P4HB	A178V	G	731	A	PGR	R899Q	C	3439	T	POLRMT	A961V	G	2938	A	PTPRQ	E2018V	A	6053	T
P4HTM	N428S	A	1651	G	PGRMC1	A8V	C	134	T	POM121C	Q522*	G	1564	A	PTPRR	Y547C	T	2056	C
P4HTM	R195W	C	951	T	PGS1	V138A	T	425	C	POM121C	S443Y	G	1328	T	PTPRR	R308*	G	1338	A
P4HTM	G217E	G	1018	A	PHACTR1	T236M	C	707	T	POM121L12	A166T	G	526	A	PTPRR	R531*	G	2007	A
PA2G4	L183I	C	547	A	PHACTR1	D139E	T	417	A	POM121L12	P273H	C	848	A	PTPRS	R979Q	C	3170	T
PABPC1	S175F	G	1028	A	PHACTR1	R27I	G	80	T	POM121L2	G982C	C	2944	A	PTPRS	G1454S	C	4594	T
PABPC1	M573I	C	2223	T	PHACTR2	R257H	G	969	A	POM121L2	A389D	G	1166	T	PTPRS	R714H	C	2375	T
PABPC1L	P412S	C	1316	T	PHACTR3	T480I	C	1906	T	POM121L2	R272I	C	815	A	PTPRS	D1144G	T	3665	C
PABPC1L	R473H	G	1500	A	PHACTR3	R105*	C	780	T	POMGNT1	V525I	C	2224	T	PTPRS	V1531I	C	4825	T
PABPC1L	R89*	C	347	T	PHACTR4	R708C	C	2336	T	POMGNT1	R207K	C	1271	T	PTPRS	K1090E	T	3502	C
PABPC1L	K592N	G	1858	T	PHAX	Q104H	G	1007	T	POMGNT1	V101I	C	952	T	PTPRS	P292S	G	1108	A
PABPC1L	Q479P	A	1518	C	PHB2	A275V	G	1034	A	POMP	K33R	A	179	G	PTPRS	R612S	G	2068	T
PABPC3	E149K	G	506	A	PHC1	R962H	G	2885	A	POMP	L100I	C	379	A	PTPRS	A440V	G	1553	A
PABPC3	R41W	C	182	T	PHC1	A902T	G	2704	A	POMT1	H224Y	C	849	T	PTPRT	A293S	C	1113	A
PABPC3	A217T	G	710	A	PHC1	F148V	T	442	G	POMT1	G77A	G	409	C	PTPRT	I521M	G	1799	C
PABPC3	K575E	A	1784	G	PHC2	S663F	G	2042	A	POMT1	N435T	A	1483	C	PTPRT	R1352C	G	4290	A
PABPC3	R94Q	G	342	A	PHC2	V57M	C	223	T	POMT1	S602L	C	1984	T	PTPRT	L781M	G	2577	T
PABPC3	R519C	C	1616	T	PHC2	P361Q	G	1136	T	POMT2	L113V	G	538	C	PTPRT	W1310*	C	4166	T
PABPC3	R374C	C	1181	T	PHC2	A694V	G	2135	A	POMT2	G340S	C	1219	T	PTPRU	R1177Q	G	3659	A
PABPC4	R459H	C	1826	T	PHEX	F531I	T	2156	A	PON1	-	C	0	A	PTPRU	R1217C	C	3778	T
PABPC4	R463H	C	1838	T	PHEX	Q714R	A	2706	G	PON2	G84E	C	498	T	PTPRU	A1392T	G	4303	A

PABPC4	A551V	G	2102	A	PHEX	F81L	T	806	C	POP1	Y636D	T	1987	G	PTPRU	I517T	T	1679	C
PABPC5	R99C	C	509	T	PHEX	M300I	G	1465	A	POPDC2	W188*	C	1023	T	PTPRU	S1185L	C	3683	T
PABPC5	R280H	G	1053	A	PHF10	R360H	C	1203	T	POPDC2	R164Q	C	951	T	PTPRU	V461M	G	1510	A
PABPC5	A157T	G	683	A	PHF10	K493N	T	1603	G	POPDC2	F182L	G	1006	T	PTPRU	V459I	G	1504	A
PACRG	H132R	A	395	G	PHF10	N280S	T	963	C	PORCN	E145G	A	477	G	PTPRU	-	G	0	T
PACRGL	E141*	G	812	T	PHF10	R112Q	C	459	T	POSTN	E298K	C	1010	T	PTPRZ1	L378V	T	1543	G
PACS1	-	G	0	T	PHF10	-	C	0	T	POSTN	R210*	G	746	A	PTPRZ1	G955C	G	3274	T
PACS1	S774G	A	2454	G	PHF12	A307D	G	1731	T	POSTN	D146E	A	556	T	PTPRZ1	L990F	C	3379	T
PACS1	H181N	C	675	A	PHF12	R357Q	C	1881	T	POSTN	F790L	G	2488	T	PTPRZ1	R2108M	G	6734	T
PACS2	D226N	G	793	A	PHF14	A172T	G	949	A	POSTN	E771*	C	2429	A	PTPRZ1	E356D	G	1479	T
PACS2	V311I	G	1048	A	PHF14	Y893C	A	3113	G	POSTN	K731N	T	2311	G	PTPRZ1	L375I	C	1534	A
PACS2	P298H	C	1010	A	PHF14	D24A	A	506	C	POSTN	L521S	A	1680	G	PTPRZ1	R833C	C	2908	T
PACS2	D309N	G	1042	A	PHF14	C871Y	G	3047	A	POSTN	M86L	T	374	G	PTPRZ1	V1311A	T	4343	C
PACSIN1	E100K	G	493	A	PHF14	A483V	C	1883	T	POSTN	K61N	C	301	A	PTPRZ1	V1642A	T	5336	C
PADI2	V212L	C	698	A	PHF14	R540W	C	2053	T	POSTN	I49M	A	265	C	PTPRZ1	K1753N	G	5670	T
PADI3	V251M	G	791	A	PHF14	A539V	C	2051	T	POSTN	L607S	A	1938	G	PTRF	R267W	G	958	A
PADI3	L264F	C	830	T	PHF14	K646T	A	2372	C	POTEA	V140A	T	462	C	PTRF	R286W	G	1015	A
PADI3	R383I	G	1188	T	PHF15	R70W	C	208	T	POTEC	S393G	T	1544	C	PTRH2	R35Q	C	1423	T
PADI4	K377N	G	1157	T	PHF15	G828C	G	2482	T	POTEE	A127T	G	379	A	PTTG1	L161M	C	529	A
PADI4	M80I	G	266	T	PHF15	P253H	C	758	A	POTEF	E130G	T	441	C	PTTG2	S103Y	C	308	A
PAF1	S38I	C	288	A	PHF15	G358S	G	1072	A	POTEG	E362*	G	1136	T	PTTG2	F117L	C	351	A
PAFAH1B1	R241W	C	1289	T	PHF15	Q84P	A	251	C	POTEH	P467S	G	1451	A	PTX3	R360W	C	1223	T
PAFAH1B1	K351E	A	1619	G	PHF16	T424M	C	1322	T	POTEI	L942M	G	3255	T	PTX4	R427W	G	1279	A
PAFAH1B1	A210P	G	1196	C	PHF16	R207Q	G	671	A	POU1F1	-	C	0	T	PUF60	R146C	G	500	A
PAFAH1B1	R363H	G	1656	A	PHF19	-	C	0	T	POU1F1	W219C	C	742	A	PUF60	A21P	C	125	G
PAFAH1B2	L212P	T	737	C	PHF2	P700L	C	2466	T	POU1F1	S8L	G	108	A	PUM1	R854*	G	2691	A
PAFAH1B2	S64F	C	293	T	PHF2	D46N	G	503	A	POU2F1	R403H	G	1417	A	PUM1	M861V	T	2712	C
PAFAH2	R71C	G	391	A	PHF2	T520M	C	1926	T	POU2F1	R311*	C	1140	T	PUM1	V1134A	A	3532	G
PAFAH2	R315Q	C	1124	T	PHF2	V129A	T	753	C	POU2F1	T31A	A	300	G	PUM1	G781D	C	2473	T
PAG1	E186K	C	1267	T	PHF2	R285Q	G	1221	A	POU2F1	G32S	G	303	A	PUM2	R174C	G	543	A
PAG1	E381K	C	1852	T	PHF2	A399D	C	1563	A	POU2F2	S274R	T	902	G	PURA	Q10*	C	87	T
PAG1	T147M	G	1151	A	PHF2	T493A	A	1844	G	POU2F3	R36Q	G	209	A	PURB	Y94H	A	293	G
PAG1	P46L	G	848	A	PHF2	P500T	C	1865	A	POU3F2	V365I	G	1232	A	PURB	R117C	G	362	A
PAG1	G123W	C	1078	A	PHF2	P700L	C	2466	T	POU3F2	P97H	C	429	A	PURG	T201A	T	1534	C
PAGE2	G15A	G	148	C	PHF2	L402I	C	1571	A	POU3F2	S106L	C	456	T	PUS1	P254L	C	1216	T
PAGE5	Q49R	A	391	G	PHF20	T798A	A	2521	G	POU3F2	I361V	A	1220	G	PUS1	R382W	C	1599	T
PAGE5	Q57*	C	414	T	PHF20	R828C	C	2611	T	POU4F1	K411*	T	1465	A	PUS10	E118*	C	614	A
PAH	E7*	C	492	A	PHF20	H130R	A	518	G	POU4F2	A407T	G	1467	A	PUS3	D455G	T	1462	C
PAICS	N297H	A	1064	C	PHF20	K547N	G	1770	T	POU4F2	R390C	C	1416	T	PUS3	K99N	C	395	A

PAIP1	L241M	A	954	T	PHF20	K171Q	A	640	C	POU4F2	R349H	G	1294	A	PUS7	D567N	C	1914	T
PAK1	R203W	G	1140	A	PHF20L1	Q841*	C	2820	T	POU4F2	L92P	T	523	C	PUS7L	A448T	C	1422	T
PAK2	F389L	C	1489	A	PHF20L1	P397S	C	1488	T	POU4F3	E273K	G	906	A	PUS7L	E227D	T	761	G
PAK2	P181L	C	864	T	PHF21A	P399L	G	1820	A	POU5F1B	K199T	A	1155	C	PUSL1	G300R	G	975	A
PAK2	G405R	G	1535	A	PHF21A	L255F	G	1387	A	POU5F1B	E215*	G	1202	T	PVR	G362R	G	1297	A
PAK2	A122D	C	687	A	PHF21A	P661L	G	2606	A	POU6F2	R494Q	G	1523	A	PVR	F365L	C	1308	A
PAK3	A154T	G	487	A	PHF21B	R303W	G	1058	A	POU6F2	Q441R	A	1364	G	PVRIG	T209I	C	989	T
PAK4	T83M	C	410	T	PHF21B	P86L	G	408	A	POU6F2	A211V	C	674	T	PVRL1	A79V	G	408	A
PAK4	R252Q	G	917	A	PHF21B	A200T	C	749	T	POU6F2	N629S	A	1928	G	PVRL1	S59N	C	348	T
PAK4	A463T	G	1549	A	PHF3	R202Q	G	945	A	PPA1	V50A	A	249	G	PVRL1	D106Y	C	488	A
PAK4	D550Y	G	1810	T	PHF3	R1755*	C	5603	T	PPA2	H200Y	G	607	A	PVRL2	G363R	G	1477	A
PAK6	R58Q	G	530	A	PHF3	S519N	G	1896	A	PPAN	R430H	G	1461	A	PVRL2	A77V	C	620	T
PAK6	A75V	C	581	T	PHF3	L939V	C	3155	G	PPAN	A515S	G	1715	T	PVRL3	L387F	G	1436	T
PAK6	L64H	T	548	A	PHF5A	I9V	T	97	C	PPAN	R355Q	G	1236	A	PVRL3	Y332C	A	1270	G
PAK7	R488*	G	2009	A	PHF6	E117D	G	553	T	PPAN	A235V	C	876	T	PVRL3	V409A	T	1501	C
PAK7	A398T	C	1739	T	PHF8	L1015F	C	3404	G	PPAN-P2RY11	M687V	A	2059	G	PVRL4	E254D	T	1065	G
PAK7	R499Q	C	2043	T	PHF8	Q925H	T	3134	G	PPAN-P2RY11	R727W	C	2179	T	PVRL4	R144Q	C	734	T
PALB2	R566H	C	1897	T	PHF8	R809H	C	2785	T	PPAP2B	S244A	A	1282	C	PVRL4	E337K	C	1312	T
PALB2	P1008T	G	3222	T	PHGDH	R135W	C	539	T	PPAPDC1B	R179S	G	556	T	PVRL4	T185M	G	857	A
PALB2	I887V	T	2859	C	PHGDH	R247W	C	875	T	PPAPDC1B	D237V	T	731	A	PWP1	G49S	G	232	A
PALB2	D777N	C	2529	T	PHGDH	A2V	C	141	T	PPAPDC3	A197V	C	894	T	PWP1	V297A	T	977	C
PALLD	-	G	0	T	PHIP	P474L	G	1589	A	PPAPDC3	L241I	C	1025	A	PWP2	A79T	G	357	A
PALM	G275C	G	1017	T	PHIP	S846I	C	2705	A	PPARA	T4M	C	276	T	PWP2	Y447H	T	1461	C
PALM2	T359M	C	1146	T	PHIP	-	C	0	T	PPARD	R144C	C	739	T	PWP2	L314R	T	1063	G
PALM2	I315L	A	1013	C	PHIP	R396*	G	1354	A	PPARD	F145V	T	742	G	PWWP2A	A217T	C	706	T
PALM2-AKAP2	R1077Q	G	3410	A	PHKA1	R1073C	G	3595	A	PPARGC1A	A193V	G	698	A	PWWP2A	S408P	A	1279	G
PALM2-AKAP2	A537T	G	1789	A	PHKA1	S1050N	C	3527	T	PPARGC1A	K480T	T	1559	G	PWWP2B	F550L	T	1709	G
PALM3	N539H	T	1615	G	PHKA1	D66A	T	575	G	PPARGC1B	T884M	C	2683	T	PWWP2B	E483D	G	1508	T
PALM3	G165V	C	494	A	PHKA2	R186H	C	1223	T	PPAT	-	A	0	G	PWWP2B	R432*	A	1353	T
PALMD	Q389R	A	1541	G	PHKA2	Y1085C	T	3920	C	PPDPF	S53F	C	303	T	PXDN	R1198W	G	3643	A
PAM	V89M	G	638	A	PHKA2	L943V	A	3493	C	PPEF2	E725D	C	2532	A	PXDN	A1292V	G	3926	A
PAM	V597M	G	2162	A	PHKB	N423S	A	1292	G	PPEF2	D179Y	C	892	A	PXDN	R1198W	G	3643	A
PAM	G552E	G	2028	A	PHKB	I956N	T	2891	A	PPEF2	E350K	C	1405	T	PXDN	A973V	G	2969	A
PAM	R931C	C	3164	T	PHKB	F330C	T	1013	G	PPEF2	-	C	0	A	PXDN	C736R	A	2257	G

PAMR1	L274F	G	1266	A	PHKG1	E331D	C	1188	A	PPFIA1	K1132N	A	3594	C	PXDN	V523F	C	1618	A
PAMR1	T249M	G	1192	A	PHKG1	R297W	G	1084	A	PPFIA2	M205I	C	918	A	PXDN	Y500C	T	1550	C
PAMR1	R514C	G	1986	A	PHKG2	R185*	C	792	T	PPFIA2	E584*	C	2053	A	PXDN	G1334D	C	4052	T
PAMR1	R197H	C	1036	T	PHLDA1	P48S	G	177	A	PPFIA2	A580V	G	2042	A	PXDNL	A570T	C	1809	T
PAN2	Q576H	C	2101	A	PHLDA3	R115W	G	741	A	PPFIA2	W1037C	C	3414	G	PXDNL	R712H	C	2236	T
PAN2	V218A	A	1026	G	PHLDB1	A855D	C	2917	A	PPFIA2	S729N	C	2489	T	PXDNL	R905W	G	2814	A
PAN3	R870H	G	2761	A	PHLDB1	A241T	G	1074	A	PPFIA2	L950F	G	3151	A	PXDNL	R675C	G	2124	A
PAN3	A440T	G	1470	A	PHLDB1	S263N	G	1141	A	PPFIA2	L1090I	G	3571	T	PXDNL	A750T	C	2349	T
PAN3	S291R	A	1023	C	PHLDB1	-	G	0	A	PPFIA2	E1017K	C	3352	T	PXDNL	S701N	C	2203	T
PAN3	R606K	G	1969	A	PHLDB1	R1316H	G	4300	A	PPFIA3	P708A	C	2454	G	PXDNL	N99H	T	396	G
PAN3	P794L	C	2533	T	PHLDB1	R1285C	C	4206	T	PPFIA3	T663I	C	2320	T	PXK	L248I	C	851	A
PAN3	S615Y	C	1996	A	PHLDB2	Q999H	G	3408	T	PPFIA3	L643S	T	2260	C	PXK	L395V	T	1292	G
PAN3	F662V	T	2136	G	PHLDB2	D516A	A	1958	C	PPFIA3	R234C	C	1032	T	PXMP4	H47R	T	233	C
PAN3	E878*	G	2784	T	PHLDB2	R438G	A	1723	G	PPFIA4	G1135D	G	3931	A	PYCR1	H250R	T	749	C
PANK1	K360T	T	1235	G	PHLDB2	A199T	G	1006	A	PPFIA4	A1142T	G	3951	A	PYCR1	V126I	C	376	T
PANK2	A15P	G	49	C	PHLDB2	R438M	G	1724	T	PPFIA4	T633M	C	2425	T	PYCR1	R231H	C	692	T
PANK3	-	A	1423	G	PHLDB2	V473M	G	1828	A	PPFIA4	S864P	T	3117	C	PYGB	D413G	A	1348	G
PANK4	Q692*	G	2074	A	PHLDB2	Y43*	C	540	A	PPFIA4	R710W	C	2655	T	PYGL	R278Q	C	946	T
PANK4	R453*	G	1357	A	PHLDB2	R1172Q	G	3926	A	PPFIBP2	-	T	3017	C	PYGL	R321H	C	1075	T
PANK4	E218K	C	652	T	PHLDB3	R558H	C	2034	T	PPFIBP2	A618V	C	2241	T	PYGL	R387H	C	1273	T
PANK4	L746M	G	2236	T	PHLDB3	R512Q	C	1896	T	PPHLN1	D362N	G	1189	A	PYGL	A329V	G	1099	A
PANK4	A319T	C	955	T	PHLDB3	R124H	C	732	T	PPHLN1	R11I	G	137	T	PYGL	R243C	G	840	A
PANX1	D261N	G	1166	A	PHLDB3	R95*	G	644	A	PPHLN1	T347A	A	1144	G	PYGL	F197L	G	704	T
PANX1	V290M	G	1253	A	PHLDB3	Q178R	T	894	C	PPIA	R144C	C	475	T	PYGL	Y114*	G	455	C
PANX1	L421H	T	1647	A	PHLPP1	A993T	G	2977	A	PPIAL4E	P70L	G	242	A	PYGM	R590C	G	2167	A
PANX2	S400L	C	1199	T	PHLPP1	G1177C	G	3529	T	PPIB	Y88C	T	482	C	PYGM	R576*	G	2125	A
PANX2	R398H	G	1193	A	PHLPP1	S1416G	A	4246	G	PPID	D303E	G	1017	C	PYGM	K597T	T	2189	G
PANX2	A139T	G	415	A	PHLPP1	R1297*	C	3889	T	PPIG	H59N	C	395	A	PYGO1	T394A	T	1275	C
PANX2	P440L	C	1319	T	PHLPP2	A809V	G	2432	A	PPIG	I145N	T	654	A	PYGO1	A3T	C	102	T
PANX2	A260T	G	778	A	PHLPP2	L337P	A	1016	G	PPIG	R342Q	G	1245	A	PYHIN1	A217T	G	894	A
PANX3	Y280D	T	838	G	PHLPP2	F334L	A	1006	G	PPIG	D510E	T	1750	G	PYROXD1	D64N	G	317	A
PAOX	A280V	C	922	T	PHLPP2	L675P	A	2030	G	PPIH	D78E	T	256	G	PYROXD1	R76C	C	353	T
PAOX	R424W	C	1353	T	PHLPP2	M392V	T	1180	C	PPIL5	S37F	C	177	T	PYROXD1	Q143K	C	554	A
PAOX	V378F	G	1215	T	PHOSPHO 2	I3M	T	397	G	PPIL6	S152F	G	509	A	PYROXD2	A87V	G	309	A
PAOX	P305L	C	997	T	PHOSPHO 2	D15N	G	431	A	PPIP5K2	R680Q	G	2548	A	PYROXD2	K161N	T	532	G
PAOX	Y211H	T	714	C	PHOX2B	A166T	C	856	T	PPIP5K2	R815C	C	2952	T	PYY	R122H	C	689	T
PAPD4	F207C	T	1038	G	PHOX2B	P284L	G	1211	A	PPIP5K2	E917*	G	3258	T	PZP	N1174K	G	3551	T
PAPD5	V621D	T	1862	A	PHOX2B	D136G	T	767	C	PPL	R1135H	C	3494	T	PZP	R155C	G	492	A

PAPD5	L693F	C	2077	T	PHPT1	C43Y	G	128	A	PPL	A1040V	G	3209	A	PZP	V1011I	C	3060	T
PAPD7	K118N	G	483	T	PHRF1	G1649D	G	5077	A	PPL	R1047Q	C	3230	T	PZP	G890E	C	2698	T
PAPD7	T109M	C	455	T	PHRF1	L422P	T	1396	C	PPL	R505W	G	1603	A	PZP	V206A	A	646	G
PAPD7	D313N	G	1066	A	PHRF1	P1289A	C	3996	G	PPL	A89V	G	356	A	PZP	R157Q	C	499	T
PAPD7	P431L	C	1421	T	PHTF1	S748R	T	2694	G	PPL	R354W	G	1150	A	QDPR	S163N	C	668	T
PAPLN	W32*	G	198	A	PHTF1	R326M	C	1429	A	PPL	V1643M	C	5017	T	QDPR	G151S	C	631	T
PAPLN	E142K	G	526	A	PHTF1	R414H	C	1693	T	PPL	R1597W	G	4879	A	QDPR	E206*	C	796	A
PAPLN	G647R	G	2041	A	PHTF1	V612A	A	2287	G	PPL	R905Q	C	2804	T	QKI	E77*	G	762	T
PAPLN	S571A	T	1813	G	PHTF1	E681*	C	2493	A	PPL	R1463*	G	4477	A	QKI	D61E	C	716	G
PAPLN	P560L	C	1781	T	PHTF1	K309T	T	1378	G	PPL	Q1249H	C	3837	A	QKI	K126N	A	911	C
PAPLN	Y907C	A	2822	G	PHTF2	R202I	G	820	T	PPL	E1075D	C	3315	A	QRFPR	R32*	G	506	A
PAPOLA	T611M	C	2044	T	PHTF2	L681I	C	2256	A	PPM1A	I152T	T	551	C	QRFPR	V291A	A	1284	G
PAPOLB	V247I	C	926	T	PHTF2	G171E	G	727	A	PPM1B	S327Y	C	1392	A	QRICH1	R536*	G	2079	A
PAPOLB	T617A	T	2036	C	PHYHD1	R78*	C	652	T	PPM1B	D114Y	G	752	T	QRICH1	S472Y	G	1888	T
PAPOLB	D35E	G	292	T	PHYHIP	A240V	G	1291	A	PPM1D	N512K	T	1758	A	QRICH1	S120P	A	831	G
PAPOLB	A608T	C	2009	T	PHYHIPL	R5H	G	278	A	PPM1D	R441H	G	1544	A	QRICH1	T51A	T	624	C
PAPOLG	T222A	A	913	G	PI15	S181F	C	721	T	PPM1D	V190I	G	790	A	QRICH2	R1568H	C	4883	T
PAPPA2	R901Q	G	3866	A	PI3	L80S	T	286	C	PPM1E	R294H	G	1008	A	QRICH2	R432H	C	1475	T
PAPPA2	L577M	C	2893	A	PI3	D95Y	G	330	T	PPM1E	R316W	C	1073	T	QRICH2	R673H	C	2198	T
PAPPA2	S1018L	C	4217	T	PI4K2A	A88V	C	320	T	PPM1E	A70E	C	336	A	QRICH2	R1606W	G	4996	A
PAPPA2	G854R	G	3724	A	PI4KA	V1017I	C	3310	T	PPM1G	D135N	C	668	T	QRICH2	G95R	C	463	T
PAPPA2	E1647A	A	6104	C	PI4KA	S495L	G	1745	A	PPM1H	R477C	G	1843	A	QRICH2	F934L	G	2982	T
PAPPA2	R526H	G	2741	A	PI4KA	A363T	C	1348	T	PPM1H	E415D	C	1659	A	QRSL1	Y40C	A	223	G
PAPPA2	E1693A	A	6242	C	PI4KA	R134*	G	661	A	PPM1J	R175C	G	699	A	QSER1	Q106H	G	585	T
PAPPA2	G1290R	G	5032	A	PI4KA	D739V	T	2477	A	PPM1K	A325V	G	1364	A	QSER1	A330V	C	1256	T
PAPPA2	R784Q	G	3515	A	PI4KA	D2041Y	C	6382	A	PPM1K	R33W	G	487	A	QSER1	R1399*	C	4462	T
PAPPA2	K1258T	A	4937	C	PI4KB	I324L	T	1330	G	PPM1M	R118*	C	717	T	QSOX1	W522C	G	1640	T
PAPPA2	P1679Q	C	6200	A	PIAS1	E273D	A	912	T	PPM1N	E149K	G	445	A	QSOX1	F413V	T	1311	G
PAPPAS	R408C	C	1591	T	PIAS2	S333G	T	1155	C	PPME1	L79P	T	335	C	QSOX2	T171M	G	550	A
PAPPAS	P679S	C	2404	T	PIAS2	S543N	C	1786	T	PPME1	E75D	G	324	T	QSOX2	A649T	C	1983	T
PAPPAS	S549F	C	2015	T	PIAS3	A587T	G	1849	A	PPOX	S35N	G	314	A	QTRT1	-	T	0	C
PAPPAS	E705*	G	2482	T	PIAS3	Q153P	A	548	C	PPOX	G358R	G	1282	A	QTRT1	N97I	A	315	T
PAPPAS	G829S	G	2854	A	PIAS4	D478E	T	1445	G	PPP1CA	R240H	C	719	T	QTRTD1	P256L	C	882	T
PAPPAS	D961N	G	3250	A	PIBF1	R230*	C	1026	T	PPP1CC	R187W	G	804	A	R3HCC1	E243A	A	728	C
PAPPAS	L1058I	C	3541	A	PIBF1	I5M	T	353	G	PPP1R12A	T322M	G	1232	A	R3HDM2	A635V	G	2201	A
PAPPAS	D1610N	G	5197	A	PIBF1	R396*	C	1524	T	PPP1R12A	A1020V	G	3326	A	R3HDM2	R1025*	G	3370	A
PAPSS1	Q144K	G	703	T	PICK1	A306T	G	1263	A	PPP1R12A	T212M	G	902	A	R3HDM2	R1014C	G	3337	A
PAPSS1	R333H	C	1271	T	PICK1	R223Q	G	1015	A	PPP1R12B	R279Q	G	980	A	RAB10	R130I	G	888	T
PAPSS1	T129A	T	658	C	PICK1	V338L	G	1359	T	PPP1R12B	R476Q	G	1571	A	RAB11A	L42I	C	124	A

PAPSS1	N16H	T	319	G	PIF1	Q206H	C	713	A	PPP1R12C	Y146H	A	452	G	RAB11A	A24T	G	70	A
PAPSS2	R416H	G	1510	A	PIGC	V203M	C	888	T	PPP1R12C	A217T	C	665	T	RAB11B	R30C	C	184	T
PAQR4	G122V	G	795	T	PIGC	R109W	G	606	A	PPP1R13B	V415M	C	1526	T	RAB11B	R132Q	G	491	A
PAQR6	W227*	C	681	T	PIGC	R271H	C	1093	T	PPP1R13B	A558V	G	1956	A	RAB11FIP1	Q696H	C	2132	A
PAQR7	R15W	G	710	A	PIGG	G636V	G	2013	T	PPP1R13B	R155H	C	747	T	RAB11FIP1	A882V	G	2689	A
PAQR7	A182T	C	1211	T	PIGH	L91F	T	370	G	PPP1R13B	P367S	G	1382	A	RAB11FIP1	V508G	A	1567	C
PAQR9	A126V	G	377	A	PIGK	E259*	C	799	A	PPP1R13B	R29*	G	368	A	RAB11FIP1	-	C	0	A
PAQR9	R334H	C	1001	T	PIGK	R287H	C	884	T	PPP1R13B	R314C	G	1223	A	RAB11FIP2	E348*	C	1482	A
PARD3	R142H	C	751	T	PIGK	V243A	A	752	G	PPP1R13L	T491M	G	1551	A	RAB11FIP2	R129Q	C	826	T
PARD3	R349C	G	1371	A	PIGN	I687T	A	2431	G	PPP1R13L	A149T	C	524	T	RAB11FIP4	R460C	C	1607	T
PARD3	A550T	C	1974	T	PIGN	L553M	G	2028	T	PPP1R13L	A236T	C	785	T	RAB11FIP4	V344A	T	1260	C
PARD3	A928T	C	3108	T	PIGN	K471Q	T	1782	G	PPP1R13L	R144H	C	510	T	RAB11FIP4	E85D	G	484	T
PARD3B	D790Y	G	2575	T	PIGO	H947N	G	3234	T	PPP1R13L	S120P	A	437	G	RAB11FIP5	S214N	C	882	T
PARD3B	A537T	G	1816	A	PIGO	G785D	C	2749	T	PPP1R14D	A193V	G	646	A	RAB11FIP5	G577D	C	1971	T
PARD3B	S675R	A	2230	C	PIGO	R999W	G	3390	A	PPP1R15A	E411K	G	1500	A	RAB11FIP5	S361L	G	1323	A
PARD3B	E52*	G	361	T	PIGP	V56M	C	390	T	PPP1R15A	A593T	G	2046	A	RAB12	K207R	A	903	G
PARD6A	R338*	C	1092	T	PIGR	D136Y	C	590	A	PPP1R15A	T379I	C	1405	T	RAB12	R181Q	G	825	A
PARD6B	R34K	G	344	A	PIGR	R272Q	C	999	T	PPP1R15A	E172D	G	785	T	RAB12	T161M	C	765	T
PARD6B	T261A	A	1024	G	PIGR	V453M	C	1541	T	PPP1R15B	G516D	C	1927	T	RAB14	T157M	G	708	A
PARD6G	A238T	C	910	T	PIGR	K230T	T	873	G	PPP1R15B	R586C	G	2136	A	RAB17	A2T	C	634	T
PARG	D90N	C	268	T	PIGS	-	C	0	T	PPP1R15B	I496V	T	1866	C	RAB18	R205G	A	611	G
PARK2	K129N	C	490	A	PIGU	F314C	A	941	C	PPP1R16A	Q364H	G	2001	T	RAB21	K111Q	A	583	C
PARK2	A398T	C	1295	T	PIGU	K104T	T	311	G	PPP1R16A	R55W	C	1072	T	RAB21	M180T	T	791	C
PARK2	H461R	T	1485	C	PIGU	K104N	T	312	G	PPP1R16B	A518T	G	1741	A	RAB22A	E52*	G	435	T
PARK2	F209L	G	730	T	PIGV	T22A	A	395	G	PPP1R16B	V5M	G	202	A	RAB23	G203S	C	1227	T
PARK7	R156Q	G	621	A	PIGV	A280V	C	1170	T	PPP1R16B	A218V	C	842	T	RAB23	Q27R	T	700	C
PARK7	F164C	T	645	G	PIGV	L406V	T	1547	G	PPP1R16B	R49*	C	334	T	RAB24	R98Q	C	625	T
PARL	V287I	C	920	T	PIGV	E441K	G	1652	A	PPP1R16B	A230S	G	877	T	RAB26	R125Q	G	534	A
PARN	E260*	C	920	A	PIGW	Q358R	A	1128	G	PPP1R16B	E296V	A	1076	T	RAB28	E35*	C	318	A
PARP1	V315I	C	1087	T	PIGX	E112D	A	458	C	PPP1R1C	-	T	0	C	RAB2A	Y3C	A	216	G
PARP1	T632M	G	2039	A	PIGZ	Y458C	T	1520	C	PPP1R1C	E104*	G	544	T	RAB2B	D177N	C	630	T
PARP10	L577M	G	1837	T	PIGZ	W48*	C	291	T	PPP1R3A	K532N	T	1665	G	RAB31	R165C	C	668	T
PARP11	F82I	A	389	T	PIGZ	G14E	C	188	T	PPP1R3A	G554V	C	1730	A	RAB31	F160C	T	654	G
PARP12	V685I	C	2927	T	PIH1D1	A146T	C	672	T	PPP1R3A	T948M	G	2912	A	RAB32	S222P	T	843	C
PARP14	D289N	G	1131	A	PIH1D2	L176V	A	749	C	PPP1R3A	I1076T	A	3296	G	RAB33A	S15L	C	458	T
PARP14	W410C	G	1496	T	PIH1D2	V90I	C	491	T	PPP1R3A	S1074Y	G	3290	T	RAB34	R37H	C	111	T
PARP14	K1663N	G	5255	T	PIK3AP1	C66Y	C	317	T	PPP1R3A	T984A	T	3019	C	RAB34	P230T	G	689	T
PARP15	K462T	A	1451	C	PIK3AP1	V180A	A	659	G	PPP1R3A	S947Y	G	2909	T	RAB34	A13V	G	39	A
PARP15	N666T	A	2063	C	PIK3C2A	H761R	T	2348	C	PPP1R3A	R521I	C	1631	A	RAB34	K238N	T	715	G

PARP16	F138C	A	859	C	PIK3C2A	T1261M	G	3848	A	PPP1R3C	S192Y	G	660	T	RAB36	L99P	T	336	C
PARP2	Q576R	A	1755	G	PIK3C2A	L1396I	G	4252	T	PPP1R3C	R167Q	C	585	T	RAB39	R119W	C	373	T
PARP2	K520E	A	1586	G	PIK3C2A	V116A	A	413	G	PPP1R3C	D103N	C	392	T	RAB39B	F46L	G	439	T
PARP3	T314M	C	1272	T	PIK3C2A	R1026Q	C	3143	T	PPP1R3C	A97T	C	374	T	RAB3A	T36M	G	241	A
PARP4	H1455R	T	4470	C	PIK3C2B	R616C	G	2403	A	PPP1R3D	R171C	G	877	A	RAB3D	A154T	C	698	T
PARP4	F1585L	G	4861	C	PIK3C2B	L1352I	G	4611	T	PPP1R3F	V385I	G	1169	A	RAB3D	A50T	C	386	T
PARP4	S1434F	G	4407	A	PIK3C2G	R258I	G	889	T	PPP1R3G	A6V	C	17	T	RAB3GAP1	V193A	T	588	C
PARP4	K594N	C	1888	A	PIK3C2G	R738C	C	2328	T	PPP1R3G	N342D	A	1024	G	RAB3GAP1	E49K	G	155	A
PARP4	R1010H	C	3135	T	PIK3C2G	D1133Y	G	3513	T	PPP1R7	V350M	G	1356	A	RAB3GAP2	E127K	C	496	T
PARP4	R1130Q	C	3495	T	PIK3C2G	I1337V	A	4125	G	PPP1R7	Q10*	C	336	T	RAB3GAP2	V1134M	C	3517	T
PARP6	D588N	C	2220	T	PIK3C2G	L976V	C	3042	G	PPP1R8	D87E	T	319	G	RAB3GAP2	V1021I	C	3178	T
PARP8	M354T	T	1243	C	PIK3C2G	F1081C	T	3358	G	PPP1R8	R176Q	G	585	A	RAB3GAP2	W820L	C	2576	A
PARP8	R287C	C	1041	T	PIK3C2G	R643I	G	2044	T	PPP1R9A	A217T	G	931	A	RAB3GAP2	W876C	C	2745	A
PARP9	T42A	T	352	C	PIK3C3	R552Q	G	1713	A	PPP1R9A	E104*	G	592	T	RAB3GAP2	Y719C	T	2273	C
PARP9	D2E	G	234	T	PIK3C3	F250C	T	807	G	PPP1R9A	M71I	G	495	A	RAB3GAP2	A1130V	G	3506	A
PARS2	R346Q	C	1120	T	PIK3C3	N436H	A	1364	C	PPP1R9A	Y439H	T	1597	C	RAB3IL1	M261I	C	783	T
PARS2	R195C	G	666	A	PIK3CA	K111N	G	490	T	PPP1R9A	L252M	C	1036	A	RAB3IL1	E42D	C	126	A
PARS2	W134L	C	484	A	PIK3CA	H1047R	A	3297	G	PPP1R9A	R194Q	G	863	A	RAB3IP	R176Q	G	966	A
PARVA	R206*	C	665	T	PIK3CA	K111E	A	488	G	PPP2CB	K283N	T	1028	G	RAB3IP	D20Y	G	497	T
PARVB	G318D	G	1083	A	PIK3CA	H1047R	A	3297	G	PPP2R1A	R134W	C	458	T	RAB40A	R99H	C	2415	T
PARVB	R58I	G	303	T	PIK3CA	C604R	T	1967	C	PPP2R2A	R262Q	G	785	A	RAB40C	G251S	G	954	A
PARVG	D199Y	G	1019	T	PIK3CA	E545K	G	1790	A	PPP2R2B	N376S	T	1416	C	RAB40C	G251S	G	954	A
PASD1	Q399*	C	1440	T	PIK3CA	E545K	G	1790	A	PPP2R2B	A496V	G	1776	A	RAB40C	G251S	G	954	A
PASD1	N22Y	A	309	T	PIK3CA	R88Q	G	420	A	PPP2R2B	R82H	C	534	T	RAB41	A9T	G	71	A
PASD1	V650M	G	2193	A	PIK3CA	E545A	A	1791	C	PPP2R2B	E201K	C	890	T	RAB43P1	A119S	C	355	A
PASK	R880H	C	2703	T	PIK3CA	H1047R	A	3297	G	PPP2R2C	V239I	C	739	T	RAB43P1	D23Y	C	67	A
PASK	S38N	C	177	T	PIK3CA	E545K	G	1790	A	PPP2R2C	A345V	G	1058	A	RAB4A	R207H	G	828	A
PASK	L619S	A	1920	G	PIK3CA	K986N	G	3115	T	PPP2R2D	A407V	C	1220	T	RAB4A	F16L	C	256	A
PASK	D653N	C	2021	T	PIK3CA	T1025A	A	3230	G	PPP2R2D	R232H	G	695	A	RAB4B	I38T	T	113	C
PATE1	A69T	G	205	A	PIK3CA	Q546K	C	1793	A	PPP2R2D	R128W	C	382	T	RAB5A	N113S	A	874	G
PATE1	E44*	G	130	T	PIK3CA	E542K	G	1781	A	PPP2R2D	-	G	0	T	RAB6B	V111I	C	681	T
PATE3	R31Q	G	133	A	PIK3CA	K111E	A	488	G	PPP2R2D	R119*	C	355	T	RAB6B	E142K	C	774	T
PATE4	G39D	G	160	A	PIK3CA	A511T	G	1688	A	PPP2R3A	S148P	T	1059	C	RAB6B	R168*	G	852	A
PATL1	A734V	G	2344	A	PIK3CA	C420R	T	1415	C	PPP2R4	R134W	C	592	T	RAB7A	A76V	C	473	T
PATL1	R304Q	C	1054	T	PIK3CA	E545G	A	1791	G	PPP2R4	A192T	G	766	A	RAB8A	T49A	A	367	G
PATL2	R212H	C	733	T	PIK3CA	E545K	G	1790	A	PPP2R5A	E332*	G	1568	T	RAB8B	F201L	C	759	A
PATL2	R157W	G	567	A	PIK3CA	H1047R	A	3297	G	PPP2R5A	Q43E	C	701	G	RAB8B	K100T	A	455	C
PATL2	K200R	T	697	C	PIK3CA	H419N	C	1412	A	PPP2R5A	L285F	A	1429	C	RAB8B	W102L	G	461	T
PAX1	G166R	G	550	A	PIK3CA	T1052K	C	3312	A	PPP2R5B	R468W	C	1987	T	RAB8B	F147L	C	597	A

PAX1	G163R	G	541	C	PIK3CA	K594E	A	1937	G	PPP2R5E	A471V	G	1801	A	RABEP1	R75Q	G	448	A
PAX2	R399H	G	1746	A	PIK3CA	H1047L	A	3297	T	PPP2R5E	S69*	G	595	C	RABEP1	V793I	G	2601	A
PAX2	R270C	C	1358	T	PIK3CA	T1025A	A	3230	G	PPP2R5E	K504N	C	1901	A	RABEP1	E258*	G	996	T
PAX2	R203C	C	1157	T	PIK3CB	A439V	G	1390	A	PPP2R5E	E408*	C	1611	A	RABEP2	V529M	C	2174	T
PAX3	P462L	G	1751	A	PIK3CB	R1065Q	C	3268	T	PPP2R5E	E222A	T	1054	G	RABEP2	E407G	T	1809	C
PAX3	R156H	C	833	T	PIK3CB	K412T	T	1309	G	PPP3CA	H151N	G	1135	T	RABGGTA	L537I	G	2031	T
PAX3	E132D	T	762	G	PIK3CB	R321Q	C	1036	T	PPP3CB	R411*	G	1366	A	RABGGTA	-	C	0	T
PAX4	P119L	G	356	A	PIK3CD	R38H	G	228	A	PPP3CC	R144W	C	757	T	RABGGTA	R134H	C	823	T
PAX5	R122Q	C	440	T	PIK3CD	Q170*	C	623	T	PPP3CC	-	T	0	C	RABGGTB	R222*	C	735	T
PAX5	V37A	A	185	G	PIK3CD	R88C	C	377	T	PPP3CC	E359*	G	1402	T	RABGGTB	M175V	A	594	G
PAX5	Y7H	A	94	G	PIK3CD	N942K	T	2941	G	PPP3R2	D68N	C	273	T	RABGGTB	D284Y	G	921	T
PAX6	-	C	0	T	PIK3CG	D819N	G	2540	A	PPP4R1	R308C	G	996	A	RABIF	G62S	C	221	T
PAX6	A153T	C	926	T	PIK3CG	P262S	C	869	T	PPP4R1	R230Q	C	763	T	RABL3	R107C	G	349	A
PAX7	S155L	C	1062	T	PIK3CG	L79M	C	320	A	PPP4R1	V438I	C	1386	T	RABL3	N138S	T	443	C
PAX7	P408S	C	1820	T	PIK3CG	S257Y	C	855	A	PPP4R1	S411P	A	1305	G	RABL3	L161V	A	511	C
PAX7	K139N	G	1015	T	PIK3CG	D946N	G	2921	A	PPP4R1	E544D	C	1706	A	RAC1	R68H	G	400	A
PAX7	R260C	C	1376	T	PIK3R1	A690V	C	2111	T	PPP4R2	R149Q	G	699	A	RAC2	V36A	A	229	G
PAX7	K195N	A	1183	C	PIK3R1	R348*	C	1084	T	PPP4R4	N719S	A	2310	G	RACGAP1P	R104*	G	511	A
PAX8	H254R	T	927	C	PIK3R1	R574I	G	1763	T	PPP4R4	E43*	G	281	T	RAD1	R109Q	C	1746	T
PAX9	D200N	G	1315	A	PIK3R1	R543I	G	1670	T	PPP4R4	L158M	C	626	A	RAD17	S628Y	C	2561	A
PAXIP1	T916M	G	2902	A	PIK3R1	R657Q	G	2012	A	PPP4R4	I309S	T	1080	G	RAD18	E227K	C	796	T
PAXIP1	C648Y	C	2098	T	PIK3R1	R162*	C	526	T	PPP5C	N303D	A	967	G	RAD18	E140*	C	535	A
PAXIP1	R483H	C	1603	T	PIK3R1	E674K	G	2062	A	PPP5C	D242E	C	786	A	RAD18	N286S	T	974	C
PAXIP1	F874L	G	2777	T	PIK3R1	R650*	C	1990	T	PPP5C	E255K	G	823	A	RAD18	E280*	C	955	A
PBK	M283V	T	1215	C	PIK3R1	N285H	A	895	C	PPP5C	E428K	G	1342	A	RAD18	Q273P	T	935	G
PBRM1	-	C	0	T	PIK3R1	N527K	T	1623	G	PPP6C	F228L	A	903	G	RAD21	W18C	C	342	G
PBRM1	E1060G	T	3181	C	PIK3R1	N564D	A	1732	G	PPPDE1	T79M	C	236	T	RAD21	I44V	T	418	C
PBX1	T88A	A	450	G	PIK3R2	V579M	G	2335	A	PPRC1	K538E	A	1651	G	RAD21L1	T364I	C	1184	T
PBX3	R311Q	G	1012	A	PIK3R2	R345Q	G	1634	A	PPRC1	R1400Q	G	4238	A	RAD21L1	R54Q	G	254	A
PBXIP1	R583W	G	1819	A	PIK3R2	P20L	C	659	T	PPRC1	L317M	C	988	A	RAD21L1	I355M	T	1158	G
PC	E932K	C	2843	T	PIK3R3	R368K	C	1103	T	PPRC1	S1360N	G	4118	A	RAD23A	K69E	A	314	G
PC	A1010V	G	3078	A	PIK3R3	K339T	T	1016	G	PPRC1	T739A	A	2254	G	RAD23B	N192I	A	926	T
PC	Y722C	T	2214	C	PIK3R4	V676M	C	2584	T	PPRC1	I1007V	A	3058	G	RAD23B	G377R	G	1480	A
PCBP1	L100Q	T	590	A	PIK3R4	R107*	G	877	A	PPTC7	P202L	G	833	A	RAD23B	E61*	G	532	T
PCBP1	L100Q	T	590	A	PIK3R5	A701T	C	2168	T	PPYR1	A99T	G	714	A	RAD23B	S252Y	C	1106	A
PCBP2	G30R	G	438	C	PIKFYVE	A434V	C	1459	T	PQBP1	A6V	C	217	T	RAD50	E977*	G	3316	T
PCBP3	P96T	C	624	A	PIKFYVE	W1464*	G	4550	A	PQLC1	V263M	C	970	T	RAD50	I1109T	T	3713	C
PCBP3	L280M	C	1176	A	PIKFYVE	D279Y	G	993	T	PQLC2	A166V	C	769	T	RAD50	R1214C	C	4027	T
PCBP4	A159V	G	476	A	PIKFYVE	R1038Q	G	3271	A	PQLC2	-	A	0	G	RAD50	A1246V	C	4124	T

PCCA	K181T	A	580	C	PIKFYVE	Q1183H	A	3707	C	PQLC2	R124C	C	642	T	RAD50	R1200Q	G	3986	A
PCCB	P338H	C	1034	A	PIKFYVE	R1284H	G	4009	A	PRAC	S19I	C	186	A	RAD51AP1	S272Y	C	971	A
PCDH1	E288K	C	1010	T	PIKFYVE	I1310V	A	4086	G	PRAME	H464Y	G	1690	A	RAD51AP2	I99L	T	319	G
PCDH1	R789H	C	2514	T	PIKFYVE	N1635T	A	5062	C	PRAME	Q283*	G	1147	A	RAD51AP2	S982G	T	2968	C
PCDH1	K581N	C	1891	A	PILRA	R228W	C	894	T	PRAME	L267F	G	1099	A	RAD51C	R319Q	G	1027	A
PCDH1	R797C	G	2537	A	PIM2	-	A	1124	G	PRAMEF1	H48Q	C	247	G	RAD51L1	P326T	C	1053	A
PCDH1	R695H	C	2232	T	PIN4	G58C	G	204	T	PRAMEF12	R319C	C	982	T	RAD51L1	G203R	G	684	A
PCDH1	R1233H	C	3846	T	PION	A429V	G	1365	A	PRAMEF22	C221Y	G	662	A	RAD51L1	E198*	G	669	T
PCDH1	L248I	G	890	T	PION	E207D	C	700	A	PRAP1	L100M	C	376	A	RAD54B	E33D	C	179	A
PCDH10	E82K	G	1070	A	PIP4K2A	-	C	0	T	PRB2	S173C	G	554	C	RAD54B	E469D	T	1487	G
PCDH10	G611C	G	2657	T	PIP4K2C	R357Q	G	1070	A	PRC1	R568H	C	1860	T	RAD54L	-	G	0	A
PCDH10	P305L	C	1740	T	PIP4K2C	L47R	T	140	G	PRC1	F428V	A	1439	C	RAD54L	-	T	0	C
PCDH10	E625K	G	2699	A	PIP4K2C	-	T	0	C	PRCC	R452Q	G	1627	A	RAD54L	L490M	C	1582	A
PCDH11X	L424F	C	2115	T	PIP5K1A	A303T	G	1329	A	PRCD	A16T	G	477	A	RAD54L	R716Q	G	2261	A
PCDH11X	V17M	G	894	A	PIP5K1C	T512M	G	1592	A	PRCP	D508Y	C	1635	A	RAD54L2	R467H	G	1525	A
PCDH11X	H961N	C	3726	A	PIP5KL1	S377G	T	1174	C	PRDM1	A315T	G	1177	A	RAD54L2	V1299I	G	4020	A
PCDH12	R929C	G	3996	A	PIP5KL1	R288C	G	907	A	PRDM10	Q1035*	G	3335	A	RADIL	T1072M	G	3403	A
PCDH12	R470W	G	2619	A	PIPOX	R378Q	G	1459	A	PRDM10	R854*	G	2792	A	RADIL	R272W	G	1002	A
PCDH12	C1183S	A	4758	T	PIPOX	R66Q	G	523	A	PRDM11	R450C	C	1597	T	RADIL	A929V	G	2974	A
PCDH12	V232A	A	1906	G	PIPOX	S365I	G	1420	T	PRDM11	A143V	C	677	T	RADIL	E166D	C	686	A
PCDH12	R59W	G	1386	A	PISD	R178Q	C	757	T	PRDM11	K3N	G	258	T	RADIL	G108S	C	510	T
PCDH12	N221Y	T	1872	A	PISD	T324A	T	1194	C	PRDM12	A86V	C	317	T	RADIL	E759K	C	2463	T
PCDH12	L477I	G	2640	T	PITPNA	F224L	G	928	T	PRDM13	E531D	G	1854	T	RADIL	G313E	C	1126	T
PCDH12	L20I	G	1269	T	PITPNA	V198I	C	848	T	PRDM13	C616Y	G	2108	A	RAE1	Q271R	A	1232	G
PCDH15	R1468H	C	4798	T	PITPNB	R170G	T	572	C	PRDM13	A191T	G	832	A	RAE1	V130I	G	808	A
PCDH15	I1501F	T	4896	A	PITPNC1	R157W	C	843	T	PRDM14	R505H	C	1716	T	RAET1G	T179I	G	604	A
PCDH15	R1526H	C	4972	T	PITPNC1	E277K	G	1203	A	PRDM14	H220R	T	861	C	RAF1	R302Q	C	1267	T
PCDH15	L844R	A	2926	C	PITPNM1	-	G	0	A	PRDM14	R332H	C	1197	T	RAF1	R638Q	C	2275	T
PCDH15	R1553S	G	5052	T	PITPNM1	A1134V	G	3627	A	PRDM14	K518T	T	1755	G	RAG1	P1021H	C	3186	A
PCDH15	Y759*	G	2672	T	PITPNM1	V532M	C	1820	T	PRDM14	H265Q	A	997	C	RAG1	R897Q	G	2814	A
PCDH15	D852N	C	2949	T	PITPNM1	I1062V	T	3410	C	PRDM15	A813T	C	2548	T	RAG2	R148Q	C	631	T
PCDH15	D748N	C	2637	T	PITPNM2	R828H	C	2622	T	PRDM15	G802S	C	2515	T	RAGE	M21I	C	289	T
PCDH15	N394S	T	1576	C	PITPNM2	G1180S	C	3677	T	PRDM15	F444I	A	1441	T	RAI1	S805L	C	2883	T
PCDH17	A727T	G	2205	A	PITPNM2	R749W	G	2384	A	PRDM16	E64G	A	240	G	RAI1	E764G	A	2760	G
PCDH17	T984I	C	2977	T	PITPNM2	P577L	G	1869	A	PRDM16	K448N	G	1393	T	RAI1	A1764T	G	5759	A
PCDH17	R1109Q	G	3352	A	PITPNM2	G612S	C	1973	T	PRDM16	S537I	G	1659	T	RAI1	D1800N	G	5867	A
PCDH17	A129V	C	412	T	PITPNM2	M220V	T	797	C	PRDM16	A1163T	G	3536	A	RAI1	A535T	G	2072	A
PCDH17	A559V	C	1702	T	PITPNM2	P750S	G	2387	A	PRDM16	A845V	C	2583	T	RAI14	S808L	C	2915	T

PCDH17	D1153N	G	3483	A	PITPNM2	V1230M	C	3827	T	PRDM2	G43S	G	983	A	RAI2	P239S	G	1072	A
PCDH17	D500E	C	1526	A	PITPNM2	A417V	G	1389	A	PRDM2	D277E	T	1687	A	RAI2	S269P	A	1162	G
PCDH17	R622H	G	1891	A	PITPNM3	A837V	G	2661	A	PRDM2	E282D	A	1702	T	RALA	F168C	T	883	G
PCDH17	R53H	G	184	A	PITPNM3	R493W	G	1628	A	PRDM2	T1365M	C	4950	T	RALB	N209S	A	626	G
PCDH17	D112N	G	360	A	PITRM1	G981V	C	2981	A	PRDM2	E282D	A	1702	T	RALBP1	Q269*	C	1028	T
PCDH17	D264N	G	816	A	PITX1	A186V	G	974	A	PRDM2	R407Q	G	2076	A	RALBP1	S383A	T	1370	G
PCDH18	R793Q	C	2765	T	PITX1	R147C	G	856	A	PRDM2	K1523Q	A	5423	C	RALBP1	L443R	T	1551	G
PCDH18	V110A	A	716	G	PITX1	N150S	T	866	C	PRDM5	R558*	G	1913	A	RALGAPA1	A617V	G	2241	A
PCDH18	S777L	G	2717	A	PITX2	R152C	G	1097	A	PRDM5	R232Q	C	936	T	RALGAPA1	G1106C	C	3707	A
PCDH18	D439N	C	1702	T	PITX2	Q102*	G	947	A	PRDM6	V223M	G	1081	A	RALGAPA1	S849G	T	2936	C
PCDH18	S655L	G	2351	A	PITX3	G22D	C	219	T	PRDM6	L472I	C	1828	A	RALGAPA1	V585M	C	2144	T
PCDH18	T919A	T	3142	C	PITX3	S251F	G	906	A	PRDM7	L66I	G	216	T	RALGAPA1	F1214C	A	4032	C
PCDH18	K406Q	T	1603	G	PIWIL1	R275Q	G	914	A	PRDM7	S312*	G	955	T	RALGAPA2	D1206N	C	3759	T
PCDH18	T585M	G	2141	A	PIWIL1	R684M	G	2141	T	PRDM7	F73V	A	237	C	RALGAPA2	S1671N	C	5155	T
PCDH19	N1100H	T	4974	G	PIWIL1	E154K	G	550	A	PRDM8	R181I	G	1381	T	RALGAPA2	R393Q	C	1321	T
PCDH19	S401R	G	2879	T	PIWIL1	R397C	C	1279	T	PRDM8	R118C	C	1191	T	RALGAPA2	R1757S	G	5412	T
PCDH19	S924N	C	4447	T	PIWIL2	A21V	C	193	T	PRDM8	V128A	T	1222	C	RALGAPA2	R385Q	C	1297	T
PCDH19	E530K	C	3264	T	PIWIL2	V138I	G	543	A	PRDM8	A385T	G	1992	A	RALGAPA2	N233T	T	841	G
PCDH19	R395Q	C	2860	T	PIWIL3	A9T	C	442	T	PRDM8	A372V	C	1954	T	RALGAPB	K58T	A	457	C
PCDH20	I785M	T	2719	C	PIWIL3	D109Y	C	742	A	PRDM9	K232N	G	878	T	RALGAPB	K600T	A	2083	C
PCDH20	K522Q	T	1928	G	PIWIL4	R283I	G	1059	T	PRDM9	R839Q	G	2698	A	RALGAPB	Q1078K	C	3516	A
PCDH7	E329D	G	987	T	PIWIL4	R687W	C	2270	T	PRDM9	P222S	C	846	T	RALGDS	I254T	A	846	G
PCDH7	P22L	C	65	T	PIWIL4	S470P	T	1619	C	PRDM9	Y51*	T	335	A	RALGDS	R827S	G	2564	T
PCDH7	A167V	C	500	T	PJA1	W351R	A	1358	G	PRDM9	R113H	G	520	A	RALGDS	R866H	C	2682	T
PCDH7	C1002*	T	3006	A	PJA2	R676H	C	2267	T	PRDM9	P11T	C	213	A	RALGPS1	A307V	C	1187	T
PCDH7	E922D	G	2766	T	PJA2	I642M	A	2166	C	PRDM9	T15I	C	226	T	RALGPS1	A359V	C	1343	T
PCDH8	P311S	G	1135	A	PKD1	W2094L	C	6490	A	PRDM9	E836K	G	2688	A	RALY	F123L	C	871	A
PCDH8	R999H	C	3200	T	PKD1	R1587H	C	4969	T	PRDM9	R279Q	G	1018	A	RALY	H67N	C	701	A
PCDH8	R77H	C	434	T	PKD1	A3653V	G	1116 7	A	PRDX1	E193*	C	917	A	RALYL	S101Y	C	444	A
PCDH8	E866*	C	2800	A	PKD1	-	C	0	T	PRDX3	L186H	A	600	T	RAMP1	D71E	C	345	G
PCDH8	R173H	C	722	T	PKD1	T1012I	G	3244	A	PRDX3	V209M	C	668	T	RAMP2	Q130*	C	463	T
PCDH8	P100L	G	503	A	PKD1	F3380L	A	1034 7	G	PRDX5	L115P	T	463	C	RAN	E90D	G	566	T
PCDH8	R907K	C	2924	T	PKD1	L1904M	G	5919	T	PRDX5	G199D	G	715	A	RAN	V197A	T	886	C
PCDH8	A974T	C	3124	T	PKD1	S3502N	C	1071 4	T	PRDX6	R108W	C	454	T	RANBP1	R140H	G	605	A
PCDH8	R963H	C	3092	T	PKD1	A3442V	G	1053 4	A	PRELID2	T115A	T	396	C	RANBP1	S85Y	C	440	A
PCDH8	S985P	A	3157	G	PKD1	R2951W	G	9060	A	PRELP	F262L	T	974	C	RANBP10	P583S	G	1863	A

PCDH9	R249M	C	881	A	PKD1	S3347P	A	10248	G	PRELP	-	G	0	T	RANBP10	T179A	T	651	C
PCDH9	H178Q	A	669	C	PKD1L1	N970S	T	2960	C	PREP	R662H	C	2178	T	RANBP10	A591T	C	1887	T
PCDH9	M857I	C	2706	A	PKD1L1	S1701Y	G	5153	T	PREP	V660M	C	2171	T	RANBP10	Y462H	A	1500	G
PCDH9	E25D	T	210	G	PKD1L1	G1524V	C	4622	A	PREP	K75N	C	418	A	RANBP10	S188R	G	680	T
PCDH9	F1161V	A	3616	C	PKD1L1	W497*	C	1542	T	PREPL	R226C	G	1114	A	RANBP10	V256M	C	882	T
PCDH9	-	T	0	C	PKD1L1	A853T	C	2608	T	PREPL	R413H	C	1676	T	RANBP17	I811N	T	2432	A
PCDH9	-	A	3847	G	PKD1L1	S659I	C	2027	A	PREX1	E1246K	C	3759	T	RANBP17	V526F	G	1576	T
PCDH9	W1143C	C	3564	A	PKD1L1	R990W	G	3019	A	PREX1	A1495T	C	4506	T	RANBP17	S620Y	C	1859	A
PCDH9	P1026H	G	3212	T	PKD1L1	A1799V	G	5447	A	PREX1	V896I	C	2709	T	RANBP2	K1032N	A	3222	C
PCDH9	K1003N	C	3144	A	PKD1L1	E1836D	C	5559	A	PREX1	L1292P	A	3898	G	RANBP2	P1713Q	C	5264	A
PCDH9	V473G	A	1553	C	PKD1L1	Y1784H	A	5401	G	PREX1	N264S	T	814	C	RANBP2	R1203C	C	3733	T
PCDH9	E95*	C	418	A	PKD1L1	I419M	A	1308	C	PREX1	R1515Q	C	4567	T	RANBP2	G1716R	G	5272	A
PCDH9	L26R	A	212	C	PKD1L1	R1674T	C	5072	G	PREX1	A1486T	C	4479	T	RANBP2	A2104V	C	6437	T
PCDH9	S905R	G	2850	T	PKD1L2	V878M	C	2632	T	PREX1	P1252H	G	3778	T	RANBP2	S3170Y	C	9635	A
PCDHA1	R428W	C	1437	T	PKD1L2	G353S	C	1057	T	PREX1	R394C	G	1203	A	RANBP3	A295T	C	1110	T
PCDHA1	P764T	C	2445	A	PKD1L2	S357P	A	1069	G	PREX1	E1499D	C	4520	A	RANBP3L	-	T	0	C
PCDHA1	R151H	G	607	A	PKD1L2	A984V	G	2951	A	PREX1	E61D	C	206	A	RANBP6	D437N	C	1320	T
PCDHA1	D91Y	G	426	T	PKD1L2	P370H	G	1109	T	PREX2	A855T	G	2840	A	RANBP6	L774P	A	2332	G
PCDHA1	R197I	G	745	T	PKD1L2	E950K	C	2848	T	PREX2	-	T	0	C	RANBP6	F542V	A	1635	C
PCDHA1	E291*	G	1026	T	PKD1L3	M176K	A	527	T	PREX2	V1540A	T	4896	C	RANGAP1	V455M	C	2076	T
PCDHA1	E804K	G	2565	A	PKD1L3	K454N	C	1362	A	PREX2	L50V	T	425	G	RANGAP1	P443S	G	2040	A
PCDHA10	G382R	G	1310	A	PKD1L3	F1306L	A	3918	C	PREX2	A1467T	G	4676	A	RANGAP1	R239W	G	1428	A
PCDHA10	V447M	G	1505	A	PKD1L3	A931D	G	2792	T	PREX2	R427G	A	1556	G	RANGAP1	R448H	C	2056	T
PCDHA10	R753Q	G	2424	A	PKD2	R638H	G	1979	A	PREX2	V167A	T	777	C	RANGRF	P146L	C	555	T
PCDHA11	V507M	G	2377	A	PKD2L1	E706*	C	2499	A	PREX2	R155Q	G	741	A	RAP1GAP	S521L	G	1562	A
PCDHA11	D559N	G	2533	A	PKD2L2	R448Q	G	1399	A	PREX2	E92K	G	551	A	RAP1GAP	V609M	C	1825	T
PCDHA12	Y699H	T	2222	C	PKD2L2	M151T	T	508	C	PREX2	A334S	G	1277	T	RAP1GAP	P563H	G	1688	T
PCDHA12	T205M	C	741	T	PKD2L2	Y120C	A	415	G	PREX2	K367Q	A	1376	C	RAP1GAP	G557R	C	1669	T
PCDHA12	A567V	C	1827	T	PKD2L2	R82H	G	301	A	PREX2	R577Q	G	2007	A	RAP1GAP2	A728V	C	2273	T
PCDHA12	V464M	G	1517	A	PKD2L2	F235L	T	761	G	PREX2	K635N	G	2182	T	RAP1GDS1	R450C	C	1396	T
PCDHA12	E93K	G	404	A	PKD2L2	R448Q	G	1399	A	PREX2	K905N	G	2992	T	RAP1GDS1	S172L	C	563	T
PCDHA12	E416K	G	1373	A	PKDCC	D379G	A	1316	G	PREX2	Y1452D	T	4631	G	RAP2A	A59V	C	425	T
PCDHA12	A412T	G	1361	A	PKDCC	S355R	T	1245	G	PREX2	A1499T	G	4772	A	RAP2B	E37D	A	565	C
PCDHA13	E301D	A	903	C	PKDREJ	S925L	G	2774	A	PREX2	K1578N	G	5011	T	RAP2C	M164I	C	1239	A
PCDHA13	A488T	G	1462	A	PKDREJ	R172Q	C	515	T	PRF1	R119Q	C	471	T	RAPGEF1	A181T	C	700	T
PCDHA13	T634M	C	1901	T	PKDREJ	R2067G	T	6199	C	PRF1	R54H	C	276	T	RAPGEF1	A418T	C	1411	T
PCDHA13	E301*	G	901	T	PKDREJ	H459R	T	1376	C	PRG2	R108H	C	379	T	RAPGEF1	E594K	C	1939	T
PCDHA2	V555M	G	1769	A	PKDREJ	C2090R	A	6268	G	PRG2	T28I	G	139	A	RAPGEF2	R823Q	G	2887	A
PCDHA2	V745M	G	2339	A	PKDREJ	V1462I	C	4384	T	PRG4	K1008T	A	3074	C	RAPGEF2	S1060F	C	3598	T

PCDHA2	V77A	T	336	C	PKDREJ	N958S	T	2873	C	PRG4	T708I	C	2174	T	RAPGEF2	R233H	G	1117	A
PCDHA2	A706V	C	2223	T	PKDREJ	V2128A	A	6383	G	PRICKLE1	R675H	C	2311	T	RAPGEF2	K240N	G	1139	T
PCDHA2	E416K	G	1352	A	PKDREJ	V2110L	C	6328	A	PRICKLE1	R657Q	C	2257	T	RAPGEF3	A204T	C	699	T
PCDHA2	L800F	A	2506	C	PKDREJ	C1619W	A	4857	C	PRICKLE1	R674H	C	2308	T	RAPGEF3	V458I	C	1461	T
PCDHA3	R47H	G	310	A	PKDREJ	L1447V	A	4339	C	PRICKLE1	R236H	C	994	T	RAPGEF3	L480I	G	1527	T
PCDHA3	V35I	G	273	A	PKDREJ	A1083T	C	3247	T	PRICKLE1	L502V	G	1791	C	RAPGEF3	D420N	C	1347	T
PCDHA3	A488T	G	1632	A	PKHD1	V629A	A	2162	G	PRICKLE1	R702W	G	2391	A	RAPGEF4	I195M	T	728	G
PCDHA3	G574D	G	1891	A	PKHD1	F3280C	A	1011 5	C	PRICKLE1	R693I	C	2365	A	RAPGEF4	F889L	C	2810	A
PCDHA3	R722W	C	2334	T	PKHD1	V3263L	C	1006 3	A	PRICKLE2	R397W	G	1775	A	RAPGEF4	R26Q	G	220	A
PCDHA3	V549M	G	1815	A	PKHD1	R793C	G	2653	A	PRICKLE2	V161I	C	1067	T	RAPGEF4	E375*	G	1266	T
PCDHA3	V45M	G	303	A	PKHD1	G470D	C	1685	T	PRICKLE3	R188C	G	560	A	RAPGEF4	E349D	G	1190	T
PCDHA3	K138N	G	584	T	PKHD1	Q2743K	G	8503	T	PRICKLE4	C55Y	G	412	A	RAPGEF4	N991H	A	3114	C
PCDHA3	T43N	C	298	A	PKHD1	R1081H	C	3518	T	PRIM1	F211C	A	696	C	RAPGEF5	E173*	C	830	A
PCDHA4	A266T	G	882	A	PKHD1	L2106R	A	6593	C	PRIM2	-	G	0	T	RAPGEF5	H660N	G	2291	T
PCDHA4	A266T	G	882	A	PKHD1	M947T	A	3116	G	PRIMA1	L3F	G	110	A	RAPGEF5	K161Q	T	794	G
PCDHA4	A484T	G	1536	A	PKHD1	G1427S	C	4555	T	PRKAA1	I211M	A	818	C	RAPGEF5	E100K	C	611	T
PCDHA4	K198T	A	679	C	PKHD1	E4072D	C	1249 2	A	PRKAA1	H291Q	A	1058	C	RAPGEFL1	A355T	G	1063	A
PCDHA5	S433L	C	1470	T	PKHD1	E3582K	C	1102 0	T	PRKAA2	H73R	A	284	G	RAPGEFL1	R613C	C	1837	T
PCDHA5	P795H	C	2556	A	PKHD1	R3350K	C	1032 5	T	PRKAA2	R227*	C	745	T	RAPGEFL1	T345M	C	1034	T
PCDHA5	P129L	C	558	T	PKHD1	S3112P	A	9610	G	PRKAA2	N144I	A	497	T	RAPH1	P884H	G	2651	T
PCDHA6	V542M	G	1651	A	PKHD1	N2842D	T	8800	C	PRKAB1	I36N	T	396	A	RAPH1	R1227Q	C	3680	T
PCDHA6	L659M	C	2002	A	PKHD1	V2552I	C	7930	T	PRKAB2	R179G	T	674	C	RAPH1	K302T	T	905	G
PCDHA6	P563L	C	1715	T	PKHD1	I1310V	T	4204	C	PRKACA	A148T	C	642	T	RAPSN	R282C	G	1058	A
PCDHA6	A439T	G	1342	A	PKHD1L1	T145A	A	537	G	PRKACA	K77E	T	429	C	RAPSN	E368K	C	1316	T
PCDHA6	S608L	C	1850	T	PKHD1L1	S4195R	C	1268 9	G	PRKACA	Y331C	T	1192	C	RARB	R294*	C	880	T
PCDHA6	E243K	G	754	A	PKHD1L1	H1477Y	C	4533	T	PRKACA	F351L	A	1253	C	RARB	L187H	T	560	A
PCDHA7	A615V	C	1997	T	PKHD1L1	A19V	C	160	T	PRKACB	T347M	C	1131	T	RARG	R367H	C	1538	T
PCDHA7	H645Y	C	2086	T	PKHD1L1	S1480N	G	4543	A	PRKACB	R181T	G	633	C	RARRES1	K166E	T	777	C
PCDHA7	A452T	G	1507	A	PKHD1L1	D219Y	G	759	T	PRKACG	G68S	C	233	T	RARRES1	N293H	T	1158	G
PCDHA7	A66V	C	350	T	PKHD1L1	L1432I	C	4398	A	PRKACG	A4T	C	41	T	RARS	G575C	G	1777	T
PCDHA7	R681W	C	2194	T	PKHD1L1	W2621C	G	7967	T	PRKAG1	P22T	G	133	T	RARS	L565I	C	1747	A
PCDHA7	R681Q	G	2195	A	PKHD1L1	E3043*	G	9231	T	PRKAG1	R70Q	C	278	T	RASA1	R427*	C	1843	T
PCDHA7	I318V	A	1105	G	PKHD1L1	V3064A	T	9295	C	PRKAG1	A60D	G	248	T	RASA1	S222N	G	1229	A
PCDHA7	R646H	G	2090	A	PKHD1L1	L3224I	C	9774	A	PRKAG3	R449Q	C	1392	T	RASA1	E193*	G	1141	T
PCDHA7	V624M	G	2023	A	PKIA	E37K	G	504	A	PRKAG3	D358Y	C	1118	A	RASA1	M967I	G	3465	T

PCDHA8	N449D	A	1440	G	PKMYT1	R246C	G	1130	A	PRKAR1B	A139T	C	590	T	RASA1	E560*	G	2242	T
PCDHA8	S491P	T	1566	C	PKMYT1	K149Q	T	839	G	PRKAR2B	L384P	T	1410	C	RASA2	R761I	G	2317	T
PCDHA8	E243K	G	822	A	PKN1	R133H	G	429	A	PRKCB	K304T	A	1063	C	RASA2	N218T	A	688	C
PCDHA9	G588S	G	2486	A	PKN1	E828D	G	2515	T	PRKCB	R161C	C	633	T	RASA3	T518M	G	1684	A
PCDHA9	A484T	G	2174	A	PKN1	T799M	C	2427	T	PRKCB	P317L	C	1102	T	RASA3	T297S	T	1020	A
PCDHAC1	R281*	C	841	T	PKN1	A326V	C	1008	T	PRKCB	K439N	G	1469	T	RASA3	A394V	G	1312	A
PCDHAC1	D128N	G	382	A	PKN1	R892C	C	2705	T	PRKCB	R161H	G	634	A	RASAL1	A436T	C	1599	T
PCDHAC1	A197V	C	590	T	PKN3	A26V	C	470	T	PRKCD	T58M	C	501	T	RASAL1	S154T	A	753	T
PCDHAC2	A109V	C	858	T	PKN3	P11L	C	425	T	PRKCE	M597V	A	2116	G	RASAL2	-	G	0	A
PCDHAC2	G425D	G	1806	A	PKN3	R431C	C	1684	T	PRKCE	R688H	G	2390	A	RASAL2	R1012*	C	3386	T
PCDHAC2	D631A	A	2424	C	PKN3	L590P	T	2162	C	PRKCG	A40T	G	400	A	RASAL2	A1243V	C	4080	T
PCDHAC2	H777P	A	2862	C	PKN3	A317V	C	1343	T	PRKCG	K495M	A	1766	T	RASAL2	L627F	C	2231	T
PCDHB1	E435K	G	1398	A	PKN3	R42C	C	517	T	PRKCG	A458V	C	1655	T	RASAL3	E567K	C	1785	T
PCDHB1	I487V	A	1554	G	PKN3	-	G	0	A	PRKCG	-	G	0	T	RASD2	R38C	C	754	T
PCDHB1	G218R	G	747	A	PKN3	R560H	G	2072	A	PRKCG	S361R	A	1363	C	RASEF	A113V	G	599	A
PCDHB1	K495N	A	1580	T	PKNOX1	R316Q	G	1158	A	PRKCH	S465L	C	1779	T	RASGEF1A	A462T	C	1469	T
PCDHB1	R806K	G	2512	A	PKNOX1	R340Q	G	1230	A	PRKCH	L124P	T	756	C	RASGEF1B	L111I	G	483	T
PCDHB11	I277L	A	879	C	PKNOX2	D197N	G	903	A	PRKCH	L371R	T	1497	G	RASGEF1B	R18Q	C	205	T
PCDHB11	C278S	G	883	C	PKNOX2	P57T	C	483	A	PRKCH	S465L	C	1779	T	RASGEF1C	A147V	G	737	A
PCDHB11	N80H	A	288	C	PKP1	C477R	T	1680	C	PRKCH	F613L	T	2224	G	RASGEF1C	V138M	C	709	T
PCDHB11	L262V	T	834	G	PKP2	V411I	C	1346	T	PRKCI	R192W	C	879	T	RASGEF1C	G293S	C	1174	T
PCDHB11	D425N	G	1323	A	PKP2	P367T	G	1214	T	PRKCI	G398S	G	1497	A	RASGEF1C	F392V	A	1471	C
PCDHB12	A579V	C	1925	T	PKP2	R79Q	C	351	T	PRKCQ	E35D	C	205	G	RASGRF1	T41A	T	415	C
PCDHB12	P721L	C	2351	T	PKP2	R871Q	C	2727	T	PRKCQ	M267V	T	899	C	RASGRF1	A82V	G	539	A
PCDHB13	A677T	G	2029	A	PKP3	R439H	G	1392	A	PRKCQ	R600W	G	1898	A	RASGRF1	V404I	C	1504	T
PCDHB13	S534T	T	1600	A	PKP4	R621Q	G	1974	A	PRKCQ	R635W	G	2003	A	RASGRF1	S873Y	G	2912	T
PCDHB14	D342N	G	1156	A	PKP4	R286W	C	968	T	PRKCSH	R506C	C	1651	T	RASGRF2	A842V	C	2592	T
PCDHB14	V66I	G	328	A	PLA1A	L423I	C	1339	A	PRKCSH	V110I	G	463	A	RASGRF2	R244I	G	798	T
PCDHB14	G299R	G	1027	A	PLA1A	S156L	C	539	T	PRKCSH	P352L	C	1190	T	RASGRF2	E202K	G	671	A
PCDHB14	D69A	A	338	C	PLA2G15	A196V	C	670	T	PRKCSH	Q195P	A	719	C	RASGRF2	D588Y	G	1829	T
PCDHB14	R790Q	G	2501	A	PLA2G16	Y74H	A	643	G	PRKCSH	R489C	C	1600	T	RASGRF2	S877L	C	2697	T
PCDHB15	R158W	C	638	T	PLA2G1B	N134T	T	437	G	PRKCZ	A142V	C	586	T	RASGRF2	R244I	G	798	T
PCDHB16	A693V	C	3233	T	PLA2G2C	S13L	G	38	A	PRKCZ	R127H	G	541	A	RASGRF2	E934K	G	2867	A
PCDHB16	T39M	C	1271	T	PLA2G2F	A80T	G	340	A	PRKCZ	V303M	G	1068	A	RASGRP1	S708R	A	2302	T
PCDHB16	P769L	C	3461	T	PLA2G3	D226N	C	929	T	PRKCZ	-	A	0	G	RASGRP1	H286R	T	1035	C
PCDHB16	E310K	G	2083	A	PLA2G3	V16A	A	300	G	PRKD1	T746I	G	2467	A	RASGRP2	P465T	G	1437	T
PCDHB18	A666V	C	2345	T	PLA2G3	S293R	T	1130	G	PRKD1	R732W	G	2424	A	RASGRP3	R60Q	G	831	A
PCDHB18	F347V	T	1387	G	PLA2G4A	V392A	T	1327	C	PRKD1	R172H	C	745	T	RASGRP3	D119N	G	1007	A
PCDHB2	T409M	C	1364	T	PLA2G4A	T28A	A	234	G	PRKD1	Y828H	A	2712	G	RASGRP3	-	A	0	C

PCDHB2	E90D	G	408	T	PLA2G4C	Q121H	C	705	A	PRKD1	D378N	C	1362	T	RASGRP3	E351*	G	1703	T
PCDHB2	L505M	C	1651	A	PLA2G4C	V20M	C	400	T	PRKD1	A731D	G	2422	T	RASIP1	R338Q	C	1210	T
PCDHB3	K434E	A	1300	G	PLA2G4C	H278Y	G	1174	A	PRKD2	A361T	C	1423	T	RASIP1	R806Q	C	2614	T
PCDHB3	Y435H	T	1303	C	PLA2G4C	K32N	C	438	A	PRKD2	D877N	C	2971	T	RASL10A	E121K	C	871	T
PCDHB3	R536C	C	1606	T	PLA2G4D	P633S	G	1992	A	PRKD2	T748A	T	2584	C	RASL10B	A201T	G	967	A
PCDHB3	E29K	G	85	A	PLA2G4D	P147Q	G	535	T	PRKD2	A202V	G	947	A	RASL11A	L223M	C	1285	A
PCDHB3	E88D	G	264	T	PLA2G4D	A388T	C	1257	T	PRKD3	R355Q	C	1827	T	RASSF1	W129C	C	423	A
PCDHB3	E100*	G	298	T	PLA2G4D	-	A	0	G	PRKD3	R647*	G	2702	A	RASSF1	R244H	C	767	T
PCDHB3	E358D	G	1074	T	PLA2G4E	R243Q	C	1215	T	PRKD3	N431T	T	2055	G	RASSF1	P15S	G	79	A
PCDHB3	G329R	G	985	A	PLA2G4E	L627M	G	2366	T	PRKD3	D107G	T	1083	C	RASSF1	F237L	A	745	G
PCDHB4	A414T	G	1240	A	PLA2G4E	G553S	C	2144	T	PRKDC	D2871N	C	8668	T	RASSF1	R176C	G	562	A
PCDHB4	R624C	C	1870	T	PLA2G6	A147T	C	623	T	PRKDC	I125L	T	430	G	RASSF2	G36D	C	303	T
PCDHB4	L153F	G	459	T	PLA2G6	R6H	C	201	T	PRKDC	D3688N	C	11119	T	RASSF8	P82L	C	444	T
PCDHB4	D555N	G	1663	A	PLA2G6	P625S	G	2057	A	PRKDC	N3696S	T	11144	C	RASSF8	D392Y	G	1496	T
PCDHB5	G328*	G	1189	T	PLA2G6	R635Q	C	2088	T	PRKDC	W1828*	C	5541	T	RASSF8	V27D	T	279	A
PCDHB5	-	A	2594	C	PLA2G7	G164D	C	688	T	PRKDC	H2681R	T	8099	C	RASSF9	A302T	C	1243	T
PCDHB6	N237S	A	710	G	PLA2R1	R1342Q	C	4232	T	PRKDC	A615T	C	1900	T	RASSF9	F218L	G	993	T
PCDHB7	P221T	C	743	A	PLA2R1	N1075H	T	3430	G	PRKG1	D26A	A	494	C	RASSF9	P91H	G	611	T
PCDHB7	R785H	G	2436	A	PLA2R1	C929W	A	2994	C	PRKG1	K405E	A	1630	G	RAVER2	A282V	C	923	T
PCDHB7	A508V	C	1605	T	PLAC1L	N19H	A	240	C	PRKG2	P672L	G	2132	A	RAVER2	T477N	C	1508	A
PCDHB7	Y563D	T	1769	G	PLAC8L1	L76I	G	284	T	PRKG2	I484T	A	1568	G	RAVER2	F389C	T	1244	G
PCDHB8	L405P	T	1459	C	PLAG1	F34C	A	497	C	PRKG2	K122M	T	482	A	RAVER2	M423I	G	1347	T
PCDHB8	T268M	C	1048	T	PLAGL1	F325V	A	2887	C	PRKRIP1	A141V	C	1732	T	RAVER2	R652Q	G	2033	A
PCDHB8	P540L	C	1864	T	PLAGL1	E17D	C	1965	A	PRL	A51V	G	671	A	RAX	A60V	G	366	A
PCDHB8	V728G	T	2428	G	PLAGL2	Q41P	T	387	G	PRLHR	R125H	C	513	T	RB1	G865V	G	2732	T
PCDHB9	T657M	C	2144	T	PLAT	R524H	C	1780	T	PRLHR	V296I	C	1025	T	RB1	S648T	T	2080	A
PCDHB9	R530H	G	1763	A	PLAT	S414L	G	1450	A	PRLR	V237M	C	1136	T	RB1CC1	E1447G	T	4898	C
PCDHB9	S173N	G	692	A	PLAU	V381I	G	1234	A	PRLR	T618A	T	2279	C	RB1CC1	G518A	C	2111	G
PCDHB9	L519M	C	1729	A	PLAUR	M280T	A	1069	G	PRLR	E169*	C	932	A	RB1CC1	F542C	A	2183	C
PCDHB9	G762E	G	2459	A	PLAUR	T49M	G	376	A	PRM3	R26W	G	76	A	RB1CC1	R57*	G	727	A
PCDHB9	H129Y	C	559	T	PLB1	A190V	C	613	T	PRMT10	R616H	C	2090	T	RBAK	G156R	G	732	A
PCDHB9	V549M	G	1819	A	PLB1	P694L	C	2125	T	PRMT2	V88M	G	1024	A	RBAK	R412*	C	1558	T
PCDHGA1	V67I	G	247	A	PLB1	L885F	G	2699	T	PRMT2	M405T	T	1976	C	RBAK	S524A	T	1894	G
PCDHGA1	A696V	C	2135	T	PLB1	P1003S	C	3051	T	PRMT5	R384W	G	1241	A	RBBP4	Q48R	A	302	G
PCDHGA1	S296F	C	935	T	PLB1	Q1233H	A	3743	T	PRMT5	T80M	G	330	A	RBBP5	A200T	C	740	T
PCDHGA1	L368I	C	1150	A	PLB1	N1275I	A	3868	T	PRMT7	P353H	C	1346	A	RBBP6	T1256A	A	4198	G
PCDHGA1	E463K	G	1435	A	PLBD1	R455*	G	1524	A	PRMT8	T285M	C	1244	T	RBBP6	S110Y	C	761	A
PCDHGA1 2	L212F	C	819	T	PLBD1	F195L	G	746	T	PRMT8	V339I	G	1405	A	RBBP6	R987G	A	3391	G
PCDHGA1	G512S	G	2432	A	PLBD2	Y116H	T	374	C	PRMT8	T96A	A	676	G	RBBP6	G1686D	G	5489	A

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PCDHGA12	L750P	T	3147	C	PLCB1	N818K	C	2481	A	PRMT8	T248I	C	1133	T	RBBP6	R1712Q	G	5567	A
PCDHGA12	A492T	G	1659	A	PLCB1	R168C	C	529	T	PRND	L17F	C	120	T	RBBP6	Y898*	T	3126	A
PCDHGA12	E311K	G	1829	A	PLCB1	L353F	C	1084	T	PRNP	Q98P	A	656	C	RBBP6	S473Y	C	1850	A
PCDHGA12	L231F	C	691	T	PLCB1	G96R	G	313	A	PRNT	V6A	A	495	G	RBBP7	R347H	C	1285	T
PCDHGA12	G571S	G	2609	A	PLCB1	G305R	G	940	A	PROC	P301T	C	907	A	RBBP7	E318K	C	1197	T
PCDHGA12	T22M	C	65	T	PLCB1	K1074T	A	3248	C	PROC	R59Q	G	182	A	RBBP8	R496Q	G	1818	A
PCDHGA12	A696V	C	2272	T	PLCB2	F648L	G	2245	T	PROCR	E132K	G	666	A	RBBP8	E742D	A	2557	T
PCDHGA12	R627H	G	2778	A	PLCB2	K1045T	T	3435	G	PRODH2	A367V	G	1100	A	RBBP8	E834*	G	2831	T
PCDHGA12	G221R	G	661	A	PLCB2	F822L	G	2767	T	PRODH2	T420M	G	1259	A	RBCK1	G485D	G	2159	A
PCDHGA12	T805M	C	2599	T	PLCB2	E539*	C	1916	A	PRODH2	R177W	G	529	A	RBCK1	S316C	A	1651	T
PCDHGA12	E93G	A	1176	G	PLCB2	E389*	C	1466	A	PROK1	R6Q	G	34	A	RBCK1	R134C	C	1105	T
PCDHGA12	V795I	G	3281	A	PLCB3	S404L	C	1291	T	PROKR1	R307C	C	2626	T	RBL1	H498N	G	1559	T
PCDHGA12	A633V	C	1898	T	PLCB3	R359H	G	1156	A	PROKR1	R279C	C	2542	T	RBL1	-	C	0	T
PCDHGA12	V505I	G	1513	A	PLCB3	T105M	C	394	T	PROKR2	K53N	C	159	A	RBL1	L355P	A	1131	G
PCDHGA12	A18V	C	53	T	PLCB3	A725T	G	2253	A	PROKR2	E377*	C	1129	A	RBL1	D837G	T	2577	C
PCDHGA12	R751W	C	2251	T	PLCB4	E892A	A	2811	C	PROL1	-	T	0	C	RBL1	R626Q	C	1944	T
PCDHGA12	R198C	C	777	T	PLCD1	A251V	G	975	A	PROM1	V338M	C	1292	T	RBL1	K277Q	T	896	G
PCDHGA12	P79L	C	236	T	PLCD3	R784H	C	2465	T	PROM1	R472Q	C	1695	T	RBL2	V843A	T	2636	C
PCDHGC3	T100A	A	412	G	PLCD3	R539H	C	1730	T	PROM1	R472Q	C	1695	T	RBL2	S982N	G	3053	A
PCDHGC4	R337*	C	1009	T	PLCD4	W389G	T	1407	G	PROM2	R48Q	G	276	A	RBL2	A66T	G	304	A
PCDHGC4	E111G	A	332	G	PLCD4	E226D	A	920	T	PROM2	Q281H	G	976	T	RBL2	E127*	G	487	T
PCDHGC4	S166L	C	497	T	PLCD4	A2V	C	247	T	PROM2	W49*	G	280	A	RBL2	S413R	A	1345	C
PCDHGC5	T273I	C	818	T	PLCD4	S60G	A	420	G	PROM2	K833E	A	2630	G	RBM10	V224D	T	1413	A
PCDHGC5	D345G	A	1034	G	PLCD4	E173*	G	759	T	PROM2	G453D	G	1491	A	RBM10	A773V	C	3060	T
PCF11	R779Q	G	2681	A	PLCD4	E194*	G	822	T	PROP1	R120C	G	667	A	RBM11	K143N	G	471	T
PCF11	S330N	G	1334	A	PLCE1	D871N	G	2846	A	PROS1	A428T	C	1599	T	RBM11	R74C	C	262	T

PCF11	R1377Q	G	4475	A	PLCE1	D1613G	A	5073	G	PROS1	F414L	A	1557	G	RBM12B	R87I	C	453	A
PCF11	Y1453H	T	4702	C	PLCE1	T1412M	C	4470	T	PROSC	L175P	T	601	C	RBM14	E145V	A	573	T
PCF11	K345Q	A	1378	C	PLCE1	N731I	A	2427	T	PROSC	D118N	G	429	A	RBM14	R585Q	G	1893	A
PCF11	-	G	0	C	PLCE1	R1053Q	G	3393	A	PROX1	R156H	G	1075	A	RBM14	G505R	G	1652	A
PCF11	E1401G	A	4547	G	PLCE1	K1753R	A	5493	G	PROX1	R596C	C	2394	T	RBM15	A601T	G	2701	A
PCF11	R565*	C	2038	T	PLCE1	E2133D	G	6634	T	PROX2	Q261R	T	782	C	RBM15	E360*	G	1978	T
PCGF2	H284N	G	1093	T	PLCE1	S1292L	C	4110	T	PROZ	A53S	G	164	T	RBM15	R663Q	G	2888	A
PCGF3	L231P	T	1087	C	PLCE1	R1434Q	G	4536	A	PROZ	T267M	C	807	T	RBM15B	R559C	C	1775	T
PCIF1	R473*	C	1716	T	PLCE1	H1756N	C	5501	A	PRPF18	E295*	G	1043	T	RBM15B	T631A	A	1991	G
PCK1	R115C	C	507	T	PLCG1	D1075N	G	3420	A	PRPF18	G293V	G	1038	T	RBM15B	R392K	G	1275	A
PCK2	R561W	C	1928	T	PLCG1	V585M	G	1950	A	PRPF18	T60A	A	338	G	RBM15B	R337C	C	1109	T
PCK2	A301T	G	1148	A	PLCG2	P950H	C	3019	A	PRPF3	E535*	G	1768	T	RBM17	R168I	G	728	T
PCLO	P734T	G	2489	T	PLCG2	R742H	G	2395	A	PRPF31	E492K	G	1823	A	RBM18	G91C	C	412	A
PCLO	E2038*	C	6401	A	PLCG2	K80T	A	409	C	PRPF31	V295M	G	1232	A	RBM19	P931L	G	2876	A
PCLO	E1238*	C	4001	A	PLCG2	E304D	G	1082	T	PRPF38A	V88L	G	448	T	RBM19	Q579P	T	1820	G
PCLO	E188K	C	851	T	PLCG2	K942N	A	2996	C	PRPF38A	E146A	A	623	C	RBM19	V457A	A	1454	G
PCLO	S1684L	G	5340	A	PLCH1	R54Q	C	161	T	PRPF38B	R270Q	G	1078	A	RBM19	R360C	G	1162	A
PCLO	G4741C	C	1451 0	A	PLCH1	R215Q	C	644	T	PRPF39	G404*	G	1352	T	RBM19	V627M	C	1963	T
PCLO	R3050*	G	9437	A	PLCH1	Q638*	G	1912	A	PRPF39	-	G	0	A	RBM20	R634Q	G	1959	A
PCLO	E5010D	T	1531 9	G	PLCH1	A924T	C	2770	T	PRPF4	R82*	C	645	T	RBM20	R589L	G	1824	T
PCLO	L1380R	A	4428	C	PLCH1	R505*	G	1513	A	PRPF4	D313N	G	1338	A	RBM20	P44Q	C	189	A
PCLO	P5090S	G	1555 7	A	PLCH2	R952Q	G	3129	A	PRPF4	F415L	C	1646	A	RBM20	V487M	G	1517	A
PCLO	K3645N	T	1122 4	G	PLCH2	R110H	G	603	A	PRPF40A	R929Q	C	3136	T	RBM20	-	G	0	T
PCLO	A1914V	G	6030	A	PLCH2	A1353P	G	4331	C	PRPF40B	I108N	T	387	A	RBM22	R216W	G	723	A
PCLO	R3843*	T	1181 6	A	PLCH2	R583C	C	2021	T	PRPF40B	R762W	C	2348	T	RBM22	R216W	G	723	A
PCLO	R4461Q	C	1367 1	T	PLCH2	R144H	G	705	A	PRPF40B	V573M	G	1781	A	RBM23	R193H	C	777	T
PCLO	E3557*	C	1095 8	A	PLCH2	R781H	G	2616	A	PRPF40B	S798N	G	2457	A	RBM23	E29*	C	284	A
PCLO	A4060V	G	1246 8	A	PLCL1	D159Y	G	873	T	PRPF4B	A86V	C	357	T	RBM25	R421W	C	1469	T
PCLO	R3420*	G	1054 7	A	PLCL1	A759V	C	2674	T	PRPF4B	E119K	G	455	A	RBM25	R549H	G	1854	A
PCLO	E3193D	T	9868	G	PLCL1	R469Q	G	1804	A	PRPF4B	R415Q	G	1344	A	RBM25	R391C	C	1379	T
PCLO	A3124D	G	9660	T	PLCL2	K789R	A	2780	G	PRPF6	R785W	C	2464	T	RBM26	R184Q	C	992	T
PCLO	R1646I	C	5226	A	PLCL2	E994K	G	3394	A	PRPF6	D42Y	G	235	T	RBM26	R186Q	C	998	T
PCLO	R5085*	G	1554	A	PLCL2	R44H	G	545	A	PRPF6	E320*	G	1069	T	RBM26	R152C	G	895	A

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PCLO	I2583M	A	8038	C	PLCL2	L1005M	T	3427	A	PRPF6	R38H	G	224	A	RBM26	-	A	0	G
PCLO	I2132M	T	6685	C	PLCXD2	R241C	C	1307	T	PRPF8	R409Q	C	1318	T	RBM26	E996D	T	3429	A
PCLO	R1994I	C	6270	A	PLCXD3	S254N	C	836	T	PRPF8	A543G	G	1720	C	RBM26	P381S	G	1582	A
PCLO	P1324S	G	4259	A	PLCXD3	P222H	G	740	T	PRPF8	A179G	G	628	C	RBM27	R510K	G	1695	A
PCLO	K1063N	T	3478	A	PLCXD3	V307A	A	995	G	PRPF8	A1731T	C	5283	T	RBM27	S566G	A	1862	G
PCM1	S1287N	G	4282	A	PLCXD3	L229I	G	760	T	PRPF8	E868K	C	2694	T	RBM27	Q586P	A	1923	C
PCM1	S643I	G	2350	T	PLCXD3	F61V	A	256	C	PRPF8	H792Y	G	2466	A	RBM28	V75M	C	338	T
PCM1	S938N	G	3235	A	PLCZ1	E511*	C	1795	A	PRPF8	-	T	0	G	RBM28	I701T	A	2217	G
PCM1	R348H	G	1465	A	PLCZ1	R391*	G	1435	A	PRPF8	K1344T	T	4123	G	RBM28	R582Q	C	1860	T
PCM1	R576*	C	2148	T	PLCZ1	R197H	C	854	T	PRPF8	Y394H	A	1272	G	RBM28	T452M	G	1470	A
PCM1	T1558A	A	5094	G	PLCZ1	R385Q	C	1418	T	PRPH	A394T	G	2679	A	RBM28	E333*	C	1112	A
PCM1	P452L	C	1777	T	PLD1	D573N	C	1844	T	PRPH2	V312M	C	1174	T	RBM28	D244G	T	846	C
PCM1	P878H	C	3055	A	PLD1	E125*	C	500	A	PRPH2	R248C	G	982	A	RBM3	R75H	G	287	A
PCM1	R354C	C	1482	T	PLD1	P507L	G	1647	A	PRPH2	E321A	T	1202	G	RBM33	R1089Q	G	3464	A
PCM1	T518P	A	1974	C	PLD1	A462D	G	1512	T	PRPS1L1	D210A	T	710	G	RBM33	R529*	C	1783	T
PCM1	N1448H	A	4764	C	PLD1	E281*	C	968	A	PRPS1L1	S58G	T	253	C	RBM34	R272C	G	1045	A
PCM1	R1529H	G	5008	A	PLD2	R202C	C	735	T	PRPSAP2	K335T	A	1416	C	RBM39	K467T	T	1424	G
PCMT1	M1T	T	287	C	PLD2	R336Q	G	1138	A	PRR11	S139R	T	488	G	RBM39	R289Q	C	890	T
PCMT1	K183N	G	834	T	PLD2	R608Q	G	1954	A	PRR12	C2035Y	G	6104	A	RBM4	R95Q	G	432	A
PCMTD1	R200Q	C	940	T	PLD2	A854T	G	2691	A	PRR12	R207H	G	620	A	RBM41	T404A	T	1241	C
PCMTD1	Y41H	A	462	G	PLD2	S243F	C	859	T	PRR12	L1289F	C	3865	T	RBM42	R181H	G	618	A
PCMTD1	R200Q	C	940	T	PLD4	L142R	T	571	G	PRR12	R381C	C	1141	T	RBM42	R102Q	G	381	A
PCNT	G2553R	G	7764	A	PLD4	T238M	C	859	T	PRR12	T535A	A	1603	G	RBM42	V18I	G	128	A
PCNT	K3081E	A	9348	G	PLD5	R173S	C	1029	G	PRR12	A106T	G	316	A	RBM42	R455C	C	1439	T
PCNT	R1285H	G	3961	A	PLD6	R204C	G	642	A	PRR12	A79V	C	236	T	RBM43	E294D	C	1034	A
PCNT	T275M	C	931	T	PLDN	T75I	C	449	T	PRR12	R228H	G	683	A	RBM43	V34I	C	252	T
PCNT	Q2785*	C	8460	T	PLEC	L2864I	G	8760	T	PRR14	R503W	C	1765	T	RBM44	S472R	C	1548	A
PCNT	R2691W	C	8178	T	PLEC	S3479L	G	10606	A	PRR14	P221T	C	919	A	RBM44	N402H	A	1336	C
PCNT	T2007M	C	6127	T	PLEC	R3991H	C	12142	T	PRR14	R532Q	G	1853	A	RBM44	R919I	G	2888	T
PCNT	L2251P	T	6859	C	PLEC	S2257T	A	6939	T	PRR16	R206W	C	825	T	RBM45	S108*	C	415	A
PCNT	A493P	G	1584	C	PLEC	S984N	C	3121	T	PRR19	V63I	G	565	A	RBM46	S385Y	C	1389	A
PCNT	R1923*	C	5874	T	PLEC	A4398T	C	13362	T	PRR19	V62M	G	562	A	RBM46	G18C	G	287	T
PCNT	E1503G	A	4615	G	PLEC	T1859M	G	5746	A	PRR23A	R262*	G	784	A	RBM46	Q217P	A	885	C
PCNT	L2001V	C	6108	G	PLEC	A1182V	G	3715	A	PRR23A	A114V	G	341	A	RBM47	I262F	T	1181	A
PCNT	S1039N	G	3223	A	PLEC	A411T	C	1401	T	PRR23A	P101S	G	301	A	RBM47	K279N	C	1234	A
PCNT	R2663C	C	8094	T	PLEC	R3935W	G	1197	A	PRR23A	A65T	C	193	T	RBM4B	R347W	G	1092	A

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PCNX	R2159*	C	6921	T	PLEC	T2504M	G	7681	A	PRR23A	S86L	G	257	A	RBM4B	A238V	G	766	A
PCNX	G1968D	G	6349	A	PLEC	R2383C	G	7317	A	PRR23B	A114V	G	606	A	RBM5	S92N	G	450	A
PCNX	H2104R	A	6757	G	PLEC	R728H	C	2353	T	PRR23C	V137I	C	681	T	RBM5	E73K	G	392	A
PCNX	I1378N	T	4579	A	PLEC	V949M	C	3015	T	PRR24	Y51C	A	152	G	RBM5	K162N	A	661	C
PCNX	A688D	C	2509	A	PLEC	R3909H	C	1189 6	T	PRR25	S127Y	C	380	A	RBM5	R722H	G	2340	A
PCNXL2	T1893M	G	5913	A	PLEC	R3446H	C	1050 7	T	PRR5	G297D	G	1499	A	RBM6	V877I	G	2888	A
PCNXL2	L1985F	G	6188	A	PLEC	E3132K	C	9564	T	PRR5-ARHGAP8	S592N	G	1775	A	RBM7	V21M	G	117	A
PCNXL2	C1634R	A	5135	G	PLEC	R1159H	C	3646	T	PRR5-ARHGAP8	E417K	G	1249	A	RBM8A	L7H	T	89	A
PCNXL2	K818M	T	2688	A	PLEC	R3897H	C	1186 0	T	PRRG4	L7P	T	273	C	RBM9	T154M	G	461	A
PCNXL2	C467R	A	1634	G	PLEC	R1317L	C	4120	A	PRRT2	T151I	C	735	T	RBM9	R442*	G	1324	A
PCNXL2	A1461T	C	4616	T	PLEC	R4589H	C	1393 6	T	PRRT3	A438V	G	1443	A	RBMS2P1	R195Q	C	584	T
PCNXL2	V2001I	C	6236	T	PLEC	T4080A	T	1240 8	C	PRRT4	A445D	G	1531	T	RBMS3	T350M	C	1385	T
PCNXL2	S1035L	G	3339	A	PLEC	A2357T	C	7239	T	PRRT4	R763C	G	2484	A	RBMS3	P269L	C	1142	T
PCNXL3	R410L	G	1229	T	PLEC	G478C	C	1602	A	PRRT4	R413Q	C	1435	T	RBMS3	M321I	G	1299	T
PCNXL3	S996Y	C	2987	A	PLEC	R2575*	G	7893	A	PRRT4	G395S	C	1380	T	RBMX	H128Y	G	537	A
PCNXL3	R858H	G	2573	A	PLEK	R174C	C	699	T	PRRX1	V172M	G	827	A	RBMX2	E250K	G	812	A
PCNXL3	P726L	C	2177	T	PLEK	R119Q	G	535	A	PRRX1	F34L	C	415	A	RBMXL1	P198Q	G	1021	T
PCNXL3	V1245M	G	3733	A	PLEK	F326L	C	1157	A	PRSS12	M806L	T	2699	G	RBMXL2	R268H	G	990	A
PCNXL3	R1880W	C	5638	T	PLEK	T73K	C	397	A	PRSS16	V71M	G	226	A	RBMXL2	G287R	G	1046	A
PCNXL3	R1177Q	G	3530	A	PLEK2	V5E	A	66	T	PRSS21	A307D	C	962	A	RBMXL2	V54I	G	347	A
PCOLCE	-	T	0	C	PLEK2	R131H	C	444	T	PRSS22	I260V	T	844	C	RBMXL2	R195H	G	771	A
PCOLCE	G100V	G	579	T	PLEKHA1	R28K	G	214	A	PRSS22	W134*	C	467	T	RBMXL2	G287R	G	1046	A
PCOLCE2	V294M	C	1187	T	PLEKHA1	D388Y	G	1293	T	PRSS23	E65K	G	370	A	RBMXL3	G384R	G	1165	A
PCP4	R41C	C	306	T	PLEKHA2	V206M	G	850	A	PRSS23	N3D	A	184	G	RBMXL3	S159R	C	492	G
PCSK1	R669Q	C	2244	T	PLEKHA2	R421W	C	1495	T	PRSS23	K182T	A	722	C	RBMXL3	A207D	C	635	A
PCSK1	R438Q	C	1551	T	PLEKHA3	R240Q	G	1121	A	PRSS27	D223N	C	722	T	RBMXL3	G100S	G	313	A
PCSK1	N316H	T	1184	G	PLEKHA4	R204H	C	1136	T	PRSS27	E200K	C	653	T	RBMXL3	R746H	G	2252	A
PCSK1N	P215A	G	744	C	PLEKHA4	R238C	G	1237	A	PRSS3	E89D	G	267	T	RBP1	N76D	T	337	C
PCSK2	T31M	C	407	T	PLEKHA4	R204C	G	1135	A	PRSS42	A29V	G	86	A	RBP2	K102R	T	362	C
PCSK2	E625K	G	2188	A	PLEKHA4	P656L	G	2492	A	PRSS42	W93*	C	279	T	RBP3	G967S	C	3013	T
PCSK2	P142H	C	740	A	PLEKHA4	F779S	A	2861	G	PRSS45	A130V	G	389	A	RBP3	G967S	C	3013	T
PCSK4	A405T	C	1275	T	PLEKHA4	R225Q	C	1199	T	PRSS46	W245*	C	811	T	RBP3	A450T	C	1462	T
PCSK4	E414D	C	1304	A	PLEKHA5	S379R	A	1221	C	PRSS46	R3C	G	83	A	RBP3	T471M	G	1526	A

PCSK4	W122*	C	427	T	PLEKHA5	-	G	0	A	PRSS48	R50C	C	148	T	RBP3	P786T	G	2470	T
PCSK4	E196D	C	650	A	PLEKHA5	E1216*	G	3732	T	PRSS53	R99C	G	449	A	RBP3	T943M	G	2942	A
PCSK5	-	G	0	A	PLEKHA6	R876Q	C	2944	T	PRSS53	Y381C	T	1296	C	RBP3	A910V	G	2843	A
PCSK6	R510M	C	1529	A	PLEKHA6	Q654R	T	2278	C	PRSS54	A106T	C	711	T	RBP3	E394*	C	1294	A
PCSK6	K490N	C	1470	A	PLEKHA6	R465C	G	1710	A	PRSS54	L132H	A	790	T	RBP7	R22*	C	71	T
PCSK6	-	C	0	T	PLEKHA6	P289S	G	1182	A	PRSS54	V32I	C	489	T	RBPJ	C92Y	G	511	A
PCSK6	D174N	C	520	T	PLEKHA7	R713*	G	2148	A	PRSS54	E379K	C	1530	T	RBPJL	T249M	C	818	T
PCSK7	W678C	C	2235	A	PLEKHA7	S117P	A	360	G	PRSS55	P258T	C	812	A	RBPJL	K79T	A	308	C
PCSK7	R429C	G	1486	A	PLEKHA7	R703M	C	2119	A	PRSS55	L144F	C	470	T	RBPMS	R38Q	G	778	A
PCSK7	D221Y	C	862	A	PLEKHA7	E133Q	C	408	G	PRSS55	G95C	G	323	T	RBPMS	A7S	G	684	T
PCSK7	-	C	0	T	PLEKHB1	E63D	G	620	T	PRSS55	E188K	G	602	A	RBPMS2	A184T	C	818	T
PCSK9	R251C	C	1041	T	PLEKHF1	N155K	C	465	G	PRSS8	R265C	G	1125	A	RBPMS2	R137W	G	677	A
PCSK9	R499H	G	1786	A	PLEKHF2	G65D	G	435	A	PRTG	R689K	C	2114	T	RC3H1	R852*	G	2633	A
PCSK9	A478T	G	1722	A	PLEKHG1	R765W	C	2605	T	PRTG	D1135N	C	3451	T	RC3H1	-	C	0	A
PCYOX1	D493Y	G	1505	T	PLEKHG1	A968V	C	3215	T	PRTG	F667L	G	2049	T	RC3H1	P562A	G	1763	C
PCYT1A	A217V	G	660	A	PLEKHG1	G711D	G	2444	A	PRTG	S267F	G	848	A	RC3H1	R26*	G	155	A
PCYT1B	L69S	A	337	G	PLEKHG1	S1214A	T	3952	G	PRTG	E148K	C	490	T	RC3H2	R699H	C	2697	T
PCYT1B	T194M	G	712	A	PLEKHG2	R285H	G	1704	A	PRUNE	H19Y	C	211	T	RC3H2	A69T	C	806	T
PCYT1B	R211C	G	762	A	PLEKHG2	S906P	T	3566	C	PRUNE	P369T	C	1261	A	RCAN3	A163V	C	801	T
PCYT1B	D82N	C	375	T	PLEKHG2	W694*	G	2932	A	PRUNE2	W1868C	C	5728	A	RCBTB2	V178G	A	824	C
PCYT2	R171L	C	575	A	PLEKHG3	L994P	T	3128	C	PRUNE2	R2704*	G	8234	A	RCBTB2	-	A	0	G
PDCD1	R204C	G	680	A	PLEKHG3	R106C	C	463	T	PRUNE2	P853L	G	2682	A	RCC1	G211*	G	989	T
PDCD1	P21S	G	131	A	PLEKHG3	D335N	G	1150	A	PRUNE2	G2197D	C	6714	T	RCC1	R170C	C	866	T
PDCD10	E140*	C	741	A	PLEKHG3	L232I	C	841	A	PRUNE2	E780K	C	2462	T	RCC2	R415H	C	1432	T
PDCD11	A1365V	C	4188	T	PLEKHG3	A606T	G	1963	A	PRUNE2	I2572L	T	7838	G	RCN1	S69P	T	471	C
PDCD11	A1233V	C	3792	T	PLEKHG4	S988N	G	5498	A	PRUNE2	S1859Y	G	5700	T	RCN1	K294T	A	1147	C
PDCD11	P845T	C	2627	A	PLEKHG4	L897R	T	5225	G	PRUNE2	E1571D	T	4837	G	RCOR1	R371*	C	1111	T
PDCD11	R1590H	G	4863	A	PLEKHG4	T312M	C	3470	T	PRUNE2	D633Y	C	2021	A	RCOR1	K221T	A	662	C
PDCD11	E114D	A	436	C	PLEKHG4	-	G	0	A	PRUNE2	K118N	T	478	G	RCOR2	-	A	0	G
PDCD2	K144R	T	460	C	PLEKHG4	V816M	G	4981	A	PRX	V832A	A	2764	G	RCOR2	S68N	C	591	T
PDCD2L	S290T	G	902	C	PLEKHG4B	V412I	G	1284	A	PRX	P1146H	G	3706	T	RCSD1	R175*	C	854	T
PDCD4	R407I	G	1494	T	PLEKHG4B	G1251D	G	3802	A	PRX	R1371W	G	4380	A	RCVRN	G115R	C	530	T
PDCD6IP	I323M	T	1633	G	PLEKHG4B	E966K	G	2946	A	PRX	G877D	C	2899	T	RCVRN	E27D	C	268	A
PDCD6IP	G63D	G	852	A	PLEKHG5	G970V	C	3407	A	PRX	A700V	G	2368	A	RD3	R190W	G	1732	A
PDCD6IP	L68F	C	866	T	PLEKHG6	P123S	C	515	T	PRX	A1035T	C	3372	T	RDH10	L40P	T	379	C
PDCD6IP	V841M	G	3185	A	PLEKHH1	L156P	T	609	C	PSAPL1	A72V	G	309	A	RDH10	F215V	T	903	G
PDCL	G191D	C	738	T	PLEKHH1	S333N	G	1140	A	PSAPL1	D186Y	C	650	A	RDH10	F220C	T	919	G
PDCL	R141Q	C	588	T	PLEKHH2	V888I	G	2772	A	PSAPL1	P9S	G	119	A	RDH11	K165N	C	585	A
PDDC1	V157I	C	494	T	PLEKHH2	A73V	C	328	T	PSD	E706*	C	2643	A	RDH11	R108*	G	412	A

PDDC1	V153M	C	482	T	PLEKHH2	S183L	C	658	T	PSD2	T671I	C	2217	T	RDH13	A46T	C	136	T
PDE10A	T25P	T	156	G	PLEKHH2	G427V	G	1390	T	PSD3	-	A	3251	G	RDH13	L153W	A	458	C
PDE10A	G390C	C	1251	A	PLEKHH3	R384C	G	1617	A	PSD3	R328I	C	1086	A	RDH13	K74T	T	221	G
PDE10A	D278Y	C	915	A	PLEKHH3	A276V	G	1294	A	PSD4	S38N	G	308	A	RDH16	P293T	G	1049	T
PDE11A	R413Q	C	1556	T	PLEKHH3	G155S	C	930	T	PSD4	L250I	C	943	A	RDH16	L171P	A	684	G
PDE11A	A130V	G	707	A	PLEKHH3	G155S	C	930	T	PSD4	T53I	C	353	T	RDH5	R75C	C	406	T
PDE11A	A373T	C	1435	T	PLEKHH3	T626M	G	2344	A	PSD4	R868C	C	2797	T	RDM1	F86V	A	283	C
PDE11A	-	C	0	T	PLEKHH3	R104W	G	777	A	PSEN1	R42W	C	396	T	RDX	R569*	G	2015	A
PDE11A	R844W	G	2848	A	PLEKHJ1	R49Q	C	218	T	PSENEN	W74*	G	426	A	RDX	F102L	G	616	T
PDE11A	P538H	G	1931	T	PLEKHM1	A380S	C	1272	A	PSG11	G229E	C	761	T	REC8	E460Q	G	1937	C
PDE11A	I212V	T	952	C	PLEKHM1P	V501I	C	1501	T	PSG3	R397H	C	1375	T	REC8	Q524H	G	2131	C
PDE12	A17V	C	153	T	PLEKHM2	Q982*	C	2944	T	PSG3	S408A	A	1407	C	RECK	D891N	G	3237	A
PDE1A	N216T	T	647	G	PLEKHM2	G221S	G	661	A	PSG4	R127*	G	617	A	RECK	I888V	A	3228	G
PDE1B	N52H	A	320	C	PLEKHM2	R508C	C	1522	T	PSG5	A117T	C	480	T	RECK	-	G	0	T
PDE1B	K358T	A	1239	C	PLEKHM3	N485S	T	1583	C	PSG6	T300M	G	944	A	RECK	V847L	G	3105	T
PDE1B	R89Q	G	432	A	PLEKHM3	R505*	G	1642	A	PSG7	K90T	T	366	G	RECQL	Y446C	T	1685	C
PDE1C	R344Q	C	1625	T	PLEKHM3	M315I	C	1074	A	PSG7	A34S	C	197	A	RECQL	-	A	0	G
PDE1C	A310V	G	1523	A	PLEKHN1	P270T	C	843	A	PSG9	Y120C	T	456	C	RECQL	I426L	T	1624	G
PDE1C	R390*	G	1762	A	PLEKHN1	H634R	A	1936	G	PSKH1	R137W	C	579	T	RECQL	H340N	G	1366	T
PDE1C	R540Q	C	2213	T	PLEKHN1	Q579*	C	1770	T	PSKH1	R369H	G	1276	A	RECQL	E176D	T	876	G
PDE1C	R478Q	C	2027	T	PLEKHO2	R80Q	G	367	A	PSKH1	R302H	G	1075	A	RECQL4	T690A	T	2100	C
PDE1C	V495M	C	2077	T	PLEKHO2	T423M	C	1396	T	PSKH2	V161I	C	556	T	RECQL4	P1040L	G	3151	A
PDE2A	P948H	G	2843	T	PLEKHO2	A293E	C	1006	A	PSKH2	A354T	C	1135	T	RECQL4	R758*	G	2304	A
PDE2A	Q261*	G	781	A	PLEKHO2	G169S	G	633	A	PSKH2	A32T	C	169	T	RECQL4	S1169I	C	3538	A
PDE2A	-	C	0	T	PLG	A419V	C	1319	T	PSKH2	S350I	C	1124	A	RECQL4	G170C	C	540	A
PDE2A	M909T	A	2726	G	PLG	D177N	G	592	A	PSKH2	A32T	C	169	T	RECQL5	R872H	C	2771	T
PDE2A	K716N	C	2148	A	PLG	K664Q	A	2053	C	PSMA1	R9*	G	25	A	RECQL5	A981V	G	3098	A
PDE2A	V646A	A	1937	G	PLIN1	V234M	C	866	T	PSMA2	G78D	C	249	T	RECQL5	R872H	C	2771	T
PDE2A	D285Y	C	853	A	PLIN2	K435N	T	1485	G	PSMA3	-	G	0	T	RECQL5	H500Q	G	1656	T
PDE3A	G45S	G	155	A	PLIN3	A200V	G	672	A	PSMA3	E226*	G	766	T	RECQL5	R696W	G	2242	A
PDE3A	D34E	C	124	G	PLIN3	A224T	C	743	T	PSMA7	S30L	G	216	A	RECQL5	P694S	G	2236	A
PDE3A	S446L	C	1359	T	PLIN4	V719I	C	2155	T	PSMA8	G16R	G	160	A	REEP2	E52K	G	346	A
PDE3A	S863L	C	2610	T	PLIN4	R1290Q	C	3869	T	PSMB11	R106W	C	375	T	REEP3	R113*	C	520	T
PDE3A	E171K	G	533	A	PLIN5	D242G	T	778	C	PSMB11	P85H	C	313	A	REEP4	R181M	C	1011	A
PDE3B	S613A	T	2190	G	PLK1	R563C	C	1798	T	PSMB4	R216C	C	700	T	REEP5	-	C	0	A
PDE4A	W34*	G	210	A	PLK1	S49N	G	257	A	PSMB7	R124W	G	384	A	REEP5	V155A	A	813	G
PDE4A	A765V	C	2402	T	PLK1	T440A	A	1429	G	PSMC2	D29N	G	496	A	REEP6	R120W	C	402	T
PDE4A	R696M	G	2195	T	PLK1	S461F	C	1493	T	PSMC2	S380N	G	1550	A	REEP6	Q194R	A	625	G
PDE4A	R409H	G	1334	A	PLK1	R313H	G	1049	A	PSMC4	A320T	G	995	A	REEP6	R206C	C	660	T

PDE4B	D620N	G	2045	A	PLK1	E186*	G	667	T	PSMC4	D148N	G	479	A	REG1A	S69L	C	309	T
PDE4B	Q216H	A	835	C	PLK1	R579Q	G	1847	A	PSMC4	R229W	C	722	T	REG3G	M62T	T	284	C
PDE4C	R489H	C	1705	T	PLK1	-	G	0	T	PSMC4	A314T	G	977	A	REG3G	M62I	G	285	A
PDE4C	V593A	A	2017	G	PLK1	A292T	G	985	A	PSMC6	E49*	G	151	T	REL	V148A	T	763	C
PDE4C	A338E	G	1252	T	PLK1	M486I	G	1569	A	PSMD1	V134I	G	562	A	REL	S422P	T	1584	C
PDE4C	D453N	C	1596	T	PLK2	R446W	G	1637	A	PSMD1	P125T	C	535	A	RELA	R330C	G	1128	A
PDE4D	-	C	0	A	PLK2	L230Q	A	990	T	PSMD10	T53P	T	255	G	RELA	R267C	G	939	A
PDE4DIP	R1226H	C	3865	T	PLK2	R480W	G	1739	A	PSMD11	H375N	C	1163	A	RELL1	E42*	C	213	A
PDE4DIP	-	C	0	T	PLK2	T298A	T	1193	C	PSMD12	E216K	C	754	T	RELL2	R243G	A	1575	G
PDE4DIP	R12H	C	35	T	PLK3	R638H	G	2152	A	PSMD14	L184S	T	1255	C	RELN	Q2806H	C	8578	A
PDE4DIP	R1855H	C	5752	T	PLK4	F12C	T	309	G	PSMD14	A93T	G	981	A	RELN	R2292H	C	7035	T
PDE4DIP	-	C	0	A	PLK4	R374H	G	1395	A	PSMD14	C238R	T	1416	C	RELN	A3083T	C	9407	T
PDE4DIP	A910D	G	2917	T	PLLP	A118T	C	499	T	PSMD3	Q377R	A	1304	G	RELN	G1420V	C	4419	A
PDE4DIP	E624G	T	2059	C	PLLP	F145L	G	582	T	PSMD4	K74E	A	294	G	RELN	T508A	T	1682	C
PDE4DIP	L1441I	G	4509	T	PLN	A11V	C	224	T	PSMD4	D261N	G	855	A	RELN	G1540V	C	4779	A
PDE4DIP	T1292A	T	4062	C	PLOD1	D566N	G	1723	A	PSMD4	T367I	C	1174	T	RELN	S2304R	T	7070	G
PDE4DIP	R174I	C	709	A	PLOD1	R457W	C	1396	T	PSMD5	R214I	C	644	A	RELN	K2889T	T	8826	G
PDE5A	V54I	C	480	T	PLOD1	R477H	G	1457	A	PSMD6	D34N	C	153	T	RELN	N3438K	A	1047 4	C
PDE5A	A572T	C	2034	T	PLOD1	D226N	G	703	A	PSMD6	V37M	C	162	T	RELN	R3326*	G	1013 6	A
PDE5A	R577W	G	2049	A	PLOD2	N82S	T	423	C	PSMD8	N70D	A	274	G	RELN	A3079D	G	9396	T
PDE5A	D248N	C	1062	T	PLOD2	R680Q	C	2217	T	PSMD8	K53N	A	225	T	RELN	-	C	0	A
PDE6A	P389L	G	1286	A	PLOD2	R530I	C	1767	A	PSMD8	R13L	G	104	T	RELN	R2428W	G	7442	A
PDE6A	F162L	G	606	T	PLOD3	R498*	G	1891	A	PSMD9	A151V	C	569	T	RELN	L2184S	A	6711	G
PDE6B	R542W	C	1645	T	PLP2	L28M	C	157	A	PSME2	R203W	G	635	A	RELN	W1970C	C	6070	A
PDE6B	F200L	C	621	A	PLS3	K23N	A	156	C	PSME4	R704I	C	2167	A	RELN	F1508L	A	4684	C
PDE6C	I184V	A	688	G	PLSCR2	V224M	C	1110	T	PSME4	R370C	G	1164	A	RELN	I859S	A	2736	C
PDE7B	R307*	C	919	T	PLSCR2	A57T	C	609	T	PSME4	G1711S	C	5187	T	RELN	R274C	G	980	A
PDE8A	R417C	C	1501	T	PLSCR2	M74I	C	662	T	PSME4	R1131H	C	3448	T	RELT	L185I	C	718	A
PDE8B	T47S	A	184	T	PLSCR2	K31E	T	531	C	PSME4	R1658*	G	5028	A	REM1	R181H	G	835	A
PDE8B	R436C	C	1351	T	PLSCR2	N209T	T	1066	G	PSME4	W242*	C	782	T	REM2	R235H	G	769	A
PDE8B	N541K	T	1668	G	PLSCR3	R109H	C	535	T	PSME4	T338A	T	1068	C	REN	P25L	G	103	A
PDE8B	D656N	G	2011	A	PLSCR4	Y60*	G	421	T	PSME4	E600*	C	1854	A	REN	G11E	C	61	T
PDE8B	R436H	G	1352	A	PLSCR4	R247C	G	980	A	PSME4	E559A	T	1732	G	REN	E144*	C	459	A
REPIN1	W126*	G	571	A	SASH3	V384M	G	1264	A	SKA2L	L126V	T	385	G	SMURF2	R172I	C	903	A
REPS1	E328K	C	1259	T	SATB1	A457D	G	3099	T	SKA3	R327C	G	1073	A	SMURF2	R187H	C	948	T
REPS1	R183H	C	825	T	SATB2	E678A	T	2850	G	SKA3	L341V	A	1115	C	SMYD1	F456L	C	1453	A
REPS1	Q772*	G	2591	A	SATB2	R239*	G	1532	A	SKAP1	R163W	G	599	A	SMYD1	A192V	C	660	T
REPS1	F233V	A	974	C	SATB2	A314T	C	1757	T	SKAP2	I260M	A	1094	C	SMYD2	K127T	A	402	C

REPS1	S162F	G	762	A	SATL1	A248T	C	822	T	SKI	A534T	G	1672	A	SMYD3	V43I	C	344	T
REPS2	R628W	C	2053	T	SATL1	F618L	A	1932	G	SKI	A540V	C	1691	T	SMYD3	F303S	A	1125	G
RER1	P89H	C	399	A	SATL1	P590T	G	1848	T	SKI	A644V	C	2003	T	SMYD4	S203N	C	745	T
RERE	A1073V	G	3853	A	SBF1	R1719C	G	5178	A	SKI	G552S	G	1726	A	SMYD4	L370F	G	1245	A
RERE	Q500H	C	2135	A	SBF1	M695R	A	2107	C	SKI	S206N	G	689	A	SMYD5	Q152H	G	501	T
RERE	P788L	G	2998	A	SBF1	A495V	G	1507	A	SKI	S151L	C	524	T	SMYD5	R52W	C	199	T
RERE	S1128G	T	4017	C	SBF1	D150N	C	471	T	SKI	S508R	C	1596	A	SMYD5	L107F	C	364	T
RERG	V17M	C	339	T	SBF1	T275I	G	847	A	SKIL	V534I	G	2271	A	SMYD5	A38T	G	157	A
REST	A991T	G	3285	A	SBF2	P867S	G	2737	A	SKIV2L2	V857A	T	2824	C	SMYD5	D142N	G	469	A
REST	K249T	A	1060	C	SBF2	A1829T	C	5623	T	SKP2	R154Q	G	637	A	SNAI2	K239R	T	880	C
RET	F174L	T	752	C	SBF2	L433F	C	1437	A	SLA	R173C	G	595	A	SNAI2	P17Q	G	214	T
RET	V648I	G	2174	A	SBF2	V1341I	C	4159	T	SLA	A30T	C	166	T	SNAI2	R205I	C	778	A
RET	-	G	0	T	SBK1	V246M	G	1525	A	SLAIN2	R559C	C	2093	T	SNAI3	S286Y	G	925	T
RET	P841L	C	2754	T	SBK1	A131T	G	1180	A	SLAMF1	E101D	C	653	A	SNAI3	R282W	G	912	A
RET	R959Q	G	3108	A	SBK2	A230T	C	726	T	SLAMF1	R95H	C	634	T	SNAP29	Y189*	C	695	A
RET	R250C	C	980	T	SBK2	V76I	C	264	T	SLAMF8	R165*	C	642	T	SNAP47	A172T	G	928	A
RETSAT	R125H	C	487	T	SBK2	D301A	T	940	G	SLAMF8	H222Y	C	813	T	SNAP47	R39H	G	530	A
RETSAT	R453Q	C	1471	T	SBK2	E106K	C	354	T	SLAMF8	E159K	G	624	A	SNAP47	M332T	T	1409	C
RETSAT	R125C	G	486	A	SBNO1	W969*	C	2907	T	SLAMF9	F244V	A	847	C	SNAP91	T277M	G	1424	A
REV1	P933L	G	3027	A	SBNO1	T455S	T	1363	A	SLBP	R188H	C	625	T	SNAP91	A481D	G	2036	T
REV1	S417N	C	1479	T	SBNO1	D156Y	C	466	A	SLBP	E91*	C	333	A	SNAPC1	W226*	G	764	A
REV1	F1165L	G	3724	T	SBNO1	D7N	C	19	T	SLC10A1	V210G	A	763	C	SNAPC1	R47I	G	226	T
REV1	E738D	T	2443	G	SBNO2	A478T	C	1432	T	SLC10A1	A67V	G	334	A	SNAPC2	R262C	C	807	T
REV3L	Q329P	T	1309	G	SBNO2	S662N	C	1985	T	SLC10A1	R180W	G	672	A	SNAPC3	V14A	T	217	C
REV3L	M2934V	T	9123	C	SBNO2	A199E	G	596	T	SLC10A2	A97V	G	887	A	SNAPC3	T366M	C	1273	T
REV3L	T2343I	G	7351	A	SBNO2	A338T	C	1012	T	SLC10A2	P65S	G	790	A	SNAPC4	R1352W	G	4423	A
REV3L	R882H	C	2968	T	SC4MOL	I225V	A	846	G	SLC10A3	E514K	C	1638	T	SNAPC4	R508W	G	1891	A
REV3L	A2775V	G	8647	A	SC4MOL	Y168H	T	675	C	SLC10A5	K129T	T	386	G	SNAPC4	R428W	G	1651	A
REV3L	S640Y	G	2242	T	SC5DL	R74C	C	368	T	SLC10A6	V176A	A	675	G	SNAPC4	R730C	G	2557	A
REXO1	E96K	C	381	T	SCAF1	A324T	G	1094	A	SLC10A6	H238N	G	860	T	SNAPC4	K265N	C	1164	A
RFC1	D167Y	C	633	A	SCAF1	V995M	G	3107	A	SLC10A6	K322N	C	1114	A	SNCAIP	N399T	A	1402	C
RFC1	A122T	C	498	T	SCAI	R531*	G	1650	A	SLC12A1	G478R	G	1648	A	SNCAIP	R350Q	G	1255	A
RFC1	K1125T	T	3508	G	SCAI	T414P	T	1299	G	SLC12A1	T18N	C	269	A	SNCAIP	S186L	C	763	T
RFC1	D639Y	C	2049	A	SCAI	R132*	G	453	A	SLC12A1	E794D	G	2598	T	SNCAIP	S418Y	C	1459	A
RFC1	I469T	A	1540	G	SCAI	R584*	G	1809	A	SLC12A1	Y89H	T	481	C	SNCAIP	L483I	C	1653	A
RFC1	K263Q	T	921	G	SCAMP5	A215T	G	805	A	SLC12A1	A510S	G	1744	T	SNCG	A85V	C	296	T
RFC3	K81N	A	373	C	SCAMP5	S104R	A	472	C	SLC12A1	L512R	T	1751	G	SND1	L627V	C	2073	G
RFC4	N317H	T	1231	G	SCAND3	E177K	C	1147	T	SLC12A1	N1051I	A	3368	T	SND1	Y682C	A	2239	G
RFC5	T67A	A	317	G	SCAND3	I623V	T	2485	C	SLC12A2	D66N	G	385	A	SND1	K388R	A	1357	G

RFPL1	S39N	G	325	A	SCAND3	N284K	A	1470	C	SLC12A2	G1033R	G	3286	A	SND1	G205D	G	808	A
RFPL1	P232L	C	904	T	SCAP	R736C	G	2619	A	SLC12A2	N690T	A	2258	C	SNED1	C762W	C	2286	G
RFPL1	E199*	G	804	T	SCAP	E832G	T	2908	C	SLC12A2	Y903H	T	2896	C	SNED1	R715W	C	2143	T
RFPL3	R225H	G	879	A	SCAPER	R580W	G	1775	A	SLC12A2	V312L	G	1123	T	SNED1	D534G	A	1601	G
RFT1	T541I	G	1684	A	SCAPER	E618Q	C	1889	G	SLC12A2	K995R	A	3173	G	SNED1	A1236T	G	3706	A
RFT1	K212T	T	697	G	SCAPER	K744N	T	2269	G	SLC12A3	R243W	C	748	T	SNED1	V58M	G	172	A
RFTN1	P135Q	G	677	T	SCAPER	R701Q	C	2139	T	SLC12A3	E121K	G	382	A	SNED1	V1151I	G	3451	A
RFTN1	V375A	A	1397	G	SCAPER	K550Q	T	1685	G	SLC12A3	A805T	G	2434	A	SNED1	R475C	C	1423	T
RFTN1	R111I	C	605	A	SCARA3	F61S	T	323	C	SLC12A3	T9M	C	47	T	SNHG4	K755N	A	2692	C
RFTN2	K423N	C	1806	A	SCARA3	R456*	C	1507	T	SLC12A3	I673S	T	2039	G	SNORA29	F167I	A	740	T
RFTN2	S415G	T	1780	C	SCARA5	W477*	C	1871	T	SLC12A5	E988D	G	3040	T	SNORA29	K33Q	T	338	G
RFTN2	F304L	G	1449	T	SCARB1	E77A	T	483	G	SLC12A5	-	G	0	A	SNORA29	A553T	C	1898	T
RFWD3	R380Q	C	1237	T	SCARB2	F453C	A	1708	C	SLC12A5	S399L	C	1272	T	SNORA29	N284T	T	1092	G
RFX1	K852R	T	2790	C	SCARF1	T357I	G	1121	A	SLC12A5	A265V	C	870	T	SNORA63	F229I	T	719	A
RFX1	S567I	C	1935	A	SCARF1	E792G	T	2426	C	SLC12A5	T316M	C	1023	T	SNORA63	K228Q	A	716	C
RFX2	Q30H	C	359	A	SCARF2	L484V	G	1555	C	SLC12A5	R348C	C	1118	T	SNORD19B	C403*	C	1382	A
RFX2	N386D	T	1425	C	SCARF2	R248C	G	847	A	SLC12A5	R754H	G	2337	A	SNORD19B	Y19*	T	230	A
RFX2	R17C	G	318	A	SCARF2	A66T	C	301	T	SLC12A5	C566G	T	1772	G	SNORD21	T177A	A	586	G
RFX3	H319Q	A	1269	T	SCARNA15	R588Q	C	1945	T	SLC12A5	R531H	G	1668	A	SNORD21	E249D	G	804	T
RFX3	T238I	G	1025	A	SCCPDH	G282D	G	1221	A	SLC12A5	G321D	G	1038	A	SNORD21	N250H	A	805	C
RFX3	D530N	C	1900	T	SCD	R174Q	G	902	A	SLC12A5	I377V	A	1205	G	SNORD73A	R136C	C	486	T
RFX3	C431Y	C	1604	T	SCD5	R165*	G	813	A	SLC12A6	R872*	G	2614	A	SNORD86	K478T	A	1949	C
RFX4	R717C	C	2149	T	SCEL	R402I	G	1289	T	SLC12A6	R659*	G	1975	A	SNPH	A455V	C	2006	T
RFX4	T568M	C	1703	T	SCEL	L273V	C	901	G	SLC12A6	P10L	G	29	A	SNPH	C446Y	G	1979	A
RFX4	S49P	T	145	C	SCFD1	I380V	A	1138	G	SLC12A6	R856C	G	2566	A	SNRK	K117N	G	733	T
RFX4	S322*	C	965	A	SCFD2	R551L	C	1786	A	SLC12A6	F316C	A	947	C	SNRK	S236P	T	1088	C
RFX5	E261*	C	960	A	SCG2	E367G	T	1333	C	SLC12A6	D132N	C	394	T	SNRK	T38M	C	495	T
RFX5	E187*	C	738	A	SCG3	N341H	A	1424	C	SLC12A6	-	C	0	A	SNRNP200	R681H	C	2120	T
RFX5	A204V	G	790	A	SCG5	N204S	A	611	G	SLC12A7	R710H	C	2195	T	SNRNP200	V1741I	C	5299	T
RFX5	E491D	T	1652	G	SCGB1A1	A19T	G	100	A	SLC12A7	D854N	C	2626	T	SNRNP200	R1519H	C	4634	T
RFX5	K55N	T	344	G	SCGB1D1	K63N	G	258	T	SLC12A7	A597T	C	1855	T	SNRNP200	A1919T	C	5833	T
RFX6	A745V	C	2250	T	SCGB2A2	C65R	T	252	C	SLC12A7	V852M	C	2620	T	SNRNP200	L1289R	A	3944	C
RFX6	F779L	C	2353	A	SCGB3A2	T11I	C	125	T	SLC12A8	W596C	C	1838	A	SNRNP200	D1155N	C	3541	T
RFX7	S843Y	G	2528	T	SCGN	R246H	G	905	A	SLC12A9	A205T	G	738	A	SNRNP200	I292M	A	954	C
RFX7	R1280Q	C	3839	T	SCIN	K299Q	A	996	C	SLC12A9	P233L	C	823	T	SNRNP35	D8N	G	324	A
RFX7	S1439Y	G	4316	T	SCLT1	Q80H	C	744	A	SLC12A9	V565I	G	1818	A	SNRNP35	D17E	T	353	A
RFX7	P1103S	G	3307	A	SCLT1	L67I	G	703	T	SLC12A9	G215W	G	768	T	SNRNP40	P16S	G	68	A
RFXANK	A214T	G	1145	A	SCLT1	S395Y	G	1688	T	SLC13A1	M114I	C	382	T	SNRNP48	R176C	C	585	T
RFXANK	R111W	C	836	T	SCLY	I75M	A	391	G	SLC13A2	T205M	C	813	T	SNRNP48	Y208*	C	683	A

RG9MTD2	Q140H	C	537	A	SCMH1	R575*	G	2023	A	SLC13A2	A379S	G	1334	T	SNRNP70	R120Q	G	798	A
RG9MTD2	F268C	A	920	C	SCMH1	N165T	T	794	G	SLC13A2	L88R	T	462	G	SNRNP70	R368W	C	1541	T
RG9MTD2	R243Q	C	845	T	SCML1	E147D	G	769	T	SLC13A3	R169Q	C	525	T	SNRPB	A153T	C	538	T
RG9MTD2	R93*	G	394	A	SCML2	Q56E	G	326	C	SLC13A3	P414S	G	1259	A	SNRPB2	N137H	A	548	C
RG9MTD3	K63Q	A	264	C	SCML4	V161L	C	727	A	SLC13A3	-	C	0	T	SNRPE	N27H	A	124	C
RGAG1	E17D	A	297	C	SCN10A	F342C	A	1025	C	SLC13A3	R169*	G	524	A	SNRPEL1	P17T	G	82	T
RGAG1	T516M	C	1793	T	SCN10A	R844H	C	2531	T	SLC13A4	R111H	C	1022	T	SNRPN	M21I	G	63	A
RGAG1	D673Y	G	2263	T	SCN10A	W1748R	A	5242	G	SLC13A4	A78V	G	923	A	SNRPN	R69Q	G	206	A
RGAG1	E921D	G	3009	T	SCN10A	I251T	A	752	G	SLC13A4	R111C	G	1021	A	SNRPN	L44M	T	130	A
RGAG4	E491K	C	1832	T	SCN10A	R534Q	C	1601	T	SLC13A5	S3L	G	43	A	SNRPN	Q149R	A	446	G
RGAG4	E400*	C	1559	A	SCN10A	R497P	C	1490	G	SLC13A5	P445L	G	1369	A	SNTA1	E107D	C	593	A
RGAG4	E77K	C	590	T	SCN10A	T1936P	T	5806	G	SLC13A5	V319M	C	990	T	SNTB1	R401Q	C	1428	T
RGL1	E8*	G	483	T	SCN10A	R1250L	C	3749	A	SLC13A5	A561P	C	1716	G	SNTG1	Q18*	C	97	T
RGL1	Q204H	G	1073	T	SCN10A	-	C	0	T	SLC14A1	A13T	G	235	A	SNTG1	L106I	C	361	A
RGL1	S297P	T	1350	C	SCN10A	F870L	G	2610	T	SLC14A1	Y243C	A	926	G	SNTG1	K272T	A	860	C
RGL1	F511L	C	1994	A	SCN10A	A394V	G	1181	A	SLC14A1	S281Y	C	1040	A	SNTG2	T444M	C	1460	T
RGL3	A131V	G	444	A	SCN10A	T365A	T	1093	C	SLC14A2	A194T	G	1396	A	SNURF	R79G	A	886	G
RGL3	R500W	G	1550	A	SCN10A	K244N	C	732	A	SLC15A1	E677D	C	2087	G	SNURF	E25K	G	724	A
RGL4	E454V	A	2531	T	SCN10A	R149Q	C	446	T	SLC15A1	E677D	C	2087	G	SNW1	R198L	C	619	A
RGMA	A209V	G	898	A	SCN10A	R1576C	G	4726	A	SLC15A1	Q158P	T	529	G	SNW1	R198Q	C	619	T
RGPD3	G946D	C	2919	T	SCN10A	R1268W	G	3802	A	SLC15A1	A145V	G	490	A	SNX1	R322C	C	1000	T
RGS11	R228Q	C	701	T	SCN11A	L1398I	G	4391	T	SLC15A1	S532*	G	1651	T	SNX1	N123H	A	403	C
RGS11	L73M	G	235	T	SCN11A	E606K	C	2015	T	SLC15A1	M421L	T	1317	G	SNX11	S187L	C	914	T
RGS12	V47I	G	1043	A	SCN11A	P667S	G	2198	A	SLC15A1	V217A	A	706	G	SNX13	R559C	G	1675	A
RGS12	P1357L	C	4974	T	SCN11A	G724D	C	2370	T	SLC15A2	E622G	A	2253	G	SNX13	N949S	T	2846	C
RGS12	K1176E	A	4430	G	SCN11A	L1561M	G	4880	T	SLC15A2	R277*	C	1217	T	SNX13	R907*	G	2719	A
RGS12	E162D	G	1390	T	SCN11A	D1701Y	C	5300	A	SLC15A2	K458T	A	1761	C	SNX15	Y295H	T	1468	C
RGS12	R620*	C	2762	T	SCN11A	Q866H	T	2797	G	SLC15A3	V160I	C	712	T	SNX15	Y52H	T	739	C
RGS12	S1413L	C	5142	T	SCN11A	K538T	T	1812	G	SLC15A3	F202V	A	838	C	SNX15	A224T	G	1255	A
RGS13	S81Y	C	530	A	SCN11A	R1466H	C	4596	T	SLC15A4	R273*	G	870	A	SNX15	A289T	G	1450	A
RGS14	E189K	G	747	A	SCN11A	R1153K	C	3657	T	SLC15A5	L362M	G	1084	T	SNX15	R3H	G	593	A
RGS16	A154V	G	610	A	SCN1A	G2008W	C	6022	A	SLC15A5	F119V	A	355	C	SNX15	T236M	C	1292	T
RGS18	-	T	0	C	SCN1A	N1897K	A	5691	T	SLC16A10	L138P	T	588	C	SNX17	-	T	0	C
RGS18	L193M	C	758	A	SCN1A	A773T	C	2317	T	SLC16A10	I515M	T	1720	G	SNX18	P382L	C	1233	T
RGS19	A106V	G	584	A	SCN1A	I747T	A	2240	G	SLC16A11	-	C	0	T	SNX18	E40Q	G	206	C
RGS20	P78L	C	325	T	SCN1B	S264Y	C	982	A	SLC16A11	D222N	C	1002	T	SNX18	K351R	A	1140	G
RGS22	K1232E	T	3889	C	SCN2A	D1526A	A	4867	C	SLC16A11	D127N	C	717	T	SNX18	P328L	C	1071	T
RGS22	Y703C	T	2303	C	SCN2A	V887I	G	2949	A	SLC16A12	R141Q	C	813	T	SNX19	L704M	G	2658	T
RGS22	R1023H	C	3263	T	SCN2A	P151H	C	742	A	SLC16A12	L27R	A	471	C	SNX19	A763V	G	2836	A

RGS7	W314C	C	942	A	SCN2A	V221F	G	951	T	SLC16A13	G341D	G	1247	A	SNX19	R872H	C	3163	T
RGS8	R179M	C	626	A	SCN2A	F1029V	T	3375	G	SLC16A14	V198I	C	1051	T	SNX19	P499S	G	2043	A
RGS9	S581F	C	1852	T	SCN2A	E1796D	G	5678	T	SLC16A14	A133T	C	856	T	SNX2	R462K	G	1493	A
RGS9BP	R94Q	G	1138	A	SCN3A	Q1390H	T	4662	G	SLC16A2	R23W	C	680	T	SNX2	D26G	A	185	G
RHAG	G370R	C	1135	G	SCN3A	T304A	T	1402	C	SLC16A3	D260N	G	917	A	SNX2	R482*	C	1552	T
RHAG	-	C	0	A	SCN3A	K1917N	C	6243	A	SLC16A3	V322M	G	1103	A	SNX2	-	T	0	G
RHAG	F151V	A	478	C	SCN3A	R621C	G	2353	A	SLC16A4	I200T	A	793	G	SNX2	R410Q	G	1337	A
RHBDD1	D134A	A	643	C	SCN3A	A1777S	C	5821	A	SLC16A5	G216S	G	646	A	SNX20	R203C	G	739	A
RHBDD2	P179H	C	671	A	SCN3A	M1666V	T	5488	C	SLC16A5	A363V	C	1088	T	SNX20	R302*	G	1036	A
RHBDD2	A275T	G	958	A	SCN3A	D1521E	A	5055	C	SLC16A5	F139L	C	417	A	SNX20	V100D	A	431	T
RHBDF1	V228I	C	825	T	SCN3A	R534I	C	2093	A	SLC16A6	A26V	G	265	A	SNX20	-	C	0	T
RHBDF1	D256N	C	909	T	SCN4A	T1351M	G	4129	A	SLC16A6	E58K	C	360	T	SNX21	R211H	G	700	A
RHBDF1	R339W	G	1158	A	SCN4A	S725N	C	2251	T	SLC16A7	C331Y	G	1148	A	SNX21	P144L	C	499	T
RHBDF1	Q354*	G	1203	A	SCN4A	R18H	C	130	T	SLC16A7	S353G	A	1213	G	SNX21	L182M	C	612	A
RHBDF1	R107H	C	463	T	SCN4B	E49D	C	147	A	SLC16A7	E46*	G	292	T	SNX21	S55C	C	232	G
RHBDF2	R255C	G	1056	A	SCN5A	R535Q	C	1798	T	SLC16A7	R312Q	G	1091	A	SNX25	-	G	0	T
RHBDF2	R401W	G	1494	A	SCN5A	L736M	G	2400	T	SLC16A8	G373D	C	1227	T	SNX27	R492*	C	1594	T
RHBDF2	R234H	C	994	T	SCN5A	T370M	G	1303	A	SLC16A9	K5T	T	651	G	SNX29	E194*	G	636	T
RHBDL3	R116C	C	360	T	SCN5A	A185T	C	747	T	SLC17A1	S261L	G	898	A	SNX30	V165L	G	657	T
RHBDL3	P32A	C	108	G	SCN5A	M28I	C	278	T	SLC17A2	R339G	T	1433	C	SNX31	D211N	C	782	T
RHBDL3	A273V	C	832	T	SCN5A	G77R	C	423	T	SLC17A3	R497C	G	1599	A	SNX32	R233C	C	868	T
RHBDL3	R392Q	G	1189	A	SCN5A	P621H	G	2056	T	SLC17A4	G473D	G	1537	A	SNX32	A355T	G	1234	A
RHCE	A237V	G	769	A	SCN5A	P468S	G	1596	A	SLC17A4	E95*	G	402	T	SNX32	R227Q	G	851	A
RHCE	A17V	G	109	A	SCN5A	C906G	A	2910	C	SLC17A4	S330R	A	1107	C	SNX32	D38N	G	283	A
RHD	S75G	A	281	G	SCN5A	Y774*	G	2516	T	SLC17A4	V340A	T	1138	C	SNX32	E139K	G	586	A
RHEB	E66*	C	609	A	SCN7A	F578L	G	1861	T	SLC17A6	A57V	C	583	T	SNX32	N321S	A	1133	G
RHEBL1	H79R	T	476	C	SCN7A	K495*	T	1610	A	SLC17A6	L31M	C	504	A	SNX33	R181H	G	1739	A
RHEBL1	S44I	C	371	A	SCN7A	G607*	C	1946	A	SLC17A7	E280G	T	1011	C	SNX4	E40*	C	143	A
RHO	K325N	G	1069	T	SCN7A	G340D	C	1146	T	SLC17A7	V444M	C	1502	T	SNX5	F99C	A	609	C
RHOA	T37I	G	495	A	SCN7A	I1616L	T	4973	G	SLC17A8	V198A	T	906	C	SOAT1	V184I	G	693	A
RHOB	F30L	T	480	C	SCN7A	D1576N	C	4853	T	SLC17A8	R218*	C	965	T	SOAT2	A213V	C	726	T
RHOBTB1	P241L	G	926	A	SCN7A	F1518L	G	4681	T	SLC17A9	A40T	G	249	A	SOBP	G391S	G	1830	A
RHOBTB1	I534V	T	1804	C	SCN7A	D1228E	A	3811	C	SLC18A1	H121P	T	629	G	SOBP	A752V	C	2914	T
RHOBTB1	A207V	G	824	A	SCN7A	E820G	T	2586	C	SLC18A1	L179I	G	802	T	SOBP	Y258*	C	1433	G
RHOBTB2	R93H	G	815	A	SCN7A	R754I	C	2388	A	SLC18A2	F178L	C	677	A	SOBP	R183Q	G	1207	A
RHOBTB2	R552W	C	2191	T	SCN7A	R282I	C	972	A	SLC18A2	P272L	C	958	T	SOCS1	A89T	C	416	T
RHOBTB2	R145C	C	970	T	SCN7A	K77Q	T	356	G	SLC18A2	L462I	C	1527	A	SOCS3	R116H	C	763	T
RHOBTB2	E591*	G	2308	T	SCN8A	R1866W	C	5774	T	SLC18A2	R471Q	G	1555	A	SOCS3	R94C	G	696	A
RHOBTB3	K411N	G	1741	T	SCN8A	P554H	C	1839	A	SLC18A3	R412H	G	1601	A	SOCS4	S213F	C	1203	T

RHOBTB3	E568A	A	2211	C	SCN8A	F1873I	T	5795	A	SLC18A3	A297T	G	1255	A	SOCS5	S464L	C	1563	T
RHOG	R49C	G	274	A	SCN8A	N909I	A	2904	T	SLC19A1	A158T	C	625	T	SOCS6	R260C	C	1063	T
RHOH	D58G	A	789	G	SCN8A	R1872W	C	5792	T	SLC19A2	G120*	C	595	A	SOCS6	R493W	C	1762	T
RHOQ	C24Y	G	390	A	SCN9A	R586G	T	1804	C	SLC19A2	A467T	C	1636	T	SOCS6	A167V	C	785	T
RHOQ	V42G	T	444	G	SCN9A	F100L	G	348	T	SLC19A3	V435A	A	1376	G	SOCS7	S337P	T	1132	C
RHOT1	E12K	G	273	A	SCN9A	S502*	G	1553	T	SLC19A3	K208N	C	696	A	SOCS7	-	G	0	A
RHOT1	K469I	A	1645	T	SCN9A	V1832I	C	5542	T	SLC1A1	R166C	C	732	T	SOCS7	R467H	G	1523	A
RHOT2	A557V	C	1784	T	SCN9A	V834G	A	2549	C	SLC1A1	I67S	T	436	G	SOHLH1	M272T	A	876	G
RHOT2	-	G	0	A	SCN9A	V196I	C	634	T	SLC1A2	T50M	G	432	A	SOHLH1	S137L	G	471	A
RHOXF1	D63V	T	263	A	SCN9A	R599H	C	1844	T	SLC1A2	R17*	G	332	A	SOHLH2	L318I	G	952	T
RHOXF1	R107C	G	394	A	SCN9A	G176D	C	575	T	SLC1A2	R65H	C	477	T	SOHLH2	A432V	G	1295	A
RHOXF1	D8N	C	97	T	SCN9A	F812V	A	2482	C	SLC1A2	M76R	A	510	C	SOHLH2	R478W	G	1432	A
RHPN1	V66A	T	197	C	SCN9A	T1354A	T	4108	C	SLC1A2	R36H	C	390	T	SOHLH2	L280P	A	839	G
RIC3	E309D	T	981	G	SCN9A	L1840I	G	5566	T	SLC1A3	R122*	C	840	T	SON	E1791D	A	5848	C
RIC8A	R179C	C	860	T	SCN9A	-	T	0	C	SLC1A3	V393G	T	1654	G	SON	N2418H	A	7727	C
RIC8A	R343Q	G	1353	A	SCN9A	M691I	C	2121	A	SLC1A3	R479W	C	1911	T	SON	R1858C	C	6047	T
RIC8A	F162L	C	811	A	SCN9A	E648D	C	1992	A	SLC1A4	R322Q	G	1208	A	SON	N2210T	A	7104	C
RIC8B	A281T	G	961	A	SCN9A	E181*	C	589	A	SLC1A6	V365I	C	1101	T	SORBS1	R1158G	T	3662	C
RIC8B	R378Q	G	1253	A	SCN9A	A102V	G	353	A	SLC1A6	V365F	C	1101	A	SORBS1	E598*	C	1982	A
RIC8B	N465D	A	1513	G	SCNN1A	R567*	G	1963	A	SLC1A6	D297N	C	897	T	SORBS1	R1275K	C	4014	T
RICTOR	R1633H	C	4920	T	SCNN1B	G213R	G	637	A	SLC1A7	R329C	G	1113	A	SORBS2	R544H	C	2345	T
RICTOR	V45M	C	155	T	SCNN1B	L209I	C	625	A	SLC1A7	I47M	A	269	C	SORBS2	L424F	G	1984	A
RICTOR	R336H	C	1029	T	SCNN1D	F636L	C	2058	A	SLC20A1	R434C	C	1839	T	SORBS2	P496L	G	2201	A
RICTOR	R280Q	C	861	T	SCNN1G	Q70R	A	352	G	SLC20A1	R648C	C	2481	T	SORBS2	R531C	G	2305	A
RICTOR	R222Q	C	687	T	SCNN1G	F154L	C	605	A	SLC20A2	V421M	C	1630	T	SORBS3	G20D	G	442	A
RIF1	R266Q	G	958	A	SCNN1G	G448D	G	1486	A	SLC20A2	R254*	G	1129	A	SORBS3	H176Y	C	909	T
RIF1	E99*	G	456	T	SCNN1G	D592G	A	1918	G	SLC20A2	N384S	T	1520	C	SORBS3	A537T	G	1992	A
RIF1	H194N	C	741	A	SCO2	R262C	G	932	A	SLC20A2	G366D	C	1466	T	SORCS1	S667P	A	1999	G
RILPL1	Q218H	C	890	A	SCO2	Q146*	G	584	A	SLC22A1	A306T	G	1079	A	SORCS1	R1078*	G	3232	A
RIMBP2	K472R	T	1579	C	SCPEP1	R384Q	G	1204	A	SLC22A1	R399H	G	1359	A	SORCS1	R444H	C	1331	T
RIMBP2	G632V	C	2059	A	SCPEP1	G226C	G	729	T	SLC22A1	G131S	G	554	A	SORCS1	D1000G	T	2999	C
RIMBP2	A196V	G	751	A	SCRIB	E77K	C	236	T	SLC22A1	A493T	G	1640	A	SORCS1	A113V	G	338	A
RIMBP2	R45W	G	297	A	SCRIB	R1483H	C	4455	T	SLC22A1	P34S	C	263	T	SORCS1	I190M	A	570	C
RIMBP2	W411*	C	1397	T	SCRIB	Q600*	G	1805	A	SLC22A1	I479T	T	1599	C	SORCS1	T142P	T	424	G
RIMBP3	R582P	C	2230	G	SCRIB	P589S	G	1772	A	SLC22A1	I421F	A	1424	T	SORCS2	N974K	C	2922	G
RIMBP3	R1059Q	C	3661	T	SCRIB	P1450S	G	4355	A	SLC22A10	F273C	T	1026	G	SORCS2	S159N	G	476	A
RIMBP3B	E1095K	G	3768	A	SCRIB	E899K	C	2702	T	SLC22A10	R90C	C	476	T	SORCS2	D609G	A	1826	G
RIMKLB	S317T	T	2211	A	SCRN1	P68L	G	252	A	SLC22A10	K309N	G	1135	T	SORCS2	R506C	C	1516	T
RIMKLB	T160M	C	1741	T	SCRN2	R250W	G	874	A	SLC22A10	N316S	A	1155	G	SORCS2	T189M	C	566	T

RIMKLB	F273L	C	2081	A	SCRN2	R250W	G	874	A	SLC22A11	P330L	C	1363	T	SORCS2	S692L	C	2075	T
RIMS1	P584H	C	1828	A	SCRN2	P25S	G	199	A	SLC22A12	V388M	G	1909	A	SORCS2	S923Y	C	2768	A
RIMS1	P452H	C	1432	A	SCRN3	E64D	A	280	C	SLC22A12	T104M	C	1058	T	SORCS2	F966V	T	2896	G
RIMS1	T855I	C	2641	T	SCRN3	H296N	C	974	A	SLC22A12	R89C	C	1012	T	SORCS3	P913H	C	2965	A
RIMS1	R721M	G	2239	T	SCRN3	N362H	A	1172	C	SLC22A14	R322W	C	1006	T	SORCS3	A286T	G	1083	A
RIMS1	S712R	A	2211	C	SCRN3	M374T	T	1209	C	SLC22A15	V32M	G	224	A	SORCS3	T361A	A	1308	G
RIMS1	S229F	C	763	T	SCRT1	H294R	T	993	C	SLC22A16	G56D	C	234	T	SORCS3	-	G	0	A
RIMS1	R215*	C	720	T	SCRT1	G46W	C	248	A	SLC22A16	V257M	C	836	T	SORCS3	R927G	A	3006	G
RIMS1	L22Q	T	142	A	SCRT2	R178G	G	1112	C	SLC22A16	Q30H	C	157	A	SORCS3	N579D	A	1962	G
RIMS1	R526Q	G	1654	A	SCTR	E114G	T	609	C	SLC22A18	L37R	T	328	G	SORL1	G738R	G	2292	A
RIMS1	R1316C	C	4023	T	SCTR	L324R	A	1239	C	SLC22A2	V467I	C	1658	T	SORL1	W1575R	T	4803	C
RIMS1	D111Y	G	408	T	SCUBE1	R755H	C	2391	T	SLC22A2	R62C	G	443	A	SORL1	K143Q	A	507	C
RIMS1	R136H	G	484	A	SCUBE1	E604G	T	1938	C	SLC22A2	T74M	G	480	A	SORL1	R1473Q	G	4498	A
RIMS1	S1083P	T	3324	C	SCUBE1	P514L	G	1668	A	SLC22A20	V192I	G	615	A	SORT1	S756Y	G	2326	T
RIMS1	S1369P	T	4182	C	SCUBE1	R923C	G	2894	A	SLC22A20	T421M	C	1303	T	SORT1	L20I	G	117	T
RIMS2	S40L	C	360	T	SCUBE1	V263M	C	914	T	SLC22A20	R333*	C	1038	T	SOS1	R547W	G	1726	A
RIMS2	R112Q	G	576	A	SCUBE2	K155T	T	544	G	SLC22A20	R84C	C	291	T	SOS1	R854*	G	2647	A
RIMS2	R812T	G	2676	C	SCUBE2	R110H	C	409	T	SLC22A20	S542Y	C	1666	A	SOS1	G1129V	C	3473	A
RIMS2	R365H	G	1335	A	SCUBE2	A920T	C	2838	T	SLC22A23	G579R	C	2198	T	SOS1	T614M	G	1928	A
RIMS2	P549H	C	1887	A	SCUBE2	R963*	G	2967	A	SLC22A23	A327V	G	1443	A	SOS2	R824C	G	2560	A
RIMS2	R46I	G	378	T	SCUBE2	R798C	G	2472	A	SLC22A23	S479F	G	1899	A	SOS2	-	T	0	C
RIMS2	D225Y	G	914	T	SCUBE2	R557C	G	1749	A	SLC22A23	Y359C	T	1539	C	SOS2	Q1296H	C	3978	A
RIMS2	R599Q	G	2037	A	SCUBE3	N260T	A	785	C	SLC22A24	R405H	C	1656	T	SOS2	R824C	G	2560	A
RIMS2	E621*	G	2102	T	SCUBE3	A951D	C	2858	A	SLC22A24	A283D	G	1290	T	SOS2	R225*	G	763	A
RIMS3	S298F	G	1363	A	SCYL1	T408M	C	1300	T	SLC22A24	R406*	G	1658	A	SOX10	A323V	G	1233	A
RIMS3	K210T	T	1099	G	SCYL1	M429I	G	1364	T	SLC22A25	R277G	T	829	C	SOX10	V70A	A	474	G
RIMS4	G145D	C	501	T	SCYL1	E440*	G	1395	T	SLC22A25	D136V	T	407	A	SOX10	R159W	G	740	A
RIN1	R514W	G	1667	A	SCYL2	R505C	C	1563	T	SLC22A25	I362T	A	1085	G	SOX11	D197N	G	644	A
RIN1	R342C	G	1151	A	SCYL2	T737I	C	2260	T	SLC22A25	L6F	G	16	A	SOX11	A102T	G	359	A
RIN1	E538K	C	1739	T	SCYL3	R61H	C	380	T	SLC22A3	F279C	T	863	G	SOX11	A45V	C	189	T
RIN1	A534V	G	1728	A	SDC1	F211L	G	878	T	SLC22A3	C148R	T	469	C	SOX13	D419N	G	1255	A
RIN1	Q212R	T	762	C	SDC2	F162V	T	1102	G	SLC22A3	E452D	A	1383	C	SOX13	A535V	C	1604	T
RIN2	R290H	G	1018	A	SDC2	A190V	C	1187	T	SLC22A4	R336Q	G	1181	A	SOX15	R119W	G	849	A
RIN2	G422S	G	1413	A	SDC3	A263T	C	962	T	SLC22A4	I221L	A	835	C	SOX17	R204H	G	815	A
RIN2	R409Q	G	1375	A	SDC3	K413T	T	1413	G	SLC22A4	K434T	A	1475	C	SOX21	D59G	T	262	C
RIN2	D667E	T	2150	A	SDC4	V146A	A	477	G	SLC22A4	A460V	C	1553	T	SOX3	M147V	T	439	C
RIN3	S183L	C	700	T	SDCBP	V158A	T	620	C	SLC22A5	A404V	C	1475	T	SOX3	R212H	C	635	T
RIN3	L791F	C	2523	T	SDCBP	S74F	C	368	T	SLC22A6	P245S	G	1040	A	SOX30	R415Q	C	1586	T
RIN3	E888K	G	2814	A	SDCCAG1	E847*	C	2574	A	SLC22A6	-	C	0	T	SOX30	V337E	A	1352	T

RINL	R170C	G	896	A	SDCCAG1	E64V	T	226	A	SLC22A7	R202H	G	700	A	SOX5	R593H	C	1880	T
RINT1	-	G	0	T	SDCCAG1	E628D	T	1919	G	SLC22A7	D426N	G	1371	A	SOX5	G705E	C	2216	T
RIOK1	P520H	C	2066	A	SDCCAG1	R327Q	C	1015	T	SLC22A8	R536W	G	1742	A	SOX5	Q259H	T	879	G
RIOK1	R379W	C	1642	T	SDCCAG8	L105F	A	433	C	SLC22A8	S565R	G	1831	T	SOX6	R93*	G	349	A
RIOK3	I306S	T	1534	G	SDK1	P299L	C	1035	T	SLC22A8	R75H	C	360	T	SOX6	R144Q	C	503	T
RIOK3	I306S	T	1534	G	SDK1	A555V	C	1803	T	SLC22A8	L481I	G	1577	T	SOX8	A279T	G	950	A
RIOK3	S107G	A	936	G	SDK1	A164D	C	630	A	SLC22A8	S211L	G	768	A	SOX8	G182S	G	659	A
RIOK3	R326H	G	1594	A	SDK1	T1456M	C	4506	T	SLC22A8	I187T	A	696	G	SOX9	A116V	C	719	T
RIOK3	S360Y	C	1696	A	SDK1	R1796C	C	5525	T	SLC22A9	T451A	A	1619	G	SOX9	A189V	C	938	T
RIPK1	M239L	A	998	C	SDK1	A2180V	C	6678	T	SLC22A9	R407*	C	1487	T	SP100	H529Q	C	1618	G
RIPK1	M126I	G	661	A	SDK1	D1174N	G	3659	A	SLC23A1	R460H	C	1418	T	SP100	M768V	A	2333	G
RIPK2	A454V	C	1675	T	SDK1	A851V	C	2691	T	SLC23A1	A67V	G	239	A	SP100	R838C	C	2543	T
RIPK3	E189*	C	737	A	SDK1	R526W	C	1715	T	SLC23A2	-	C	0	T	SP100	S228L	C	714	T
RIPK3	P419S	G	1427	A	SDK1	H341Q	C	1162	G	SLC23A3	V196M	C	697	T	SP110	K512N	C	1614	A
RIPK4	T654M	G	2026	A	SDK1	V691D	T	2211	A	SLC24A1	A1060V	C	3466	T	SP140	R401C	C	1315	T
RIPK4	R260C	G	843	A	SDK1	L701I	C	2240	A	SLC24A1	Q642H	G	2213	T	SP2	A588V	C	1900	T
RIPK4	K51N	C	218	A	SDK2	T1296A	T	3886	C	SLC24A2	G362*	C	1146	A	SP2	E409D	G	1364	T
RIPK4	R79C	G	300	A	SDK2	R90C	G	268	A	SLC24A2	G561W	C	1743	A	SP3	G289C	C	1396	A
RIPPLY1	-	C	0	A	SDK2	S263G	T	787	C	SLC24A2	N407S	T	1282	C	SP3	Q150H	T	981	G
RIPPLY1	R68M	C	203	A	SDK2	A1841T	C	5521	T	SLC24A2	V209L	C	687	A	SP4	V538I	G	1830	A
RIT2	R104C	G	482	A	SDK2	H595L	T	1784	A	SLC24A2	K558R	T	1735	C	SP4	E7K	G	237	A
RLF	Q787P	A	2387	C	SDK2	E313A	T	938	G	SLC24A2	W463C	C	1451	A	SP4	E8K	G	240	A
RLF	R339C	C	1042	T	SDK2	G1658W	C	4972	A	SLC24A3	T634A	A	2097	G	SP4	E711K	G	2349	A
RLF	E135K	G	430	A	SDK2	A50V	G	149	A	SLC24A3	R82W	C	441	T	SP5	R396W	C	1348	T
RLF	K617N	G	1878	T	SDK2	T540M	G	1619	A	SLC24A4	V574M	G	1744	A	SP6	H274R	T	1099	C
RLF	Q684H	A	2079	C	SDK2	S1733G	T	5197	C	SLC24A4	T444M	C	1355	T	SP6	V322I	C	1242	T
RLF	V1417A	T	4277	C	SDPR	L387P	A	1490	G	SLC24A5	D272Y	G	887	T	SP7	S338L	G	1120	A
RLN1	V165M	C	620	T	SDR16C5	F231C	A	1330	C	SLC24A6	A533T	C	1807	T	SP8	P498S	G	1580	A
RLN1	Q18P	T	180	G	SDR16C6	F198L	A	594	C	SLC24A6	I496V	T	1696	C	SP9	Y159C	A	623	G
RLN2	F90C	A	658	C	SDR16C6	R78Q	C	233	T	SLC25A11	A56V	G	425	A	SP9	A176T	G	673	A
RLTPR	R220Q	G	779	A	SDR39U1	N234S	T	701	C	SLC25A12	S25R	A	113	T	SPACA3	R150M	G	449	T
RLTPR	K1263T	A	3908	C	SDS	A34V	G	219	A	SLC25A12	K416N	T	1286	G	SPACA3	C66G	T	196	G
RLTPR	G407V	G	1340	T	SDSL	S228I	G	893	T	SLC25A13	A341S	C	1094	A	SPACA4	G16C	G	282	T
RMI1	N612T	A	2070	C	SEC11B	L172V	A	882	C	SLC25A13	D565Y	C	1766	A	SPAG1	-	A	0	G
RMND5A	P319H	C	1451	A	SEC11B	L112V	A	702	C	SLC25A15	A147V	C	676	T	SPAG1	A528V	C	1669	T
RMND5A	E181D	A	1038	C	SEC14L1	R168C	C	722	T	SLC25A15	V130M	G	624	A	SPAG1	L43I	C	213	A
RMND5A	K365T	A	1589	C	SEC14L1	R387W	C	1379	T	SLC25A16	T286I	G	956	A	SPAG1	L525M	C	1659	A
RMND5B	R184H	G	902	A	SEC14L1	T382I	C	1365	T	SLC25A16	N232S	T	794	C	SPAG16	V451A	T	1447	C
RNASE11	R122H	C	828	T	SEC14L1	S88Y	C	483	A	SLC25A2	L240I	G	898	T	SPAG16	S467C	A	1494	T

RNASE11	K115E	T	806	C	SEC14L3	P199L	G	687	A	SLC25A2	A15V	G	224	A	SPAG16	G448C	G	1437	T
RNASE11	S150N	C	912	T	SEC14L3	E235G	T	795	C	SLC25A2	M37T	A	290	G	SPAG16	D427N	G	1374	A
RNASE13	Y73H	A	355	G	SEC14L4	D107N	C	403	T	SLC25A2	R61Q	C	362	T	SPAG16	R628*	C	1977	T
RNASE13	-	A	607	C	SEC14L5	R67W	C	379	T	SLC25A21	G71S	C	521	T	SPAG17	N311K	A	999	T
RNASE13	E143G	T	566	C	SEC16A	P517L	G	2158	A	SLC25A22	A240V	G	1061	A	SPAG17	R1486G	T	4522	C
RNASE9	P65H	G	342	T	SEC16A	E1866*	C	6204	A	SLC25A25	R315C	C	970	T	SPAG17	E2197*	C	6655	A
RNASE9	-	C	781	A	SEC16A	A1636V	G	5515	A	SLC25A25	A340T	G	1045	A	SPAG17	I1320M	A	4026	C
RNASEH1	G167C	C	855	A	SEC16A	D1087N	C	3867	T	SLC25A25	F307L	C	948	A	SPAG17	E991D	C	3039	A
RNASEH2B	K306T	A	1316	C	SEC16B	R546H	C	2379	T	SLC25A26	V269A	T	1534	C	SPAG17	E905*	C	2779	A
RNASEK	-	A	326	G	SEC16B	E149K	C	1187	T	SLC25A27	G206A	G	869	C	SPAG17	V84G	A	317	C
RNASEL	V319A	A	1210	G	SEC22A	G222C	G	712	T	SLC25A28	R112C	G	363	A	SPAG4	K398N	G	1306	T
RNASEL	F123L	A	623	C	SEC22A	R209Q	G	674	A	SLC25A28	T314M	G	970	A	SPAG5	R797W	G	2481	A
RNASEN	H609Y	G	1872	A	SEC22C	I141N	A	566	T	SLC25A29	S64L	G	492	A	SPAG6	A540E	C	1761	A
RNASEN	R271*	G	858	A	SEC23A	R216C	G	871	A	SLC25A29	R129C	G	686	A	SPAG6	V21M	G	203	A
RNASEN	R778C	G	2379	A	SEC23B	E109K	G	465	A	SLC25A30	R227C	G	815	A	SPAG8	Q279R	T	961	C
RNASEN	R759H	C	2323	T	SEC23IP	G770R	G	2380	A	SLC25A31	P221L	C	830	T	SPAG8	R387Q	C	1285	T
RNASEN	K382N	C	1193	A	SEC23IP	S235Y	C	776	A	SLC25A32	F100L	A	601	G	SPAG9	R1094*	G	3489	A
RNASET2	K255T	T	1171	G	SEC23IP	R569Q	G	1778	A	SLC25A32	G3A	C	311	G	SPAG9	Q69R	T	415	C
RND1	L165P	A	625	G	SEC24B	I954N	T	2916	A	SLC25A32	P42S	G	427	A	SPAG9	T1112M	G	3544	A
RND1	D75N	C	354	T	SEC24B	Y1122H	T	3419	C	SLC25A32	F278L	A	1137	C	SPAG9	P1187S	G	3768	A
RNF10	T36A	A	106	G	SEC24B	S856L	C	2622	T	SLC25A36	R282H	G	1013	A	SPAG9	V1071A	A	3421	G
RNF10	R149W	C	445	T	SEC24B	N472S	A	1470	G	SLC25A37	P234Q	C	854	A	SPAM1	R156I	G	824	T
RNF10	K435N	G	1305	T	SEC24B	F847L	T	2596	G	SLC25A37	-	T	0	A	SPANXE	R54C	G	494	A
RNF10	T418I	C	1253	T	SEC24B	R912Q	G	2790	A	SLC25A38	R281H	G	1219	A	SPANXN3	E75D	C	309	A
RNF103	E226*	C	1645	A	SEC24C	V997I	G	3071	A	SLC25A38	Y248F	A	1120	T	SPARC	A282T	C	1158	T
RNF103	Q474P	T	2390	G	SEC24C	R1040W	C	3200	T	SLC25A4	R244Q	G	863	A	SPARC	R195Q	C	898	T
RNF103	V560I	C	2647	T	SEC24C	I824V	A	2552	G	SLC25A4	A150T	G	580	A	SPARC	F6L	G	332	T
RNF103	V683I	C	3016	T	SEC24C	R222Q	G	747	A	SLC25A4	K23N	G	201	T	SPAST	R499C	C	1620	T
RNF103	E305K	C	1882	T	SEC24C	R661M	G	2064	T	SLC25A4	T24S	A	202	T	SPAST	I580V	A	1863	G
RNF111	L972R	T	3337	G	SEC24C	R1090W	C	3350	T	SLC25A42	Y121C	A	513	G	SPAST	P293L	C	1003	T
RNF111	E264*	G	1212	T	SEC24D	G145D	C	646	T	SLC25A43	F246L	C	1082	A	SPAST	F465V	T	1518	G
RNF113A	P294L	G	1096	A	SEC24D	M1T	A	214	G	SLC25A45	R243C	G	931	A	SPATA1	N105H	A	512	C
RNF115	F87C	T	464	G	SEC24D	V7M	C	231	T	SLC25A46	T226A	A	676	G	SPATA12	S15A	T	718	G
RNF121	R78H	G	594	A	SEC31A	T406M	G	1218	A	SLC25A5	T24M	C	187	T	SPATA13	R715G	A	2141	G
RNF123	E959D	G	2983	T	SEC31A	A1016T	C	3047	T	SLC25A5	R31W	C	207	T	SPATA13	K154T	A	459	C
RNF123	D629G	A	1992	G	SEC31A	R254C	G	761	A	SLC26A1	K401M	T	1580	A	SPATA13	N673H	A	2015	C
RNF123	S1080G	A	3344	G	SEC31B	A1152V	G	3553	A	SLC26A1	V447M	C	1717	T	SPATA16	F229L	G	871	T
RNF123	R1209H	G	3732	A	SEC31B	H342Y	G	1122	A	SLC26A10	D25G	A	385	G	SPATA17	E270*	G	863	T
RNF130	R232C	G	1110	A	SEC61A1	L181I	C	786	A	SLC26A10	S59Y	C	487	A	SPATA18	A338T	G	1386	A

RNF130	D228N	C	1098	T	SEC61A2	Q398H	G	1283	T	SLC26A11	-	G	0	T	SPATA18	L321P	T	1336	C
RNF130	S209P	A	1041	G	SEC61A2	F423L	T	1356	C	SLC26A2	S347A	T	1307	G	SPATA18	R498Q	G	1867	A
RNF133	R225*	G	911	A	SEC63	K633N	T	2079	G	SLC26A3	N161T	T	667	G	SPATA19	R139Q	C	467	T
RNF135	L425P	T	1325	C	SEC63	E335*	C	1183	A	SLC26A3	-	C	0	A	SPATA19	D152Y	C	505	A
RNF138	Y145C	A	882	G	SECISBP2	A512V	C	1606	T	SLC26A3	L659I	G	2160	T	SPATA2	L298P	A	1124	G
RNF138	N166K	T	946	A	SECISBP2	L854V	T	2631	G	SLC26A3	K523T	T	1753	G	SPATA20	R47W	C	259	T
RNF139	R121Q	G	705	A	SECISBP2L	V861I	C	2780	T	SLC26A3	E277*	C	1014	A	SPATA20	R80H	G	359	A
RNF139	A415T	G	1586	A	SECISBP2L	G1077V	C	3429	A	SLC26A4	P140H	C	643	A	SPATA21	T256M	G	1250	A
RNF139	W419R	T	1598	C	SECISBP2L	R673I	C	2217	A	SLC26A4	L251I	C	975	A	SPATA21	F280L	G	1323	T
RNF139	L402P	T	1548	C	SECISBP2L	K185Q	T	752	G	SLC26A5	K608T	T	2059	G	SPATA22	E352D	C	1179	A
RNF139	I147L	A	782	C	SECTM1	G72R	C	612	T	SLC26A5	L440M	G	1554	T	SPATA22	Q206H	T	741	G
RNF139	R217Q	G	993	A	SEH1L	P145Q	C	572	A	SLC26A5	R15M	C	280	A	SPATA24	S237P	A	737	G
RNF14	P312L	C	974	T	SEH1L	R406Q	G	1355	A	SLC26A5	P331L	G	1228	A	SPATA24	A218T	C	680	T
RNF14	F77C	T	269	G	SEL1L	S421L	G	1307	A	SLC26A5	-	C	0	A	SPATA24	-	C	0	A
RNF144A	R194*	C	1022	T	SEL1L	A752V	G	2300	A	SLC26A5	A343V	G	1264	A	SPATA4	S185L	G	663	A
RNF144B	V251L	G	1068	T	SEL1L	R537P	C	1655	G	SLC26A6	T522M	G	1613	A	SPATA4	N166T	T	606	G
RNF145	K23R	T	95	C	SEL1L2	A588T	C	1837	T	SLC26A6	A367T	C	1147	T	SPATA5	R879H	G	2705	A
RNF148	R272H	C	1032	T	SEL1L2	S497Y	G	1565	T	SLC26A7	C359*	C	1316	A	SPATA5	D152Y	G	523	T
RNF149	R283I	C	956	A	SEL1L2	A486T	C	1531	T	SLC26A7	G314R	G	1179	A	SPATA5	K674T	A	2090	C
RNF149	R226C	G	784	A	SEL1L3	-	C	0	A	SLC26A7	D139N	G	654	A	SPATA6	E427K	C	1444	T
RNF150	G327W	C	1013	A	SEL1L3	L324I	G	1093	T	SLC26A8	L500M	G	1852	T	SPATA7	T76A	A	377	G
RNF150	D289Y	C	899	A	SEL1L3	G251D	C	875	T	SLC26A8	K179N	C	891	A	SPATA7	D575N	G	1874	A
RNF152	G115R	C	1443	T	SEL1L3	K200N	C	723	A	SLC26A9	A254T	C	762	T	SPATC1	P477S	C	1531	T
RNF157	R652Q	C	2024	T	SELE	R375*	G	1263	A	SLC26A9	A439T	C	1317	T	SPATC1	A108T	G	424	A
RNF157	W674C	C	2091	A	SELE	A182V	G	685	A	SLC26A9	P325T	G	975	T	SPATC1	R367Q	G	1202	A
RNF157	T601M	G	1871	A	SELE	L7I	G	159	T	SLC26A9	Q527P	T	1582	G	SPATS2	A100T	G	1287	A
RNF157	S420P	A	1327	G	SELENBP1	R23H	C	213	T	SLC26A9	R317C	G	951	A	SPATS2	S19P	T	1044	C
RNF160	N582K	A	1752	C	SELENBP1	R237Q	C	855	T	SLC26A9	Q614K	G	1842	T	SPATS2L	E157*	G	569	T
RNF160	P10S	G	34	A	SELL	-	C	0	A	SLC26A9	P234Q	G	703	T	SPATS2L	S399*	C	1296	A
RNF160	M1455I	C	4371	T	SELL	D151Y	C	612	A	SLC26A9	S218L	G	655	A	SPC24	A90S	C	274	A
RNF160	R1111H	C	3338	T	SELP	R429W	G	1353	A	SLC26A9	R38C	G	114	A	SPC25	E77D	T	373	G
RNF160	S1632N	C	4901	T	SELP	R656M	C	2035	A	SLC27A1	Y267H	T	1042	C	SPC25	D10N	C	170	T
RNF160	C1220R	A	3664	G	SELP	R458W	G	1440	A	SLC27A1	A477T	G	1672	A	SPC25	E5K	C	155	T
RNF160	E1355*	C	4069	A	SELP	R556*	G	1734	A	SLC27A1	A389V	C	1409	T	SPCS2	A4S	G	49	T
RNF160	L974R	A	2927	C	SELP	C448*	G	1412	T	SLC27A2	F361L	T	1312	C	SPCS2	K47Q	A	178	C
RNF160	L575F	C	1731	A	SELPLG	S409N	C	1384	T	SLC27A2	G278*	G	1063	T	SPDEF	S264R	G	1207	T

RNF160	K191Q	T	577	G	SELPLG	Q122H	C	524	A	SLC27A2	K428N	A	1515	C	SPDEF	A299T	C	1310	T
RNF165	Q323R	A	1019	G	SEMA3A	V14A	A	356	G	SLC27A2	R523C	C	1798	T	SPDYC	R290C	C	950	T
RNF166	R179C	G	631	A	SEMA3A	R613Q	C	2153	T	SLC27A3	G462S	G	2144	A	SPDYE3	R518C	C	1736	T
RNF167	R205Q	G	1270	A	SEMA3A	R554K	C	1976	T	SLC27A3	R539H	G	2376	A	SPEF2	E1334*	G	4154	T
RNF168	A92T	C	869	T	SEMA3A	Q433H	T	1614	G	SLC27A3	A173T	G	1277	A	SPEF2	R1366Q	G	4251	A
RNF168	E246*	C	1331	A	SEMA3C	R528W	G	2144	A	SLC27A3	R599W	C	2555	T	SPEF2	P1321T	C	4115	A
RNF168	I80L	T	833	G	SEMA3D	N686S	T	2101	C	SLC27A3	R768W	C	3062	T	SPEF2	I248N	T	897	A
RNF17	Y743C	A	2269	G	SEMA3D	R642I	C	1969	A	SLC27A4	R40H	G	236	A	SPEF2	D279N	G	989	A
RNF17	R1587W	C	4800	T	SEMA3D	T320I	G	1003	A	SLC27A4	V626I	G	1993	A	SPEF2	E596*	G	1940	T
RNF17	A441T	G	1362	A	SEMA3D	L296M	G	930	T	SLC27A5	L458I	G	1482	T	SPEF2	R794C	C	2534	T
RNF17	F959C	T	2917	G	SEMA3E	P769H	G	2774	T	SLC27A5	P23S	G	177	A	SPEF2	A1772V	C	5469	T
RNF17	E1554*	G	4701	T	SEMA3E	G574*	C	2188	A	SLC27A5	G595D	C	1894	T	SPEG	E2291K	G	7003	A
RNF170	Y248C	T	906	C	SEMA3F	R477C	C	1913	T	SLC27A5	R248H	C	853	T	SPEG	R1875Q	G	5756	A
RNF175	S221R	T	1034	G	SEMA3F	G305D	G	1398	A	SLC27A6	F473S	T	2428	C	SPEG	R771Q	G	2444	A
RNF181	D22Y	G	62	T	SEMA3F	R477C	C	1913	T	SLC27A6	L558F	A	2684	C	SPEG	H1355Y	C	4195	T
RNF182	I51T	T	675	C	SEMA3G	V729M	C	2185	T	SLC28A3	A392V	G	1225	A	SPEG	L1327M	C	4111	A
RNF183	E153*	C	731	A	SEMA3G	R721W	G	2161	A	SLC28A3	R154*	G	510	A	SPEG	P845L	C	2666	T
RNF185	R109C	C	525	T	SEMA3G	R225Q	C	674	T	SLC28A3	G575R	C	1773	T	SPEG	P3117S	C	9481	T
RNF185	G31R	G	291	A	SEMA3G	R278L	C	833	A	SLC28A3	R551C	G	1701	A	SPEG	Y3152D	T	9586	G
RNF187	R101Q	G	1057	A	SEMA4A	A509S	G	1629	T	SLC28A3	A252V	G	805	A	SPEG	R1803Q	G	5540	A
RNF19A	A641T	C	2019	T	SEMA4A	R658W	C	2076	T	SLC28A3	R154*	G	510	A	SPEG	A3191T	G	9703	A
RNF19A	N801T	T	2500	G	SEMA4B	A574T	G	2003	A	SLC29A1	R190Q	G	569	A	SPEM1	S19N	G	81	A
RNF19B	S525G	T	1636	C	SEMA4B	E65K	G	476	A	SLC29A1	L371P	T	1112	C	SPEM1	Y303C	A	933	G
RNF2	A286T	G	1144	A	SEMA4B	V479M	G	1718	A	SLC29A2	W29R	A	314	G	SPEN	R176Q	G	731	A
RNF2	R43Q	G	416	A	SEMA4C	R815C	G	2576	A	SLC29A3	S285L	C	906	T	SPEN	R1959G	C	6079	G
RNF20	-	G	0	A	SEMA4D	E510K	C	2305	T	SLC29A4	R424C	C	1431	T	SPEN	D2905N	G	8917	A
RNF20	K689N	G	2157	T	SEMA4D	L322M	G	1741	T	SLC29A4	D286N	G	1017	A	SPEN	T3045A	A	9337	G
RNF20	G316S	G	1036	A	SEMA4D	A130T	C	1165	T	SLC29A4	G498E	G	1654	A	SPEN	T907I	C	2924	T
RNF20	R748H	G	2333	A	SEMA4D	T634M	G	2678	A	SLC29A4	D154N	G	621	A	SPEN	K1131T	A	3596	C
RNF20	L543V	T	1717	G	SEMA4F	A625T	G	2022	A	SLC2A10	A111T	G	581	A	SPEN	E1242*	G	3928	T
RNF207	K378N	G	1261	T	SEMA4F	R569C	C	1854	T	SLC2A10	A449T	G	1595	A	SPEN	K1596Q	A	4990	C
RNF207	L193P	T	705	C	SEMA4F	V577M	G	1878	A	SLC2A13	E7D	C	72	A	SPEN	S3492F	C	10679	T
RNF208	S133Y	G	567	T	SEMA4G	R268H	G	881	A	SLC2A13	L109I	G	376	T	SPEN	L182I	C	748	A
RNF212	F297V	A	951	C	SEMA4G	R521Q	G	1640	A	SLC2A13	R323H	C	1019	T	SPERT	V98G	T	373	G
RNF212	E117*	C	411	A	SEMA4G	Y131C	A	470	G	SLC2A14	F235V	A	703	C	SPERT	R33I	G	178	T
RNF213	A3732T	G	11339	A	SEMA5A	V989I	C	3631	T	SLC2A2	L368I	G	1182	T	SPERT	Q384P	A	1231	C
RNF213	R2902C	C	8849	T	SEMA5A	R433W	G	1963	A	SLC2A2	V45G	A	214	C	SPESP1	I233M	T	853	G
RNF213	Q4029*	C	1223	T	SEMA5A	E526G	T	2243	C	SLC2A2	V87L	C	339	G	SPG11	R2211C	G	6648	A

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RNF213	T3263M	C	9933	T	SEMA5A	S528G	T	2248	C	SLC2A3	A401V	G	1443	A	SPG11	M935T	A	2821	G
RNF213	E2162K	G	6629	A	SEMA5A	A315V	G	1610	A	SLC2A3	L213F	G	878	A	SPG11	F626L	A	1893	G
RNF213	V9F	G	170	T	SEMA5B	R985Q	C	3341	T	SLC2A4RG	S163N	G	540	A	SPG20	E406A	T	1278	G
RNF213	V1469M	G	4550	A	SEMA5B	V15I	C	430	T	SLC2A4RG	L120I	C	410	A	SPG20	S206Y	G	678	T
RNF213	D1600V	A	4944	T	SEMA5B	G373R	C	1504	T	SLC2A5	R238C	G	892	A	SPG21	A283T	C	1143	T
RNF213	A3193V	C	9723	T	SEMA5B	M1I	C	390	T	SLC2A5	-	C	0	A	SPG21	V269I	C	1101	T
RNF213	K5095R	A	15429	G	SEMA5B	R604Q	C	2198	T	SLC2A6	R224W	G	748	A	SPG21	K117T	T	646	G
RNF214	K224N	G	681	T	SEMA5B	A674V	G	2408	A	SLC2A6	A129V	G	464	A	SPG7	R391W	C	1186	T
RNF214	S519N	G	1565	A	SEMA5B	R320L	C	1346	A	SLC2A7	R237*	G	709	A	SPG7	A149T	G	460	A
RNF216	R518Q	C	1821	T	SEMA5B	G613S	C	2224	T	SLC2A7	A151T	C	451	T	SPHK1	Q125H	G	872	T
RNF216	R677W	T	2297	A	SEMA5B	R635Q	C	2291	T	SLC2A7	G354S	C	1060	T	SPHK2	A516D	C	2252	A
RNF219	R235C	G	762	A	SEMA6A	R712C	G	2383	A	SLC2A8	R182C	C	633	T	SPHK2	R322C	C	1669	T
RNF219	Q647*	G	1998	A	SEMA6A	Q783*	G	2596	A	SLC2A8	L210P	T	718	C	SPHK2	P492H	C	2180	A
RNF219	S717G	T	2208	C	SEMA6C	P937S	G	2938	A	SLC2A8	A310T	G	1017	A	SPHKAP	A1113V	G	3385	A
RNF220	-	A	0	C	SEMA6D	A1007V	C	3459	T	SLC2A9	P434L	G	1355	A	SPHKAP	R1142I	C	3472	A
RNF24	-	A	0	G	SEMA6D	E106*	G	755	T	SLC2A9	R539S	C	1671	A	SPHKAP	L1692I	G	5121	T
RNF25	S90T	A	709	T	SEMA6D	I306T	T	1356	C	SLC2A9	D528G	T	1637	C	SPHKAP	S1392Y	G	4222	T
RNF25	R233C	G	1138	A	SEMA6D	D484E	C	1891	G	SLC2A9	-	C	0	A	SPHKAP	S1386Y	G	4204	T
RNF25	R323M	C	1409	A	SEMA7A	K365N	C	1136	A	SLC30A1	R361*	G	1192	A	SPHKAP	F178C	A	580	C
RNF26	L426M	C	1872	A	SEMA7A	C500*	G	1541	T	SLC30A10	G467R	C	1561	T	SPHKAP	R1169W	G	3552	A
RNF31	R616C	C	2015	T	SEMA7A	R261H	C	823	T	SLC30A10	R177W	G	691	A	SPIC	L86M	C	282	A
RNF31	R621C	C	2030	T	SEMA7A	R261H	C	823	T	SLC30A3	V232I	C	1047	T	SPIN1	F244Y	T	1009	A
RNF32	R32*	C	212	T	SEMG1	T139K	C	473	A	SLC30A3	R132H	C	748	T	SPIN1	R122Q	G	643	A
RNF32	E109*	G	443	T	SEMG1	H399Y	C	1252	T	SLC30A4	L21P	A	377	G	SPINK1	R67C	G	408	A
RNF32	N49K	C	265	A	SEMG2	S386C	C	1247	G	SLC30A5	L467M	C	2009	A	SPINK14	G34V	G	101	T
RNF34	R366Q	G	1274	A	SEMG2	V71A	T	302	C	SLC30A5	L163V	T	1097	G	SPINK2	R130Q	C	469	T
RNF34	D234A	A	878	C	SEMG2	E163D	A	579	C	SLC30A6	R344*	C	1067	T	SPINK5	E649A	A	2019	C
RNF34	A278G	C	1010	G	SEMG2	L273F	C	907	T	SLC30A6	T362I	C	1122	T	SPINK5	Q27R	A	153	G
RNF34	E303D	G	1086	T	SENP1	R165H	C	973	T	SLC30A6	L353I	C	1094	A	SPINK5	G144C	G	503	T
RNF34	D323N	G	1144	A	SENP1	R352Q	C	1534	T	SLC30A7	K7Q	A	206	C	SPINK5	E292*	G	947	T
RNF40	A501T	G	1655	A	SENP1	P399S	G	1674	A	SLC30A8	Q172H	G	745	T	SPINK5	K305N	G	988	T
RNF40	S402C	C	1359	G	SENP2	P69L	C	206	T	SLC30A8	L315I	C	1172	A	SPINK5	R853*	C	2630	T
RNF40	-	A	0	G	SENP3	R31C	C	364	T	SLC30A8	F363L	C	1318	A	SPINT1	R406H	G	1426	A
RNF41	R168*	G	871	A	SENP5	T69M	C	455	T	SLC30A9	E525D	A	1755	C	SPINT3	R20*	G	58	A
RNF43	R132*	G	882	A	SENP5	K317R	A	1199	G	SLC32A1	A495T	G	1746	A	SPINT4	F55C	T	181	G
RNF43	R132*	G	882	A	SENP6	Y657*	T	2590	A	SLC32A1	F306C	T	1180	G	SPIRE1	A493V	G	1746	A

RNF43	R561Q	C	2170	T	SENP6	R737W	C	2828	T	SLC32A1	M330V	A	1251	G	SPIRE1	E684D	T	2320	G
RNF43	T142A	T	912	C	SENP6	E526G	A	2196	G	SLC33A1	Q356H	C	1449	A	SPIRE1	R567H	C	1968	T
RNF43	R454C	G	1848	A	SENP7	Y862*	A	2640	C	SLC34A1	E334G	A	1092	G	SPIRE1	F225L	A	943	C
RNF43	R609Q	C	2314	T	SEPHS1	E13K	C	413	T	SLC34A1	R439K	G	1407	A	SPIRE1	D312G	T	1203	C
RNF43	G133E	C	886	T	SEPHS1	G270R	C	1184	T	SLC34A1	P442S	C	1415	T	SPIRE2	K384T	A	1203	C
RNF44	A389V	G	1691	A	SEPHS1	A245V	G	1110	A	SLC34A1	Y511C	A	1623	G	SPIRE2	R294C	C	932	T
RNF44	T115M	G	869	A	SEPHS1	M187L	T	935	G	SLC34A1	L551M	C	1742	A	SPIRE2	V595I	G	1835	A
RNF44	R390Q	C	1694	T	SEPT1	R246H	C	924	T	SLC34A1	G149R	G	536	A	SPIRE2	P429R	C	1338	G
RNF44	R52H	C	680	T	SEPT10	G183D	C	548	T	SLC34A2	T543M	C	1678	T	SPIRE2	S122G	A	416	G
RNF44	D221G	T	1187	C	SEPT10	R278H	C	833	T	SLC34A2	R617C	C	1899	T	SPIRE2	R357H	G	1122	A
RNF44	S36G	T	631	C	SEPT10	G439D	C	1316	T	SLC34A2	R179W	C	585	T	SPN	R278C	C	968	T
RNF6	R508I	C	1685	A	SEPT12	A248V	G	836	A	SLC34A2	K585N	G	1805	T	SPN	V289M	G	1001	A
RNF7	Q70R	A	347	G	SEPT14	R157H	C	587	T	SLC34A2	L547F	C	1689	T	SPN	A307V	C	1056	T
RNF8	R472Q	G	1608	A	SEPT14	G219D	C	773	T	SLC34A3	G495R	G	1669	A	SPNS1	R239Q	G	1093	A
RNFT1	R297Q	C	946	T	SEPT14	S171P	A	628	G	SLC35A4	G274D	G	1928	A	SPNS2	V527I	G	1793	A
RNFT1	W423*	C	1324	T	SEPT14	R157H	C	587	T	SLC35A5	N295H	A	1166	C	SPNS3	R289C	C	909	T
RNFT2	-	T	0	C	SEPT2	H395R	A	1184	G	SLC35B1	K76E	T	226	C	SPNS3	F63L	C	233	A
RNFT2	E252D	G	989	T	SEPT2	Y331C	A	992	G	SLC35B2	R333*	G	1141	A	SPOCD1	K833T	T	2556	G
RNFT2	R416C	C	1479	T	SEPT3	E250D	G	1005	T	SLC35B2	R333*	G	1141	A	SPOCD1	W1111C	C	3391	G
RNGTT	R470H	C	1596	T	SEPT4	R375W	G	1123	A	SLC35B3	S341L	G	1472	A	SPOCK3	G35S	C	241	T
RNGTT	D205G	T	801	C	SEPT4	K330N	C	990	A	SLC35B4	G178W	C	832	A	SPOCK3	R71H	C	350	T
RNGTT	R116I	C	534	A	SEPT4	R372W	G	1114	A	SLC35B4	V272I	C	1114	T	SPOCK3	-	C	0	A
RNMT	G349*	G	1285	T	SEPT4	C392*	G	1176	T	SLC35C1	S92N	G	987	A	SPON1	R634Q	G	1901	A
RNPC3	L187I	C	674	A	SEPT4	E368D	C	1104	A	SLC35C1	R108C	C	1034	T	SPON1	I169V	A	505	G
RNPEPL1	P286L	C	1450	T	SEPT4	R373*	G	1117	A	SLC35C2	G149W	C	928	A	SPON1	F388L	C	1164	A
RNPS1	R66C	G	637	A	SEPT6	S220L	G	924	A	SLC35C2	S111L	G	815	A	SPON2	R175C	G	856	A
ROBO1	S915G	T	2857	C	SEPT8	Y258C	T	1011	C	SLC35D3	G157R	G	634	A	SPON2	R245Q	C	1067	T
ROBO1	A977V	G	3044	A	SEPT8	P183H	G	786	T	SLC35D3	A189V	C	731	T	SPOP	K180E	T	904	C
ROBO1	E1329*	C	4099	A	SEPT9	G139D	G	542	A	SLC35E1	D390G	T	1187	C	SPOP	A61T	C	547	T
ROBO1	S1606P	A	4930	G	SEPT9	T346M	C	1163	T	SLC35E4	R300W	C	1697	T	SPP1	A213V	C	765	T
ROBO1	G859V	C	2690	A	SEPT9	R84H	G	377	A	SLC35E4	R42L	G	924	T	SPP1	Q58*	C	299	T
ROBO1	T996M	G	3101	A	SEPX1	M1V	T	32	C	SLC35F1	V366M	G	1297	A	SPP2	M10T	T	137	C
ROBO1	Q883H	T	2763	G	SERAC1	E97*	C	421	A	SLC35F2	Y209D	A	786	C	SPP2	D75Y	G	331	T
ROBO1	R1472C	G	4528	A	SERBP1	P98L	G	379	A	SLC35F4	S177F	G	530	A	SPRED1	V229A	T	1021	C
ROBO1	P1505H	G	4628	T	SERGEF	R186*	G	708	A	SLC35F4	D444N	C	1330	T	SPRED1	K288T	A	1198	C
ROBO1	S1442G	T	4438	C	SERHL2	R183I	G	650	T	SLC35F4	R236W	G	706	A	SPRED2	R323Q	C	1035	T
ROBO1	M189I	C	681	A	SERINC1	S301N	C	1046	T	SLC35F5	A213G	G	1052	C	SPRED2	E273K	C	884	T
ROBO1	Y1009H	A	3139	G	SERINC1	G77D	C	374	T	SLC35F5	Q506H	C	1932	A	SPRED3	L194F	C	683	T
ROBO1	V850A	A	2663	G	SERINC1	P444S	G	1474	A	SLC35F5	C248*	G	1158	T	SPRED3	G199E	G	699	A

ROBO1	E255K	C	877	T	SERINC2	G422S	G	1537	A	SLC35F5	L116*	A	761	T	SPRR2A	K66T	T	283	G
ROBO2	D385N	G	1209	A	SERINC2	R42H	G	398	A	SLC35F5	R133C	G	811	A	SPRR2D	S71I	C	272	A
ROBO2	K1053N	G	3215	T	SERINC4	S329G	T	1220	C	SLC36A1	P128S	C	605	T	SPRR2G	P70H	G	248	T
ROBO2	D1125Y	G	3429	T	SERINC4	R309H	C	1161	T	SLC36A2	S275Y	G	926	T	SPRR4	P56L	C	216	T
ROBO2	P1196H	C	3643	A	SERINC5	K111T	T	489	G	SLC36A4	K442N	C	1423	A	SPRY1	R66Q	G	384	A
ROBO2	S1334R	A	4056	C	SERP1	S65Y	G	558	T	SLC36A4	R152W	G	551	A	SPRY2	C244W	G	1113	C
ROBO2	-	G	0	A	SERPINA10	Y292N	A	1340	T	SLC36A4	Q48R	T	240	C	SPRYD3	R32Q	C	148	T
ROBO2	R122Q	G	421	A	SERPINA10	E30K	C	554	T	SLC37A1	A317T	G	1361	A	SPRYD5	W131C	G	393	T
ROBO2	R173Q	G	574	A	SERPINA10	G430V	C	1755	A	SLC37A1	A446T	G	1748	A	SPRYD5	A47T	G	139	A
ROBO2	R1366Q	G	4153	A	SERPINA10	-	A	0	C	SLC37A2	R22*	C	315	T	SPSB3	W151*	C	544	T
ROBO3	R115H	G	536	A	SERPINA10	L232I	G	1160	T	SLC37A2	R479W	C	1686	T	SPSB3	S329P	A	1076	G
ROBO3	V1308M	G	4114	A	SERPINA12	L391M	G	1967	T	SLC37A3	R137H	C	614	T	SPSB4	R109H	G	1070	A
ROBO3	G78V	G	425	T	SERPINA12	K330Q	T	1784	G	SLC38A11	-	C	0	A	SPTA1	A2097V	G	6471	A
ROBO4	E882D	C	2684	A	SERPINA3	S226L	C	761	T	SLC38A11	K151T	T	682	G	SPTA1	Q434E	G	1481	C
ROBO4	R96W	G	324	A	SERPINA3	R66*	C	280	T	SLC38A11	F206C	A	847	C	SPTA1	A2226T	C	6857	T
ROBO4	A764T	C	2328	T	SERPINA5	R376H	G	1337	A	SLC38A4	F491C	A	1679	C	SPTA1	K1374R	T	4302	C
ROCK1	E270K	C	1749	T	SERPINA5	P69H	C	416	A	SLC38A4	R292H	C	1082	T	SPTA1	R268*	G	983	A
ROCK2	M1367I	C	4550	A	SERPINA9	A191V	G	733	A	SLC38A5	L143M	G	1271	T	SPTA1	R268*	G	983	A
ROCK2	N547I	T	2089	A	SERPINB10	A267V	C	859	T	SLC38A6	F293V	T	993	G	SPTA1	F1085L	A	3436	C
ROCK2	W190S	C	1018	G	SERPINB13	M214T	T	743	C	SLC38A8	T358M	G	1073	A	SPTA1	E882*	C	2825	A
ROCK2	R1380Q	C	4588	T	SERPINB2	D274N	G	900	A	SLC38A8	A171T	C	511	T	SPTA1	K858T	T	2754	G
ROCK2	K718T	T	2602	G	SERPINB3	N161S	T	626	C	SLC38A9	S182T	C	1137	G	SPTA1	K199Q	T	776	G
ROCK2	R131I	C	841	A	SERPINB3	K296N	C	1032	A	SLC39A1	S176L	G	637	A	SPTAN1	R1534*	C	4710	T
ROD1	R65C	G	193	A	SERPINB3	F387L	G	1305	T	SLC39A1	L38V	G	222	C	SPTAN1	A1027T	G	3189	A
ROD1	V163I	C	487	T	SERPINB3	H330R	T	1133	C	SLC39A10	E212*	G	909	T	SPTAN1	Q881K	C	2751	A
ROD1	S167R	G	501	T	SERPINB3	L114I	G	484	T	SLC39A10	I732T	T	2470	C	SPTAN1	A2064T	G	6300	A
ROM1	E204D	A	1153	C	SERPINB4	F28L	G	200	T	SLC39A11	E306K	C	1010	T	SPTAN1	R2069K	G	6316	A
ROR1	R117L	G	725	T	SERPINB5	R110I	G	621	T	SLC39A12	H284N	C	1123	A	SPTAN1	E1033D	G	3209	T
ROR1	D922N	G	3139	A	SERPINB5	A10S	G	320	T	SLC39A13	L37I	C	280	A	SPTB	V2259I	C	6817	T
ROR1	H359R	A	1451	G	SERPINB5	T108M	C	615	T	SLC39A13	P181H	C	713	A	SPTB	T856M	G	2609	A
ROR1	R332C	C	1369	T	SERPINB8	N133H	A	653	C	SLC39A14	F183L	C	668	G	SPTB	I1256T	A	3809	G
ROR1	G807V	G	2795	T	SERPINB8	E200K	G	854	A	SLC39A3	V206I	C	870	T	SPTB	A2090T	C	6310	T
ROR2	A100T	C	497	T	SERPINB9	V315M	C	1033	T	SLC39A5	P287L	C	1090	T	SPTB	G801V	C	2444	A

ROR2	T327M	G	1179	A	SERPINB9	V267F	C	889	A	SLC39A5	L140I	C	648	A	SPTB	V384L	C	1192	G
ROR2	N458D	T	1571	C	SERPINC1	G360S	C	1197	T	SLC39A8	K160N	C	863	A	SPTB	R447C	G	1381	A
ROR2	G200E	C	798	T	SERPINC1	R356C	G	1185	A	SLC3A1	E483*	G	1523	T	SPTB	R959Q	C	2918	T
ROR2	C135*	G	604	T	SERPINC1	D393A	T	1297	G	SLC3A1	R301W	C	977	T	SPTB	Y83D	A	289	C
ROR2	R108Q	C	522	T	SERPIND1	V65I	G	476	A	SLC3A2	N342K	C	1250	G	SPTBN1	D161Y	G	762	T
RORA	F286L	G	947	T	SERPINE1	R210H	G	786	A	SLC3A2	L416I	C	1470	A	SPTBN1	L2084S	T	6532	C
RORA	I482M	A	1535	C	SERPINE1	K230T	A	846	C	SLC3A2	R634H	G	2125	A	SPTBN1	H1634R	A	5182	G
ROS1	N2234K	G	6901	C	SERPINE2	R393Q	C	1315	T	SLC40A1	G206S	C	1043	T	SPTBN1	R384W	C	1431	T
ROS1	R360I	C	1278	A	SERPINE2	A81V	G	379	A	SLC40A1	H125R	T	801	C	SPTBN1	A2240T	G	6999	A
RP1	T1173K	C	3666	A	SERPINE2	A71V	G	349	A	SLC41A1	A194V	G	1596	A	SPTBN1	R913H	G	3019	A
RP1	D1728V	A	5331	T	SERPINF2	Q312R	A	1012	G	SLC41A2	E154K	C	627	T	SPTBN1	-	G	0	T
RP1	V1148I	G	3590	A	SERPINF2	I235T	T	781	C	SLC41A3	P351S	G	1290	A	SPTBN1	R1375Q	G	4405	A
RP1	L1186V	T	3704	G	SERPING1	A202T	G	970	A	SLC43A1	-	A	0	G	SPTBN1	W970R	T	3189	C
RP1	K2022N	G	6214	T	SERPING1	E76K	G	592	A	SLC43A1	R534C	G	1856	A	SPTBN1	Q1440H	A	4601	C
aaRP1L1	V1163I	C	3716	T	SERPINH1	S266N	G	1026	A	SLC43A2	V440M	C	1407	T	SPTBN2	R387H	C	1232	T
RP1L1	P888L	G	2892	A	SERPINI1	S232Y	C	1107	A	SLC43A2	P513H	G	1627	T	SPTBN2	E1702K	C	5176	T
RP1L1	A1709T	C	5354	T	SERPINI2	E245D	T	1034	G	SLC44A1	-	T	0	C	SPTBN2	R1066Q	C	3269	T
RP1L1	R1609C	G	5054	A	SERPINI2	Q141E	G	720	C	SLC44A2	G508D	G	1604	A	SPTBN2	R1959Q	C	5948	T
RP1L1	R720K	C	2388	T	SERTAD1	G193D	C	737	T	SLC44A2	L41P	T	203	C	SPTBN2	A1171V	G	3584	A
RP1L1	R130Q	C	618	T	SERTAD1	P196A	G	745	C	SLC44A3	S425L	C	1376	T	SPTBN2	L1566M	G	4768	T
RP1L1	S484N	C	1680	T	SERTAD3	A74V	G	388	A	SLC44A3	G257C	G	871	T	SPTBN2	A2266T	C	6868	T
RP1L1	R423Q	C	1497	T	SERTAD4	R51Q	G	382	A	SLC44A3	E602D	A	1908	C	SPTBN2	R1572C	G	4786	A
RP1L1	D2313Y	C	7166	A	SERTAD4	V82M	G	474	A	SLC44A5	L126V	A	490	C	SPTBN2	R1686W	G	5128	A
RP1L1	E1423*	C	4496	A	SERTAD4	P238L	C	943	T	SLC44A5	D38Y	C	226	A	SPTBN2	G479V	C	1508	A
RP1L1	K1419N	T	4486	G	SERTAD4	N8T	A	253	C	SLC44A5	S587P	A	1873	G	SPTBN4	F280L	C	942	A
RP1L1	K311T	T	1161	G	SESN1	A124T	C	371	T	SLC44A5	S197R	T	703	G	SPTBN4	L317R	T	1052	G
RP1L1	S89N	C	495	T	SESN1	Y446D	A	1337	C	SLC44A5	Q81R	T	356	C	SPTBN4	V937I	G	2911	A
RP9	R110H	C	347	T	SESN1	N322D	T	965	C	SLC45A1	G672R	G	2014	A	SPTBN4	R1191C	C	3673	T
RPA1	R412H	G	1357	A	SESN3	D337Y	C	1231	A	SLC45A1	R545C	C	1633	T	SPTBN4	R2285H	G	6956	A
RPA1	W197G	T	711	G	SESN3	M476I	C	1650	T	SLC45A2	P351S	G	1198	A	SPTBN4	A586V	C	1859	T
RPA1	R210H	G	751	A	SESN3	S258Y	G	995	T	SLC45A2	V115M	C	490	T	SPTBN4	R1844*	C	5632	T
RPA2	K125N	C	445	A	SESTD1	R570C	G	2025	A	SLC45A2	G343D	C	1175	T	SPTBN5	A1832V	G	5723	A
RPA4	R105Q	G	612	A	SESTD1	E656K	C	2283	T	SLC45A2	L107I	G	466	T	SPTBN5	R646H	C	2165	T
RPAP1	R137W	G	533	A	SESTD1	Y554C	T	1978	C	SLC45A2	V504I	C	1657	T	SPTBN5	R430H	C	1517	T
RPAP1	E509K	C	1649	T	SETBP1	S830F	C	2795	T	SLC45A2	V217A	A	797	G	SPTBN5	A2200S	C	6826	A
RPAP2	P515S	C	1652	T	SETBP1	A549T	G	1951	A	SLC45A3	S169R	T	801	G	SPTBN5	R1931H	C	6020	T
RPAP3	N239H	T	715	G	SETBP1	A1385T	G	4459	A	SLC45A3	R272C	G	1110	A	SPTBN5	R1709Q	C	5354	T
RPAP3	K430T	T	1289	G	SETBP1	E862A	A	2891	C	SLC45A3	R81H	C	538	T	SPTBN5	A3389V	G	1039 4	A
RPAP3	K82N	T	246	G	SETBP1	R942W	C	3130	T	SLC45A3	H240N	G	1014	T	SPTBN5	A1818T	C	5680	T

RPAP3	E9K	C	25	T	SETBP1	T508M	C	1829	T	SLC45A3	R81C	G	537	A	SPTBN5	R2371Q	C	7340	T
RPGR	G1019W	C	3232	A	SETBP1	S716G	A	2452	G	SLC45A4	A394T	C	1180	T	SPTBN5	G3134R	C	9628	T
RPGR	L237R	A	887	C	SETBP1	R530Q	G	1895	A	SLC45A4	K543T	T	1628	G	SPTBN5	E2510K	C	7756	T
RPGR	D378N	C	1309	T	SETD1A	R312H	G	1621	A	SLC45A4	R766L	C	2297	A	SPTBN5	E510K	C	1756	T
RPGRIP1	R984I	G	2951	T	SETD1A	R745W	C	2919	T	SLC46A3	D287N	C	1358	T	SPTBN5	A241D	G	950	T
RPGRIP1	-	A	0	C	SETD1A	R889W	C	3351	T	SLC47A1	V338I	G	1098	A	SPTBN5	R2885C	G	8881	A
RPGRIP1	R1018I	G	3053	T	SETD1A	T1446M	C	5023	T	SLC47A1	M521I	G	1649	A	SPTLC1	D205G	T	652	C
RPGRIP1L	R94W	G	344	A	SETD1B	L681P	T	2048	C	SLC47A1	A120V	C	445	T	SPTLC1	G489V	C	1504	A
RPGRIP1L	A284T	C	914	T	SETD1B	S350L	C	1055	T	SLC47A1	E273G	A	904	G	SPTLC2	R88*	G	450	A
RPGRIP1L	Q684R	T	2115	C	SETD1B	R996Q	G	2993	A	SLC47A2	N391H	T	1222	G	SPTLC3	R121*	C	635	T
RPGRIP1L	T677A	T	2093	C	SETD1B	R852C	C	2560	T	SLC4A1	P97Q	G	446	T	SPTY2D1	L7I	G	235	T
RPGRIP1L	R1150W	G	3512	A	SETD1B	R966K	G	2903	A	SLC4A1	D6Y	C	172	A	SPZ1	K74Q	A	412	C
RPGRIP1L	S989Y	G	3030	T	SETD1B	L809F	C	2431	T	SLC4A1	D807G	T	2576	C	SPZ1	E239*	G	907	T
RPGRIP1L	R744*	G	2294	A	SETD1B	S1232R	A	3700	C	SLC4A1	R344*	G	1186	A	SPZ1	N364K	T	1284	G
RPH3A	P190L	C	569	T	SETD1B	D1134V	A	3407	T	SLC4A10	R757*	C	2362	T	SQLE	R99K	G	1222	A
RPH3A	C140R	T	418	C	SETD1B	P552S	C	1660	T	SLC4A10	H719R	A	2249	G	SQSTM1	M1V	A	179	G
RPH3A	Q607K	C	1819	A	SETD2	-	C	0	A	SLC4A10	D762A	A	2378	C	SRBD1	E99*	C	358	A
RPIA	R136C	C	461	T	SETD2	R1322Q	C	4008	T	SLC4A10	E533V	A	1691	T	SRBD1	A180T	C	601	T
RPIA	V294I	G	935	A	SETD2	L1855P	A	5607	G	SLC4A10	A348V	C	1136	T	SRBD1	V274I	C	883	T
RPIA	L84M	C	305	A	SETD2	R433P	C	1341	G	SLC4A10	V424G	T	1364	G	SRBD1	K45N	C	198	A
RPL10L	K156M	T	556	A	SETD2	R1322Q	C	4008	T	SLC4A10	I487F	A	1552	T	SRC	P493L	C	1653	T
RPL10L	Q133R	T	487	C	SETD2	E1115D	T	3388	G	SLC4A10	W498R	T	1585	C	SRC	L367M	C	1274	A
RPL11	R35*	C	148	T	SETD2	S511Y	G	1575	T	SLC4A11	V167I	C	601	T	SRCAP	R2767Q	G	8685	A
RPL11	R16C	C	91	T	SETD2	K115N	T	388	G	SLC4A11	R86*	G	358	A	SRCAP	R2151H	G	6837	A
RPL11	E66G	A	242	G	SETD3	E495G	T	1644	C	SLC4A11	A578T	C	1834	T	SRCAP	S2596L	C	8172	T
RPL13	S140Y	C	504	A	SETD3	T364I	G	1251	A	SLC4A11	D480G	T	1541	C	SRCAP	T2889P	A	9050	C
RPL15	R96Q	G	926	A	SETD3	E94D	C	442	A	SLC4A11	T517M	G	1652	A	SRCAP	E95K	G	668	A
RPL23P8	D30N	C	189	T	SETD3	M152T	A	615	G	SLC4A11	R374W	G	1222	A	SRCAP	R840Q	G	2904	A
RPL27	N76S	A	272	G	SETD3	D275G	T	984	C	SLC4A11	I102V	T	406	C	SRCIN1	T772M	G	2540	A
RPL31	R44W	C	153	T	SETD3	K8Q	T	182	G	SLC4A1AP	G161C	G	763	T	SRCIN1	R120H	C	584	T
RPL34	K71N	G	257	T	SETD4	R90Q	C	509	T	SLC4A2	G766S	G	3336	A	SRCIN1	A236V	G	932	A
RPL35A	A48T	G	409	A	SETD5	T606A	A	1830	G	SLC4A2	T877M	C	3670	T	SRCIN1	R1023H	C	3293	T
RPL35A	K54N	G	429	T	SETD5	R465W	C	1407	T	SLC4A2	M244V	A	1770	G	SRCRB4D	R109L	C	674	A
RPL36	R85K	G	323	A	SETD5	A366D	C	1111	A	SLC4A2	S813I	G	3478	T	SRCRB4D	R467L	C	1748	A
RPL36AL	E92K	C	392	T	SETD5	F1149C	T	3460	G	SLC4A2	W992C	G	4016	T	SRCRB4D	G508S	C	1870	T
RPL37A	T78M	C	919	T	SETD5	Q433H	A	1313	C	SLC4A3	R1043W	C	3341	T	SRD5A2	E174*	C	520	A
RPL3L	T346M	G	1084	A	SETD5	E513*	G	1551	T	SLC4A3	R1130C	C	3602	T	SRD5A3	F76L	T	456	G
RPL4	R337Q	C	1103	T	SETD5	F796L	T	2400	C	SLC4A3	E113D	G	553	T	SREBF1	R39G	T	284	C
RPLP0	Y24N	A	307	T	SETD6	R31W	C	141	T	SLC4A3	-	G	0	T	SREBF1	G481S	C	1610	T

RPN1	R263C	G	836	A	SETD7	-	T	0	C	SLC4A3	Y1143H	T	3641	C	SREBF1	A249V	G	915	A
RPN2	A160V	C	790	T	SETD7	G70D	C	846	T	SLC4A4	N220S	A	776	G	SREBF2	R90Q	G	435	A
RPN2	T24M	C	382	T	SETD7	S3R	T	644	G	SLC4A4	K404N	G	1329	T	SRFBP1	R292Q	G	947	A
RPN2	P511H	C	1843	A	SETD8	V315I	G	1369	A	SLC4A4	F487I	T	1576	A	SRGAP1	N66Y	A	252	T
RPP38	V117I	G	708	A	SETD8	E73D	G	645	T	SLC4A4	F713I	T	2254	A	SRGAP1	T386A	A	1212	G
RPP40	S53L	G	203	A	SETDB1	V863M	G	2704	A	SLC4A4	E56D	A	285	C	SRGAP1	L285M	C	909	A
RPP40	K326N	T	1023	G	SETDB1	R923W	C	2884	T	SLC4A5	D1099N	C	3693	T	SRGAP1	T945M	C	2890	T
RPRD1A	E278*	C	1004	A	SETDB1	G391C	G	1288	T	SLC4A5	R1059*	G	3573	A	SRGAP1	L845S	T	2590	C
RPRD1B	D65Y	G	595	T	SETDB1	T492A	A	1591	G	SLC4A5	R410Q	C	1627	T	SRGAP2	R797H	G	2390	A
RPRD2	E284*	G	854	T	SETX	A314T	C	1123	T	SLC4A7	R1168W	G	3723	A	SRGAP2	P575S	C	1723	T
RPRD2	V1106I	G	3320	A	SETX	P2510T	G	7711	T	SLC4A7	R804I	C	2632	A	SRGAP3	K985N	C	3057	G
RPRD2	A289S	G	869	T	SETX	K2031N	C	6276	A	SLC4A8	A528T	G	1760	A	SRGAP3	R866H	C	2699	T
RPRD2	G1303V	G	3912	T	SETX	K596Q	T	1969	G	SLC4A8	M1070I	G	3388	A	SRGAP3	R211H	C	734	T
RPRD2	F708V	T	2126	G	SEZ6	R523C	G	1761	A	SLC4A8	K411T	A	1410	C	SRGAP3	Q191*	G	673	A
RPRM	V27M	C	322	T	SEZ6L	P645S	C	2028	T	SLC4A8	I1064S	T	3369	G	SRGAP3	T916M	G	2849	A
RPRM	V61A	A	425	G	SEZ6L	T786A	A	2451	G	SLC4A9	A505V	C	1549	T	SRI	Y3C	T	61	C
RPRM	A42T	C	367	T	SEZ6L	Y370H	T	1203	C	SLC4A9	S95F	C	319	T	SRI	A64V	G	244	A
RPRML	A46V	G	378	A	SEZ6L	E36D	G	203	T	SLC5A1	A575V	C	1974	T	SRL	R836H	C	2507	T
RPS10	-	C	0	T	SEZ6L	A98V	C	388	T	SLC5A1	T519A	A	1805	G	SRMS	A353T	C	1098	T
RPS24	R110H	G	471	A	SEZ6L2	T477M	G	1648	A	SLC5A10	G515R	G	1584	A	SRMS	S94L	G	322	A
RPS24	K263T	A	930	C	SEZ6L2	P372H	G	1333	T	SLC5A10	T25I	C	115	T	SRMS	D378N	C	1173	T
RPS27L	L96P	A	381	G	SEZ6L2	R640M	C	2137	A	SLC5A10	T98M	C	334	T	SRP14	A110T	C	400	T
RPS6	R198H	C	652	T	SEZ6L2	E513*	C	1755	A	SLC5A11	R331H	G	1614	A	SRP68	R335H	C	1039	T
RPS6KA1	R734W	C	2249	T	SF1	R260C	G	855	A	SLC5A11	V658I	G	2594	A	SRP68	R95Q	C	319	T
RPS6KA1	R597H	G	1839	A	SF1	R227H	C	757	T	SLC5A11	R244Q	G	1353	A	SRP72	L339S	T	1737	C
RPS6KA1	R313W	C	986	T	SF1	R380Q	C	1216	T	SLC5A11	L106V	T	938	G	SRPK1	K284T	T	851	G
RPS6KA2	T247M	G	1081	A	SF3A2	R26C	C	198	T	SLC5A11	E234D	G	1324	T	SRPK1	N234I	T	701	A
RPS6KA3	A4V	G	219	A	SF3A2	H429R	A	1408	G	SLC5A12	I252T	A	1065	G	SRPK2	K569T	T	1706	G
RPS6KA3	A178E	G	741	T	SF3A3	R356Q	C	2023	T	SLC5A12	G195S	C	893	T	SRPK2	G198D	C	593	T
RPS6KA4	R511H	G	1597	A	SF3A3	M19V	T	1011	C	SLC5A2	V532M	G	1613	A	SRPX	P268S	G	909	A
RPS6KA4	V328A	T	1048	C	SF3A3	F130L	G	1346	T	SLC5A3	D223N	G	1179	A	SRR	A123V	C	436	T
RPS6KA4	Y44H	T	195	C	SF3B1	R1041H	C	3214	T	SLC5A3	R364W	C	1602	T	SRRD	R207W	C	633	T
RPS6KA5	S263Y	G	1003	T	SF3B1	R939H	C	2908	T	SLC5A4	R414W	G	1252	A	SRRM1	R568Q	G	1731	A
RPS6KA5	Y683H	A	2262	G	SF3B1	R568C	G	1794	A	SLC5A4	V33G	A	110	C	SRRM1	R661H	G	2010	A
RPS6KA5	E754K	C	2475	T	SF3B2	I43T	T	168	C	SLC5A5	I432V	A	1641	G	SRRM1	P261L	C	810	T
RPS6KA6	-	C	0	A	SF3B2	A774V	C	2361	T	SLC5A5	R376Q	G	1474	A	SRRM1	E258*	G	800	T
RPS6KA6	T447A	T	1347	C	SF3B2	A164T	G	530	A	SLC5A6	L402I	G	1678	T	SRRM1	R419I	G	1284	T
RPS6KA6	L303I	G	915	T	SF3B2	P713Q	C	2178	A	SLC5A6	P564Q	G	2165	T	SRRM1	K799T	A	2424	C
RPS6KB2	G245C	G	815	T	SF3B3	R690C	C	2279	T	SLC5A6	R253W	G	1231	A	SRRM2	R796C	C	2935	T

RPS6KB2	R364W	C	1172	T	SF3B3	R692W	C	2285	T	SLC5A6	V545D	A	2108	T	SRRM2	R814C	C	2989	T
RPS6KC1	L115V	C	493	G	SF3B4	R374C	G	1705	A	SLC5A7	R38H	G	402	A	SRRM2	R1932H	G	6344	A
RPS6KC1	Q21P	A	212	C	SF3B4	R186H	C	1142	T	SLC5A7	L421M	C	1550	A	SRRM2	R280Q	G	1388	A
RPS6KC1	-	G	0	A	SF4	A355T	C	1065	T	SLC5A9	S332L	C	1047	T	SRRM2	S1103Y	C	3857	A
RPS6KL1	R58Q	C	424	T	SF4	A275V	G	826	A	SLC5A9	S90G	A	320	G	SRRM2	R247W	C	1288	T
RPS6KL1	Q335H	C	1256	A	SF4	R310Q	C	931	T	SLC6A1	R579H	G	2157	A	SRRM2	R403H	G	1757	A
RPTN	K233N	T	764	G	SF4	F83C	A	250	C	SLC6A1	R195H	G	1005	A	SRRM2	R1689C	C	5614	T
RPTN	A256S	C	831	A	SFI1	R924H	G	2876	A	SLC6A1	V342M	G	1445	A	SRRM2	A2062D	C	6734	A
RPTOR	S285G	A	1658	G	SFI1	A399T	G	1300	A	SLC6A1	V342M	G	1445	A	SRRM2	P2400L	C	7748	T
RPTOR	D1042N	G	3929	A	SFI1	R670L	G	2114	T	SLC6A11	T588M	C	1829	T	SRRM2	R682C	C	2593	T
RPTOR	R1148W	C	4247	T	SFMBT1	R646I	C	2320	A	SLC6A11	R40C	C	184	T	SRRM2	P1084S	C	3799	T
RPTOR	T1071I	C	4017	T	SFMBT1	L281V	A	1224	C	SLC6A11	E165*	G	559	T	SRRM2	L1505P	T	5063	C
RPUSD1	R296W	G	1021	A	SFMBT2	A126T	C	467	T	SLC6A11	D409G	A	1292	G	SRRM2	R2007H	G	6569	A
RPUSD2	R373*	C	1155	T	SFMBT2	R617Q	C	1941	T	SLC6A12	A95V	G	565	A	SRRM2	S573Y	C	2267	A
RPUSD3	V249M	C	747	T	SFMBT2	R617W	G	1940	A	SLC6A13	G7S	C	72	T	SRRM2	R605W	C	2362	T
RPUSD4	F31C	A	146	C	SFMBT2	R772Q	C	2406	T	SLC6A13	A316T	C	999	T	SRRM2	R1945H	G	6383	A
RQCD1	P50H	C	524	A	SFMBT2	R219H	C	747	T	SLC6A14	N552S	A	1743	G	SRRM2	R2089Q	G	6815	A
RQCD1	D269G	A	1181	G	SFMBT2	R241*	G	812	A	SLC6A14	S204G	A	698	G	SRRM4	R611H	G	2124	A
RRAD	R249C	G	897	A	SFN	Y84C	A	302	G	SLC6A15	A707T	C	2612	T	SRRM4	R209Q	G	918	A
RRAD	E137D	C	563	A	SFN	Q244H	G	783	T	SLC6A15	F512C	A	2028	C	SRRM4	E425G	A	1566	G
RRAD	R189H	C	718	T	SFPQ	E489K	C	1564	T	SLC6A15	I428T	A	1776	G	SRRM4	Q10R	A	321	G
RRAGA	I89M	T	553	G	SFPQ	R571*	G	1810	A	SLC6A15	D59N	C	668	T	SRRM4	D165Y	G	785	T
RRAGB	R71H	G	655	A	SFRP1	L243R	A	1042	C	SLC6A16	Y210C	T	863	C	SRRM4	R482*	C	1736	T
RRAGB	T229A	A	1128	G	SFRP1	L25F	G	387	A	SLC6A16	K88T	T	497	G	SRRM5	V242M	G	745	A
RRAGC	K333N	T	1176	A	SFRP2	Q277*	G	1114	A	SLC6A17	W458*	G	1852	A	SRRM5	P395L	C	1205	T
RRAGD	R378*	G	1409	A	SFRP2	A255T	C	1048	T	SLC6A17	V637I	G	2387	A	SRRM5	R309I	G	947	T
RRAS2	-	C	0	T	SFRP4	G8W	C	342	A	SLC6A17	A62T	G	662	A	SRRM5	R389C	C	1186	T
RRBP1	R1021W	G	3365	A	SFRP4	R254Q	C	1081	T	SLC6A19	S431Y	C	1348	A	SRRT	R41I	G	280	T
RRBP1	K746T	T	2541	G	SFRS1	F280C	A	1048	C	SLC6A19	V536M	G	1662	A	SRRT	R690C	C	2226	T
RRBP1	R1365C	G	4397	A	SFRS11	R335C	C	1085	T	SLC6A19	P265L	C	850	T	SRRT	Q842H	G	2684	T
RRBP1	R700H	C	2403	T	SFRS11	R275W	C	905	T	SLC6A19	L443P	T	1384	C	SS18L2	L25I	C	281	A
RRBP1	E1284K	C	4154	T	SFRS11	R254C	C	842	T	SLC6A19	P579L	C	1792	T	SS18L2	-	A	442	C
RRBP1	R852W	G	2858	A	SFRS12	A56T	G	325	A	SLC6A2	L458M	C	1423	A	SSB	M142T	T	599	C
RRBP1	R806W	G	2720	A	SFRS12	V94A	T	440	C	SLC6A2	A105V	C	365	T	SSB	Q243H	G	903	T
RRBP1	E1178K	C	3836	T	SFRS12	G4S	G	169	A	SLC6A2	D298E	C	945	A	SSBP1	S58A	T	305	G
RREB1	S970Y	C	3446	A	SFRS12IP1	A64T	C	299	T	SLC6A20	V547M	C	1755	T	SSBP2	R79C	G	283	A
RREB1	R1472H	G	4952	A	SFRS12IP1	D53N	C	266	T	SLC6A20	D136N	C	522	T	SSBP3	V31I	C	502	T
RREB1	T1240I	C	4256	T	SFRS13B	R257H	C	898	T	SLC6A3	G293S	C	1003	T	SSBP3	A285T	C	1264	T
RREB1	A1403T	G	4744	A	SFRS13B	L158*	A	601	C	SLC6A3	D436N	C	1432	T	SSBP4	P150L	C	772	T

RRH	R302W	C	938	T	SFRS13B	R122Q	C	493	T	SLC6A3	V34A	A	227	G	SSFA2	G578R	G	1911	A
RRH	T225I	C	708	T	SFRS14	R982*	G	3090	A	SLC6A4	R276C	G	1005	A	SSFA2	R819Q	G	2635	A
RRM1	Y717H	T	2353	C	SFRS14	R680Q	C	2185	T	SLC6A4	A547T	C	1818	T	SSFA2	L1007S	T	3199	C
RRM2B	K80N	C	484	A	SFRS14	S153Y	G	604	T	SLC6A4	G67*	C	378	A	SSH1	S147N	C	519	T
RRM2B	F323L	G	1213	T	SFRS15	A247D	G	740	T	SLC6A5	K342N	G	1299	T	SSH1	S777L	G	2409	A
RRN3	M318V	T	1033	C	SFRS15	E1136K	C	3406	T	SLC6A5	V421A	T	1535	C	SSH1	D31N	C	170	T
RRP12	K1124N	C	3484	A	SFRS15	P1135T	G	3403	T	SLC6A5	D322Y	G	1237	T	SSH1	V397M	C	1268	T
RRP12	P762L	G	2397	A	SFRS15	-	C	0	T	SLC6A5	E536D	G	1881	T	SSH2	L1124V	A	3522	C
RRP12	V178I	C	644	T	SFRS18	G49*	C	350	A	SLC6A5	D577A	A	2003	C	SSH2	S1322Y	G	4117	T
RRP8	R401Q	C	1226	T	SFRS18	R418Q	C	1458	T	SLC6A7	M605I	G	2186	T	SSH3	R303C	C	1003	T
RRP9	R81C	G	315	A	SFRS18	-	C	0	A	SLC6A7	Y497C	A	1861	G	SSPN	A62T	G	284	A
RS1	E215*	C	684	A	SFRS2IP	P1277L	G	4064	A	SLC6A8	G518D	G	1553	A	SSPN	E113G	A	438	G
RS1	R191Q	C	613	T	SFRS2IP	R1244C	G	3964	A	SLC6A9	N237D	T	901	C	SSPO	A1035V	C	3104	T
RSAD1	A15T	G	128	A	SFRS2IP	N188I	T	797	A	SLC6A9	A86V	G	449	A	SSPO	R3517H	G	1055 0	A
RSAD2	E267K	G	935	A	SFRS2IP	P609H	G	2060	T	SLC6A9	A6T	C	182	T	SSPO	P2368T	C	7102	A
RSAD2	L252V	T	890	G	SFRS2IP	L94F	C	516	A	SLC7A1	R16W	G	329	A	SSPO	T4404M	C	1321 1	T
RSBN1	R660W	G	2014	A	SFRS2IP	K166E	T	730	C	SLC7A10	V150A	A	596	G	SSPO	R4078H	G	1223 3	A
RSBN1L	A111T	G	358	A	SFRS3	R75C	C	339	T	SLC7A10	A301V	G	1049	A	SSPO	Q1002*	C	3004	T
RSC1A1	N295S	A	884	G	SFRS3	R141W	C	537	T	SLC7A11	N293H	T	1157	G	SSPO	C4449Y	G	1334 6	A
RSF1	D1042N	C	3244	T	SFRS4	S316G	T	1181	C	SLC7A14	A759V	G	2592	A	SSPO	L1643M	C	4927	A
RSF1	P1340L	G	4139	A	SFRS5	R95Q	G	572	A	SLC7A14	G475V	C	1740	A	SSPO	H1981Y	C	5941	T
RSF1	R1272*	G	3934	A	SFRS5	R242H	G	1013	A	SLC7A14	S302Y	G	1221	T	SSPO	R3381Q	G	1014 2	A
RSF1	L596I	G	1906	T	SFRS6	R111M	G	438	T	SLC7A2	A382T	G	1261	A	SSPO	R142Q	G	425	A
RSL1D1	-	A	0	C	SFRS7	P193L	G	816	A	SLC7A2	M246I	G	855	A	SSPO	T1024I	C	3071	T
RSPH3	R403C	G	1397	A	SFRS7	G5W	C	251	A	SLC7A2	T177I	C	647	T	SSPO	H3584R	A	1075 1	G
RSPH3	Y260C	T	969	C	SFRS7	R142*	G	662	A	SLC7A2	L404M	C	1327	A	SSPO	T4442I	C	1332 5	T
RSPH4A	Y657H	T	2106	C	SFRS8	A546V	C	1777	T	SLC7A2	S619G	A	1972	G	SSPO	R247W	C	739	T
RSPH4A	M364I	G	1229	A	SFRS8	T410I	C	1369	T	SLC7A2	T694A	A	2197	G	SSPO	V3719I	G	1115 5	A
RSPH4A	D528A	A	1720	C	SFT2D1	G71S	C	321	T	SLC7A2	P355L	C	1181	T	SSPO	R1708Q	G	5123	A
RSPH4A	L552F	C	1791	T	SFT2D3	F108L	T	828	C	SLC7A3	G612S	C	1979	T	SSPO	V2404M	G	7210	A
RSPH6A	Q336*	G	1149	A	SFTPA2	P36H	G	192	T	SLC7A3	E56D	C	313	A	SSPO	C4292Y	G	1287 5	A
RSPO1	G209V	C	1414	A	SFTPB	A226V	G	683	A	SLC7A4	G599V	C	1864	A	SSPO	R5118C	C	1535 2	T

RSPO1	R70C	G	996	A	SFXN1	M108V	A	576	G	SLC7A4	A328V	G	1051	A	SSPO	V997M	G	2989	A
RSPO2	D108Y	C	980	A	SFXN1	K253N	G	1013	T	SLC7A6OS	D162Y	C	503	A	SSPO	R1784H	G	5351	A
RSPO3	E66K	G	351	A	SFXN2	E251V	A	919	T	SLC7A8	R346*	G	1762	A	SSPO	F1149V	T	3445	G
RSRC1	R130H	G	547	A	SFXN4	F271L	A	833	C	SLC7A9	T59M	G	293	A	SSPO	R4992C	C	1497 4	T
RSRC2	S192R	G	722	C	SFXN5	R152H	C	586	T	SLC7A9	V346I	C	1153	T	SSPO	R1876C	C	5626	T
RSU1	L128I	G	407	T	SFXN5	A22T	C	195	T	SLC7A9	A70V	G	326	A	SSPO	P1619S	C	4855	T
RTDR1	M298V	T	1089	C	SFXN5	M105T	A	445	G	SLC7A9	I355V	T	1180	C	SSR3	A191T	C	631	T
RTEL1	D12Y	G	861	T	SGCA	G162R	G	520	A	SLC7A9	I444V	T	1447	C	SSRP1	R22*	G	331	A
RTEL1	A1100T	G	4125	A	SGCA	R34H	G	137	A	SLC7A9	S373L	G	1235	A	SSRP1	S481P	A	1708	G
RTEL1	W89R	T	1092	C	SGCB	S279T	C	1059	G	SLC8A1	R255K	C	925	T	SSSCA1	V80M	G	258	A
RTEL1	H795Y	C	3210	T	SGCD	E5K	G	532	A	SLC8A1	D760Y	C	2439	A	SST	E71D	T	321	G
RTF1	R707*	C	2131	T	SGCD	L70P	T	728	C	SLC8A2	E706D	C	2396	G	SSTR1	A165V	C	1111	T
RTF1	L196V	C	598	G	SGCE	T386M	G	1268	A	SLC8A3	A759T	C	3029	T	SSTR2	V330I	G	1348	A
RTKN	V12M	C	117	T	SGCG	R79H	G	360	A	SLC9A1	T685M	G	2630	A	SSTR3	V56M	C	700	T
RTKN	R542Q	C	1708	T	SGCG	I211V	A	755	G	SLC9A1	P715S	G	2719	A	SSTR5	A85T	G	324	A
RTN1	R552L	C	1991	A	SGCG	F189L	T	691	G	SLC9A10	E323D	T	1222	G	SSTR5	A275V	C	895	T
RTN1	G391R	C	1507	T	SGCZ	-	T	0	C	SLC9A10	G114S	C	593	T	SSU72	D50N	C	460	T
RTN2	R87H	C	488	T	SGCZ	S267*	G	1516	T	SLC9A10	E643K	C	2180	T	SSX1	P109L	C	462	T
RTN2	R135H	C	632	T	SGIP1	S638P	T	2050	C	SLC9A11	F317L	G	1374	T	SSX2IP	S290Y	G	1133	T
RTN3	M964T	T	3010	C	SGIP1	S304P	T	1048	C	SLC9A11	L99S	A	719	G	SSX2IP	I397S	A	1454	C
RTN3	L207S	T	739	C	SGIP1	W776R	T	2464	A	SLC9A11	E454D	C	1785	A	SSX7	I18T	A	186	G
RTN4	P145H	G	678	T	SGIP1	P729S	C	2323	T	SLC9A2	A31T	G	233	A	ST14	G31V	G	285	T
RTN4	T837A	T	2753	C	SGIP1	S107Y	C	458	A	SLC9A3	T374M	G	1131	A	ST14	-	G	0	A
RTN4IP1	A213T	C	1103	T	SGIP1	S541L	C	1760	T	SLC9A3	R24W	G	80	A	ST14	H78Y	C	425	T
RTN4R	R510H	C	1528	T	SGIP1	V140I	G	556	A	SLC9A3	A86V	G	267	A	ST18	A1041T	C	3941	T
RTN4R	A444V	G	1330	A	SGK1	P58S	G	770	A	SLC9A3R2	A298T	G	898	A	ST18	E932*	C	3614	A
RTN4R	S162G	T	483	C	SGK2	A119V	C	575	T	SLC9A3R2	R254Q	G	767	A	ST18	D811Y	C	3251	A
RTP1	R10C	C	58	T	SGMS1	Q381K	G	2077	T	SLC9A3R2	R275W	C	829	T	ST20	I64F	T	870	A
RTP2	G193D	C	1007	T	SGOL1	R476C	G	1566	A	SLC9A4	A327V	C	1437	T	ST3GAL1	T186A	T	933	C
RTP2	R151C	G	880	A	SGOL2	R718W	C	2250	T	SLC9A4	A108V	C	780	T	ST3GAL1	R135M	C	781	A
RTP3	L70P	T	781	C	SGOL2	R276C	C	924	T	SLC9A4	I592T	T	2232	C	ST3GAL2	E138K	C	1555	T
RTP3	R121*	C	933	T	SGOL2	I16S	T	145	G	SLC9A4	S436A	T	1763	G	ST3GAL3	P194S	C	757	T
RTTN	D1541Y	C	4689	A	SGPL1	L453P	T	1558	C	SLC9A5	R613H	G	1903	A	ST3GAL3	R339Q	G	1193	A
RTTN	R1501W	G	4569	A	SGPL1	K27N	G	281	T	SLC9A5	V546I	G	1701	A	ST3GAL5	L73F	G	326	A
RTTN	V1419M	C	4323	T	SGPL1	E187*	G	759	T	SLC9A7	T623M	G	1894	A	ST3GAL6	E222*	G	807	T
RTTN	T1252M	G	3823	A	SGSH	V220A	A	746	G	SLC9A7	A308V	G	949	A	ST3GAL6	R280Q	G	982	A
RTTN	R772H	C	2383	T	SGSH	D484E	G	1539	C	SLC9A7	E152K	C	480	T	ST3GAL6	R148*	C	585	T
RTTN	R542Q	C	1693	T	SGSH	R160W	G	565	A	SLC9A8	L300*	T	1109	G	ST3GAL6	S191Y	C	715	A
RUFY1	R368*	C	1114	T	SGSH	E447K	C	1426	T	SLC9A9	R524W	G	1779	A	ST5	A159T	C	661	T

RUFY1	A209V	C	638	T	SGSM1	M486V	A	1463	G	SLC9A9	E132*	C	603	A	ST5	R1095Q	C	3470	T
RUFY1	E376D	G	1140	T	SGSM1	R319H	G	963	A	SLC9A9	F48Y	A	352	T	ST5	V1038I	C	3298	T
RUFY2	Q439K	G	1642	T	SGSM2	M632V	A	2071	G	SLCO1A2	C500Y	C	2220	T	ST5	T986M	G	3143	A
RUFY2	E540D	C	1947	A	SGSM2	I207T	T	797	C	SLCO1A2	P452H	G	2076	T	ST5	A267T	C	985	T
RUFY4	R64W	C	600	T	SGSM2	A996T	G	3163	A	SLCO1B3	R23C	C	133	T	ST6GAL1	W181*	G	1217	A
RUFY4	R515W	C	1953	T	SGSM3	G388S	G	1351	A	SLCO1B3	F410C	T	1295	G	ST6GAL2	R342H	C	1214	T
RUNDC1	V489A	T	1478	C	SGTB	R16W	G	282	A	SLCO1C1	R197C	C	957	T	ST6GALNAC1	L293P	A	1052	G
RUNDC2A	D138N	G	474	A	SH2B1	E260D	G	1052	T	SLCO1C1	E201*	G	969	T	ST6GALNAC1	G394R	C	1354	T
RUNDC2A	V357A	T	1132	C	SH2B1	R555C	C	1935	T	SLCO2A1	F338L	G	1288	C	ST6GALNAC1	F469L	G	1581	T
RUNX1	P395L	G	1629	A	SH2B2	T86M	C	257	T	SLCO2B1	S166L	C	884	T	ST6GALNAC1	K229N	C	861	A
RUNX1	R232W	G	1139	A	SH2B2	R226C	C	676	T	SLCO2B1	K299E	A	1282	G	ST6GALNAC2	R104H	C	566	T
RUNX1T1	S590P	A	1852	G	SH2B3	A84V	C	608	T	SLCO2B1	R434W	C	1687	T	ST6GALNAC3	R59Q	G	324	A
RUNX1T1	A501T	C	1585	T	SH2D2A	E73K	C	319	T	SLCO3A1	V149I	G	659	A	ST6GALNAC4	L38P	A	389	G
RUNX1T1	P593L	G	1862	A	SH2D2A	F21V	A	163	C	SLCO3A1	F668L	C	2218	A	ST6GALNAC4	R144*	G	706	A
RUNX1T1	R604C	G	1894	A	SH2D3A	R541W	G	1815	A	SLCO4C1	E704D	C	2399	A	ST6GALNAC6	P319S	G	1128	A
RUNX1T1	D246G	T	821	C	SH2D3A	E233K	C	891	T	SLCO4C1	K691E	T	2358	C	ST7OT3	R488H	G	1483	A
RUNX1T1	-	C	0	A	SH2D3C	A274V	G	935	A	SLCO4C1	I647V	T	2226	C	ST7OT3	A239V	C	930	T
RUSC2	R682H	G	2183	A	SH2D4A	E120*	G	769	T	SLCO4C1	K337N	T	1298	A	ST7OT3	K43N	A	343	C
RUSC2	A950V	C	2987	T	SH2D4A	E210*	G	1039	T	SLCO5A1	R694Q	C	2697	T	ST8SIA1	P346S	G	1518	A
RUSC2	P1292L	C	4013	T	SH2D4A	R285I	G	1265	T	SLCO5A1	E296*	C	1502	A	ST8SIA2	R251H	G	989	A
RUSC2	D1283N	G	3985	A	SH2D4B	D298Y	G	892	T	SLCO5A1	L360H	A	1695	T	ST8SIA2	I96S	T	524	G
RUVBL2	I247M	C	754	G	SH2D5	P5L	G	12	A	SLCO6A1	D647N	C	2111	T	ST8SIA2	R274C	C	1057	T
RUVBL2	A189V	C	579	T	SH2D5	R76C	G	224	A	SLCO6A1	R693C	G	2249	A	ST8SIA3	F97Y	T	647	A
RUVBL2	E454K	G	1373	A	SH2D5	R256C	G	764	A	SLCO6A1	S587Y	G	1932	T	ST8SIA4	E24*	C	381	A
RWDD1	Q185H	A	634	C	SH2D5	V79I	C	233	T	SLCO6A1	D362Y	C	1256	A	ST8SIA4	K305N	C	1226	A
RWDD2A	R237H	G	915	A	SH2D5	F83V	A	245	C	SLCO6A1	G243*	C	899	A	ST8SIA4	E205V	T	925	A
RWDD2B	T176A	T	627	C	SH3BGRL2	L97P	T	469	C	SLCO6A1	L611V	G	2003	C	ST8SIA4	E155G	T	775	C
RXFP1	K465T	A	1594	C	SH3BGRL3	A117V	C	350	T	SLFN11	G803D	C	2681	T	ST8SIA5	R363*	G	1748	A
RXFP2	M503I	G	1580	A	SH3BP1	S318L	C	1266	T	SLFN11	S80Y	G	512	T	ST8SIA5	A185T	C	1214	T
RXFP2	N306H	A	987	C	SH3BP1	A524S	G	1883	T	SLFN11	E744*	C	2503	A	ST8SIA5	E269K	C	1466	T
RXFP2	D475N	G	1494	A	SH3BP1	Q11*	C	344	T	SLFN12	E263K	C	1311	T	ST8SIA5	F116V	A	1007	C
RXFP3	A441T	G	1678	A	SH3BP2	T239M	C	716	T	SLFN12	R545K	C	2158	T	ST8SIA6	E375*	C	1198	A
RXFP3	A356V	C	1424	T	SH3BP2	R326Q	G	977	A	SLFN12	R540I	C	2143	A	STAB1	G940R	G	2894	A

RXFP3	V387I	G	1516	A	SH3BP4	V341M	G	1425	A	SLFN12	Y522D	A	2088	C	STAB1	R1601H	G	4878	A
RXFP3	V375M	G	1480	A	SH3BP5	R402W	G	1425	A	SLFN12	Q408R	T	1747	C	STAB1	Q26K	C	152	A
RXFP3	A300T	G	1255	A	SH3BP5L	G307R	C	2149	T	SLFN12	K407N	C	1745	A	STAB1	V901I	G	2777	A
RXFP3	S177N	G	887	A	SH3BP5L	K112N	T	1566	G	SLFN13	F866V	A	2872	C	STAB1	A394V	C	1257	T
RXFP3	A97V	C	647	T	SH3GL1	R65Q	C	325	T	SLFN14	R800I	C	2435	A	STAB1	Q1116H	G	3424	T
RXFP3	R81W	C	598	T	SH3GL1	L143I	G	558	T	SLFN14	G77E	C	266	T	STAB2	A1352V	C	4259	T
RXFP3	S183L	C	905	T	SH3GL2	D291G	A	992	G	SLFN14	K38T	T	149	G	STAB2	A2343S	G	7231	T
RXFP4	V293G	T	898	G	SH3GL3	T97M	C	782	T	SLFN14	T635I	G	1940	A	STAB2	R2540W	C	7822	T
RXRA	L383F	C	1199	T	SH3GLB1	T290A	A	873	G	SLFN5	S509L	C	1643	T	STAB2	I660T	T	2183	C
RXRA	A311T	G	983	A	SH3GLB2	D151G	T	577	C	SLFN5	A832V	C	2612	T	STAB2	G86R	G	460	A
RXRA	A121T	G	413	A	SH3GLB2	R273H	C	943	T	SLFN5	R71C	C	328	T	STAB2	T1333M	C	4202	T
RXRA	A416T	G	1298	A	SH3GLB2	A119V	G	481	A	SLFN5	I643T	T	2045	C	STAB2	E2528D	A	7788	C
RXRG	R188C	G	865	A	SH3KBP1	P550L	G	1940	A	SLFN5	D843G	A	2645	G	STAB2	K482N	G	1650	T
RXRG	R217L	C	953	A	SH3KBP1	-	A	2287	G	SLFNL1	Y246C	T	955	C	STAC	A141V	C	722	T
RXRG	R186H	C	860	T	SH3PXD2A	R780H	C	2616	T	SLFNL1	V260M	C	996	T	STAC	T151A	A	751	G
RYBP	D209V	T	624	A	SH3PXD2A	S572N	C	1992	T	SLIT1	R429L	C	1532	A	STAG1	V485L	C	1710	A
RYR1	E798*	G	2522	T	SH3PXD2A	R431C	G	1568	A	SLIT1	D1210N	C	3874	T	STAG1	Q170P	T	766	G
RYR1	L822I	C	2594	A	SH3PXD2A	K298N	C	1171	A	SLIT1	K1328N	C	4230	A	STAG1	P730S	G	2445	A
RYR1	F2973C	T	9048	G	SH3PXD2B	I41M	A	294	C	SLIT1	R546Q	C	1883	T	STAG1	D112V	T	592	A
RYR1	S3374F	C	10251	T	SH3RF2	S171N	G	734	A	SLIT1	R1222C	G	3910	A	STAG1	Q619R	T	2113	C
RYR1	D3529N	G	10715	A	SH3RF3	A298V	C	893	T	SLIT1	Q829R	T	2732	C	STAG2	R1045Q	G	3644	A
RYR1	N609D	A	1955	G	SH3RF3	D327G	A	980	G	SLIT1	R178H	C	779	T	STAG2	R954H	G	3371	A
RYR1	R1024H	G	3201	A	SH3RF3	S585W	C	1754	G	SLIT1	R1091H	C	3518	T	STAG2	A998V	C	3503	T
RYR1	V1551I	G	4781	A	SH3TC1	W177*	G	598	A	SLIT1	R753W	G	2503	A	STAG2	E276D	A	1338	C
RYR1	T5005M	C	15144	T	SH3TC1	R1192H	G	3642	A	SLIT1	A451T	C	1597	T	STAG3	E456G	A	1774	G
RYR1	R644H	G	2061	A	SH3TC1	C729G	T	2252	G	SLIT2	R832*	C	2720	T	STAG3	R460*	A	1785	T
RYR1	A1988T	G	6092	A	SH3TC2	K248N	C	846	A	SLIT2	C869F	G	2832	T	STAG3	P73L	C	625	T
RYR1	P4517S	C	13679	T	SH3TC2	R536W	G	1708	A	SLIT2	R2C	C	230	T	STAG3	T148I	C	850	T
RYR1	A1962V	C	6015	T	SH3TC2	G177D	C	632	T	SLIT2	A459V	C	1602	T	STAG3	A473T	G	1824	A
RYR1	P728Q	C	2313	A	SH3TC2	D285G	T	956	C	SLIT2	R205*	C	839	T	STAG3	E536D	A	2015	C
RYR1	P1779S	C	5465	T	SH3TC2	R1099H	C	3398	T	SLIT2	K478N	G	1660	T	STAG3	E956K	G	3273	A
RYR1	A4504T	G	13640	A	SHANK1	F1585L	A	4772	G	SLIT3	R1177*	G	3949	A	STAM	S358A	T	1287	G
RYR1	V2416A	T	7377	C	SHANK1	P810S	G	2447	A	SLIT3	V596M	C	2206	T	STAM2	K163T	T	838	G
RYR1	T2538M	C	7743	T	SHANK2	G1286C	C	3856	A	SLIT3	-	C	0	A	STAP1	R216W	C	728	T
RYR1	R109Q	G	456	A	SHANK2	E459K	C	1375	T	SLIT3	R1292C	G	4294	A	STAR	V125M	C	637	T
RYR1	K1903R	A	5838	G	SHANK2	A1095T	C	3283	T	SLIT3	I73V	T	637	C	STARD10	T64A	T	1134	C

RYR1	D1056A	A	3297	C	SHANK2	Y524C	T	1571	C	SLITRK1	R52C	G	1040	A	STARD10	P13H	G	982	T
RYR1	E9K	G	155	A	SHANK2	T1312A	T	3934	C	SLITRK1	N481S	T	2328	C	STARD13	P1058L	G	3290	A
RYR1	R207H	G	750	A	SHANK2	A802V	G	2405	A	SLITRK1	G407D	C	2106	T	STARD13	T52A	T	271	C
RYR1	E2296D	A	7018	C	SHANK3	R91*	C	271	T	SLITRK2	R646H	G	6192	A	STARD13	D1011V	T	3149	A
RYR2	D1373E	T	4443	G	SHANK3	V263M	G	787	A	SLITRK2	E555*	G	5918	T	STARD3NL	E179*	G	792	T
RYR2	A2268S	G	7126	T	SHANK3	A1189V	C	3566	T	SLITRK2	V662I	G	6239	A	STARD3NL	E228D	G	941	T
RYR2	A3480V	C	10763	T	SHANK3	I765F	A	2293	T	SLITRK3	R249H	C	1190	T	STARD4	E115*	C	478	A
RYR2	K4013N	A	12363	T	SHANK3	L626P	T	1877	C	SLITRK3	S938L	G	3257	A	STARD7	R300H	C	1283	T
RYR2	M4941L	A	15145	T	SHANK3	R1319Q	G	3956	A	SLITRK3	L658I	G	2416	T	STARD7	R232Q	C	1079	T
RYR2	A3527P	G	10903	C	SHANK3	R1379H	G	4136	A	SLITRK4	V516I	C	1639	T	STARD7	L105M	A	697	T
RYR2	R1098W	C	3616	T	SHANK3	T163M	C	488	T	SLITRK4	K94T	T	374	G	STARD8	A995T	G	3197	A
RYR2	V4008M	G	12346	A	SHARPIN	R281C	G	1325	A	SLITRK5	A654T	G	2179	A	STARD8	P1026L	C	3291	T
RYR2	T4884I	C	14975	T	SHB	P212L	G	1201	A	SLITRK5	R335C	C	1222	T	STARD8	R677C	C	2243	T
RYR2	A4245V	C	13058	T	SHC2	V454M	C	1360	T	SLITRK5	A658V	C	2192	T	STARD8	C571*	C	1927	A
RYR2	R4571C	C	14035	T	SHC2	V513I	C	1537	T	SLITRK5	P613T	C	2056	A	STARD9	A1381T	G	4141	A
RYR2	T856M	C	2891	T	SHC2	R580W	G	1738	A	SLITRK5	L283V	C	1066	G	STARD9	E69D	G	207	T
RYR2	E3221K	G	9985	A	SHC2	T238M	G	713	A	SLITRK5	A38T	G	331	A	STARD9	R268H	G	803	A
RYR2	R2088Q	G	6587	A	SHC3	M536I	C	1915	T	SLITRK5	E475G	A	1643	G	STARD9	R541K	G	1622	A
RYR2	T2830A	A	8812	G	SHC3	R177I	C	837	A	SLITRK5	P631H	C	2111	A	STARD9	S1102L	C	3305	T
RYR2	T1347I	C	4364	T	SHC4	I406M	T	1647	C	SLITRK5	E781K	G	2560	A	STARD9	A2821T	G	8461	A
RYR2	S558I	G	1997	T	SHC4	R239Q	C	1145	T	SLITRK5	E947K	G	3058	A	STARD9	V2650A	T	7949	C
RYR2	T644I	C	2255	T	SHC4	R214I	C	1070	A	SLITRK6	F431L	G	1892	T	STARD9	A2724S	G	8170	T
RYR2	G3766D	G	11621	A	SHC4	S162L	G	914	A	SLITRK6	R599*	G	2394	A	STARD9	R2313C	C	6937	T
RYR2	R502H	G	1829	A	SHD	R166Q	G	1960	A	SLITRK6	T411M	G	1831	A	STARD9	Q3358*	C	10072	T
RYR2	P4229L	C	13010	T	SHD	L136F	C	1869	T	SLITRK6	T602M	G	2404	A	STARD9	A1506V	C	4517	T
RYR2	G348R	G	1366	A	SHH	R258W	G	923	A	SLITRK6	L721I	G	2760	T	STARD9	H218N	C	652	A
RYR2	A1922T	G	6088	A	SHH	L76P	A	378	G	SLITRK6	L565I	G	2292	T	STARD9	N392H	A	1174	C
RYR2	E1944K	G	6154	A	SHH	R232Q	C	846	T	SLITRK6	F494C	A	2080	C	STARD9	N529D	A	1585	G
RYR2	F3886L	T	11982	G	SHH	A365T	C	1244	T	SLK	F798C	T	2938	G	STARD9	E1105D	G	3315	T
RYR2	L4505V	T	13837	G	SHISA2	G51D	C	237	T	SLPI	K124E	T	391	C	STARD9	E1165*	G	3493	T

RYR2	V1561L	G	5005	T	SHISA3	S213*	C	856	G	SLTM	F1034I	A	3188	T	STARD9	K1709N	G	5127	T
RYR3	R2025H	G	6144	A	SHISA3	Q22R	A	283	G	SLTM	R635T	C	1992	G	STARD9	E1745*	G	5233	T
RYR3	D708N	G	2192	A	SHISA6	R275*	C	983	T	SLU7	E492V	T	1863	A	STARD9	R2326Q	G	6977	A
RYR3	E3901*	G	1177 1	T	SHISA6	R451H	G	1512	A	SLU7	R263W	G	1175	A	STARD9	S2612Y	C	7835	A
RYR3	E4026K	G	1214 6	A	SHISA6	N245S	A	894	G	SMAD1	R282C	C	1267	T	STARD9	E2952D	G	8856	T
RYR3	V3368M	G	1017 2	A	SHISA7	T139M	G	416	A	SMAD2	R120Q	C	611	T	STARD9	S3103F	C	9308	T
RYR3	V4072L	G	1228 4	C	SHISA7	S434N	C	1301	T	SMAD2	W422*	C	1518	T	STARD9	P3785S	C	1135 3	T
RYR3	R3982Q	G	1201 5	A	SHISA7	R529C	G	1585	A	SMAD2	P177S	G	781	A	STAT1	K550N	T	2038	G
RYR3	R402C	C	1274	T	SHISA7	R74W	G	220	A	SMAD2	T303I	G	1160	A	STAT1	R274Q	C	1209	T
RYR3	R1575C	C	4793	T	SHISA7	A311V	G	932	A	SMAD2	E142*	C	676	A	STAT1	K298Q	T	1280	G
RYR3	R3411W	C	1030 1	T	SHISA9	G299D	G	1240	A	SMAD2	L179*	A	788	C	STAT1	F94V	A	668	C
RYR3	R1518C	C	4622	T	SHISA9	R155Q	G	808	A	SMAD2	R321*	G	1213	A	STAT2	V682F	C	2122	A
RYR3	A2214T	G	6710	A	SHISA9	D120N	G	702	A	SMAD3	R90H	G	579	A	STAT2	K55N	C	243	A
RYR3	R2321C	C	7031	T	SHISA9	D263G	A	1132	G	SMAD3	R368Q	G	1413	A	STAT2	Q42H	C	204	A
RYR3	P1021S	C	3131	T	SHKBP1	P131S	C	440	T	SMAD3	N276I	A	1137	T	STAT3	G342S	C	1156	T
RYR3	A1579T	G	4805	A	SHKBP1	D505N	G	1562	A	SMAD3	R373H	G	1428	A	STAT3	L413M	G	1369	T
RYR3	R3624C	C	1094 0	T	SHMT1	R137C	G	544	A	SMAD3	R287W	C	1169	T	STAT3	E74*	C	352	A
RYR3	R101M	G	372	T	SHMT1	R397Q	C	1325	T	SMAD4	P246R	C	1275	G	STAT4	F94S	A	539	G
RYR3	I528T	T	1653	C	SHMT2	R228Q	G	683	A	SMAD4	R361H	G	1620	A	STAT4	A670V	G	2267	A
RYR3	R3350W	C	1011 8	T	SHMT2	A280V	C	839	T	SMAD4	R361C	C	1619	T	STAT4	D206H	C	874	G
RYR3	A3457T	G	1043 9	A	SHOC2	K416N	G	1593	T	SMAD4	D493A	A	2016	C	STAT4	T369A	T	1363	C
RYR3	E4289*	G	1293 5	T	SHOC2	E100D	G	645	T	SMAD4	S178*	C	1071	A	STAT5A	K384R	A	1793	G
RYR3	N4447S	A	1341 0	G	SHOC2	K459T	A	1721	C	SMAD4	P356S	C	1604	T	STAT5A	R673H	G	2660	A
RYR3	-	A	1468 3	C	SHOC2	E512*	G	1879	T	SMAD4	R361H	G	1620	A	STAT5A	P636S	C	2548	T
S100A12	D50Y	C	266	A	SHOX2	D190N	C	704	T	SMAD4	G299R	G	1433	A	STAT5A	L455F	C	2005	T
S100A12	E6D	C	136	A	SHOX2	V125F	C	509	A	SMAD4	F505Y	T	2052	A	STAT5B	V227M	C	848	T
S100A2	L122F	G	414	A	SHPRH	L1084F	C	3651	A	SMAD4	R361C	C	1619	T	STAT5B	I28T	A	252	G
S100A6	L29P	A	400	G	SHPRH	A1618V	G	5252	A	SMAD4	W509*	G	2065	A	STAT5B	R423Q	C	1437	T
S100A7L2	G103*	C	385	A	SHPRH	V731A	A	2591	G	SMAD4	R380K	G	1677	A	STAT6	E339*	C	1286	A
S100A7L2	D34Y	C	178	A	SHPRH	S1328*	G	4382	T	SMAD4	D351G	A	1590	G	STAT6	P657H	G	2241	T
S100A8	A82T	C	414	T	SHPRH	K512N	C	1935	A	SMAD4	R361C	C	1619	T	STAT6	L364R	A	1362	C

S100B	F44L	G	329	T	SHROOM1	R732Q	C	3000	T	SMAD4	E108*	G	860	T	STAU1	R115M	C	344	A
S100PBP	Y373C	A	1395	G	SHROOM2	E1484K	G	4540	A	SMAD4	R361C	C	1619	T	STAU1	C523*	G	1569	T
S1PR1	L163V	C	739	G	SHROOM2	A191T	G	661	A	SMAD4	G386V	G	1695	T	STAU1	T396S	T	1186	A
S1PR1	A253S	G	1009	T	SHROOM2	A70T	G	298	A	SMAD4	W524S	G	2109	C	STAU2	K273*	T	817	A
S1PR2	R296W	G	997	A	SHROOM2	R751W	C	2341	T	SMAD5	E26D	G	363	T	STAU2	A264V	G	791	A
S1PR2	P226L	G	788	A	SHROOM3	F834L	C	3455	A	SMAD7	A374V	G	1408	A	STAU2	A178T	C	532	T
S1PR2	V84M	C	361	T	SHROOM3	E297K	G	1842	A	SMAD7	N239K	A	1004	T	STAU2	P143T	G	427	T
S1PR3	A121V	C	758	T	SHROOM3	R1857H	G	6523	A	SMAD9	F115L	A	483	G	STC1	R112Q	C	619	T
S1PR5	L83M	G	304	T	SHROOM3	A1478P	G	5385	C	SMAD9	G77R	C	369	T	STC2	G24R	C	1380	T
SAA1	F21L	C	139	A	SHROOM4	S1089L	G	3550	A	SMAD9	R294Q	C	1021	T	STEAP1	A416T	G	1246	A
SAA2	E81D	C	280	A	SI	I1585L	T	4816	G	SMAP2	R37*	C	533	T	STEAP2	I394S	T	1574	G
SAC3D1	R305H	G	914	A	SI	T1753P	T	5320	G	SMAP2	-	G	0	A	STEAP4	E454K	C	1462	T
SACM1L	A379V	C	1340	T	SI	R1230H	C	3752	T	SMAP2	G353*	G	1481	T	STEAP4	R171C	G	613	A
SACM1L	R145W	C	637	T	SI	-	C	0	A	SMARCA2	R1349*	C	4144	T	STIL	P107H	G	475	T
SACS	Y2630H	A	8162	G	SI	K786T	T	2420	G	SMARCA2	K434N	G	1401	T	STIL	A1191T	C	3726	T
SACS	E2280*	C	7112	A	SI	R692H	C	2138	T	SMARCA2	A1188T	G	3661	A	STIL	E1243D	C	3884	A
SACS	E2067*	C	6473	A	SI	R248I	C	806	A	SMARCA2	T1321M	C	4061	T	STIL	K819N	T	2612	G
SACS	E1095K	C	3557	T	SIAE	K400N	C	1359	A	SMARCA4	D1127G	A	3664	G	STIL	D573N	C	1872	T
SACS	R1682M	C	5319	A	SIAH3	R219W	G	762	A	SMARCA4	R381*	C	1425	T	STIL	L247V	A	894	C
SACS	S4429P	A	1355 9	G	SIAH3	H78R	T	340	C	SMARCA4	R966W	C	3180	T	STIM1	K384Q	A	1719	C
SACS	C3329Y	C	1026 0	T	SIDT1	-	G	0	T	SMARCA4	T910M	C	3013	T	STIM1	K408T	A	1792	C
SACS	A4101T	C	1257 5	T	SIDT1	E779K	G	2986	A	SMARCA4	G1146S	G	3720	A	STIM2	R667Q	G	2269	A
SACS	V631M	C	2165	T	SIDT1	Y673N	T	2668	A	SMARCA4	K1098R	A	3577	G	STIP1	R134C	C	400	T
SACS	C2484Y	C	7725	T	SIDT1	V637A	T	2561	C	SMARCA4	R1323C	C	4251	T	STIP1	G414C	G	1240	T
SACS	S3911I	C	1200 6	A	SIDT1	W446R	T	1987	C	SMARCA4	L456P	T	1651	C	STK10	V118M	C	652	T
SACS	E4418*	C	1352 6	A	SIDT1	E786K	G	3007	A	SMARCA4	E371K	G	1395	A	STK10	R817C	G	2749	A
SACS	R4412I	C	1350 9	A	SIDT2	R105H	G	835	A	SMARCA4	S1167L	C	3784	T	STK10	D764Y	C	2590	A
SACS	D3926N	C	1205 0	T	SIDT2	R461H	G	1903	A	SMARCA5	I427V	A	1741	G	STK10	E37D	C	411	A
SACS	D3561Y	C	1095 5	A	SIDT2	R235H	G	1225	A	SMARCA5	R974Q	G	3383	A	STK11	P314H	C	2056	A
SACS	A2980T	C	9212	T	SIGIRR	A23V	G	253	A	SMARCA5	R144C	C	892	T	STK11IP	V34A	T	144	C
SACS	R2906Q	C	8991	T	SIGLEC1	R1555*	G	4663	A	SMARCA5	R501Q	G	1964	A	STK11IP	P790S	C	2411	T
SACS	Q2605H	C	8089	A	SIGLEC1	R578W	G	1732	A	SMARCAL 1	E775*	G	2653	T	STK11IP	R393C	C	1220	T
SACS	E2521*	C	7835	A	SIGLEC1	A237T	C	709	T	SMARCAL	R334*	C	1330	T	STK11IP	S19Y	C	99	A

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SACS	E2384K	C	7424	T	SIGLEC1	H410Y	G	1228	A	SMARCAL 1	T541P	A	1951	C	STK17A	R299G	A	1074	G
SACS	R2093H	C	6552	T	SIGLEC1	P1471T	G	4411	T	SMARCAL 1	T541N	C	1952	A	STK17B	F259L	A	1064	C
SACS	F1495L	G	4759	T	SIGLEC1	P539H	G	1616	T	SMARCAL 1	T541I	C	1952	T	STK3	S326C	C	1193	G
SACS	E1447D	T	4615	G	SIGLEC1	V731M	C	2191	T	SMARCB1	A321T	G	1168	A	STK3	R165P	G	710	C
SACS	K1109*	T	3599	A	SIGLEC1	E1035K	C	3103	T	SMARCB1	R383W	C	1354	T	STK31	K312N	A	1055	C
SACS	R961Q	C	3156	T	SIGLEC1	V69M	C	205	T	SMARCB1	Q252*	C	961	T	STK31	Q753H	G	2378	T
SACS	K853N	T	2833	A	SIGLEC10	R518G	T	2168	C	SMARCC1	R652C	G	2074	A	STK31	Q587R	A	1879	G
SACS	K514Q	T	1814	G	SIGLEC10	R119W	G	971	A	SMARCC1	H570Y	G	1828	A	STK31	R728Q	G	2302	A
SAE1	-	G	0	T	SIGLEC10	-	C	0	A	SMARCC1	K359E	T	1195	C	STK31	N931H	A	2910	C
SAE1	K152T	A	499	C	SIGLEC10	E326D	C	1594	G	SMARCC1	E840*	C	2638	A	STK31	F972L	C	3035	A
SAFB	R629C	C	1952	T	SIGLEC10	L383V	A	1161	C	SMARCC1	Q808H	T	2544	G	STK32A	R145M	G	605	T
SAFB	S455F	C	1431	T	SIGLEC11	A570V	G	1800	A	SMARCC1	S697N	C	2210	T	STK32B	N400K	C	1622	G
SAFB2	P945L	G	3046	A	SIGLEC14	T542M	G	1764	A	SMARCC2	P1050S	G	3254	A	STK32B	R27W	C	501	T
SAFB2	R667C	G	2211	A	SIGLEC14	D501V	T	1641	A	SMARCC2	D110N	C	434	T	STK32B	K46N	G	560	T
SAFB2	G99D	C	508	T	SIGLEC14	L329I	G	1124	T	SMARCD1	R274W	C	990	T	STK32B	D207N	G	1041	A
SAFB2	T561A	T	1893	C	SIGLEC15	M325T	T	1123	C	SMARCD1	D218E	T	824	G	STK32B	L315R	T	1366	G
SAFB2	A780T	C	2550	T	SIGLEC6	R29Q	C	294	T	SMARCD1	R183Q	G	718	A	STK32C	A120T	C	465	T
SAGE1	S382G	A	1218	G	SIGLEC6	T40M	G	327	A	SMARCD2	M375T	A	1441	G	STK32C	P255L	G	871	A
SAGE1	N95D	A	357	G	SIGLEC6	S60L	G	387	A	SMARCD2	R276Q	C	1144	T	STK33	V312I	C	1457	T
SAGE1	L316V	T	1020	G	SIGLEC7	Q164H	G	561	T	SMARCD2	R290W	G	1185	A	STK33	G94D	C	804	T
SAGE1	T375A	A	1197	G	SIGLEC8	E18*	C	119	A	SMARCD2	P154L	G	778	A	STK35	I451L	A	1622	C
SALL1	F436S	A	1325	G	SIGLEC9	R120H	G	426	A	SMARCD2	R233Q	C	1015	T	STK36	C447F	G	1619	T
SALL1	T935M	G	2822	A	SIGLEC9	T223I	C	735	T	SMARCD2	A378T	C	1449	T	STK36	P278H	C	1112	A
SALL1	C832*	A	2514	T	SIK1	G582E	C	1878	T	SMARCD3	Q262*	G	1195	A	STK36	R968C	C	3181	T
SALL1	L185P	A	572	G	SIK1	R470Q	C	1542	T	SMARCD3	E365D	C	1506	A	STK38	N33D	T	383	C
SALL1	G811S	C	2449	T	SIK1	L68V	A	335	C	SMARCD3	S203Y	G	1019	T	STK38	F257V	A	1055	C
SALL1	E1251K	C	3769	T	SIK1	S66I	C	330	A	SMC1A	A1150V	G	3577	A	STK38L	F246L	T	939	G
SALL1	R498C	G	1510	A	SIK2	L510I	C	1624	A	SMC1A	R509H	C	1654	T	STK4	G350*	G	1143	T
SALL2	I66T	A	479	G	SIK2	V777I	G	2425	A	SMC1B	L6V	G	16	C	STK4	I473V	A	1512	G
SALL2	R413C	G	1519	A	SIK2	R672Q	G	2111	A	SMC1B	D332Y	C	994	A	STK4	R304H	G	1006	A
SALL2	M825I	C	2757	A	SIK3	T1160A	T	3476	C	SMC1B	D555Y	C	1663	A	STK40	A363V	G	1262	A
SALL3	R1133H	G	3398	A	SIK3	Q991H	C	2971	A	SMC1B	E63*	C	187	A	STMN2	R30C	C	158	T
SALL3	S600N	G	1799	A	SIK3	L732I	G	2192	T	SMC2	-	G	0	T	STMN4	R205W	G	757	A
SALL3	P376L	C	1127	T	SIKE1	E99D	C	375	A	SMC2	K930E	A	3076	G	STMN4	K123N	C	513	A
SALL3	S1124L	C	3371	T	SIKE1	I75T	A	302	G	SMC2	R1132C	C	3682	T	STOML1	R148H	C	568	T
SALL4	R890Q	C	2736	T	SIL1	C301R	A	1114	G	SMC2	A375D	C	1412	A	STOML1	S250I	C	874	A

SALL4	E1047*	C	3206	A	SIL1	K144T	T	644	G	SMC2	E841*	G	2809	T	STOML1	R122Q	C	490	T
SALL4	A297T	C	956	T	SIL1	R118Q	C	566	T	SMC2	E19K	G	343	A	STOML2	G220R	C	721	T
SAMD3	A428V	G	1283	A	SILV	L593I	G	1865	T	SMC2	D956Y	G	3154	T	STOML2	L276M	G	889	T
SAMD3	R347Q	C	1040	T	SILV	M400V	T	1286	C	SMC2	K1079N	A	3525	C	STOML3	R149I	C	791	A
SAMD4A	P413L	C	1239	T	SIM1	G700D	C	2882	T	SMC3	E975K	G	3049	A	STON1-GTF2A1L	Y1171N	T	3622	A
SAMD4A	G210W	G	629	T	SIM1	H691Y	G	2854	A	SMC3	H55Y	C	289	T	STON1-GTF2A1L	I116L	A	457	C
SAMD4A	G232E	G	696	A	SIM2	A221V	C	1275	T	SMC3	I176L	A	652	C	STON1-GTF2A1L	E737D	A	2322	C
SAMD4A	R152H	G	456	A	SIM2	R163*	C	1100	T	SMC4	S1056L	C	3618	T	STON1-GTF2A1L	K205N	G	726	T
SAMD4B	R259Q	G	1811	A	SIM2	L150M	C	1061	A	SMC4	S1056L	C	3618	T	STON2	T300M	G	1100	A
SAMD4B	R477W	C	2464	T	SIM2	F93V	T	890	G	SMC5	T841A	A	2579	G	STON2	A669V	G	2207	A
SAMD4B	R536C	C	2641	T	SIN3A	K686N	C	2373	A	SMC5	M1066R	T	3255	G	STON2	Q389H	T	1368	G
SAMD7	R67W	C	588	T	SIN3A	P1127L	G	3695	A	SMC5	A747E	C	2298	A	STOX1	R503Q	G	1591	A
SAMD7	R441*	C	1710	T	SIN3A	R537*	G	1924	A	SMC5	T904A	A	2768	G	STOX1	E776A	A	2410	C
SAMD7	L318I	C	1341	A	SIN3A	D822G	T	2780	C	SMC5	R972*	C	2972	T	STOX2	R759H	G	3711	A
SAMD8	G330D	G	1067	A	SIN3A	-	T	0	C	SMC6	G266R	C	989	T	STOX2	T237A	A	2144	G
SAMD9	S926*	G	3047	T	SIN3A	R1205H	C	3929	T	SMC6	R413L	C	1431	A	STOX2	S493L	C	2913	T
SAMD9	V162L	C	754	G	SIN3A	E752*	C	2569	A	SMC6	R914Q	C	2934	T	STRA6	R272H	C	815	T
SAMD9	L1526R	A	4847	C	SIN3A	K440N	C	1635	A	SMCHD1	V101A	T	332	C	STRA8	T241M	C	722	T
SAMD9	I576S	A	1997	C	SIN3B	R856W	C	2580	T	SMCR7	R149H	G	472	A	STRA8	L246H	T	737	A
SAMD9	L544I	G	1900	T	SIN3B	E916K	G	2760	A	SMCR7	R19W	C	81	T	STRADB	R100H	G	664	A
SAMD9	R285*	G	1123	A	SIN3B	R1083W	C	3261	T	SMCR7	R263H	G	814	A	STRAP	E249*	G	1046	T
SAMD9L	R986C	G	4173	A	SIN3B	R960H	G	2893	A	SMCR8	R715C	C	2531	T	STRBP	V658I	C	2438	T
SAMD9L	E961D	T	4100	G	SIN3B	R491C	C	1485	T	SMCR8	K703N	A	2497	C	STRBP	G577V	C	2196	A
SAMHD1	D207Y	C	819	A	SIN3B	S122P	T	378	C	SMEK1	F607L	A	2316	G	STRBP	R12H	C	501	T
SAMHD1	T232M	G	895	A	SIN3B	R1035C	C	3117	T	SMEK1	R739W	G	2712	A	STRBP	R203Q	C	1074	T
SAMHD1	K288T	T	1063	G	SIN3B	G384R	G	1164	A	SMEK1	L363V	A	1584	C	STRBP	R375Q	C	1590	T
SAMHD1	S247Y	G	940	T	SIN3B	D1128V	A	3397	T	SMEK2	I566V	T	1998	C	STRBP	R5Q	C	480	T
SAMHD1	F59C	A	376	C	SIN3B	Y848C	A	2557	G	SMEK2	F604L	A	2114	C	STRN	N527S	T	1589	C
SAMM50	G410S	G	1228	A	SIN3B	F72L	C	230	A	SMEK2	S388Y	G	1465	T	STRN	A82V	G	254	A
SAMSN1	R235C	G	878	A	SIN3B	F310L	C	944	A	SMG1	E3129K	C	9748	T	STRN	A746T	C	2245	T
SAMSN1	R235H	C	879	T	SIN3B	P764L	C	2305	T	SMG1	V3359A	A	10439	G	STRN	-	A	0	C
SAMSN1	K151E	T	626	C	SIPA1	R565G	C	1989	G	SMG1	S1866L	G	5960	A	STRN3	S655T	C	2180	G
SAP130	R489*	G	1652	A	SIPA1	A521V	C	1858	T	SMG1	K1877T	T	5993	G	STRN4	A124V	G	404	A
SAP130	A209V	G	813	A	SIPA1	A206T	G	912	A	SMG5	V674M	C	2165	T	STT3A	R538Q	G	1723	A
SAP130	A209P	C	812	G	SIPA1	A997V	C	3286	T	SMG5	Q643*	G	2072	A	STT3B	E642D	A	2135	C
SAP130	R530*	G	1775	A	SIPA1	S346L	C	1333	T	SMG5	R280Q	C	984	T	STUB1	F98L	C	544	A

SAP130	G554R	C	1847	G	SIPA1	R1015Q	G	3340	A	SMG5	A995V	G	3129	A	STUB1	R154H	G	711	A
SAP30BP	K256T	A	821	C	SIPA1L1	P766L	C	2645	T	SMG6	R130H	C	444	T	STX11	R126H	G	560	A
SAPS1	A381T	C	1141	T	SIPA1L1	S1639L	C	5264	T	SMG6	R739Q	C	2271	T	STX19	V220D	A	916	T
SAPS1	S149P	A	445	G	SIPA1L1	H1241Y	C	4069	T	SMG6	P527H	G	1635	T	STX4	L93P	T	593	C
SAPS1	A661T	C	1981	T	SIPA1L1	R519Q	G	1904	A	SMG7	D353E	C	1202	A	STX5	R91C	G	425	A
SAPS1	E466D	C	1398	A	SIPA1L2	L1278I	G	4191	T	SMG7	R501H	G	1645	A	STX6	R142C	G	662	A
SAPS2	A838V	C	2880	T	SIPA1L2	S1029L	G	3445	A	SMG7	A1099V	C	3439	T	STXBP1	R467C	C	1538	T
SAPS2	P694S	C	2447	T	SIPA1L2	S1149P	A	3804	G	SMG7	E282D	G	989	T	STXBP2	K204N	G	638	T
SAPS3	R582Q	G	1978	A	SIPA1L2	W857R	A	2928	G	SMG7	S364N	G	1234	A	STXBP3	M355V	A	1113	G
SAPS3	R42C	C	357	T	SIPA1L2	V710I	C	2487	T	SMNDC1	R171I	C	716	A	STXBP3	Y497H	T	1539	C
SAPS3	A629T	G	2118	A	SIPA1L2	R321H	C	1321	T	SMO	R763*	C	2567	T	STXBP4	E435D	G	1512	T
SAPS3	N363H	A	1320	C	SIPA1L2	R296*	G	1245	A	SMO	A235V	C	984	T	STXBP5	R683*	C	2047	T
SAPS3	A813V	C	2671	T	SIPA1L3	L890W	T	3185	G	SMO	A324T	G	1250	A	STXBP5	A133V	C	398	T
SAR1A	L165P	A	621	G	SIPA1L3	A380V	C	1655	T	SMO	D486E	C	1738	A	STXBP5	G382V	G	1145	T
SAR1A	G37C	C	236	A	SIPA1L3	S1559I	G	5192	T	SMOC1	G80C	G	491	T	STXBP5L	C106Y	G	588	A
SARDH	S60R	G	438	C	SIPA1L3	A1088T	G	3778	A	SMOC1	A234V	C	954	T	STXBP5L	S215I	G	915	T
SARDH	A364T	C	1348	T	SIPA1L3	E1708G	A	5639	G	SMOX	G566S	G	1897	A	STXBP5L	A77T	G	500	A
SARDH	A568V	G	1961	A	SIPA1L3	D1570V	A	5225	T	SMOX	S333L	C	1199	T	STXBP5L	F165L	C	766	A
SARDH	A819T	C	2713	T	SIRPB1	V197M	C	654	T	SMOX	L414I	C	1441	A	STXBP5L	F656C	T	2238	G
SARDH	S905L	G	2972	A	SIRPB2	Q79*	G	272	A	SMOX	V539I	G	1816	A	STXBP5L	K932E	A	3065	G
SARM1	A142V	C	425	T	SIRPB2	A203V	G	645	A	SMPD1	A346V	C	1211	T	STXBP6	W80C	C	575	A
SARM1	I693N	T	2078	A	SIRPD	R133W	G	449	A	SMPD1	V114M	G	514	A	STYK1	E240*	C	1239	A
SARNP	M103I	C	364	T	SIRPG	T194S	G	646	C	SMPD1	V512M	G	1708	A	STYK1	R377C	G	1650	A
SARS	R192Q	G	586	A	SIRT3	W15C	C	148	A	SMPD1	A48V	C	317	T	STYX	H165P	A	556	C
SART1	E301D	G	995	T	SIRT3	D385A	T	1257	G	SMPD2	A327T	G	1338	A	STYX	K103T	A	370	C
SART1	R299W	C	987	T	SIRT4	R104Q	G	331	A	SMPD2	I19T	T	415	C	STYXL1	N14T	T	214	G
SART1	I273L	A	909	C	SIRT4	V232I	G	714	A	SMPD3	C397Y	C	1794	T	SUB1	S12Y	C	320	A
SART3	D362Y	C	1319	A	SIRT6	F82L	G	306	T	SMPD3	S434F	G	1905	A	SUCLG1	E241K	C	932	T
SART3	V535I	C	1838	T	SIRT7	W336*	C	1041	T	SMPD3	A470T	C	2012	T	SUCLG1	E109*	C	536	A
SART3	A371T	C	1346	T	SIX1	R29H	C	359	T	SMPD3	G594V	C	2385	A	SUCLG2	R392W	G	1198	A
SART3	R252W	G	989	A	SIX2	Q167*	G	793	A	SMPD4	R796W	G	2906	A	SUCLG2	R206W	G	640	A
SART3	A508T	C	1757	T	SIX4	V418M	C	1312	T	SMPD4	H279R	T	1356	C	SUCLG2	E79*	C	259	A
SART3	R623H	C	2103	T	SIX4	A237T	C	769	T	SMPDL3A	D399E	C	1374	G	SUDS3	R126Q	G	516	A
SASH1	S757Y	C	2745	A	SIX5	A499V	G	1706	A	SMPDL3B	A5T	G	204	A	SUDS3	K132N	G	535	T
SASH1	R1139W	C	3890	T	SIX6	G259C	G	846	T	SMR3B	P26H	C	226	A	SULF1	R522W	C	2119	T
SASH1	-	A	0	G	SIX6	R162H	G	556	A	SMS	A80V	C	491	T	SULF1	R38*	C	667	T
SASH1	R558C	C	2147	T	SIX6	A144T	G	501	A	SMTN	R98C	C	292	T	SULF1	G820D	G	3014	A
SASH1	V77M	G	704	A	SIX6	R265W	C	864	T	SMU1	D185N	C	604	T	SULF1	F234L	T	1257	G
SASH1	R723Q	G	2643	A	SKA2	R63H	C	464	T	SMURF1	-	A	0	G	SULF2	W868*	C	3456	T

SULF2	A557T	C	2521	T	THBS4	R588C	C	2085	T	TRBV5-3	R73G	T	217	C	UGT1A7	L215S	T	644	C
SULF2	V83M	C	1099	T	THEG	D26N	C	115	T	TRBV6-6	V79I	C	279	T	UGT1A8	A423T	G	1330	A
SULF2	A139T	C	1267	T	THEM4	F208L	A	974	T	TRBV6-8	K28*	T	82	A	UGT1A8	V190I	G	631	A
SULT1A2	V270M	C	925	T	THEM5	A167T	C	498	T	TRBV7-3	W53*	C	209	T	UGT2A2	E81*	C	297	A
SULT1B1	I57M	A	469	C	THEM5	S26Y	G	76	T	TRBV7-3	F84L	G	302	T	UGT2A2	V91I	C	327	T
SULT1C2	P251S	C	928	T	THEMIS	S381P	A	1460	G	TRBV7-4	P89S	G	265	A	UGT2A2	K682T	T	2101	G
SULT1C2	R118W	C	529	T	THEMIS	R238*	G	1031	A	TRBV7-8	V31F	C	130	A	UGT2A2	R611I	C	1888	A
SULT1C2	P165S	C	670	T	THEMIS	E7*	C	338	A	TRBV9	L65P	A	241	G	UGT2A2	D41Y	C	177	A
SULT1C4	K289N	G	1193	T	THNSL1	K555E	A	1913	G	TRBV9	E72*	C	261	A	UGT2A3	N211H	T	662	G
SULT2A1	N226D	T	816	C	THNSL1	T180A	A	788	G	TRDMT1	E185K	C	601	T	UGT2B11	L445*	A	1336	C
SULT2A1	S20F	G	199	A	THNSL1	E312*	G	1184	T	TRDMT1	E63K	C	235	T	UGT2B15	E441D	C	1333	A
SULT2B1	R341H	G	1103	A	THNSL1	E683*	G	2297	T	TRDN	R713H	C	2138	T	UGT2B28	L9I	C	34	A
SULT2B1	Q56H	A	249	C	THNSL2	R473Q	G	1571	A	TRDN	E483D	C	1449	A	UGT2B28	R259Q	G	785	A
SULT4A1	R32C	G	215	A	THOC1	E386K	C	1196	T	TREH	R383C	G	1192	A	UGT2B4	G24*	C	117	A
SULT4A1	R32C	G	215	A	THOC1	S38R	G	154	T	TREH	-	T	0	C	UGT2B7	E225K	G	719	A
SUMF2	V200I	G	629	A	THOC2	R1409H	C	4258	T	TREM1	P202L	G	669	A	UGT2B7	K524N	G	1618	T
SUMF2	A192T	G	605	A	THOC2	E1157K	C	3501	T	TREML1	C297R	A	899	G	UGT2B7	T351A	A	1097	G
SUMF2	K101N	G	334	T	THOC2	P290L	G	901	A	TRERF1	V1166D	A	4060	T	UGT3A1	E71D	T	571	G
SUMO3	P38L	G	113	A	THOC4	H96D	G	292	C	TRERF1	T746M	G	2800	A	UGT3A2	E88*	C	364	A
SUN2	S468L	G	1585	A	THOC5	E4*	C	133	A	TREX2	R199H	C	1738	T	UGT8	E102K	G	826	A
SUN2	P291S	G	1053	A	THOC6	A259V	C	1072	T	TREX2	P7H	G	1162	T	UGT8	E32G	A	617	G
SUN3	Q96*	G	446	A	THOC6	R22W	C	360	T	TREX2	S12R	A	1178	C	UGT8	K22N	A	588	C
SUN5	S203Y	G	701	T	THPO	T281I	G	1057	A	TREX2	R111H	C	1474	T	UGT8	R443Q	G	1850	A
SUN5	R54L	C	254	A	THPO	T315I	G	1159	A	TRGC1	K84N	T	251	G	UHMK1	G368D	G	1261	A
SUPT16H	E1007K	C	3358	T	THPO	V166A	A	712	G	TRGV4	L66Q	A	531	T	UHMK1	Q248R	A	901	G
SUPT16H	A29V	G	425	A	THRA	V407A	T	1800	C	TRGV5	R64H	C	389	T	UHRF1	M21T	T	355	C
SUPT16H	A482V	G	1784	A	THRA	R104H	G	891	A	TRGV8	K97Q	T	403	G	UHRF1	D341E	C	1316	G
SUPT3H	-	C	0	T	THRAP3	R156H	G	691	A	TRH	R61W	C	708	T	UHRF1BP1	R621H	G	2033	A
SUPT3H	E132K	C	712	T	THRAP3	A550V	C	1873	T	TRHDE	-	G	0	T	UHRF1BP1	D332N	G	1165	A
SUPT4H1	M1V	T	68	C	THRAP3	N113K	T	563	G	TRHDE	P147L	C	536	T	UHRF2	E241*	G	889	T
SUPT5H	R989W	C	3144	T	THRB	T138M	G	654	A	TRHDE	R250H	G	845	A	UHRF2	Y372C	A	1283	G
SUPT5H	R813H	G	2617	A	THRB	R258W	G	1013	A	TRHDE	S126L	C	473	T	UHRF2	R759H	G	2444	A
SUPT6H	D856N	G	2656	A	THRSP	N11I	A	53	T	TRHDE	S823C	A	2563	T	ULBP1	F181L	C	586	A
SUPT6H	R715W	C	2233	T	THSD1	I302V	T	1083	C	TRHDE	G1019V	G	3152	T	ULK1	G208S	G	890	A
SUPT6H	R607G	A	1909	G	THSD1	A52T	C	333	T	TRHR	W91C	G	291	T	ULK1	-	T	0	C
SUPT6H	D1077N	G	3319	A	THSD1	G493D	C	1657	T	TRHR	R17*	C	67	T	ULK1	A428T	G	1550	A
SUPT6H	R818Q	G	2543	A	THSD1	T430I	G	1468	A	TRIB2	D211N	G	2050	A	ULK2	R120Q	C	878	T
SUPV3L1	R365W	C	1153	T	THSD1	R753I	C	2437	A	TRIB2	R286*	C	2275	T	ULK2	R465Q	C	1913	T
SUPV3L1	R118C	C	412	T	THSD1	L496M	G	1665	T	TRIB2	R290H	G	2288	A	ULK2	S347Y	G	1559	T

SURF1	-	C	0	A	THSD1	E249*	C	924	A	TRIB3	R56H	G	167	A	ULK3	E290V	T	869	A
SURF1	R84Q	C	283	T	THSD1	R338K	C	1192	T	TRIB3	R29*	C	85	T	ULK4	V690A	A	2532	G
SURF4	A143V	G	558	A	THSD1	E689K	C	2244	T	TRIB3	V188M	G	562	A	ULK4	A984T	C	3413	T
SURF4	L111V	A	461	C	THSD4	T872M	C	2749	T	TRIM11	L200P	A	878	G	UMOD	G487S	C	1583	T
SUSD1	S279Y	G	877	T	THSD4	Q30R	A	223	G	TRIM14	L223S	A	690	G	UMOD	A471T	C	1535	T
SUSD2	H114R	A	602	G	THSD4	F326L	C	1112	A	TRIM14	G392D	C	1197	T	UMOD	A103T	C	431	T
SUSD2	R282L	G	1106	T	THSD7A	R277H	C	1082	T	TRIM16L	F80V	T	1717	G	UMOD	C65R	A	317	G
SUSD2	R326H	G	1238	A	THSD7A	R544C	G	1882	A	TRIM2	A139V	C	481	T	UMODL1	R1294W	C	3880	T
SUSD5	E230D	C	1108	A	THSD7A	S1526L	G	4829	A	TRIM2	C157Y	G	535	A	UMODL1	P107S	C	319	T
SUV39H1	D391N	G	1171	A	THSD7A	R1311I	C	4184	A	TRIM2	R647M	G	2005	T	UMODL1	H1199R	A	3596	G
SUV39H1	I230M	C	690	G	THSD7A	R448H	C	1595	T	TRIM2	R490Q	G	1534	A	UMODL1	A1007T	G	3019	A
SUV39H1	I230M	C	690	G	THSD7A	L1464I	A	4642	T	TRIM22	W262C	G	1063	T	UMODL1	E1268K	G	3802	A
SUV39H2	Q91R	A	272	G	THSD7B	S668L	C	2003	T	TRIM22	S312L	C	1212	T	UNC119B	R150C	C	895	T
SUV39H2	R353Q	G	1058	A	THSD7B	P1288S	C	3862	T	TRIM22	V445G	T	1611	G	UNC13A	-	C	0	T
SUV39H2	L209I	C	625	A	THSD7B	R1454H	G	4361	A	TRIM22	W262L	G	1062	T	UNC13A	V1707M	C	5119	T
SUV420H1	G14C	C	394	A	THSD7B	T693M	C	2078	T	TRIM23	E525*	C	1945	A	UNC13A	W647L	C	1940	A
SUV420H1	-	C	0	A	THSD7B	-	A	0	G	TRIM23	K344N	C	1404	A	UNC13A	R285H	C	854	T
SUV420H1	K776E	T	2680	C	THSD7B	R574H	G	1721	A	TRIM23	E525*	C	1945	A	UNC13A	G571S	C	1711	T
SUV420H1	K612N	C	2190	A	THSD7B	R1426H	G	4277	A	TRIM24	V208A	T	838	C	UNC13A	R285C	G	853	A
SUV420H1	R187Q	C	914	T	THSD7B	R1287W	C	3859	T	TRIM25	N225I	T	734	A	UNC13A	F337L	G	1011	T
SUV420H1	F119V	A	709	C	THSD7B	T427M	C	1280	T	TRIM25	A98T	C	352	T	UNC13B	R647H	G	2222	A
SUV420H2	T69M	C	454	T	THSD7B	R151Q	G	452	A	TRIM3	L212P	A	866	G	UNC13B	S276P	T	1108	C
SUV420H2	R95H	G	532	A	THSD7B	R264I	G	791	T	TRIM3	A160V	G	710	A	UNC13B	H1584R	A	5033	G
SUV420H2	L398M	C	1440	A	THSD7B	L732I	C	2194	A	TRIM32	E191A	A	730	C	UNC13C	R171H	G	512	A
SUV420H2	P411T	C	1479	A	THSD7B	I1559M	T	4677	G	TRIM32	C509Y	G	1684	A	UNC13C	L1071I	C	3211	A
SUZ12P	R256H	G	977	A	THUMPD3	L30I	C	427	A	TRIM32	R596H	G	1945	A	UNC13C	K1335R	A	4004	G
SUZ12P	R360C	C	1288	T	THUMPD3	V481F	G	1780	T	TRIM32	T266I	C	955	T	UNC13C	R2082C	C	6244	T
SUZ12P	N642K	T	2136	G	THY1	R39H	C	172	T	TRIM32	A579P	G	1893	C	UNC13C	D685A	A	2054	C
SV2A	-	C	0	A	THYN1	D148A	T	927	G	TRIM32	R540W	C	1776	T	UNC13C	E1387*	G	4159	T
SV2A	L577M	G	2220	T	THYN1	R94C	G	764	A	TRIM33	R440C	G	1402	A	UNC13C	D1290Y	G	3868	T
SV2A	R483H	C	1939	T	TIA1	N315T	T	1155	G	TRIM33	R865*	G	2677	A	UNC13C	P1571Q	C	4712	A
SV2C	A205V	C	1056	T	TIAF1	R25W	G	73	A	TRIM35	V200L	C	680	G	UNC13C	G20V	G	59	T
SV2C	D398G	A	1635	G	TIAM1	R1527W	G	5051	A	TRIM35	R427H	C	1362	T	UNC13C	E249K	G	745	A
SV2C	F230C	T	1131	G	TIAM1	R1540Q	C	5091	T	TRIM35	A469T	C	1487	T	UNC13C	Q386H	A	1158	C
SVEP1	G3397S	C	1052 6	T	TIAM1	R380H	C	1611	T	TRIM35	L284M	G	932	T	UNC13C	R572I	G	1715	T
SVEP1	A2556T	C	8003	T	TIAM1	R871*	G	3083	A	TRIM36	C171R	A	633	G	UNC13C	E936D	A	2808	C
SVEP1	R1213C	G	3974	A	TIAM1	P359S	G	1547	A	TRIM37	A895V	G	3128	A	UNC13C	K1134R	A	3401	G
SVEP1	S1598A	A	5129	C	TIAM1	L1115I	G	3815	T	TRIM37	R446Q	C	1781	T	UNC13C	T1601N	C	4802	A
SVEP1	T3108A	T	9659	C	TIAM1	R788W	G	2834	A	TRIM37	E568K	C	2146	T	UNC13C	I1931M	T	5793	G

SVEP1	C1035Y	C	3441	T	TIAM1	K1222N	C	4138	A	TRIM37	-	C	0	A	UNC13D	K661E	T	2361	C
SVEP1	-	C	0	A	TIAM1	A1004T	C	3482	T	TRIM38	K158E	A	896	G	UNC13D	L435P	A	1684	G
SVEP1	I3470M	A	10747	C	TIAM1	K724N	C	2644	A	TRIM38	E82K	G	668	A	UNC13D	E39D	C	497	A
SVEP1	F2512L	G	7873	T	TIAM1	K443N	C	1801	A	TRIM38	L198I	C	1016	A	UNC13D	Q878*	G	3012	A
SVEP1	R3032Q	C	9432	T	TIAM2	G49R	G	353	A	TRIM38	L147P	T	864	C	UNC45A	A428T	G	1322	A
SVIL	R1178*	G	3982	A	TIAM2	G1075D	G	3432	A	TRIM38	K389N	A	1591	C	UNC45B	L117P	T	797	C
SVIL	A1494V	G	4931	A	TIAM2	P99T	C	503	A	TRIM4	Y381D	A	1271	C	UNC45B	K174M	A	968	T
SVIL	L1428P	A	4733	G	TIAM2	S92C	C	483	G	TRIM41	R547Q	G	2350	A	UNC45B	R225Q	G	1121	A
SVIL	T2192M	G	7025	A	TIAM2	R62Q	G	393	A	TRIM41	P177H	C	1240	A	UNC5B	R143Q	G	844	A
SVIL	S1314G	T	4390	C	TIAM2	N457S	A	1578	G	TRIM41	A429V	C	1996	T	UNC5B	S544R	C	2048	A
SVIL	S425*	G	1724	C	TIAM2	R464Q	G	1599	A	TRIM42	Y90C	A	460	G	UNC5B	G420D	G	1675	A
SVIL	S1958R	T	6322	G	TIAM2	F588L	T	1970	C	TRIM45	-	C	0	T	UNC5B	Y581H	T	2157	C
SVIL	K1123T	T	3818	G	TIAM2	R1080W	C	3446	T	TRIM45	R373C	G	1644	A	UNC5B	G419A	G	1672	C
SVOPL	R15Q	C	44	T	TICAM1	R463H	C	1639	T	TRIM46	I446V	A	1336	G	UNC5C	A29T	C	434	T
SVOPL	A429T	C	1285	T	TICAM1	Q647*	G	2190	A	TRIM46	V609I	G	1825	A	UNC5C	L717I	G	2498	T
SYAP1	P155L	C	557	T	TICAM1	P434L	G	1552	A	TRIM46	R711C	C	2131	T	UNC5C	R278*	G	1181	A
SYBU	A570T	C	1871	T	TIE1	V381M	G	1220	A	TRIM46	E617*	G	1849	T	UNC5C	K346N	C	1387	A
SYBU	E342K	C	1187	T	TIE1	R4W	C	89	T	TRIM47	R581C	G	1768	A	UNC5CL	R292H	C	964	T
SYCE1	L36F	C	213	G	TIE1	R583C	C	1826	T	TRIM47	R573W	G	1744	A	UNC5CL	R192C	G	663	A
SYCE1	G218E	C	758	T	TIE1	R518H	G	1632	A	TRIM48	S3Y	C	142	A	UNC5D	S244L	C	741	T
SYCE1L	K64N	G	192	T	TIE1	R68H	G	282	A	TRIM48	Y176H	T	660	C	UNC5D	A14V	C	51	T
SYCE1L	S171L	C	512	T	TIE1	R388C	C	1241	T	TRIM48	S33N	G	232	A	UNC5D	L927I	C	2789	A
SYCN	F103L	G	321	T	TIE1	R369W	C	1184	T	TRIM5	K463T	T	1645	G	UNC5D	R799H	G	2406	A
SYCP1	L530R	T	1829	G	TIE1	Q87R	A	339	G	TRIM50	R348H	C	1244	T	UNC5D	L157V	T	479	G
SYCP2	I680T	A	2178	G	TIE1	R583H	G	1827	A	TRIM50	T314M	G	1142	A	UNC80	L662I	C	2064	A
SYCP2	S1204Y	G	3750	T	TIFAB	R55H	C	365	T	TRIM52	N222D	T	969	C	UNC80	N172S	A	595	G
SYCP2	K931N	C	2932	A	TIFAB	Y13C	T	239	C	TRIM54	E131*	G	661	T	UNC80	L2271I	C	6891	A
SYCP2	K741N	C	2362	A	TIGD5	R619C	C	1924	T	TRIM55	T34M	C	327	T	UNC80	S2445L	C	7414	T
SYCP2	K459T	T	1515	G	TIGD5	Q63*	C	256	T	TRIM55	E334D	A	1228	T	UNC80	C2027W	T	6161	G
SYCP2	Y318C	T	1092	C	TIGD5	R67C	C	268	T	TRIM55	S182N	G	771	A	UNC80	L2320V	C	7038	G
SYCP2	K175N	T	664	G	TIGD5	R546K	G	1706	A	TRIM55	K226N	G	904	T	UNC80	P1700L	C	5179	T
SYCP2L	K782R	A	2641	G	TIGD6	K513R	T	2313	C	TRIM56	R533C	C	1894	T	UNC80	Q1701*	C	5181	T
SYCP2L	R106W	C	612	T	TIGD7	R313*	G	2766	A	TRIM56	P480L	C	1736	T	UNC80	R2679W	C	8115	T
SYCP2L	S527Y	C	1876	A	TIGIT	T97M	C	2905	T	TRIM56	L19M	C	352	A	UNC80	V1691I	G	5151	A
SYDE1	Q294R	A	912	G	TIGIT	R238K	G	3328	A	TRIM56	A327V	C	1277	T	UNC80	R911H	G	2812	A
SYDE1	R574H	G	1752	A	TIMD4	R113H	C	395	T	TRIM56	A329T	G	1282	A	UNC80	Q1667H	G	5081	T
SYDE1	P693S	C	2108	T	TIMD4	T29M	G	143	A	TRIM58	M177I	G	579	A	UNC80	R2604*	C	7890	T
SYDE2	I383M	T	1198	C	TIMELESS	R801*	G	2569	A	TRIM58	R472M	G	1463	T	UNC80	S974Y	C	3001	A
SYDE2	C147Y	C	489	T	TIMELESS	F777I	A	2497	T	TRIM6	E130*	G	632	T	UNC80	R2059*	C	6255	T

SYDE2	D357V	T	1119	A	TIMELESS	E139G	T	584	C	TRIM6	L350I	C	1292	A	UNC80	E2185K	G	6633	A
SYDE2	N756H	T	2315	G	TIMELESS	R1033W	G	3265	A	TRIM6-TRIM34	T484A	A	1623	G	UNC80	R2706*	C	8196	T
SYK	P85L	C	402	T	TIMM22	A76V	C	253	T	TRIM60	E459K	G	1591	A	UNC80	K698R	A	2173	G
SYK	V633M	G	2045	A	TIMM44	R143G	G	429	C	TRIM60	R390*	C	1384	T	UNC80	R1807C	C	5499	T
SYK	A52T	G	302	A	TIMM50	V400M	G	1331	A	TRIM60	D433N	G	1513	A	UNC93A	K236N	G	883	T
SYMPK	G1272W	C	4059	A	TIMM8A	R58Q	C	705	T	TRIM62	A358V	G	1307	A	UNC93A	A214D	C	816	A
SYMPK	S598L	G	2038	A	TIMM8B	G20C	C	69	A	TRIM63	R230Q	C	828	T	UNC93A	F353L	C	1234	A
SYMPK	G178D	C	778	T	TIMP3	A183T	G	848	A	TRIM63	F307L	G	1060	T	UNC93B1	T184A	T	630	C
SYMPK	S353L	G	1303	A	TIMP4	S122I	C	876	A	TRIM64	Q415H	A	1245	C	UNC93B1	A121T	C	441	T
SYN3	Y177C	T	773	C	TINAGL1	I337T	T	1086	C	TRIM64B	R411M	C	1232	A	UNG	D72G	A	285	G
SYN3	A281T	C	1084	T	TINF2	R338S	C	1356	A	TRIM64C	I247V	T	739	C	UNK	M1T	T	2	C
SYN3	R435C	G	1546	A	TINF2	M286V	T	1198	C	TRIM64C	R47I	C	140	A	UNK	F678L	T	2034	G
SYNC	P27H	G	539	T	TINF2	A373V	G	1460	A	TRIM64C	G413V	C	1238	A	UNKL	T313M	G	946	A
SYNC	I85T	A	713	G	TIPARP	E470D	G	1578	T	TRIM66	S493N	C	1919	T	UPB1	R334W	C	1344	T
SYNE1	A1608V	G	5425	A	TIPARP	N298T	A	1061	C	TRIM66	A1149V	G	3887	A	UPF1	I404V	A	1482	G
SYNE1	S4796Y	G	1498 9	T	TJP1	R170Q	C	960	T	TRIM66	R895L	C	3125	A	UPF1	E415D	G	1517	T
SYNE1	A3140V	G	1002 1	A	TJP1	S994L	G	3432	A	TRIM66	G59V	C	617	A	UPF1	A437T	G	1581	A
SYNE1	E3099K	C	9897	T	TJP1	S454I	C	1812	A	TRIM66	-	A	0	G	UPF1	R854W	C	2832	T
SYNE1	S2326L	G	7579	A	TJP1	-	T	5698	G	TRIM66	R895Q	C	3125	T	UPF1	P504L	C	1783	T
SYNE1	A242D	G	1327	T	TJP1	R1342W	G	4475	A	TRIM67	V719M	G	2197	A	UPF2	E1033D	T	3573	A
SYNE1	R4764*	G	1489 2	A	TJP2	A909T	G	2933	A	TRIM67	R188Q	G	605	A	UPF2	E78*	C	706	A
SYNE1	S8236L	G	2530 9	A	TJP2	T1124M	C	3579	T	TRIM67	R619W	C	1897	T	UPF2	D40N	C	592	T
SYNE1	E4538G	T	1421 5	C	TJP2	R731K	G	2400	A	TRIM67	G669R	G	2047	A	UPF3A	R377Q	G	1186	A
SYNE1	T8698M	G	2669 5	A	TJP2	T335M	C	1212	T	TRIM68	S183G	T	799	C	UPF3B	R451*	G	1421	A
SYNE1	-	A	0	T	TJP2	F608V	T	2030	G	TRIM68	V347I	C	1291	T	UPK1A	R263C	C	787	T
SYNE1	R5272W	G	1641 6	A	TJP2	R837Q	G	2718	A	TRIM68	Q264K	G	1042	T	UPK3A	G86D	G	289	A
SYNE1	R1340*	T	4620	A	TJP3	Y786C	A	2357	G	TRIM68	L97P	A	542	G	UPP1	R175Q	G	1147	A
SYNE1	R4982H	C	1554 7	T	TJP3	R201W	C	601	T	TRIM69	E120D	G	703	T	UPP1	T207P	A	1242	C
SYNE1	Q1395R	T	4786	C	TJP3	R366Q	G	1097	A	TRIM69	P42S	C	467	T	UPP1	Y85S	A	877	C
SYNE1	-	C	0	A	TK1	F108L	G	563	T	TRIM69	V345I	G	1376	A	UPP2	M271I	G	833	A
SYNE1	E7676G	T	2362 9	C	TK2	D84G	T	476	C	TRIM69	E218*	G	995	T	UPP2	F290L	T	888	C
SYNE1	E5467G	T	1700	C	TKTL1	S564L	C	1880	T	TRIM7	R419C	G	1317	A	UPRT	K206N	G	785	T

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SYNE1	V3671M	C	11613	T	TKTL1	R375Q	G	1313	A	TRIM7	Q283*	G	909	A	UQCRC1	T343I	G	1445	A
SYNE1	R5964C	G	18492	A	TKTL2	R475Q	C	1585	T	TRIM71	S563Y	C	1751	A	UQCRC1	N175K	A	942	C
SYNE1	L5095I	G	15885	T	TKTL2	I282R	A	1006	C	TRIM71	V359F	G	1138	T	UQCRC2	A143T	G	1191	A
SYNE1	Q541*	G	2223	A	TLCD2	N250S	T	864	C	TRIM71	R496H	G	1550	A	UQCRC2	R259*	C	1539	T
SYNE1	T7210S	G	22231	C	TLE1	R565C	G	2758	A	TRIM71	N767K	C	2364	A	UQCRFSL1	R92H	C	386	T
SYNE1	G8529E	C	26188	T	TLE1	L119F	C	1422	G	TRIM71	E344K	G	1093	A	URB1	-	A	0	G
SYNE1	E7921*	C	24363	A	TLE2	P662L	G	2248	A	TRIM72	R386C	C	1367	T	URB1	L1486P	A	4573	G
SYNE1	E7181D	T	22145	G	TLE2	K82R	T	508	C	TRIM72	R169W	C	716	T	URB1	A1234T	C	3816	T
SYNE1	L7129F	G	21987	A	TLE3	A198V	G	1712	A	TRIM72	E473K	G	1628	A	URB1	E296K	C	1002	T
SYNE1	L5590V	A	17370	C	TLE3	P16T	G	1165	T	TRIM75	V106I	G	316	A	URB1	F1755V	A	5379	C
SYNE1	A5450V	G	16951	A	TLE3	M678I	C	3153	T	TRIM77	C29F	G	86	T	URB1	A1229V	G	3802	A
SYNE1	D4241Y	C	13323	A	TLE4	M81L	A	417	T	TRIM77	W274R	T	820	C	URB1	A1686T	C	5172	T
SYNE1	E3281*	C	10443	A	TLE4	R463H	G	1564	A	TRIM77	D24A	A	71	C	URB1	L277M	G	945	T
SYNE1	S1186F	G	4159	A	TLE4	V352I	G	1230	A	TRIM77	K143T	A	428	C	URB1	K468T	T	1519	G
SYNE1	F1136L	G	4010	T	TLE4	K25T	A	250	C	TRIM9	A314V	G	1331	A	URB1	K348T	T	1159	G
SYNE1	K1056N	C	3770	A	TLE6	R165Q	G	695	A	TRIM9	A280V	G	1229	A	URB1	E2009*	C	6141	A
SYNE1	I945V	T	3435	C	TLE6	R134Q	G	602	A	TRIML1	L145R	T	574	G	URB2	I245V	A	869	G
SYNE1	L731R	A	2794	C	TLK1	R739*	G	2620	A	TRIML1	T289M	C	1006	T	URB2	D703N	G	2243	A
SYNE1	R8735W	G	26805	A	TLK2	A165V	C	765	T	TRIML1	L200P	T	739	C	URB2	P248H	C	879	A
SYNE1	R5325*	G	16575	A	TLK2	A284V	C	1122	T	TRIML2	A302T	C	934	T	URB2	K82Q	A	380	C
SYNE1	S6857*	G	21172	T	TLL1	L122V	T	921	G	TRIML2	T306M	G	947	A	URGCP	A650T	C	2442	T
SYNE2	E637K	G	2139	A	TLL1	I246V	A	1293	G	TRIO	R1502*	C	4528	T	URGCP	W294*	C	1376	T
SYNE2	V1094A	T	3511	C	TLL1	F507V	T	2076	G	TRIO	R2496Q	G	7511	A	URGCP	F250V	A	1242	C
SYNE2	L3382I	C	10374	A	TLL2	D520N	C	1784	T	TRIO	G1787S	G	5383	A	URGCP	W316C	C	1442	A
SYNE2	W16G	T	276	G	TLL2	E666A	T	2223	G	TRIO	D1817G	A	5474	G	UROC1	T514A	T	1574	C
SYNE2	G6670C	G	20238	T	TLN1	L2509P	A	7880	G	TRIO	A1290V	C	3893	T	UROC1	F502L	G	1540	T

SYNE2	C6103F	G	1853 8	T	TLN1	V1851L	C	5905	A	TRIO	H679R	A	2060	G	UROC1	G656S	C	2000	T
SYNE2	A4314V	C	1317 1	T	TLN1	Q783*	G	2701	A	TRIO	A1147V	C	3464	T	UROC1	G656D	C	2001	T
SYNE2	Q5979H	G	1816 7	T	TLN1	R1368Q	C	4457	T	TRIO	R1926H	G	5801	A	UROD	E125K	G	492	A
SYNE2	G777C	G	2559	T	TLN1	D525G	T	1928	C	TRIO	L1440P	T	4343	C	UROS	S51Y	G	377	T
SYNE2	D20N	G	288	A	TLN1	K2063N	C	6543	A	TRIO	W1558C	G	4698	T	USF1	T10M	G	234	A
SYNE2	V113A	T	568	C	TLN1	S1427A	A	4633	C	TRIO	N163T	A	512	C	USF2	K250N	G	859	T
SYNE2	K958R	A	3103	G	TLN1	R1955W	G	6217	A	TRIO	N171H	A	535	C	USF2	A48V	C	252	T
SYNE2	K2699N	G	8327	T	TLN2	A1565T	G	4726	A	TRIOBP	Q336*	C	1261	T	USH1C	R754W	G	2369	A
SYNE2	K3573T	A	1094 8	C	TLN2	G1786R	G	5389	A	TRIOBP	S2053G	A	6412	G	USH1C	V43M	C	236	T
SYNE2	E4038*	G	1234 2	T	TLN2	G2496R	G	7519	A	TRIOBP	R546*	C	1891	T	USH1C	F700L	G	2209	T
SYNE2	L4533M	T	1382 7	A	TLN2	E850K	G	2581	A	TRIOBP	R1309H	G	4181	A	USH1C	N207S	T	729	C
SYNE2	-	G	0	T	TLN2	A1416V	C	4280	T	TRIP10	S512I	G	1570	T	USH1G	E228K	C	865	T
SYNGAP1	P38L	C	214	T	TLN2	C2244Y	G	6764	A	TRIP10	R196H	G	622	A	USH1G	I147N	A	623	T
SYNGR3	L57P	T	328	C	TLN2	Q769R	A	2339	G	TRIP10	A441T	G	1356	A	USH1G	M450V	T	1531	C
SYNGR4	-	G	0	T	TLN2	A1018S	G	3085	T	TRIP11	R252*	G	1542	A	USH1G	E142K	C	607	T
SYNJ1	E1023D	C	3077	A	TLN2	G2066V	G	6230	T	TRIP11	A1481V	G	5230	A	USH2A	R4192C	G	1296 1	A
SYNJ1	P1167L	G	3508	A	TLN2	T1856M	C	5600	T	TRIP11	F1284C	A	4639	C	USH2A	D1904G	T	6098	C
SYNJ1	P1111L	G	3340	A	TLN2	N125H	A	406	C	TRIP11	N1003T	T	3796	G	USH2A	T4222I	G	1305 2	A
SYNJ1	G883C	C	2655	A	TLN2	E1298*	G	3925	T	TRIP11	D160N	C	1266	T	USH2A	L3486F	G	1084 3	A
SYNJ1	M1I	C	11	A	TLN2	S2396F	C	7220	T	TRIP12	A1726V	G	5346	A	USH2A	Q4541*	G	1400 8	A
SYNJ2	D226N	G	751	A	TLR1	G417R	C	1523	T	TRIP12	I826V	T	2645	C	USH2A	K3892N	T	1206 3	G
SYNJ2	D243N	G	802	A	TLR1	S77Y	G	504	T	TRIP12	R379W	G	1304	A	USH2A	T2604N	G	8198	T
SYNJ2	P1252L	C	3830	T	TLR10	L727I	G	2785	T	TRIP12	R1193H	C	3747	T	USH2A	A1069V	G	3593	A
SYNJ2	D726N	G	2251	A	TLR10	L206I	G	1222	T	TRIP13	N365S	A	1450	G	USH2A	T648N	G	2330	T
SYNJ2	F727L	C	2256	A	TLR2	V451I	G	1396	A	TRIP13	N50S	A	505	G	USH2A	C999F	C	3383	A
SYNJ2	R730H	G	2264	A	TLR2	R230Q	G	734	A	TRIP4	K474*	A	1480	T	USH2A	T4652N	G	1434 2	T
SYNJ2BP	R46H	C	264	T	TLR2	R486I	G	1502	T	TRIP4	A4D	C	71	A	USH2A	P3777H	G	1171 7	T
SYNM	G1178S	G	3652	A	TLR3	E460K	G	1482	A	TRIP4	Q96E	C	346	G	USH2A	S3616A	A	1123 3	C
SYNM	E1051*	G	3271	T	TLR3	Y302C	A	1009	G	TRMT1	S416I	C	1497	A	USH2A	D3076Y	C	9613	A
SYNM	R802*	C	2524	T	TLR3	R890H	G	2773	A	TRMT1	A531T	C	1841	T	USH2A	K2597T	T	8177	G

SYNPO	V469A	T	1780	C	TLR3	G869V	G	2710	T	TRMT11	R319I	G	1077	T	USH2A	R2509W	G	7912	A
SYNPO2	S549Y	C	1842	A	TLR3	K89T	A	370	C	TRMT11	T43S	C	249	G	USH2A	-	C	0	A
SYNPO2	R401H	G	1398	A	TLR3	L149*	T	550	G	TRMT2A	P593L	G	2094	A	USH2A	F1583S	A	5135	G
SYNPO2	K1188N	G	3760	T	TLR3	E306K	G	1020	A	TRMT2A	A432V	G	1611	A	USH2A	N856H	T	2953	G
SYNPO2	R121*	C	557	T	TLR4	T537M	C	1711	T	TRMT5	R248*	G	833	A	USH2A	T495A	T	1870	C
SYNPO2	L438I	C	1508	A	TLR5	S615L	G	2306	A	TRMT5	E155*	C	554	A	USH2A	Y2214H	A	7027	G
SYNPO2	S663L	C	2184	T	TLR5	F622L	G	2328	T	TRMT61A	T269M	C	886	T	USHBP1	A199V	G	738	A
SYNPO2L	T961I	G	3032	A	TLR5	K323T	T	1430	G	TRMT61A	A120T	G	438	A	USHBP1	A295S	C	1025	A
SYNPO2L	A846V	G	2687	A	TLR6	E539*	C	1681	A	TRMT61A	I10S	T	109	G	USHBP1	R196C	G	728	A
SYNPO2L	F849C	A	2696	C	TLR6	D92Y	C	340	A	TRMU	I245M	T	1075	G	USHBP1	Q463R	T	1530	C
SYNPR	K184T	A	962	C	TLR7	L254I	C	899	A	TRNAU1AP	S228I	G	709	T	USHBP1	P416S	G	1388	A
SYNRG	V492I	C	1474	T	TLR7	I735S	T	2343	G	TRNT1	E50G	A	251	G	USO1	A614V	C	1841	T
SYNRG	R138C	G	412	A	TLR8	I547V	A	1790	G	TRO	A1247T	G	3851	A	USO1	A120V	C	359	T
SYP	Y295H	A	956	G	TLR8	E206K	G	767	A	TRO	T373I	C	1230	T	USO1	S645A	T	1933	G
SYP	S48I	C	216	A	TLR8	V118A	T	504	C	TRO	-	G	0	T	USP1	P239L	C	1044	T
SYPL1	D153Y	C	504	A	TLR8	R298C	C	1043	T	TRO	L863F	C	2699	T	USP1	I530V	A	1916	G
SYPL2	Q252H	G	972	T	TLR9	G783S	C	2981	T	TRO	F1406C	T	4329	G	USP1	R517*	C	1877	T
SYS1	R140W	C	661	T	TLR9	A435V	G	1938	A	TROAP	R25H	G	241	A	USP1	K219T	A	984	C
SYT1	-	T	0	C	TLR9	R901C	G	3335	A	TROAP	E507D	G	1688	T	USP10	I712M	T	2278	G
SYT10	R379C	G	1432	A	TLR9	A736T	C	2840	T	TROAP	F725L	C	2342	A	USP11	R638Q	G	1913	A
SYT10	T204I	G	908	A	TLR9	R247C	G	1373	A	TROVE2	D134Y	G	776	T	USP11	-	G	0	T
SYT10	R40W	G	415	A	TLR9	C790R	A	3002	G	TRPA1	V302I	C	1079	T	USP11	E360K	G	1078	A
SYT10	R286H	C	1154	T	TLR9	M371I	C	1747	T	TRPA1	K610T	T	2004	G	USP12	R285H	C	1111	T
SYT10	N236S	T	1004	C	TM2D1	P94H	G	398	T	TRPA1	S887N	C	2835	T	USP12	D334N	C	1257	T
SYT11	V381I	G	1394	A	TM2D1	A66P	C	313	G	TRPA1	S293L	G	1053	A	USP12	Q367R	T	1357	C
SYT11	G328S	G	1235	A	TM2D2	T182M	G	628	A	TRPA1	K54N	C	337	A	USP12	L68I	G	459	T
SYT12	R419Q	G	1320	A	TM2D2	H67R	T	283	C	TRPC1	R148Q	G	929	A	USP13	V44I	G	601	A
SYT12	R236W	C	770	T	TM4SF1	N218H	T	886	G	TRPC1	R486W	C	1942	T	USP13	Q386H	G	1629	T
SYT12	R247H	G	804	A	TM4SF18	E132*	C	660	A	TRPC1	R610I	G	2315	T	USP13	Q646R	A	2408	G
SYT12	S45L	C	198	T	TM4SF20	A167T	C	537	T	TRPC3	R174C	G	594	A	USP13	A683T	G	2518	A
SYT12	K308N	G	988	T	TM4SF4	A88V	C	1167	T	TRPC3	R189H	C	640	T	USP14	S340Y	C	1019	A
SYT13	A112T	C	460	T	TM4SF5	L172P	T	546	C	TRPC3	Q498H	C	1568	G	USP14	R162H	G	485	A
SYT14	A598V	C	1902	T	TM4SF5	G187D	G	591	A	TRPC3	E879*	C	2709	A	USP15	P672S	C	2023	T
SYT14	F296L	T	995	C	TM4SF5	V30A	T	120	C	TRPC4	G425R	C	2131	T	USP16	R305H	G	1104	A
SYT14	V328I	G	1091	A	TM6SF1	K268T	A	912	C	TRPC4	D428E	G	2142	T	USP17L1P	V369A	T	1106	C
SYT14	R380C	C	1247	T	TM6SF1	S278A	T	941	G	TRPC4	N621I	T	2720	A	USP17L1P	Q345H	G	1035	T
SYT15	R203W	G	1195	A	TM7SF2	M210V	A	775	G	TRPC4	R706K	C	2975	T	USP18	L54P	T	591	C
SYT15	D198N	C	1180	T	TM7SF2	G254R	G	907	A	TRPC4	K159T	T	1334	G	USP19	W447*	C	1553	T
SYT16	Q622H	A	2063	C	TM7SF3	L377P	A	1368	G	TRPC4AP	A657T	C	2059	T	USP19	R881H	C	2854	T

SYT16	R441Q	G	1519	A	TM7SF4	F81C	T	293	G	TRPC4AP	N331H	T	1081	G	USP19	R1380H	C	4351	T
SYT16	R599C	C	1992	T	TM9SF1	R98Q	C	652	T	TRPC5	A704V	G	3030	A	USP19	G1151S	C	3663	T
SYT16	E87D	A	458	C	TM9SF2	E88K	G	452	A	TRPC5	G846S	C	3455	T	USP19	W481R	A	1653	G
SYT17	Y3H	T	405	C	TM9SF3	A119V	G	573	A	TRPC5	E595K	C	2702	T	USP19	L1114P	A	3553	G
SYT17	R65W	C	591	T	TM9SF3	V311G	A	1149	C	TRPC6	S36L	G	532	A	USP19	-	C	0	T
SYT17	S73Y	C	616	A	TM9SF4	S371L	C	1347	T	TRPC6	G20R	C	483	T	USP19	S542G	T	1836	C
SYT17	S66N	G	595	A	TMBIM4	K217N	C	686	A	TRPC6	E120*	C	783	A	USP19	S317T	A	1161	T
SYT17	M415L	A	1641	T	TMBIM4	I131F	T	426	A	TRPC7	V483M	C	1730	T	USP2	S280*	G	1134	T
SYT3	G108C	C	956	A	TMBIM4	F199S	A	631	G	TRPC7	R136H	C	690	T	USP2	-	C	0	T
SYT3	R45Q	C	768	T	TMC1	-	T	0	A	TRPC7	R120C	G	641	A	USP2	L185F	G	848	A
SYT3	A118V	G	987	A	TMC1	R604*	C	2350	T	TRPC7	S394Y	G	1464	T	USP20	R703Q	G	2290	A
SYT3	R97H	C	924	T	TMC1	A166V	C	1037	T	TRPM1	R928W	G	2896	A	USP20	Q809R	A	2608	G
SYT4	E80*	C	607	A	TMC2	S840A	T	2533	G	TRPM1	R546H	C	1751	T	USP20	T911M	C	2914	T
SYT4	E235*	C	1072	A	TMC2	F611Y	T	1847	A	TRPM1	E223K	C	781	T	USP20	R613C	C	2019	T
SYT5	V212A	A	916	G	TMC2	G350S	G	1063	A	TRPM1	R1444W	G	4444	A	USP20	A253T	G	939	A
SYT7	L247M	G	745	T	TMC2	K300N	G	915	T	TRPM1	P1028S	G	3196	A	USP21	R445Q	G	1711	A
SYT8	A55T	G	291	A	TMC2	F304L	T	927	G	TRPM1	I1485S	A	4568	C	USP21	-	A	0	G
SYT8	R261Q	G	910	A	TMC2	R663H	G	2003	A	TRPM1	K1476N	C	4542	A	USP21	R354*	C	1437	T
SYT8	W292*	G	1003	A	TMC2	N730S	A	2204	G	TRPM1	K1433T	T	4412	G	USP22	K489N	C	1484	A
SYT9	E344K	G	1267	A	TMC3	I718V	T	2193	C	TRPM1	L59I	G	289	T	USP22	G325A	C	991	G
SYT9	D209Y	G	862	T	TMC3	S1059N	C	3217	T	TRPM2	S947P	T	2852	C	USP24	R1451C	G	4604	A
SYT9	L339R	T	1253	G	TMC3	R535W	G	1644	A	TRPM2	R546C	C	1649	T	USP24	I2297M	A	7144	C
SYTL1	G5D	G	181	A	TMC3	H434N	G	1341	T	TRPM2	R1380H	G	4152	A	USP24	R540W	G	1871	A
SYTL2	V973A	A	2918	G	TMC4	P550H	G	1781	T	TRPM2	A701T	G	2114	A	USP25	R211Q	G	1001	A
SYTL2	I1554T	A	4661	G	TMC4	S35L	G	236	A	TRPM2	A1013T	G	3050	A	USP26	T122I	G	417	A
SYTL2	E1617A	T	4850	G	TMC5	Q485H	G	2204	T	TRPM2	V1495I	G	4496	A	USP26	L460P	A	1431	G
SYTL2	K1181T	T	3542	G	TMC6	R395Q	C	1325	T	TRPM2	E450K	G	1361	A	USP28	R1060*	G	3211	A
SYTL2	F1161L	G	3483	T	TMC6	T76M	G	368	A	TRPM2	A1547T	G	4652	A	USP28	-	C	0	A
SYTL2	E1053K	C	3157	T	TMC7	A375P	G	1235	C	TRPM3	R159*	G	475	A	USP28	G905D	C	2747	T
SYTL2	E956D	T	2868	G	TMC7	A375P	G	1235	C	TRPM3	L506I	A	1516	T	USP28	F232C	A	728	C
SYTL2	K650N	C	1950	A	TMC7	P626T	C	1988	A	TRPM3	P1094S	G	3280	A	USP29	H498Y	C	1759	T
SYVN1	F29L	A	179	G	TMC8	A715V	C	2526	T	TRPM3	A723V	G	2168	A	USP29	D91Y	G	538	T
SYVN1	P360T	G	1172	T	TMC8	F490L	C	1852	A	TRPM3	K1184R	T	3551	C	USP29	E217*	G	916	T
SYVN1	R140H	C	513	T	TMCC1	R618H	C	2194	T	TRPM3	L1107F	C	3321	A	USP29	L537*	T	1877	G
T	S431L	G	1576	A	TMCC2	Q366*	C	1485	T	TRPM3	S1125L	G	3374	A	USP29	S898Y	C	2960	A
T	P360S	G	1362	A	TMCC3	A127T	C	497	T	TRPM3	L784I	G	2350	T	USP3	E189D	A	696	T
T	R422H	C	1549	T	TMCO1	L149I	G	874	T	TRPM3	R652W	G	1954	A	USP3	G305*	G	1042	T
TAAR1	I62V	T	184	C	TMCO1	R87Q	C	689	T	TRPM3	R231C	G	691	A	USP30	L45I	C	226	A
TAAR2	A173S	C	517	A	TMCO2	K132T	A	488	C	TRPM3	K154T	T	461	G	USP31	R516C	G	1546	A

TAAR5	A3V	G	8	A	TMCO3	R47W	C	498	T	TRPM3	R119Q	C	356	T	USP31	S891R	T	2671	G
TAAR6	A10V	C	29	T	TMCO3	A19V	C	415	T	TRPM4	R474C	C	1492	T	USP31	L146V	G	436	C
TAAR6	F206L	T	616	C	TMCO4	A282T	C	1086	T	TRPM4	R597Q	G	1862	A	USP31	K1097R	T	3290	C
TAAR8	D128N	G	382	A	TMCO5A	L186I	C	658	A	TRPM4	R640C	C	1990	T	USP32	R229H	C	972	T
TAAR9	L268I	C	802	A	TMCO5A	T85A	A	355	G	TRPM4	R645H	G	2006	A	USP32	L529S	A	1872	G
TAAR9	C190*	C	570	A	TMCO5A	F230L	C	792	A	TRPM4	R39H	G	188	A	USP32	S1017L	G	3336	A
TAB1	D123N	G	429	A	TMCO6	R111W	C	355	T	TRPM4	W579C	G	1809	T	USP33	F619V	A	1855	C
TAB1	A343T	G	1089	A	TMCO7	E778A	A	2345	C	TRPM5	R903C	G	2716	A	USP33	V709A	A	2126	G
TAB1	R83W	C	309	T	TMCO7	K42T	A	137	C	TRPM5	E568K	C	1711	T	USP33	R464I	C	1391	A
TAB2	R342C	C	1202	T	TMCO7	E502D	A	1518	C	TRPM5	Q118*	G	361	A	USP33	L287F	C	861	A
TAB2	S440G	A	1496	G	TMED10	R209*	G	692	A	TRPM5	G405D	C	1223	T	USP33	Q211P	T	632	G
TAB3	R96Q	C	465	T	TMED10	K169E	T	572	C	TRPM5	T690M	G	2078	A	USP34	F957I	A	2869	T
TACC1	G83R	G	626	A	TMED5	R183H	C	1034	T	TRPM6	E1649*	C	5183	A	USP34	R403*	G	1207	A
TACC1	N330T	A	1368	C	TMED5	P8S	G	508	A	TRPM6	R549I	C	1884	A	USP34	P2602T	G	7804	T
TACC2	A1263T	G	4127	A	TMED5	T144P	T	916	G	TRPM6	G1995R	C	6221	T	USP34	I412V	T	1234	C
TACC2	R2301G	A	7241	G	TMED7-TICAM2	I378V	T	1501	C	TRPM6	A1239T	C	3953	T	USP34	R211H	C	632	T
TACC3	E822K	G	2570	A	TMED7-TICAM2	R169H	C	875	T	TRPM6	R952Q	C	3093	T	USP34	R688Q	C	2063	T
TACC3	A443V	C	1434	T	TMEFF2	P346H	G	2222	T	TRPM6	E1736*	C	5444	A	USP34	L3002I	G	9004	T
TACR2	R65C	G	193	A	TMEM102	A242S	G	997	T	TRPM6	D223Y	C	905	A	USP34	R2966*	G	8896	A
TACR2	R103H	C	308	T	TMEM106B	P200H	C	786	A	TRPM7	F1001L	A	3266	G	USP34	K1061T	T	3182	G
TACR3	A146V	G	578	A	TMEM108	R200*	C	808	T	TRPM7	R274I	C	1086	A	USP34	-	C	0	T
TACR3	D417N	C	1390	T	TMEM108	A7V	C	230	T	TRPM7	R588Q	C	2028	T	USP35	P771H	C	2558	A
TADA1	D135N	C	497	T	TMEM108	A156V	C	677	T	TRPM8	D198Y	G	632	T	USP35	R616H	G	2093	A
TADA2A	R256*	C	939	T	TMEM108	T357M	C	1280	T	TRPM8	N530K	C	1630	A	USP35	R779C	C	2581	T
TADA2B	D171A	A	701	C	TMEM108	T360A	A	1288	G	TRPM8	T522M	C	1605	T	USP35	P602T	C	2050	A
TADA3	R347C	G	1598	A	TMEM108	D71G	A	422	G	TRPM8	E282D	G	886	T	USP35	S423N	G	1514	A
TADA3	A335T	C	1562	T	TMEM108	T292A	A	1084	G	TRPM8	D718N	G	2192	A	USP35	A426V	C	1523	T
TADA3	R333C	G	1556	A	TMEM11	A178T	C	975	T	TRPS1	E731K	C	2796	T	USP36	T905M	G	3039	A
TAF1	D1426G	A	4328	G	TMEM11	A177T	C	972	T	TRPS1	P1292H	G	4480	T	USP36	K813N	T	2764	G
TAF1	D1502A	A	4556	C	TMEM115	T184A	T	1097	C	TRPS1	G873R	C	3222	T	USP38	R1010W	C	3534	T
TAF1	V1877I	G	5680	A	TMEM117	R97*	C	416	T	TRPS1	Q671K	G	2616	T	USP38	S897G	A	3195	G
TAF1	L671P	T	2063	C	TMEM117	P512S	C	1661	T	TRPS1	A852V	G	3160	A	USP38	T922A	A	3270	G
TAF1	R122Q	G	416	A	TMEM117	-	A	0	G	TRPS1	A619V	G	2461	A	USP38	L350V	T	1554	G
TAF1	T127M	C	431	T	TMEM117	R423H	G	1395	A	TRPS1	R257Q	C	1375	T	USP38	E696K	G	2592	A
TAF10	-	C	0	A	TMEM117	L71Q	T	339	A	TRPS1	K236T	T	1312	G	USP40	R103*	G	307	A
TAF10	F162C	A	963	C	TMEM119	V88M	C	425	T	TRPS1	R758M	C	2878	A	USP40	G509W	C	1525	A
TAF11	R126H	C	509	T	TMEM121	V250I	G	912	A	TRPV1	P429L	G	1813	A	USP40	R1231L	C	3692	A
TAF12	E135*	C	562	A	TMEM121	V41M	G	285	A	TRPV1	A209T	C	1152	T	USP40	-	C	0	A

TAF12	F91C	A	431	C	TMEM128	F151C	A	462	C	TRPV1	R628W	G	2409	A	USP40	R574S	T	1722	G
TAF15	R483*	C	1533	T	TMEM130	R94C	G	469	A	TRPV1	D423N	C	1794	T	USP42	R584H	G	1874	A
TAF1B	R261C	C	969	T	TMEM131	R75H	C	453	T	TRPV2	R537H	G	1977	A	USP42	E1153K	G	3580	A
TAF1B	M1T	T	190	C	TMEM131	S418Y	G	1482	T	TRPV2	F403L	T	1574	C	USP42	V250I	G	871	A
TAF1B	F519C	T	1744	G	TMEM132A	R1014C	C	3233	T	TRPV2	E230D	G	1057	T	USP42	R1131H	G	3515	A
TAF1C	R425H	C	1502	T	TMEM132A	V410A	T	1422	C	TRPV3	R690C	G	2390	A	USP42	A569T	G	1828	A
TAF1C	P300H	G	1127	T	TMEM132B	D719N	G	2163	A	TRPV3	R363C	G	1409	A	USP43	Y672C	A	2015	G
TAF1C	V100M	C	526	T	TMEM132B	T213N	C	646	A	TRPV3	K434N	C	1624	A	USP43	R1071H	G	3212	A
TAF1C	G407R	C	1447	T	TMEM132B	T361M	C	1090	T	TRPV4	V829M	C	2574	T	USP45	V204G	A	655	C
TAF1C	D113Y	C	565	A	TMEM132B	V447A	T	1348	C	TRPV4	R661C	G	2070	A	USP46	L256R	A	767	C
TAF1L	L1813I	G	5527	T	TMEM132B	S863T	G	2596	C	TRPV4	S48L	G	232	A	USP47	F925C	T	2774	G
TAF1L	D1105N	C	3403	T	TMEM132B	F922I	T	2772	A	TRPV5	I341S	A	1371	C	USP48	C512Y	C	2184	T
TAF1L	V946F	C	2926	A	TMEM132C	R148*	C	442	T	TRPV5	S696N	C	2436	T	USP49	R156W	G	796	A
TAF1L	R1450C	G	4438	A	TMEM132C	A549T	G	1645	A	TRPV5	-	T	0	C	USP49	P137Q	G	740	T
TAF1L	E1819*	C	5545	A	TMEM132C	E672V	A	2015	T	TRPV6	R686*	G	2302	A	USP5	R754W	C	2319	T
TAF1L	R1049C	G	3235	A	TMEM132C	G563S	G	1687	A	TRPV6	R628H	C	2129	T	USP5	V465M	G	1452	A
TAF1L	E680*	C	2128	A	TMEM132C	V664I	G	1990	A	TRPV6	R359H	C	1322	T	USP5	V794F	G	2439	T
TAF1L	D144Y	C	520	A	TMEM132C	G472*	G	1414	T	TRPV6	E535K	C	1849	T	USP50	K135N	C	585	A
TAF1L	R122I	C	455	A	TMEM132C	D1038N	G	3112	A	TRRAP	R1015W	C	3252	T	USP50	D107G	T	500	C
TAF2	E205K	C	883	T	TMEM132D	H254N	G	760	T	TRRAP	R1447C	C	4548	T	USP53	E898*	G	3871	T
TAF2	N149D	T	715	C	TMEM132D	S836I	C	2507	A	TRRAP	A1918V	C	5962	T	USP54	C1293R	A	3978	G
TAF2	R541*	G	1891	A	TMEM132D	S716N	C	2147	T	TRRAP	R1947Q	G	6049	A	USP54	A885V	G	2755	A
TAF3	E122*	G	570	T	TMEM132D	P525L	G	1574	A	TRRAP	R3618Q	G	11062	A	USP54	T397M	G	1291	A
TAF3	R425I	G	1480	T	TMEM132D	S737Y	G	2210	T	TRRAP	P3647L	C	11149	T	USP54	D1484Y	C	4551	A
TAF3	E594D	A	1988	C	TMEM132D	E495*	C	1483	A	TRRAP	A1055T	G	3372	A	USP54	S1154R	T	3561	G
TAF4	T725M	G	2174	A	TMEM132E	H134Y	C	554	T	TRRAP	R616H	G	2056	A	USP54	K1103T	T	3409	G
TAF4B	R760C	C	2767	T	TMEM132E	R317Q	G	1104	A	TRRAP	V2212I	G	6843	A	USP54	R758Q	C	2374	T
TAF4B	R616L	G	2336	T	TMEM132E	A391T	G	1325	A	TRRAP	V3428I	G	10491	A	USP54	F508C	A	1624	C
TAF5	R610Q	G	1852	A	TMEM133	T31N	C	321	A	TRRAP	R816W	C	2655	T	USP6	V338M	G	3242	A
TAF5	R505C	C	1536	T	TMEM135	R55W	C	186	T	TRRAP	R2469C	C	7614	T	USP6	N842T	A	4755	C
TAF5L	R491W	G	1471	A	TMEM135	I268N	T	826	A	TRRAP	A2V	C	214	T	USP6	R1249W	C	5975	T
TAF5L	V566I	C	1696	T	TMEM136	L26P	T	318	C	TRRAP	V399I	G	1404	A	USP6	R1113Q	G	5568	A
TAF6	D443N	C	1505	T	TMEM139	R104H	G	419	A	TRRAP	W2374L	G	7330	T	USP6	-	G	0	T
TAF6	R103H	C	486	T	TMEM140	R9C	C	248	T	TRRAP	H1661R	A	5191	G	USP6	E893D	G	4909	T
TAF6	C187Y	C	738	T	TMEM143	R278H	C	853	T	TRRAP	A2777V	C	8539	T	USP6	E1273A	A	6048	C
TAF6	R459L	C	1554	A	TMEM144	F101C	T	822	G	TRRAP	G1024C	G	3279	T	USP6NL	A492T	C	1517	T
TAF6L	R236H	G	818	A	TMEM146	R787H	G	2421	A	TRRAP	T1219M	C	3865	T	USP6NL	R543W	G	1670	A
TAF6L	V322A	T	1076	C	TMEM146	S476R	T	1489	A	TRRAP	D3636N	G	11115	A	USP6NL	T520I	G	1602	A
TAF7	K154N	C	1202	A	TMEM146	F72C	T	276	G	TRRAP	F2814S	T	8650	C	USP6NL	A492T	C	1517	T

TAF7	K129T	T	1126	G	TMEM146	F437L	C	1372	A	TRUB1	-	A	0	C	USP6NL	L186V	A	599	C
TAF7L	-	C	0	T	TMEM149	G226W	C	774	A	TRUB2	L147P	A	774	G	USP6NL	R113Q	C	381	T
TAF7L	S271L	G	824	A	TMEM149	S301L	G	1000	A	TRUB2	W274C	C	1156	A	USP6NL	A527P	C	1622	G
TAF7L	T65M	G	206	A	TMEM14C	F86C	T	568	G	TRUB2	R199Q	C	930	T	USP7	S371*	G	1156	T
TAF8	V169M	G	525	A	TMEM150A	G99V	C	484	A	TSC1	R1097C	G	3511	A	USP7	A579T	C	1779	T
TAF8	M194I	G	602	T	TMEM150A	A136V	G	595	A	TSC1	A57T	C	391	T	USP7	E555K	C	1707	T
TAF9B	P144S	G	525	A	TMEM150A	G70S	C	396	T	TSC2	V679M	G	2665	A	USP7	H3Q	G	208	C
TAGAP	N272D	T	1146	C	TMEM150B	A205T	C	796	T	TSC2	R1639H	G	5546	A	USP8	N744S	A	2569	G
TAGLN	A2V	C	523	T	TMEM150C	R219C	G	974	A	TSC2	N1214I	A	4271	T	USP9X	G985V	G	3587	T
TAGLN2	R70C	G	455	A	TMEM151A	R256H	G	911	A	TSC2	R901C	C	3331	T	USP9X	S722G	A	2797	G
TAGLN2	N186H	T	803	G	TMEM151A	W289C	G	1011	T	TSC2	V461M	G	2011	A	USP9X	D62N	G	817	A
TAGLN3	A187V	C	1013	T	TMEM151A	T216M	C	791	T	TSC22D1	T962A	T	3375	C	USP9X	R371Q	G	1745	A
TALDO1	T167A	A	652	G	TMEM151B	R174C	C	520	T	TSC22D2	D695E	T	3101	G	USP9X	K1156E	A	4099	G
TANC1	I1286V	A	4093	G	TMEM151B	A533T	G	1597	A	TSC22D2	F580S	T	2755	C	USP9Y	-	G	0	T
TANC1	A113V	C	575	T	TMEM160	A81T	C	268	T	TSEN15	L135V	T	482	G	USPL1	G831V	G	2834	T
TANC1	A184T	G	787	A	TMEM161A	V92M	C	307	T	TSEN2	W354C	G	1217	T	USPL1	S23Y	C	410	A
TANC1	V941I	G	3058	A	TMEM163	A103T	C	372	T	TSEN2	-	A	1552	C	USPL1	Q743H	G	2571	T
TANC1	E1225G	A	3911	G	TMEM163	V228M	C	747	T	TSGA10	R347K	C	1885	T	USPL1	K901N	G	3045	T
TANC1	R856H	G	2804	A	TMEM164	G249C	G	1081	T	TSGA10	R17W	G	894	A	UST	G130R	G	491	A
TANC1	E1238K	G	3949	A	TMEM167B	I10T	T	29	C	TSGA10	R330C	G	1833	A	UTP11L	R25Q	G	135	A
TANC2	E811K	G	2454	A	TMEM168	I381M	A	1704	C	TSGA10	E523*	C	2412	A	UTP14A	G177D	G	558	A
TANC2	M297V	A	912	G	TMEM168	L44V	A	691	C	TSGA10	R418*	G	2097	A	UTP14C	V93I	G	1010	A
TANC2	H1089R	A	3289	G	TMEM17	N23I	T	280	A	TSHB	M29V	A	153	G	UTP14C	E632K	G	2627	A
TANC2	G1728R	G	5205	A	TMEM17	E28D	C	296	A	TSHR	R701C	C	2257	T	UTP14C	E331*	G	1724	T
TANC2	T1088A	A	3285	G	TMEM170A	V132I	C	480	T	TSHZ1	K600N	G	2342	T	UTP15	Y95H	T	282	C
TANC2	L783F	C	2370	T	TMEM171	R107C	C	792	T	TSHZ1	R492H	G	2017	A	UTP15	V230I	G	687	A
TANC2	R879W	C	2658	T	TMEM173	R310H	C	1263	T	TSHZ1	P774L	C	2863	T	UTP18	T15A	A	100	G
TANC2	R1210Q	G	3652	A	TMEM175	R335C	C	1188	T	TSHZ1	S970L	C	3451	T	UTP18	E374*	G	1177	T
TANK	D307N	G	1124	A	TMEM175	S497P	T	1674	C	TSHZ2	A222V	C	1552	T	UTP20	R1998W	C	6148	T
TAOK1	D418Y	G	1446	T	TMEM175	A305V	C	1099	T	TSHZ2	A222V	C	1552	T	UTP20	A1852V	C	5711	T
TAOK2	R1124C	C	4115	T	TMEM175	-	T	0	G	TSHZ2	E59A	A	1063	C	UTP20	I1927M	A	5937	G
TAOK2	A41V	C	867	T	TMEM175	R335S	C	1188	A	TSHZ2	S431L	C	2179	T	UTP20	H1066Y	C	3352	T
TAOK3	R581Q	C	2233	T	TMEM178	R153Q	G	514	A	TSHZ2	S519Y	C	2443	A	UTP20	L254I	C	916	A
TAOK3	A296V	G	1378	A	TMEM178	A141T	G	477	A	TSHZ3	R4K	C	317	T	UTP20	L571R	T	1868	G
TARBP1	V1493I	C	4477	T	TMEM180	R159H	G	695	A	TSHZ3	T361M	G	1388	A	UTP20	T1354M	C	4217	T
TARBP1	T937A	T	2809	C	TMEM180	A123V	C	587	T	TSHZ3	E715D	T	2451	A	UTP20	F1479L	C	4593	A
TARBP1	K1063N	T	3189	G	TMEM180	A93V	C	497	T	TSHZ3	E880Q	C	2944	G	UTP20	E1571*	G	4867	T
TARBP2	E191*	G	1059	T	TMEM182	C136S	G	612	C	TSHZ3	N785K	G	2661	T	UTP20	R2378C	C	7288	T
TARDBP	L248S	T	857	C	TMEM184A	A234T	C	1017	T	TSHZ3	G161D	C	788	T	UTP3	R220Q	G	858	A

TARS	T316A	A	1068	G	TMEM186	H209Q	A	661	C	TSKS	R503H	C	1547	T	UTP3	D179G	A	735	G
TARS	E739K	G	2337	A	TMEM187	R252I	G	1502	T	TSKS	H560N	G	1717	T	UTP3	K387Q	A	1358	C
TARS	R671*	C	2133	T	TMEM192	H118R	T	499	C	TSKU	A347D	C	1212	A	UTP6	E258*	C	857	A
TARS2	S349Y	C	1080	A	TMEM194A	G170V	C	555	A	TSNARE1	V194G	A	695	C	UTP6	R74H	C	306	T
TARS2	T449I	C	1380	T	TMEM194A	F186V	A	602	C	TSNARE1	A320T	C	1072	T	UTP6	F425L	A	1358	G
TARS2	R196Q	G	621	A	TMEM194B	A26E	G	144	T	TSNARE1	A229T	C	799	T	UTRN	R1084Q	G	3251	A
TARS2	R304C	C	944	T	TMEM195	R68H	C	373	T	TSNARE1	R196W	G	700	A	UTRN	R2532*	C	7594	T
TARSL2	G689R	C	2282	T	TMEM199	D305Y	G	1548	T	TSNARE1	R166C	G	610	A	UTRN	E2847K	G	8539	A
TARSL2	I774V	T	2537	C	TMEM199	Y239C	A	1351	G	TSNAXIP1	F53L	C	204	A	UTRN	Q832*	C	2494	T
TARSL2	L137I	G	626	T	TMEM199	A200V	C	1234	T	TSNAXIP1	I199V	A	640	G	UTRN	D3407N	G	1021 9	A
TARSL2	E133*	C	614	A	TMEM2	A1342V	G	4173	A	TSNAXIP1	R262W	C	829	T	UTRN	V235I	G	703	A
TAS1R1	R187C	C	752	T	TMEM2	F391L	G	1321	T	TSNAXIP1	-	G	0	A	UTRN	D2933G	A	8798	G
TAS1R1	V53A	T	351	C	TMEM2	G991V	C	3120	A	TSNAXIP1	V86A	T	302	C	UTRN	E1277*	G	3829	T
TAS1R2	R473*	G	1439	A	TMEM20	T153A	A	518	G	TSNAXIP1	D214N	G	685	A	UTRN	T3218A	A	9652	G
TAS1R2	P440L	G	1341	A	TMEM20	K247Q	A	800	C	TSPAN10	S107Y	C	410	A	UTRN	E1260D	G	3780	C
TAS1R2	W341R	A	1043	G	TMEM200A	A202T	G	1475	A	TSPAN11	R86Q	G	370	A	UTS2D	D60Y	C	965	A
TAS1R2	R254C	G	782	A	TMEM200A	G109S	G	1196	A	TSPAN12	E4*	C	618	A	UXS1	I71T	A	310	G
TAS1R2	P241H	G	744	T	TMEM200A	V112L	G	1205	C	TSPAN15	N166T	A	619	C	VAC14	R233C	G	965	A
TAS1R2	R457Q	C	1392	T	TMEM200A	R43W	C	998	T	TSPAN17	A266T	G	796	A	VAMP4	D12N	C	173	T
TAS1R2	R707H	C	2142	T	TMEM201	C617Y	G	1859	A	TSPAN17	A266T	G	796	A	VAMP5	R30H	G	172	A
TAS1R2	S86N	C	279	T	TMEM201	R474H	G	1430	A	TSPAN18	F116L	C	504	A	VANGL1	R360S	G	1351	T
TAS2R1	E74G	T	540	C	TMEM201	V57L	G	178	C	TSPAN18	E216K	G	802	A	VANGL2	G142R	G	898	A
TAS2R10	K285N	C	855	A	TMEM201	C67R	T	208	C	TSPAN19	E81K	C	241	T	VANGL2	H430Y	C	1762	T
TAS2R10	L129I	G	385	T	TMEM201	R474C	C	1429	T	TSPAN2	A213V	G	670	A	VANGL2	R440Q	G	1793	A
TAS2R16	T111A	T	397	C	TMEM202	D200Y	G	598	T	TSPAN2	R118*	G	384	A	VAPA	-	T	0	C
TAS2R16	F68V	A	268	C	TMEM203	E76D	C	452	A	TSPAN2	-	C	0	T	VASH1	F197L	C	1521	A
TAS2R20	M181V	T	541	C	TMEM204	A9V	C	645	T	TSPAN32	R316W	C	1083	T	VASH1	V270M	G	1738	A
TAS2R3	E70*	G	270	T	TMEM205	H44P	T	438	G	TSPAN5	D190Y	C	971	A	VASH1	T309A	A	1855	G
TAS2R38	D324N	C	1054	T	TMEM206	P144L	G	569	A	TSPAN7	-	T	0	C	VASH1	F60L	C	1110	A
TAS2R39	H172Q	C	516	G	TMEM206	R110H	C	467	T	TSPAN8	N37H	T	662	G	VASH2	T106M	C	627	T
TAS2R40	N125T	A	416	C	TMEM206	E49K	C	283	T	TSPAN9	A220V	C	806	T	VASH2	V208I	G	932	A
TAS2R50	L182I	G	544	T	TMEM209	R427*	G	1402	A	TSPAN9	R146*	C	583	T	VASH2	R265W	C	1103	T
TAS2R60	R310H	G	929	A	TMEM209	A315T	C	1066	T	TSPYL2	-	G	0	A	VASH2	E286D	G	1168	T
TAS2R60	Y167H	T	499	C	TMEM212	Y117H	T	384	C	TSPYL2	R289C	C	997	T	VASN	G467C	G	1554	T
TAT	C241Y	C	856	T	TMEM212	E142K	G	459	A	TSPYL6	R332P	C	1070	G	VASP	R154C	C	802	T
TAT	-	A	0	C	TMEM214	R611H	G	1894	A	TSPYL6	G194R	C	655	T	VASP	G115E	G	686	A
TAT	S28N	C	217	T	TMEM214	K93T	A	340	C	TSR1	V111A	A	1289	G	VAT1	Q153*	G	577	A
TATDN1	R167W	G	525	A	TMEM214	L118R	T	415	G	TSR1	E487D	T	2418	G	VAT1L	F291C	T	969	G
TATDN2	Y759H	T	3326	C	TMEM215	F197L	C	956	A	TSR2	R13W	C	58	T	VAT1L	P268S	C	899	T

TATDN3	A185T	G	588	A	TMEM216	R54H	G	597	A	TSSC1	R218Q	C	794	T	VAT1L	R414W	C	1337	T
TAX1BP1	R704Q	G	2246	A	TMEM217	R168Q	C	543	T	TSSC4	E172K	G	1005	A	VAV1	W671*	G	2110	A
TAX1BP3	V12M	C	190	T	TMEM219	M174L	A	657	C	TSSK1B	D97N	C	439	T	VAV1	L258P	T	870	C
TAZ	K153E	A	457	G	TMEM22	R102Q	G	933	A	TSSK1B	R9Q	C	176	T	VAV1	V370A	T	1206	C
TBC1D1	Y625C	A	2229	G	TMEM22	W252*	G	1383	A	TSSK1B	R135W	G	553	A	VAV2	G605W	C	1845	A
TBC1D1	T632A	A	2249	G	TMEM22	V148L	G	1070	T	TSSK1B	R168Q	C	653	T	VAV2	F792C	A	2407	C
TBC1D1	L104P	T	666	C	TMEM220	D27Y	C	557	A	TSSK2	V124I	G	962	A	VAV3	L11F	G	125	A
TBC1D1	K314N	A	1297	C	TMEM222	R84W	C	288	T	TSSK2	A24T	G	662	A	VAV3	T80M	G	333	A
TBC1D10A	A465V	G	1414	A	TMEM229A	N116D	T	812	C	TSSK3	R63C	C	692	T	VAV3	G563D	C	1782	T
TBC1D10A	Q451*	G	1371	A	TMEM229B	R143H	C	660	T	TST	A56T	C	901	T	VAV3	V625I	C	1967	T
TBC1D10A	Q129*	G	405	A	TMEM231	Y84S	T	290	G	TSTA3	Y161C	T	1274	C	VAV3	A52V	G	249	A
TBC1D10B	L497I	G	1570	T	TMEM231	K80E	T	277	C	TSTD1	E93D	T	314	G	VAV3	K5E	T	107	C
TBC1D10B	R728Q	C	2264	T	TMEM232	A480T	C	1489	T	TTBK1	A1010T	G	3111	A	VAX1	G94D	C	281	T
TBC1D10B	T521M	G	1643	A	TMEM232	R476*	G	1477	A	TTBK1	D116N	G	429	A	VAX1	P47L	G	140	A
TBC1D12	R416H	G	1357	A	TMEM232	K393Q	T	1228	G	TTBK2	E1163*	C	3985	A	VAX2	E263*	G	819	T
TBC1D12	R625H	G	1984	A	TMEM232	K73R	T	269	C	TTBK2	R1578W	G	5230	A	VCAM1	S568Y	C	1804	A
TBC1D12	S592P	T	1884	C	TMEM232	E66*	C	247	A	TTC12	Y143C	A	479	G	VCAM1	I351K	T	1153	A
TBC1D13	R128Q	G	533	A	TMEM25	A219V	C	709	T	TTC13	E172G	T	523	C	VCAM1	M571V	A	1812	G
TBC1D14	P76L	C	306	T	TMEM25	P234S	C	753	T	TTC13	L738I	G	2220	T	VCAM1	K604Q	A	1911	C
TBC1D14	Y46*	C	217	A	TMEM26	A351T	C	1420	T	TTC15	A264P	G	959	C	VCAN	-	G	0	A
TBC1D14	P324T	C	1049	A	TMEM26	K292N	C	1245	A	TTC16	S656L	C	2047	T	VCAN	E2002*	G	6569	T
TBC1D14	F607L	T	1898	C	TMEM27	N209H	T	881	G	TTC17	V754I	G	2274	A	VCAN	S2864Y	C	9156	A
TBC1D15	S519F	C	1620	T	TMEM30A	N163S	T	635	C	TTC17	A1064V	C	3205	T	VCAN	E3211K	G	1019 6	A
TBC1D15	-	T	0	C	TMEM30A	E184A	T	698	G	TTC17	L499P	T	1510	C	VCAN	S1158R	T	4039	A
TBC1D15	C514Y	G	1605	A	TMEM33	S197L	C	955	T	TTC18	R1029I	C	3398	A	VCAN	A360T	G	1643	A
TBC1D15	K353E	A	1121	G	TMEM38A	A53T	G	248	A	TTC18	S440N	C	1631	T	VCAN	A1519S	G	5120	T
TBC1D16	R684W	G	2166	A	TMEM38B	E71G	A	329	G	TTC18	S781G	T	2653	C	VCAN	P348S	C	1607	T
TBC1D16	V220M	C	774	T	TMEM38B	K256N	G	885	T	TTC18	S438Y	G	1625	T	VCAN	A2982V	C	9510	T
TBC1D17	L136P	T	559	C	TMEM40	Y210C	T	750	C	TTC18	D430Y	C	1600	A	VCAN	Y3111C	A	9897	G
TBC1D17	P178L	C	685	T	TMEM41A	D47N	C	235	T	TTC19	V104F	G	328	T	VCAN	-	A	1075 6	G
TBC1D19	H287R	A	1138	G	TMEM41A	L173H	A	614	T	TTC21A	T266A	A	973	G	VCAN	R327C	C	1544	T
TBC1D2	A345V	G	1126	A	TMEM41A	L8I	G	118	T	TTC21A	R1187H	G	3737	A	VCAN	E1167*	G	4064	T
TBC1D2	V788I	C	2454	T	TMEM42	W130G	T	444	G	TTC21B	E233D	C	837	A	VCAN	S1444L	C	4896	T
TBC1D2	A666V	G	2089	A	TMEM43	R96W	C	540	T	TTC21B	R1050W	G	3286	A	VCAN	K1723N	G	5734	T
TBC1D2	R697L	C	2182	A	TMEM43	P373L	C	1372	T	TTC23	A64T	C	1024	T	VCAN	E2261*	G	7346	T
TBC1D20	L194*	A	581	C	TMEM43	T357I	C	1324	T	TTC24	R31W	C	91	T	VCAN	N2281S	A	7407	G
TBC1D22A	R286H	G	1023	A	TMEM44	P208L	G	829	A	TTC24	D388E	T	1164	G	VCAN	S2630Y	C	8454	A
TBC1D22A	N15I	A	210	T	TMEM45A	E186*	G	1176	T	TTC24	-	A	1749	G	VCL	A1037D	C	3204	A

TBC1D22B	R108I	G	469	T	TMEM45B	R44C	C	191	T	TTC25	E648*	G	2021	T	VCL	A314T	G	1034	A
TBC1D25	R466*	C	1737	T	TMEM45B	Y29H	T	146	C	TTC25	-	T	0	C	VCL	D810N	G	2522	A
TBC1D25	R649H	G	2287	A	TMEM45B	I181V	A	602	G	TTC25	K636N	G	1987	T	VCP	F575L	G	2621	T
TBC1D25	W463C	G	1730	T	TMEM45B	F95C	T	345	G	TTC27	Q411R	A	1463	G	VCP	E397D	T	2087	G
TBC1D25	A491V	C	1813	T	TMEM47	A30V	G	348	A	TTC27	R659H	G	2207	A	VCPIP1	R785*	G	2642	A
TBC1D26	K127E	A	791	G	TMEM48	E409*	C	1824	A	TTC28	A1608V	G	4965	A	VCPIP1	F924L	G	3061	T
TBC1D28	R109Q	C	1026	T	TMEM48	L382I	G	1743	T	TTC28	A2213V	G	6780	A	VCPIP1	L840*	A	2808	C
TBC1D2B	L543P	A	1628	G	TMEM49	I324T	T	1244	C	TTC28	S1462N	C	4527	T	VDAC1	E36D	C	353	A
TBC1D4	L968I	G	3249	T	TMEM49	K250Q	A	1021	C	TTC28	G1377R	C	4271	T	VDAC2	G298C	G	1141	T
TBC1D4	T448M	G	1690	A	TMEM51	H109R	A	772	G	TTC28	S1596L	G	4929	A	VDAC2	-	G	0	A
TBC1D4	M1023T	A	3415	G	TMEM52	R95W	G	291	A	TTC28	R1207*	G	3761	A	VDAC3	K111N	G	476	T
TBC1D4	-	A	0	G	TMEM53	R165Q	C	658	T	TTC28	Q746H	C	2380	A	VDR	R358C	G	1232	A
TBC1D4	R293W	G	1224	A	TMEM55A	R59H	C	402	T	TTC28	N955D	T	3005	C	VDR	R154W	G	620	A
TBC1D4	S1000Y	G	3346	T	TMEM55A	P11H	G	258	T	TTC28	S2153N	C	6600	T	VDR	T365M	G	1254	A
TBC1D4	Q850H	T	2897	G	TMEM55A	R219Q	C	882	T	TTC28	E356*	C	1208	A	VEGFB	G30D	G	129	A
TBC1D4	R637*	G	2256	A	TMEM55B	R131*	G	499	A	TTC28	M103I	C	451	A	VEGFC	E333*	C	1413	A
TBC1D4	I171F	T	858	A	TMEM57	A338T	G	1191	A	TTC29	K365T	T	1294	G	VEGFC	N251S	T	1168	C
TBC1D4	A710T	C	2475	T	TMEM57	A382T	G	1323	A	TTC29	E275*	C	1023	A	VENTX	C184Y	G	562	A
TBC1D5	R706*	G	2380	A	TMEM57	V110A	T	508	C	TTC29	A124V	G	571	A	VENTX	S160L	C	490	T
TBC1D5	I667S	A	2264	C	TMEM57	L197F	C	768	T	TTC29	R249C	G	945	A	VEPH1	T103A	T	615	C
TBC1D7	R20C	G	142	A	TMEM59	L19P	A	69	G	TTC29	E163K	C	687	T	VEPH1	E789K	C	2673	T
TBC1D8	K1136M	T	3538	A	TMEM59	R102*	G	317	A	TTC29	-	C	0	T	VEPH1	L221F	G	969	A
TBC1D8	R319Q	C	1087	T	TMEM59L	A129V	C	473	T	TTC30A	S41I	C	387	A	VEZF1	R91C	G	414	A
TBC1D8	S1002I	C	3136	A	TMEM59L	R82C	C	331	T	TTC30B	L194M	G	831	T	VGF	S573L	G	1958	A
TBC1D8	R619W	G	1986	A	TMEM62	G27D	G	359	A	TTC31	L109I	C	332	A	VGLL1	Q174H	A	692	C
TBC1D8B	Y188C	A	737	G	TMEM62	V617A	T	2129	C	TTC32	E92K	C	406	T	VGLL3	R143W	G	791	A
TBC1D8B	N729T	A	2360	C	TMEM63A	G415D	C	1515	T	TTC33	V225A	A	827	G	VGLL3	A79D	G	600	T
TBC1D9	T113S	T	412	A	TMEM63A	S799T	C	2667	G	TTC35	K127T	A	415	C	VGLL4	S238P	A	1118	G
TBC1D9	V1094M	C	3355	T	TMEM63A	Y752H	A	2525	G	TTC37	A617T	C	2148	T	VGLL4	R104W	G	716	A
TBC1D9	-	C	0	A	TMEM63A	R92K	C	546	T	TTC37	G797D	C	2689	T	VHL	G29D	G	926	A
TBC1D9B	S601L	G	1837	A	TMEM63B	R542C	C	1762	T	TTC37	A427V	G	1579	A	VHL	R205H	G	1454	A
TBC1D9B	G1189S	C	3600	T	TMEM63B	A622T	G	2002	A	TTC38	S216L	C	723	T	VHL	L201P	T	1442	C
TBC1D9B	V706A	A	2152	G	TMEM63B	V220I	G	796	A	TTC39A	A376T	C	1175	T	VHL	G127V	G	1220	T
TBC1D9B	P852S	G	2589	A	TMEM63C	R636H	G	2119	A	TTC39B	R553I	C	1695	A	VILL	I43T	T	394	C
TBC1D9B	T646M	G	1972	A	TMEM63C	A543T	G	1839	A	TTC39C	C446S	G	1789	C	VILL	R741W	C	2487	T
TBC1D9B	A536T	C	1641	T	TMEM63C	R60W	C	390	T	TTC3L	R1970C	C	6013	T	VIPAR	R407*	G	1219	A
TBCB	G171*	G	1086	T	TMEM63C	E94D	G	494	T	TTC3L	N121H	A	466	C	VIPR1	E453K	G	1470	A
TBCC	F104S	A	334	G	TMEM63C	I443V	A	1539	G	TTC3L	R246I	G	842	T	VIPR1	S431N	G	1405	A
TBCCD1	R539H	C	2096	T	TMEM65	A174T	C	1062	T	TTC3L	R277C	C	934	T	VIPR1	G28D	G	196	A

TBCCD1	E88K	C	742	T	TMEM67	R549C	C	1658	T	TTC3L	V1461M	G	4486	A	VIPR1	H171R	A	625	G
TBCCD1	A303T	C	1387	T	TMEM67	K594R	A	1794	G	TTC3L	L1118S	T	3458	C	VIPR2	F358L	G	1162	T
TBCCD1	C384*	G	1632	T	TMEM67	S116Y	C	360	A	TTC3L	V344I	G	1135	A	VIT	S272*	C	1117	A
TBCCD1	T401M	G	1682	A	TMEM67	F563L	C	1702	A	TTC3L	S1749P	T	5350	C	VIT	T685A	A	2355	G
TBCD	-	G	0	A	TMEM67	F637L	C	1924	A	TTC3L	-	A	0	G	VLDLR	N364H	A	1446	C
TBCD	A751T	G	2381	A	TMEM67	R757I	G	2283	T	TTC3L	E159D	A	582	C	VLDLR	R448Q	G	1699	A
TBCD	V794I	G	2510	A	TMEM67	H790N	C	2381	A	TTC7A	D87Y	G	515	T	VLDLR	D187E	C	917	G
TBCE	R386Q	G	1333	A	TMEM70	I95M	T	372	G	TTC7A	A288V	C	1119	T	VLDLR	A476V	C	1783	T
TBCEL	F318L	C	1032	G	TMEM71	D83N	C	476	T	TTC7A	R163W	C	743	T	VLDLR	G604R	G	2166	A
TBCK	K742T	T	2673	G	TMEM71	D155G	T	693	C	TTC7A	T520M	C	1815	T	VLDLR	G54E	G	517	A
TBCK	R41C	G	569	A	TMEM71	D83N	C	476	T	TTC7A	A868V	C	2859	T	VLDLR	I769M	T	2663	G
TBK1	Q289R	A	965	G	TMEM72	Y149C	A	759	G	TTC7B	R750W	G	2370	A	VN1R1	R81K	C	242	T
TBK1	R440*	C	1417	T	TMEM79	A207V	C	781	T	TTC7B	E143Q	C	549	G	VN1R2	C299Y	G	980	A
TBK1	R724C	C	2269	T	TMEM80	R118H	G	353	A	TTC7B	Q670H	C	2132	A	VN1R2	L128I	C	466	A
TBKBP1	E255D	G	1614	T	TMEM81	T76A	T	366	C	TTC7B	Q641*	G	2043	A	VN1R2	S344F	C	1115	T
TBL1X	H359Y	C	1443	T	TMEM82	L159M	C	613	A	TTC8	Y53N	T	231	A	VN1R4	W299*	C	897	T
TBL1X	V511I	G	1899	A	TMEM82	A160T	G	616	A	TTC8	A346T	G	1110	A	VNN1	A351T	C	1065	T
TBL1XR1	E351*	C	1311	A	TMEM86A	V147M	G	522	A	TTC8	K460N	G	1454	T	VNN2	D81Y	C	252	A
TBL1XR1	T396A	T	1446	C	TMEM87B	T187M	C	929	T	TTC8	V463I	G	1461	A	VNN2	-	C	0	A
TBL1XR1	S447G	T	1599	C	TMEM87B	Y208H	T	991	C	TTF1	F527C	A	1620	C	VPRBP	R177Q	C	530	T
TBL1XR1	K335Q	T	1263	G	TMEM87B	D119N	G	724	A	TTF1	N615S	T	1884	C	VPRBP	L1505P	A	4514	G
TBL2	K446N	C	1580	A	TMEM87B	Y241S	A	1091	C	TTF2	S883G	A	2691	G	VPRBP	V1242I	C	3724	T
TBL2	L82M	G	486	T	TMEM8A	M474I	C	1583	T	TTF2	R733Q	G	2242	A	VPRBP	E1439D	C	4317	G
TBL2	R33C	G	339	A	TMEM8A	T357M	G	1231	A	TTF2	K871Q	A	2655	C	VPRBP	A906T	C	2716	T
TBL3	R322C	C	1092	T	TMEM8B	R377H	G	2145	A	TTK	T458A	A	1483	G	VPRBP	K1020N	C	3060	A
TBL3	R708H	G	2251	A	TMEM8B	R428C	C	2297	T	TTK	V208A	T	734	C	VPREB1	R38H	G	252	A
TBL3	R148*	C	570	T	TMEM8B	R364C	C	2105	T	TTLL1	D196G	T	828	C	VPREB1	S73L	C	357	T
TBL3	S54L	C	289	T	TMEM8C	R62C	G	286	A	TTLL10	T351M	C	1225	T	VPREB3	D87N	C	358	T
TBR1	S22N	G	382	A	TMEM90A	G100V	C	547	A	TTLL10	L213R	T	811	G	VPS11	Y497H	T	1489	C
TBRG4	T156I	G	516	A	TMEM90A	L162P	A	733	G	TTLL11	V80A	A	427	G	VPS11	G231D	G	692	A
TBX1	R171Q	G	641	A	TMEM90B	V246M	G	1369	A	TTLL11	W242C	C	914	A	VPS13A	D2745Y	G	8493	T
TBX1	Y195C	A	713	G	TMEM91	A156V	C	1127	T	TTLL11	A611T	C	2019	T	VPS13A	S978N	G	3193	A
TBX15	R404Q	C	1221	T	TMEM92	V60I	G	288	A	TTLL12	R252Q	C	819	T	VPS13A	N1338D	A	4272	G
TBX15	G343D	C	1038	T	TMEM97	P134L	C	506	T	TTLL13	R439W	C	1605	T	VPS13A	L555M	C	1923	A
TBX15	R172I	C	525	A	TMF1	P70H	G	426	T	TTLL13	K46N	G	428	T	VPS13A	V1716I	G	5406	A
TBX18	A421G	G	1600	C	TMF1	N969H	T	3122	G	TTLL2	S459L	C	1464	T	VPS13A	A2748V	C	8503	T
TBX18	P9L	G	364	A	TMF1	E914*	C	2957	A	TTLL4	-	G	0	T	VPS13A	F1565S	T	4954	C
TBX19	A430T	G	1339	A	TMF1	E695*	C	2300	A	TTLL4	G624E	G	2211	A	VPS13A	I591L	A	2031	C
TBX19	N59D	A	226	G	TMF1	R398Q	C	1410	T	TTLL4	R1025Q	G	3414	A	VPS13B	K254E	A	871	G

TBX2	R436C	C	1587	T	TMF1	R325I	C	1191	A	TTLL5	R71*	C	416	T	VPS13B	R3741W	C	1133 2	T
TBX20	R315C	G	1470	A	TMIGD2	R35M	C	150	A	TTLL5	Q1136*	C	3611	T	VPS13B	L1166I	C	3607	A
TBX21	E396K	G	1397	A	TMIGD2	K58E	T	218	C	TTLL5	D47N	G	344	A	VPS13B	N204T	A	722	C
TBX21	G202S	G	815	A	TMLHE	R70H	C	355	T	TTLL6	Q58H	C	209	A	VPS13B	E288*	G	973	T
TBX21	A481S	G	1652	T	TMOD1	N279S	A	1049	G	TTLL6	-	C	0	A	VPS13B	D361N	G	1192	A
TBX21	S511I	G	1743	T	TMOD4	R340H	C	1154	T	TTLL7	R619H	C	2234	T	VPS13B	E792*	G	2485	T
TBX3	A664V	G	2955	A	TMOD4	V305M	C	1048	T	TTLL7	T382A	T	1522	C	VPS13B	L2257I	C	6880	A
TBX3	P579S	G	2699	A	TMPO	D14Y	G	244	T	TTLL7	R669Q	C	2384	T	VPS13B	F2936L	C	8919	A
TBX3	A472V	G	2379	A	TMPO	E406D	A	1422	C	TTLL7	D503Y	C	1885	A	VPS13B	I3016S	T	9158	G
TBX4	D375N	G	1168	A	TMPO	P280S	C	1079	T	TTLL7	E231D	C	1071	A	VPS13C	T2261M	G	6856	A
TBX4	Y427C	A	1325	G	TMPRSS11 A	T80M	G	986	A	TTLL7	N73T	T	596	G	VPS13C	T2256M	G	6841	A
TBX4	R496C	C	1531	T	TMPRSS11 A	Y364H	A	1837	G	TTLL7	R152Q	C	833	T	VPS13C	M2014T	A	6115	G
TBX5	P307T	G	1586	T	TMPRSS11 A	A32T	C	841	T	TTLL8	R431Q	C	1292	T	VPS13C	R3388Q	C	1023 7	T
TBX5	K325M	T	1641	A	TMPRSS11 A	Q293*	G	1624	A	TTLL9	A342V	C	1278	T	VPS13C	K2310Q	T	7002	G
TBX6	A423T	C	1327	T	TMPRSS11 A	T34A	T	847	C	TTN	I28650F	T	86173	A	VPS13D	R2621H	G	7992	A
TCAP	F21L	C	1236	A	TMPRSS11 B	G206D	C	779	T	TTN	A25142 T	C	75649	T	VPS13D	E187V	A	690	T
TCEA1	R132L	C	718	A	TMPRSS11 B	G23E	C	230	T	TTN	T7172A	T	21739	C	VPS13D	L2118P	T	6483	C
TCEA1	E88K	C	585	T	TMPRSS11 B	A176S	C	688	A	TTN	T4942M	G	15050	A	VPS13D	R3253*	C	9887	T
TCEA2	A12T	G	203	A	TMPRSS11 D	V276G	A	926	C	TTN	D3897G	T	11915	C	VPS13D	R4231H	G	1282 2	A
TCEAL2	R218Q	G	872	A	TMPRSS11 E	S254L	C	825	T	TTN	Y1764C	T	5516	C	VPS13D	R694C	C	2210	T
TCEAL3	K123N	G	727	T	TMPRSS11 E	R330*	C	1052	T	TTN	F30298L	G	91119	T	VPS13D	P1695H	C	5214	A
TCEAL4	L202V	T	843	G	TMPRSS11 F	A149D	G	506	T	TTN	P26987 S	G	81184	A	VPS13D	E2437K	G	7439	A
TCEAL7	E47*	G	393	T	TMPRSS11 F	S202Y	G	665	T	TTN	L20402I	G	61429	T	VPS13D	E578*	G	1862	T
TCEANC	E62A	A	430	C	TMPRSS12	A59V	C	223	T	TTN	E15863 K	C	47812	T	VPS13D	S1663Y	C	5118	A
TCEB3	E132A	A	666	C	TMPRSS13	R272Q	C	815	T	TTN	S15320 G	T	46183	C	VPS13D	F2325C	T	7104	G
TCEB3B	N314D	T	1297	C	TMPRSS13	G535D	C	1604	T	TTN	L14685 M	G	44278	T	VPS16	C3Y	G	80	A
TCEB3B	R530H	C	1946	T	TMPRSS13	L342P	A	1025	G	TTN	T11982 N	G	36170	T	VPS16	R544H	G	1703	A

TCERG1	D144N	G	468	A	TMPRSS13	R132Q	C	395	T	TTN	E5276*	C	16051	A	VPS18	R590H	G	2109	A
TCERG1	R153W	C	495	T	TMPRSS15	A60V	G	213	A	TTN	A4832T	C	14719	T	VPS18	R48H	G	483	A
TCERG1	L671P	T	2050	C	TMPRSS15	F984C	A	2985	C	TTN	R3505*	G	10738	A	VPS18	R301C	C	1241	T
TCERG1	R693W	C	2115	T	TMPRSS15	F123C	A	402	C	TTN	R31176 C	G	93751	A	VPS24	E16K	C	46	T
TCERG1	V256I	G	804	A	TMPRSS2	A386G	G	1292	C	TTN	S30811 T	A	92656	T	VPS24	S24G	T	70	C
TCERG1	V675M	G	2061	A	TMPRSS2	V275I	C	958	T	TTN	G5585S	C	16978	T	VPS26A	I195M	T	1238	G
TCERG1L	P221L	G	748	A	TMPRSS2	K449N	C	1482	A	TTN	H2732Y	G	8419	A	VPS26B	R283H	G	1304	A
TCERG1L	A246T	C	822	T	TMPRSS3	D418N	C	1956	T	TTN	Y2009*	A	6252	C	VPS26B	D146G	A	893	G
TCERG1L	R458*	G	1458	A	TMPRSS4	R20C	C	349	T	TTN	A848V	G	2768	A	VPS29	K76R	T	227	C
TCERG1L	Q220H	C	746	A	TMPRSS5	H136R	T	556	C	TTN	A427V	G	1505	A	VPS33A	L433I	G	1410	T
TCERG1L	T350M	G	1135	A	TMPRSS5	R130C	G	537	A	TTN	S26537 R	T	79834	G	VPS33A	R505W	G	1626	A
TCERG1L	L527I	G	1665	T	TMPRSS5	D363G	T	1237	C	TTN	R24459 G	T	73600	C	VPS33B	Y121D	A	715	C
TCF12	G444*	G	1614	T	TMPRSS6	R802Q	C	2546	T	TTN	R22482 C	G	67669	A	VPS35	E171*	C	570	A
TCF12	R603Q	G	2092	A	TMPRSS6	Q743H	C	2370	A	TTN	R16839 H	C	50741	T	VPS36	V255M	C	791	T
TCF12	R603W	C	2091	T	TMPRSS6	R103C	G	448	A	TTN	R28672 H	C	86240	T	VPS36	L108P	A	351	G
TCF12	Q179*	C	819	T	TMPRSS6	G690D	C	2210	T	TTN	P19409 L	G	58451	A	VPS36	K34Q	T	128	G
TCF12	R603Q	G	2092	A	TMPRSS6	D512N	C	1675	T	TTN	G13785 R	C	41578	T	VPS37A	P203S	C	960	T
TCF12	R90*	C	552	T	TMPRSS7	R102C	C	304	T	TTN	P12822 L	G	38690	A	VPS37A	F123I	T	720	A
TCF12	K181N	A	827	C	TMPRSS7	R713H	G	2138	A	TTN	S14405 G	T	43438	C	VPS37D	A97T	G	423	A
TCF12	R611C	C	2115	T	TMPRSS7	T385A	A	1153	G	TTN	A1021V	G	3287	A	VPS39	H2Y	G	155	A
TCF15	E25G	T	235	C	TMPRSS7	Q543R	A	1628	G	TTN	R139W	G	640	A	VPS39	M634V	T	2051	C
TCF20	A1681V	G	5179	A	TMPRSS7	R785Q	G	2354	A	TTN	T24383 M	G	73373	A	VPS39	A171V	G	663	A
TCF20	A1292T	C	4011	T	TMPRSS9	G630*	G	1888	T	TTN	R21486 H	C	64682	T	VPS41	N836D	T	2561	C
TCF20	D1728Y	C	5319	A	TMPRSS9	R900C	C	2698	T	TTN	E11410 G	T	34454	C	VPS41	R611C	G	1886	A
TCF21	G143R	G	687	A	TMPRSS9	A359D	C	1076	A	TTN	V24067 F	C	72424	A	VPS41	E788G	T	2418	C
TCF25	A514T	G	1646	A	TMSB10	K19N	G	166	T	TTN	K12741 T	T	38447	G	VPS41	R757C	G	2324	A
TCF25	D33E	C	205	G	TMTC1	R441W	G	1795	A	TTN	R12428 C	G	37507	A	VPS41	M663V	T	2042	C

TCF25	L354P	T	1167	C	TMTC2	R29C	C	517	T	TTN	D32581 G	T	97967	C	VPS41	R208W	G	677	A
TCF3	R563W	G	1754	A	TMTC2	K378T	A	1565	C	TTN	G28117 D	C	84575	T	VPS45	-	T	0	C
TCF4	A766T	C	2353	T	TMTC3	A756S	G	2486	T	TTN	F18429 V	A	55510	C	VPS45	R433*	C	1843	T
TCF7	P415S	C	1438	T	TMTC3	S703R	A	2327	C	TTN	R14769 Q	C	44531	T	VPS45	R205H	G	1160	A
TCF7L1	V440I	G	1593	A	TMTC3	F230L	T	910	G	TTN	A11661 V	G	35207	A	VPS4A	V338M	G	1148	A
TCF7L1	A34E	C	376	A	TMTC3	F326L	C	1198	A	TTN	A471V	G	1637	A	VPS4A	A42T	G	260	A
TCF7L1	L211I	C	906	A	TMTC3	I197M	T	811	G	TTN	R32112 C	G	96559	A	VPS53	R361C	G	1228	A
TCF7L2	R465C	C	1698	T	TMTC4	R611C	G	1831	A	TTN	I27746F	T	83461	A	VPS53	S363F	G	1235	A
TCF7L2	L48P	T	448	C	TMTC4	L638M	G	1912	T	TTN	V14125I	C	42598	T	VPS54	E908*	C	2877	A
TCF7L2	Q147*	C	744	T	TMTC4	T312A	T	934	C	TTN	A15126 V	G	45602	A	VPS54	E899K	C	2850	T
TCF7L2	T182M	C	850	T	TMTC4	A171V	G	512	A	TTN	G13988 V	C	42188	A	VPS54	K420T	T	1414	G
TCF7L2	E17*	G	354	T	TMTC4	R717C	G	2149	A	TTN	R31516 G	T	94771	C	VPS8	V936G	T	2984	G
TCF7L2	R465H	G	1699	A	TMUB2	R301*	C	1050	T	TTN	D30806 N	C	92641	T	VPS8	A201T	G	778	A
TCF7L2	A374V	C	1426	T	TMX2	-	A	0	G	TTN	Y28221 H	A	84886	G	VPS8	E1293*	G	4054	T
TCFL5	G295R	C	976	T	TMX2	A241D	C	722	A	TTN	M22710I	C	68355	A	VPS8	F1298C	T	4070	G
TCHH	R739S	C	2217	A	TMX3	D120V	T	503	A	TTN	A8079T	C	24460	T	VRK1	K211T	A	738	C
TCHH	N1233S	T	3698	C	TNC	T1844A	T	5845	C	TTN	R17850 G	T	53773	C	VRK2	Y488D	T	1607	G
TCHH	D1290N	C	3868	T	TNC	A1010T	C	3343	T	TTN	R12194*	G	36805	A	VRK3	A222T	C	1010	T
TCHH	E908A	T	2723	G	TNC	T1760A	T	5593	C	TTN	A6934T	C	21025	T	VSIG1	A95T	G	344	A
TCHH	W1865*	C	5595	T	TNC	I1313T	A	4253	G	TTN	D32583 N	C	97972	T	VSIG1	A310T	G	989	A
TCHH	L1086P	A	3257	G	TNC	R293Q	C	1193	T	TTN	R30584 H	C	91976	T	VSIG10	A235T	C	1037	T
TCHH	R1496H	C	4487	T	TNC	Q515H	C	1860	G	TTN	A26933 T	C	81022	T	VSIG10L	R361C	G	1081	A
TCHHL1	G587C	C	1824	A	TNC	F739V	A	2530	C	TTN	P26769 S	G	80530	A	VSIG10L	T326M	G	977	A
TCHHL1	S90A	A	333	C	TNFAIP1	D304N	G	1177	A	TTN	K24941 N	C	75048	A	VSIG10L	R190W	G	568	A
TCHP	Y191C	A	725	G	TNFAIP1	R272C	C	1081	T	TTN	T24772 A	T	74539	C	VSIG2	V143F	C	528	A
TCHP	G382E	G	1298	A	TNFAIP3	G367V	G	1166	T	TTN	A20725 T	C	62398	T	VSIG4	R134H	C	510	T

TCHP	A371T	G	1264	A	TNFAIP8	F179C	T	926	G	TTN	R19559S	G	58900	T	VSIG4	Q313H	T	1048	G
TCIRG1	V728I	G	2290	A	TNFAIP8L1	R89S	C	380	A	TTN	P14745Q	G	44459	T	VSTM1	Q70*	G	384	A
TCIRG1	G451S	G	1459	A	TNFAIP8L3	C16F	C	147	A	TTN	L14391M	G	43396	T	VSTM2A	F29L	T	402	G
TCL1A	R83Q	C	378	T	TNFRSF10A	R282C	G	909	A	TTN	G14327C	C	43204	A	VSX1	G270W	C	1072	A
TCL1A	A33T	C	227	T	TNFRSF10C	A234T	G	783	A	TTN	A10976T	C	33151	T	VTA1	L10F	C	86	T
TCN1	Q390H	C	1268	A	TNFRSF11A	M416V	A	1284	G	TTN	Y9751C	T	29477	C	VTA1	G108E	G	381	A
TCN1	A108T	C	420	T	TNFRSF11A	G72C	G	252	T	TTN	K925N	C	3000	A	VTCN1	S246L	G	776	A
TCOF1	G1319V	G	4064	T	TNFRSF11A	-	G	0	A	TTN	T29987A	T	90184	C	VTI1A	R192C	C	690	T
TCP10L	G23*	C	181	A	TNFRSF11B	K268N	C	1127	A	TTN	K25210R	T	75854	C	VWA1	G114V	G	419	T
TCP11	P15S	G	461	A	TNFRSF11B	L227V	A	1002	C	TTN	A18540V	G	55844	A	VWA2	R520W	C	1808	T
TCP11L1	A111V	C	732	T	TNFRSF13B	R20H	C	72	T	TTN	R16654C	G	50185	A	VWA3A	R576W	C	1822	T
TCP11L2	A418T	G	1426	A	TNFRSF13B	R14C	G	53	A	TTN	T16275M	G	49049	A	VWA3A	-	T	0	C
TCP11L2	K440T	A	1493	C	TNFRSF19	S336F	C	1306	T	TTN	G15660S	C	47203	T	VWA3A	N569D	A	1801	G
TCP11L2	R239C	C	889	T	TNFRSF1A	E342D	C	1307	A	TTN	R8839C	G	26740	A	VWA3A	G1144R	G	3526	A
TCTE1	G398S	C	1315	T	TNFRSF1A	A321T	C	1242	T	TTN	R18623H	C	56093	T	VWA3A	E225K	G	769	A
TCTE1	R158W	G	595	A	TNFRSF1A	L329I	G	1266	T	TTN	R25853*	G	77782	A	VWA5A	K72T	A	424	C
TCTE1	V141M	C	544	T	TNFRSF1B	T84I	C	340	T	TTN	T33385A	T	10037 8	C	VWA5A	F588L	C	1973	A
TCTE1	R62H	C	308	T	TNFRSF1B	D257N	G	858	A	TTN	I32909S	A	98951	C	VWA5A	S766L	C	2506	T
TCTE1	N498H	T	1615	G	TNFRSF21	D455N	C	1757	T	TTN	R32269*	G	97030	A	VWA5B1	A17T	G	245	A
TCTEX1D2	N76D	T	362	C	TNFRSF21	K545N	C	2029	A	TTN	R31265C	G	94018	A	VWA5B1	A1146T	G	3632	A
TCTEX1D2	A2T	C	140	T	TNFRSF25	S201P	A	669	G	TTN	F31096L	G	93513	T	VWA5B1	G981S	G	3137	A
TCTN1	E551*	G	1670	T	TNFRSF4	G92V	C	280	A	TTN	F28376V	A	85351	C	VWA5B1	V462M	G	1580	A
TCTN1	V312I	G	953	A	TNFRSF8	R417W	C	1471	T	TTN	R28188I	C	84788	A	VWA5B1	S258N	G	969	A
TCTN3	F564V	A	1880	C	TNFRSF9	S145Y	G	601	T	TTN	D27637E	A	83136	C	VWA5B1	D702V	A	2301	T
TCTN3	Y542C	T	1815	C	TNFRSF9	E111*	C	498	A	TTN	T27302A	T	82129	C	VWA5B1	R356I	G	1263	T
TCTN3	E463D	C	1579	A	TNFRSF9	T207M	G	787	A	TTN	R26935	G	81028	A	VWA5B1	D677G	A	2226	G

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TDG	S366N	G	1320	A	TNFSF11	R89K	G	417	A	TTN	S23775Y	G	71549	T	VWA5B1	R993H	G	3174	A
TDO2	R283W	C	911	T	TNFSF11	R118I	G	504	T	TTN	R19873C	G	59842	A	VWC2	R58W	C	728	T
TDO2	L226F	C	740	T	TNFSF11	S115*	C	495	A	TTN	P19187S	G	57784	A	VWC2L	E33*	G	899	T
TDO2	R94*	C	344	T	TNFSF12	K97*	A	552	T	TTN	F16123L	G	48594	T	VWC2L	G52W	G	956	T
TDO2	F97Y	T	354	A	TNFSF13B	R33W	C	275	T	TTN	E16122*	C	48589	A	VWC2L	C109W	C	1129	G
TDO2	F388C	T	1227	G	TNFSF14	A132T	C	776	T	TTN	D14757G	T	44495	C	VWC2L	G104R	G	1112	A
TDP1	N369D	A	1404	G	TNFSF8	L221H	A	776	T	TTN	E13451K	C	40576	T	VWCE	C493*	G	1758	T
TDP1	R137M	G	709	T	TNFSF8	L229V	A	799	C	TTN	K12684E	T	38275	C	VWCE	G242D	C	1004	T
TDP1	D6N	G	315	A	TNFSF8	V27M	C	193	T	TTN	R12540Q	C	37844	T	VWDE	C1585R	A	4753	G
TDP1	K177N	G	830	T	TNIK	R1340Q	C	4364	T	TTN	R11257Q	C	33995	T	VWDE	R1540H	C	4619	T
TDP2	G288D	C	1034	T	TNIK	A201V	G	947	A	TTN	E11160D	C	33705	A	VWDE	W813R	A	2437	G
TDP2	N239D	T	886	C	TNIK	-	A	0	G	TTN	P11021L	G	33287	A	VWDE	P823H	G	2468	T
TDRD1	L888R	T	2816	G	TNIK	A777V	G	2675	A	TTN	K10844N	C	32757	A	VWDE	F1171C	A	3512	C
TDRD10	P208L	C	708	T	TNIK	R299C	G	1240	A	TTN	P10702T	G	32329	T	VWDE	L264F	C	792	A
TDRD10	C69Y	G	291	A	TNIK	R404W	G	1555	A	TTN	K9860N	T	29805	G	VWF	G2560D	C	7929	T
TDRD12	Q394*	C	1480	T	TNIK	Q614H	C	2187	A	TTN	V9344A	A	28256	G	VWF	R1956W	G	6116	A
TDRD3	A654T	G	2515	A	TNIK	A279S	C	1180	A	TTN	E9190D	T	27795	G	VWF	H95N	G	533	T
TDRD5	E538D	G	1864	T	TNIP1	P549L	G	2235	A	TTN	P9076S	G	27451	A	VWF	E333*	C	1247	A
TDRD5	A181V	C	792	T	TNIP1	S107N	C	909	T	TTN	D8899N	C	26920	T	VWF	R1837W	G	5759	A
TDRD6	K559*	A	1675	T	TNIP2	G84A	C	338	G	TTN	K8800T	T	26624	G	VWF	P2506L	G	7767	A
TDRD6	S861Y	C	2582	A	TNIP3	T95M	G	363	A	TTN	K8214T	T	24866	G	VWF	V657M	C	2219	T
TDRD6	R103H	G	308	A	TNK1	R367Q	G	1260	A	TTN	L8055R	A	24389	C	VWF	N2636H	T	8156	G
TDRD6	H980R	A	2939	G	TNK1	A574T	G	1880	A	TTN	W7619R	A	23080	G	VWF	D1832N	C	5744	T
TDRD6	S68L	C	203	T	TNK2	A735V	G	2349	A	TTN	R6737W	G	20434	A	VWF	E990D	C	3220	A
TDRD6	R270H	G	809	A	TNK2	A210T	C	773	T	TTN	F6717L	A	20376	C	VWF	D400Y	C	1448	A
TDRD6	A53V	C	158	T	TNK2	S561T	C	1827	G	TTN	E6044D	T	18357	G	WAC	T552M	C	1816	T
TDRD6	F335L	T	1003	C	TNK2	R116Q	C	492	T	TTN	V5621G	A	17087	C	WAC	E172*	G	675	T
TDRD6	L634I	C	1900	A	TNKS	R383*	C	1173	T	TTN	S5541L	G	16847	A	WAPAL	I331V	T	1076	C
TDRD7	L907*	T	3015	G	TNKS	Q629*	C	1911	T	TTN	F4163V	A	12712	C	WAPAL	S95N	C	369	T
TDRD7	R1041Q	G	3417	A	TNKS	T686M	C	2083	T	TTN	F3926C	A	12002	C	WAPAL	V705F	C	2198	A

TDRD9	R203H	G	656	A	TNKS	R1161W	C	3507	T	TTN	S3376L	G	10352	A	WAPAL	E237K	C	794	T
TDRD9	T878M	C	2681	T	TNKS	R537C	C	1635	T	TTN	F2202C	A	6830	C	WAPAL	D161Y	C	566	A
TDRD9	A196T	G	634	A	TNKS1BP1	D924N	C	2935	T	TTN	F1757C	A	5495	C	WAPAL	E142D	T	511	G
TDRD9	E258K	G	820	A	TNKS1BP1	R155C	G	628	A	TTN	S1433P	A	4522	G	WAPAL	K85N	T	340	G
TDRD9	R564H	G	1739	A	TNKS1BP1	R1018Q	C	3218	T	TTN	E1153*	C	3682	A	WARS2	R269H	C	833	T
TDRKH	S282P	A	1014	G	TNKS1BP1	R1543Q	C	4793	T	TTN	D592Y	C	1999	A	WAS	G11R	G	106	A
TDRKH	R203I	C	778	A	TNKS1BP1	R427Q	C	1445	T	TTN	E197*	C	814	A	WAS	R41Q	G	197	A
TEAD3	R85Q	C	442	T	TNKS2	R153Q	G	837	A	TTN	R29463 C	G	88612	A	WASF1	D244N	C	1162	T
TEAD3	R398H	C	1381	T	TNKS2	P829Q	C	2865	A	TTN	A14034 V	G	42326	A	WASF1	T301A	T	1333	C
TEAD3	E454K	C	1548	T	TNN	P200L	C	712	T	TTN	P18494 T	G	55705	T	WASF3	P10S	C	254	T
TEAD4	S134L	C	675	T	TNN	E752D	G	2369	T	TTN	L1188H	A	3788	T	WASF3	K5R	A	240	G
TEAD4	A56T	G	440	A	TNN	P10H	C	142	A	TTN	-	C	0	G	WASF4	K148T	T	659	G
TEC	T560M	G	1837	A	TNN	R214C	C	753	T	TTPA	F250L	G	768	T	WASL	K269T	T	1139	G
TEC	V234I	C	858	T	TNN	E961D	G	2996	T	TTYH1	Q36H	A	135	C	WASL	K233N	C	1032	A
TEC	R617H	C	2008	T	TNN	K1235N	G	3818	T	TTYH1	A51V	C	179	T	WASL	N208H	T	955	G
TEC	-	C	0	A	TNN	R1297Q	G	4003	A	TTYH3	R302H	G	1110	A	WBP1	R110H	G	532	A
TEC	D620Y	C	2016	A	TNNC1	R83Q	C	303	T	TTYH3	A49T	G	350	A	WBP11	R3W	G	168	A
TEC	A396T	C	1344	T	TNNC1	S37N	C	165	T	TUB	R323C	C	1208	T	WBP11	D292N	C	1035	T
TECPR1	C920R	A	2963	G	TNNI1	A24V	G	164	A	TUB	R164I	G	732	T	WBP11	P580S	G	1899	A
TECPR1	G801S	C	2606	T	TNNI3K	R164H	G	507	A	TUB	H48Q	C	385	A	WBP11	D356N	C	1227	T
TECPR1	A935T	C	3008	T	TNNI3K	-	G	0	T	TUB	I324S	T	1212	G	WBP2	P207L	G	743	A
TECPR1	-	T	0	C	TNNT1	I66N	A	286	T	TUBA1C	W388*	G	1264	A	WBP4	S225L	C	1074	T
TECPR2	S523T	T	1715	A	TNNT2	R151Q	C	452	T	TUBA1C	E447G	A	1440	G	WBP5	I88T	T	574	C
TECPR2	V962M	G	3032	A	TNNT2	E33D	C	99	A	TUBA3C	E279K	C	940	T	WBSCR16	E44D	C	188	A
TECPR2	A1363V	C	4236	T	TNNT2	Q159H	C	477	A	TUBA3E	A333T	C	1098	T	WBSCR17	G239W	G	1349	T
TECPR2	T903M	C	2856	T	TNPO1	F729L	C	2337	A	TUBA3E	R339H	C	1117	T	WBSCR17	V477I	G	2063	A
TECPR2	E710*	G	2276	T	TNPO2	G866D	C	2782	T	TUBA4A	R2C	G	178	A	WBSCR17	R262C	C	1418	T
TECR	A214T	G	640	A	TNPO2	L178P	A	718	G	TUBA4A	R402M	C	1379	A	WBSCR17	C364F	G	1725	T
TECR	R66H	G	197	A	TNPO3	R852Q	C	2929	T	TUBA8	S16Y	C	344	A	WDFY2	R212W	C	814	T
TECR	A111V	C	332	T	TNPO3	R297H	C	1264	T	TUBA8	E308K	G	1219	A	WDFY3	P66L	G	605	A
TECR	R66H	G	197	A	TNR	R1007W	G	3728	A	TUBA8	R238C	C	1009	T	WDFY3	E2468Q	C	7810	G
TECRL	S272Y	G	926	T	TNR	G543R	C	2336	T	TUBB1	A275P	G	1092	C	WDFY3	I1369V	T	4513	C
TECTA	S45N	G	405	A	TNR	R1227H	C	4389	T	TUBB2B	S75L	G	416	A	WDFY3	P2031S	G	6499	A
TECTA	F706S	T	2388	C	TNR	A397T	C	1898	T	TUBB2B	K58R	T	365	C	WDFY3	R1003W	G	3415	A
TECTA	R767Q	G	2571	A	TNR	Q43P	T	837	G	TUBB2C	N48D	A	290	G	WDFY3	T3049A	T	9553	C
TECTA	E1750A	A	5520	C	TNR	-	T	0	G	TUBB2C	K336E	A	1154	G	WDFY3	R1183*	G	3955	A
TECTA	G1732C	G	5465	T	TNR	P463S	G	2096	A	TUBB4	A352V	G	1162	A	WDFY3	S796Y	G	2795	T

TECTA	D1444N	G	4601	A	TNR	S1060P	A	3887	G	TUBB4	A63V	G	295	A	WDFY4	P919L	C	2783	T
TECTA	A1510T	G	4799	A	TNR	D532N	C	2303	T	TUBB6	I345V	A	1255	G	WDFY4	V2722M	G	8191	A
TECTA	R586*	C	2027	T	TNR	Q509H	C	2236	A	TUBB6	T95M	C	506	T	WDFY4	Q3092E	C	9301	G
TECTA	A1736T	G	5477	A	TNR	S497L	G	2199	A	TUBD1	I3T	A	286	G	WDFY4	V1286I	G	3883	A
TECTA	V1645M	G	5204	A	TNRC18	A540T	C	1967	T	TUBG1	L243M	C	789	A	WDFY4	E2344K	G	7057	A
TECTA	R2021H	G	6333	A	TNRC18	S2713L	G	8487	A	TUBG2	S239N	G	972	A	WDFY4	Y2762S	A	8312	C
TECTA	Q1160*	C	3749	T	TNRC18	A811T	C	2780	T	TUBGCP2	A124V	G	411	A	WDFY4	L724M	C	2197	A
TECTA	R2101Q	G	6573	A	TNRC18	R2832H	C	8844	T	TUBGCP2	V217M	C	689	T	WDFY4	A165T	G	520	A
TECTA	R63C	C	458	T	TNRC18	G987C	C	3308	A	TUBGCP3	Y544C	T	1818	C	WDFY4	E374*	G	1147	T
TECTA	R108*	C	593	T	TNRC18	T1026A	T	3425	C	TUBGCP3	H387N	G	1346	T	WDFY4	D502N	G	1531	A
TECTA	F664L	C	2263	A	TNRC18	A811T	C	2780	T	TUBGCP3	E838*	C	2699	A	WDFY4	A1017V	C	3077	T
TECTA	E185K	G	824	A	TNRC18	P1169H	G	3855	T	TUBGCP3	R64Q	C	378	T	WDFY4	D1117N	G	3376	A
TECTB	V27D	T	80	A	TNRC18	K1577N	C	5080	A	TUBGCP3	Q31P	T	279	G	WDFY4	E1242*	G	3751	T
TECTB	F165L	C	495	A	TNRC18	E469D	C	1756	A	TUBGCP3	V277G	A	1017	C	WDFY4	R1304I	G	3938	T
TEF	S150P	T	534	C	TNRC18	D1106N	C	3665	T	TUBGCP4	L34I	C	360	A	WDFY4	D1388Y	G	4189	T
TEK	K808T	A	2548	C	TNRC18	F869V	A	2954	C	TUBGCP5	V399M	G	1325	A	WDFY4	R1495S	G	4512	T
TEK	V948M	G	2967	A	TNRC6A	P402S	C	1333	T	TUBGCP5	I820M	T	2590	G	WDFY4	S2001Y	C	6029	A
TEK	R849W	C	2670	T	TNRC6A	G754R	G	2389	A	TUBGCP6	S1342R	T	4129	G	WDFY4	R2249Q	G	6773	A
TEK	C233Y	G	823	A	TNRC6A	A1097V	C	3419	T	TUBGCP6	W1266*	C	3903	T	WDFY4	N2774H	A	8347	C
TEK	S654L	C	2086	T	TNRC6A	A664P	G	2119	C	TUBGCP6	T408M	G	1328	A	WDFY4	K2816T	A	8474	C
TEK	K690N	G	2195	T	TNRC6A	-	A	0	G	TUFT1	N166H	A	558	C	WDFY4	R1091C	C	3298	T
TEK	C1074*	C	3347	A	TNRC6A	V1637D	T	5039	A	TUFT1	E366D	G	1160	T	WDFY4	R1091C	C	3298	T
TEKT1	V205G	A	744	C	TNRC6A	A1672V	C	5144	T	TULP1	R519W	G	1635	A	WDR1	F342L	G	1100	T
TEKT1	K95T	T	414	G	TNRC6A	S1599L	C	4925	T	TULP1	V435A	A	1384	G	WDR1	A339S	C	1089	A
TEKT2	R268W	C	929	T	TNRC6A	L718Q	T	2282	A	TULP2	T406I	G	1362	A	WDR1	A172T	C	588	T
TEKT2	E341K	G	1148	A	TNRC6B	T1726A	A	5544	G	TULP2	K404E	T	1355	C	WDR11	G30D	G	327	A
TEKT2	D340N	G	1145	A	TNRC6B	D1735G	A	5572	G	TULP3	D282G	A	926	G	WDR12	R63*	G	937	A
TEKT2	R268Q	G	930	A	TNRC6B	P1359L	C	4444	T	TULP3	P318L	C	1034	T	WDR13	R84H	G	427	A
TEKT3	K383N	C	1336	A	TNRC6B	G856C	G	2934	T	TULP3	Y418C	A	1334	G	WDR16	E549*	G	1645	T
TEKT3	E222D	T	853	G	TNRC6B	A1755V	C	5632	T	TULP4	R403C	C	2564	T	WDR16	R502H	G	1505	A
TEKT3	A385V	G	1341	A	TNRC6B	Q1291L	A	4240	T	TULP4	R1504Q	G	5868	A	WDR16	E524*	G	1570	T
TEKT4	R82H	G	382	A	TNRC6B	A1333T	G	4365	A	TULP4	T232M	C	2052	T	WDR16	A489T	G	1465	A
TEKT4	R157C	C	606	T	TNRC6B	R1129*	C	3753	T	TULP4	R369H	G	2463	A	WDR16	E549*	G	1645	T
TEKT4	A406T	G	1353	A	TNRC6B	I205S	T	982	G	TULP4	P683S	C	3404	T	WDR16	Q9*	C	25	T
TEKT5	D329E	A	1059	T	TNRC6B	W1035*	G	3473	A	TULP4	A386T	G	2513	A	WDR17	R249C	C	901	T
TEKT5	R197*	G	661	A	TNS1	G1732D	C	5648	T	TULP4	R567W	C	3056	T	WDR17	L559F	G	1833	T
TELO2	Q228*	C	903	T	TNS1	R618H	C	2306	T	TUSC1	A127V	G	917	A	WDR17	V108A	T	479	C
TELO2	W74*	G	443	A	TNS1	P1447L	G	4793	A	TUSC3	G5S	G	223	A	WDR17	N606K	T	1974	A
TENC1	R1012W	C	3229	T	TNS1	A1375T	C	4576	T	TUSC3	R312W	C	1144	T	WDR17	K84N	A	408	C

TENC1	V461M	G	1576	A	TNS1	R1163Q	C	3941	T	TUSC5	A86V	C	596	T	WDR17	E1107*	G	3475	T
TEP1	D1738N	C	5253	T	TNS1	L1655I	G	5416	T	TUT1	R464Q	C	1391	T	WDR17	D405E	T	1371	A
TEP1	R528W	G	1623	A	TNS1	T392I	G	1628	A	TUT1	R818L	C	2451	A	WDR19	L649V	C	2099	G
TEP1	G1885D	C	5695	T	TNS1	V216M	C	1099	T	TWISTNB	D119N	C	426	T	WDR19	S110R	T	484	G
TEP1	R942H	C	2866	T	TNS1	E1578*	C	5185	A	TWISTNB	E176A	T	598	G	WDR19	G294A	G	1035	C
TEP1	S2461N	C	7423	T	TNS1	R1062M	C	3638	A	TWSG1	A124T	G	561	A	WDR19	N374S	A	1275	G
TEP1	R2364Q	C	7132	T	TNS1	D1086Y	C	3709	A	TXK	E382G	T	1231	C	WDR19	R828C	C	2636	T
TEP1	E92D	C	317	A	TNS3	R558Q	C	2031	T	TXLNB	S284G	T	1083	C	WDR19	L721I	C	2315	A
TEPP	A216E	C	684	A	TNS3	R250H	C	1107	T	TXLNG	P516L	C	1608	T	WDR20	T542M	C	1674	T
TERF1P3	A260V	C	804	T	TNS3	G1394D	C	4539	T	TXNDC11	R895H	C	2746	T	WDR24	T163M	G	488	A
TERF1P3	N281D	A	866	G	TNS3	R15C	G	401	A	TXNDC11	R902H	C	2767	T	WDR25	R466C	C	1451	T
TERF1P3	A303V	C	933	T	TNS3	V218A	A	1011	G	TXNDC11	S662Y	G	2047	T	WDR25	R465W	C	1448	T
TERF2	R192I	C	686	A	TNS3	G1204V	C	3969	A	TXNDC16	D520Y	C	1930	A	WDR26	R315W	G	1137	A
TERT	P1124H	G	3429	T	TNS3	G494V	C	1839	A	TXNDC16	R627G	T	2251	C	WDR27	A519T	C	2075	T
TERT	R653H	C	2016	T	TNS4	G469E	C	1470	T	TXNDC2	S419R	C	1456	A	WDR3	V282A	T	892	C
TERT	R446C	G	1394	A	TNS4	S446Y	G	1401	T	TXNDC2	A540T	G	1817	A	WDR33	R834*	G	2659	A
TERT	A716V	G	2205	A	TOB2	G290V	C	1576	A	TXNDC3	C208Y	G	995	A	WDR33	R1196C	G	3745	A
TERT	A1040V	G	3177	A	TOB2	P255S	G	1470	A	TXNDC3	Q482*	C	1816	T	WDR33	Q571H	T	1872	G
TERT	A855V	G	2622	A	TOLLIP	G125C	C	404	A	TXNDC3	A101S	G	673	T	WDR33	K216T	T	806	G
TES	R374Q	G	1336	A	TOLLIP	P310L	G	960	A	TXNDC5	R296H	C	925	T	WDR34	R202Q	C	666	T
TES	I40V	A	333	G	TOM1	F452L	T	1481	G	TXNDC6	G270D	C	837	T	WDR35	R148C	G	558	A
TES	E15K	G	258	A	TOM1L1	V151I	G	626	A	TXNDC6	R70H	C	237	T	WDR35	R700C	G	2214	A
TESK1	V194M	G	830	A	TOM1L1	E138K	G	587	A	TXNDC6	E75K	C	251	T	WDR35	E474*	C	1536	A
TESK2	E462A	T	1786	G	TOM1L2	R278H	C	917	T	TXNDC8	G33C	C	146	A	WDR36	G369C	G	1678	T
TESK2	Y491C	T	1873	C	TOMM5	K19E	T	162	C	TXNIP	P106H	C	651	A	WDR36	F362C	T	1658	G
TESK2	R299C	G	1296	A	TOMM70A	E320*	C	1407	A	TXNL1	R234C	G	949	A	WDR36	S692F	C	2648	T
TESK2	A79T	C	636	T	TOP1	R138K	G	663	A	TXNL1	K181T	T	791	G	WDR38	D74N	G	276	A
TET1	S879L	C	2845	T	TOP1	D83N	G	497	A	TXNL1	R151Q	C	701	T	WDR4	R84H	C	287	T
TET1	S1012*	C	3244	A	TOP1MT	T405I	G	1233	A	TXNL4A	R124H	C	511	T	WDR4	P393L	G	1214	A
TET1	R81H	G	451	A	TOP2B	E1042*	C	3124	A	TXNL4B	D148N	C	764	T	WDR4	R341C	G	1057	A
TET1	A2129V	C	6595	T	TOP2B	K571Q	T	1711	G	TXNRD1	N267I	A	822	T	WDR43	E661*	G	2037	T
TET1	C1482Y	G	4654	A	TOP3A	G739*	C	2411	A	TXNRD1	R238Q	G	735	A	WDR44	R738C	C	2607	T
TET1	A1896V	C	5896	T	TOP3A	F436C	A	1503	C	TXNRD1	N298T	A	915	C	WDR44	L384F	C	1545	T
TET1	K795I	A	2593	T	TOP3A	R103*	G	503	A	TXNRD2	G46D	C	144	T	WDR44	F898S	T	3088	C
TET1	E417A	A	1459	C	TOP3B	T156M	G	652	A	TXNRD2	G235D	C	711	T	WDR44	G605*	G	2208	T
TET1	K540T	A	1828	C	TOPBP1	R769C	G	2437	A	TXNRD3IT 1	G32W	C	573	A	WDR44	K518T	A	1948	C
TET1	K792T	A	2584	C	TOPBP1	A932V	G	2927	A	TYK2	R633C	G	1999	A	WDR46	R319W	G	1312	A
TET1	K1056N	A	3377	C	TOPORS	R490M	C	1586	A	TYK2	R220C	G	760	A	WDR46	E107*	C	676	A
TET1	Q1322*	C	4173	T	TOPORS	R188Q	C	680	T	TYK2	R224W	G	772	A	WDR47	S549G	T	2021	C

TET2	S289L	C	1663	T	TOPORS	R181C	G	658	A	TYK2	R565W	G	1795	A	WDR47	T548P	T	2018	G
TET2	Y1169*	T	4304	A	TOPORS	R360Q	C	1196	T	TYK2	R992W	G	3076	A	WDR47	E13*	C	413	A
TET2	T118I	C	1150	T	TOPORS	R188*	G	679	A	TYK2	R868L	C	2705	A	WDR48	R249*	C	773	T
TET2	A1497V	C	5287	T	TOR1A	R292W	G	874	A	TYMP	E51K	C	273	T	WDR48	K168N	A	532	C
TET2	K108T	A	1120	C	TOR1A	A193T	C	577	T	TYRO3	G817D	G	2674	A	WDR48	R235C	C	731	T
TET2	F373L	C	1916	A	TOR1A	R188*	G	562	A	TYRO3	M600I	G	2024	A	WDR49	Y452H	A	1660	G
TET2	V1857M	G	6366	A	TOR1AIP1	E531K	G	2052	A	TYRO3	-	A	0	C	WDR49	E642*	C	2230	A
TET3	M977V	A	2994	G	TOR2A	R214C	G	687	A	TYRO3	-	A	0	C	WDR49	E558*	C	1978	A
TET3	R1576Q	G	4792	A	TOR2A	R137H	C	457	T	TYRP1	T98I	C	422	T	WDR5	R196C	C	757	T
TET3	G1398R	G	4257	A	TOR2A	S315P	A	990	G	TYRP1	L133I	C	526	A	WDR52	K718N	C	4756	A
TET3	R1576W	C	4791	T	TOR2A	T200M	G	646	A	TYRP1	F220S	T	788	C	WDR52	P992S	G	5576	A
TET3	T165M	C	559	T	TOX	S354L	G	1282	A	TYSND1	A544T	C	1630	T	WDR53	C214Y	C	1209	T
TET3	A874T	G	2685	A	TOX	D227N	C	900	T	TYW1	V582M	G	1908	A	WDR53	A2T	C	572	T
TEX10	L304P	A	1088	G	TOX2	A424T	G	1270	A	U2AF1	R188H	C	656	T	WDR54	A109V	C	414	T
TEX10	V849A	A	2723	G	TOX3	E65K	C	364	T	U2AF1	R229K	C	779	T	WDR54	L193V	C	665	G
TEX10	R550H	C	1826	T	TOX3	A318V	G	1124	A	U2AF1L4	A139V	G	460	A	WDR55	R248H	G	803	A
TEX10	W903R	A	2884	G	TOX3	M469I	C	1578	T	U2AF2	R89H	G	1321	A	WDR55	A186S	G	616	T
TEX10	S682R	T	2221	G	TOX3	S559P	A	1846	G	U2AF2	K408R	A	2278	G	WDR59	R631C	G	1993	A
TEX10	R598Q	C	1970	T	TOX4	D8Y	G	298	T	UACA	L1277*	A	3982	C	WDR59	A411V	G	1334	A
TEX10	K529T	T	1763	G	TP53	R213*	G	827	A	UACA	A142T	C	576	T	WDR6	A568T	G	1982	A
TEX10	R115Q	C	521	T	TP53	P152L	G	645	A	UACA	Q1393K	G	4329	T	WDR6	G629S	G	2165	A
TEX10	V506F	C	1693	A	TP53	S241Y	G	912	T	UACA	T1220N	G	3811	T	WDR6	S1085N	G	3534	A
TEX101	T148A	A	442	G	TP53	P151H	G	642	T	UACA	E1157D	C	3623	A	WDR60	R84M	G	409	T
TEX11	R639*	G	2071	A	TP53	R273H	C	1008	T	UACA	L1061F	T	3335	G	WDR60	E406D	A	1376	T
TEX11	M123V	T	523	C	TP53	R158H	C	663	T	UACA	K1003N	T	3161	G	WDR62	K838T	A	2604	C
TEX11	K738E	T	2368	C	TP53	R196*	G	776	A	UAP1	E32*	G	396	T	WDR62	T1101M	C	3393	T
TEX11	R120*	G	514	A	TP53	Y234H	A	890	G	UAP1L1	V305A	T	946	C	WDR62	R1169H	G	3597	A
TEX11	L576I	G	1882	T	TP53	-	C	0	G	UAP1L1	V358A	T	1105	C	WDR62	A162T	G	575	A
TEX12	G34V	G	233	T	TP53	I232T	A	885	G	UAP1L1	R244L	G	763	T	WDR63	S800F	C	2579	T
TEX13A	K113E	T	449	C	TP53	R196*	G	776	A	UBA1	M539I	G	1707	T	WDR64	E457*	G	1576	T
TEX13A	G31S	C	203	T	TP53	-	T	0	A	UBA2	R610H	G	1899	A	WDR64	V925A	T	2981	C
TEX13A	R91W	G	383	A	TP53	R273C	G	1007	A	UBA2	N423H	A	1337	C	WDR64	F115L	C	552	A
TEX13B	A26T	C	169	T	TP53	R337L	C	1200	A	UBA3	A318S	C	1007	A	WDR64	I1007F	A	3226	T
TEX14	F578L	G	1852	C	TP53	C176Y	C	717	T	UBA3	Y156H	A	521	G	WDR64	L1028P	T	3290	C
TEX14	S1296F	G	4005	A	TP53	C238F	C	903	A	UBA6	S411Y	G	1292	T	WDR64	D689Y	G	2272	T
TEX14	P1201T	G	3719	T	TP53	I254S	A	951	C	UBA6	K27T	T	140	G	WDR64	R991*	C	3178	T
TEX14	F881L	A	2761	C	TP53	L257Q	A	960	T	UBA7	G800D	C	2558	T	WDR64	-	A	3453	C
TEX14	F252L	G	874	T	TP53	R175H	C	714	T	UBA7	F574L	G	1881	T	WDR65	G53C	G	278	T
TEX15	E1603Q	C	4807	G	TP53	R213*	G	827	A	UBA7	Q92H	T	435	G	WDR66	R213S	A	781	C

TEX15	S583Y	G	1748	T	TP53	T125M	G	564	A	UBAC1	R404H	C	1429	T	WDR66	M350I	G	1192	T
TEX15	S88L	G	263	A	TP53	-	C	0	T	UBAP1	K60N	G	415	T	WDR66	G750E	G	2391	A
TEX15	P2762T	G	8284	T	TP53	G245S	C	923	T	UBAP2	S685P	A	2171	G	WDR66	K828N	A	2626	C
TEX15	S2494Y	G	7481	T	TP53	R175H	C	714	T	UBAP2	L575F	C	1843	A	WDR67	S131L	C	482	T
TEX15	L1437R	A	4310	C	TP53	R248L	C	933	A	UBAP2L	P17L	C	217	T	WDR67	D638N	G	2002	A
TEX15	S401A	A	1201	C	TP53	G245D	C	924	T	UBASH3A	T118M	C	384	T	WDR67	L842H	T	2615	A
TEX15	S30Y	G	89	T	TP53	R282W	G	1034	A	UBASH3A	T325M	C	1005	T	WDR67	A843T	G	2617	A
TEX15	A29V	G	86	A	TP53	R273H	C	1008	T	UBASH3A	P603L	C	1839	T	WDR7	-	G	0	A
TEX2	E543*	C	1778	A	TP53	L257Q	A	960	T	UBASH3B	D597G	A	2150	G	WDR7	N1461H	A	4592	C
TEX2	S91L	G	423	A	TP53	R273H	C	1008	T	UBASH3B	A182V	C	905	T	WDR7	V1107A	T	3531	C
TEX2	V785M	C	2504	T	TP53	R175H	C	714	T	UBASH3B	F132L	C	756	A	WDR7	R1474C	C	4631	T
TEX2	G359R	C	1226	T	TP53	-	C	0	A	UBASH3B	R416H	G	1607	A	WDR72	K142N	T	666	G
TEX2	K1087N	C	3412	A	TP53	R282W	G	1034	A	UBE2A	I33T	T	272	C	WDR72	S928Y	G	3023	T
TEX2	E470K	C	1559	T	TP53	R248W	G	932	A	UBE2D4	R90L	G	358	T	WDR72	S894Y	G	2921	T
TEX9	E296D	G	912	T	TP53	C176F	C	717	A	UBE2E2	-	G	0	T	WDR72	Y874C	T	2861	C
TEX9	S391A	T	1195	G	TP53	R273C	G	1007	A	UBE2E3	I211M	T	1026	G	WDR72	L862V	A	2824	C
TF	G636D	G	3635	A	TP53	R248Q	C	933	T	UBE2F	F153C	T	652	G	WDR72	T719I	G	2396	A
TF	A398T	G	2920	A	TP53	R248W	G	932	A	UBE2G1	P97H	G	648	T	WDR72	E499*	C	1735	A
TF	V120M	G	2086	A	TP53	H193Y	G	767	A	UBE2G2	A155V	G	735	A	WDR75	F233L	T	759	G
TF	G484D	G	3179	A	TP53	R175H	C	714	T	UBE2I	G47R	G	256	A	WDR76	P234Q	C	771	A
TFAM	-	G	0	A	TP53	G244C	C	920	A	UBE2N	A126V	G	743	A	WDR76	K45Q	A	203	C
TFAP2B	A381V	C	1308	T	TP53BP1	R1405*	G	4341	A	UBE2N	I39V	T	481	C	WDR76	E264A	A	861	C
TFAP2B	S125L	C	540	T	TP53BP1	R1405*	G	4341	A	UBE2NL	P98T	C	322	A	WDR77	G82E	C	452	T
TFAP2B	S216L	C	813	T	TP53BP1	Q1943*	G	5955	A	UBE2NL	A137D	C	440	A	WDR78	K382N	T	1202	G
TFAP2B	V280F	G	1004	T	TP53BP1	L1822M	G	5592	T	UBE2O	D884N	C	2715	T	WDR78	-	C	0	T
TFAP2D	R132W	C	622	T	TP53BP1	P1144H	G	3559	T	UBE2O	V169I	C	570	T	WDR8	R115W	G	417	A
TFAP2D	A119V	C	584	T	TP53BP1	R1961I	C	6010	A	UBE2O	P892S	G	2739	A	WDR8	E55D	C	239	A
TFAP2D	D17N	G	277	A	TP53BP1	S899R	T	2823	G	UBE2Q1	Q173*	G	597	A	WDR8	E371K	C	1185	T
TFAP2D	E267D	G	1029	T	TP53BP1	E687*	C	2187	A	UBE2Q1	V131I	C	471	T	WDR8	V356I	C	1140	T
TFAP2E	S434L	C	1509	T	TP53BP2	H924R	T	2771	C	UBE2R2	A60V	C	370	T	WDR8	V75A	A	298	G
TFAP4	R293Q	C	1132	T	TP53BP2	F1052C	A	3155	C	UBE2R2	A44T	G	321	A	WDR81	V928M	G	2782	A
TFB2M	C42G	A	310	C	TP53BP2	D837A	T	2510	G	UBE2S	G30D	C	457	T	WDR81	V1071I	G	3211	A
TFB2M	K356E	T	1252	C	TP53BP2	K739N	C	2217	A	UBE2T	R35*	G	253	A	WDR81	A1277T	G	3829	A
TFCP2	G370A	C	1568	G	TP53INP1	Y240N	A	1102	T	UBE2U	L16I	C	470	A	WDR81	P759L	C	2276	T
TFCP2	-	C	0	A	TP53TG5	R280K	C	996	T	UBE2V2	N92H	A	294	C	WDR81	P318L	C	953	T
TFCP2L1	S310L	G	1027	A	TP63	R266*	C	885	T	UBE2Z	D140Y	G	553	T	WDR81	A478T	G	1432	A
TFCP2L1	T229A	T	783	C	TP63	R655Q	G	2053	A	UBE2Z	R164W	C	625	T	WDR81	P191S	C	571	T
TFDP1	G115D	G	556	A	TP63	T39A	A	204	G	UBE2Z	K113T	A	473	C	WDR81	T420I	C	1259	T
TFDP1	A72V	C	427	T	TPCN1	A413T	G	1237	A	UBE2Z	N241S	A	857	G	WDR81	R1673H	G	5018	A

TFDP1	I153T	T	670	C	TPCN1	T498M	C	1493	T	UBE3A	R168Q	C	503	T	WDR81	L1397M	C	4189	A
TFDP2	N262S	T	1216	C	TPCN1	-	T	0	C	UBE3A	R424Q	C	1271	T	WDR82	R219C	G	937	A
TFDP3	V34M	C	189	T	TPCN1	A448V	C	1343	T	UBE3A	I352T	A	1055	G	WDR82	R193Q	C	860	T
TFDP3	K229N	C	776	A	TPCN1	R800W	C	2398	T	UBE3A	M545T	A	1634	G	WDR83	R304*	C	1245	T
TFEB	S381Y	G	1147	T	TPCN1	A873T	G	2617	A	UBE3A	A67T	C	199	T	WDR87	A2576V	G	7888	A
TFEB	A85V	G	259	A	TPCN2	R187C	C	675	T	UBE3A	E190*	C	568	A	WDR87	E1952D	C	6017	A
TFEB	A82V	G	250	A	TPD52	T162A	T	806	C	UBE3B	R686H	G	2660	A	WDR87	K1410N	C	4391	A
TFEB	P419L	G	1261	A	TPD52L1	A95V	C	503	T	UBE3B	A415T	G	1846	A	WDR87	H2609Q	A	7988	C
TFF2	E99K	C	466	T	TPD52L3	K93N	G	500	T	UBE3B	N136S	A	1010	G	WDR87	H885R	T	2815	C
TFG	A382V	C	1242	T	TPH2	E26K	G	217	A	UBE3B	L444I	C	1933	A	WDR87	P2673T	G	8178	T
TFIP11	K170N	C	794	A	TPH2	K374N	G	1263	T	UBE3C	A897V	C	3050	T	WDR87	L2595I	G	7944	T
TFIP11	R386Q	C	1441	T	TPK1	I135M	A	508	C	UBE4A	L929R	T	2915	G	WDR87	R986H	C	3118	T
TFIP11	A714V	G	2425	A	TPM1	E82K	G	323	A	UBE4B	T1274M	C	3896	T	WDR87	E2828K	C	8643	T
TFIP11	R386Q	C	1441	T	TPM3	Q217H	T	691	G	UBE4B	R1255C	C	3838	T	WDR87	K2331N	C	7154	A
TFIP11	E405K	C	1497	T	TPM4	R91C	C	389	T	UBE4B	R331C	C	1066	T	WDR87	K1883N	C	5810	A
TFPI	R243H	C	756	T	TPM4	E234D	G	820	T	UBE4B	F953L	T	2934	G	WDR87	K1867N	C	5762	A
TFPI	C175Y	C	552	T	TPMT	F99C	A	382	C	UBE4B	L1064F	G	3267	T	WDR87	R1841M	C	5683	A
TFPI	R69I	C	234	A	TPO	G842R	G	2607	A	UBL5	L30P	T	193	C	WDR87	D1284N	C	4011	T
TFPI2	Q63R	T	501	C	TPO	G534V	G	1684	T	UBLCP1	-	G	0	A	WDR87	D1219Y	C	3816	A
TFPI2	A185S	C	866	A	TPO	D585N	G	1836	A	UBLCP1	E283*	G	983	T	WDR87	R906Q	C	2878	T
TFPI2	G108W	C	635	A	TPO	Q550R	A	1732	G	UBN1	P328H	C	1322	A	WDR87	Q726H	C	2339	A
TFPT	R190W	G	974	A	TPO	R438C	C	1395	T	UBN1	A455V	C	1703	T	WDR87	K32N	C	257	A
TFR2	T553A	T	1698	C	TPP1	T188S	T	596	A	UBN2	G1101C	G	3858	T	WDR88	D364Y	G	1168	T
TFR2	R152C	G	495	A	TPP1	A344T	C	1064	T	UBN2	L1302V	T	4461	G	WDR88	A25T	G	151	A
TFR2	D204G	T	652	C	TPP1	S233N	C	732	T	UBOX5	G135D	C	876	T	WDR88	R308*	C	1000	T
TG	A2692D	C	8116	A	TPP2	V1261A	T	3798	C	UBP1	S291F	G	1402	A	WDR89	C221G	A	800	C
TG	A53V	C	199	T	TPP2	R282W	C	860	T	UBQLN1	I84F	T	774	A	WDR90	V364I	G	1144	A
TG	L2634F	C	7941	T	TPP2	A272T	G	830	A	UBQLN1	R274C	G	1344	A	WDR90	D669N	G	2059	A
TG	R2379H	G	7177	A	TPP2	A507V	C	1536	T	UBQLN1	G483W	C	1971	A	WDR90	S916L	C	2801	T
TG	Q45H	A	176	C	TPPP3	D97N	C	451	T	UBQLN2	F46L	T	371	C	WDR90	V1659A	T	5030	C
TG	E560D	G	1721	T	TPR	E584D	C	2049	G	UBQLN3	F65V	A	341	C	WDR90	T142I	C	479	T
TG	L1322S	T	4006	C	TPR	R1808Q	C	5720	T	UBQLN3	G429C	C	1433	A	WDR90	A52T	G	208	A
TG	A1886V	C	5698	T	TPR	M1320T	A	4256	G	UBQLN3	R624W	G	2018	A	WDR90	T1709I	C	5180	T
TG	S1988Y	C	6004	A	TPR	G1901E	C	5999	T	UBQLN3	R624W	G	2018	A	WDR90	V575M	G	1777	A
TG	R2555H	G	7705	A	TPR	A1995D	G	6281	T	UBQLN3	A2V	G	153	A	WDR91	E611K	C	1863	T
TGFA	R140Q	C	816	T	TPRA1	A232T	C	985	T	UBQLN4	G346S	C	1129	T	WDR91	R476C	G	1458	A
TGFB1	A262T	C	1651	T	TPRX1	G283C	C	918	A	UBQLN4	R298Q	C	986	T	WDR91	Y620H	A	1890	G
TGFB1I1	R95W	C	399	T	TPSD1	N223K	T	817	A	UBQLNL	E210D	T	894	G	WDR91	A731T	C	2223	T
TGFB1I1	E394D	G	1298	T	TPSG1	A127T	C	381	T	UBQLNL	A22E	G	329	T	WDR92	P100S	G	415	A

TGFB2	P255S	C	1230	T	TPSG1	R56H	C	169	T	UBQLNL	D43Y	C	391	A	WDSUB1	C160W	A	721	C
TGFB2	R181C	C	1008	T	TPSG1	V107M	C	321	T	UBR1	L1718F	G	5231	A	WEE1	P517L	C	1601	T
TGFB2	K301E	A	1368	G	TPSG1	D321E	G	965	T	UBR1	R1716W	G	5225	A	WEE1	D271G	A	863	G
TGFBI	T238I	C	874	T	TPST2	A200V	G	870	A	UBR1	L790V	A	2447	C	WEE1	R533W	C	1648	T
TGFBI	A650V	C	2110	T	TPST2	A90T	C	539	T	UBR1	E686*	C	2135	A	WEE2	I218N	T	1059	A
TGFBI	L509P	T	1687	C	TPST2	R78L	C	504	A	UBR2	L1504M	C	4768	A	WFDC12	L56M	G	184	T
TGFBI	N609S	A	1987	G	TPT1	E32A	T	112	G	UBR2	R522H	G	1823	A	WFDC12	C34Y	C	119	T
TGFBI	A659T	G	2136	A	TPTE	-	C	0	T	UBR2	S377I	G	1388	T	WFDC6	K67N	C	201	A
TGFBI	V322A	T	1126	C	TPTE	L183V	A	547	C	UBR2	R200W	C	856	T	WFDC6	I139V	T	415	C
TGFBI	N437S	A	1471	G	TPTE	G341S	C	1021	T	UBR2	E1303D	A	4167	C	WFDC8	S15I	C	123	A
TGFBR2	R403M	G	1491	T	TPTE	L463*	A	1388	C	UBR3	D342V	A	1025	T	WFDC8	T121I	G	441	A
TGFBR3	T747M	G	2706	A	TPTE	Q434H	T	1302	G	UBR3	E790K	G	2368	A	WFIKKN1	R266C	C	1118	T
TGFBRAP1	R426C	G	1703	A	TPTE	L271I	G	811	T	UBR3	P1556H	C	4667	A	WFIKKN1	R413H	G	1560	A
TGFBRAP1	V244M	C	1157	T	TPTE	N332T	T	995	G	UBR4	R2703*	G	8111	A	WFIKKN1	C347Y	G	1362	A
TGFBRAP1	E747*	C	2666	A	TPTE2	R214S	C	687	A	UBR4	R666Q	C	2001	T	WFIKKN1	R283*	C	1169	T
TGIF1	Q195*	C	886	T	TPTE2	E512*	C	1579	A	UBR4	T1162M	G	3489	A	WFS1	V803M	G	2574	A
TGIF2	A115T	G	542	A	TPTE2	V88A	A	308	G	UBR4	R2272H	C	6819	T	WHAMM	L701M	T	2607	A
TGIF2	E140K	G	617	A	TPX2	E651K	G	2479	A	UBR4	E3196K	C	9590	T	WHSC1	G92D	G	423	A
TGIF2LX	G150C	G	497	T	TPX2	R267*	C	1327	T	UBR4	Q4234*	G	12704	A	WHSC1	A427T	G	1427	A
TGM2	R296C	G	1060	A	TPX2	E474D	G	1950	T	UBR4	L1492R	A	4479	C	WHSC1	E104*	G	458	T
TGM2	R213C	G	811	A	TRA2A	R189I	C	783	A	UBR4	A428V	G	1287	A	WHSC1	E1339D	G	4165	T
TGM2	T360M	G	1253	A	TRA2B	T201M	G	745	A	UBR4	C4049R	A	12149	G	WHSC1	E104K	G	458	A
TGM2	N586T	T	1931	G	TRAC	R84C	C	248	T	UBR4	I4213V	T	12641	C	WHSC1	R660Q	G	2127	A
TGM2	D400N	C	1372	T	TRADD	R278H	C	890	T	UBR4	R3498W	G	10496	A	WHSC1	R401W	C	1349	T
TGM3	R53K	G	221	A	TRAF2	A127V	C	425	T	UBR4	C1380*	A	4144	T	WHSC1	G795R	G	2531	A
TGM3	G93D	G	341	A	TRAF3IP2	Q377P	T	1130	G	UBR4	S950Y	G	2853	T	WHSC1	A165T	G	641	A
TGM3	S67L	C	263	T	TRAF3IP3	L502R	T	1925	G	UBR5	R1978*	G	5965	A	WHSC1L1	E246*	C	1254	A
TGM3	F330V	T	1051	G	TRAF3IP3	K214T	A	1061	C	UBR5	A2585V	G	7787	A	WHSC1L1	R211C	G	1149	A
TGM3	P647L	C	2003	T	TRAF5	N97K	T	376	G	UBR5	I2449V	T	7378	C	WHSC1L1	E728G	T	2701	C
TGM4	N550D	A	1716	G	TRAF6	R332Q	C	1020	T	UBR5	L419S	A	1289	G	WHSC1L1	S854I	C	3079	A
TGM4	F15L	C	113	A	TRAF7	S348N	G	1175	A	UBR5	S1857P	A	5602	G	WHSC1L1	A564S	C	2208	A
TGM4	R431W	C	1359	T	TRAF7	R371W	C	1243	T	UBR5	R2353Q	C	7091	T	WHSC2	G29V	C	1204	A
TGM4	N595S	A	1852	G	TRAFD1	K101T	A	919	C	UBR5	N2795K	A	8418	C	WHSC2	P253L	G	1876	A
TGM4	P340S	C	1086	T	TRAK1	R506Q	G	1917	A	UBR5	R2485Q	C	7487	T	WIF1	R107C	G	464	A
TGM6	G199S	G	656	A	TRAK1	R351W	C	1451	T	UBR5	W494G	A	1513	C	WIF1	W332*	C	1141	T
TGM6	D160N	G	539	A	TRAK1	R401C	C	1601	T	UBR7	E90*	G	504	T	WIF1	P308S	G	1067	A
TGM6	Q683*	C	2108	T	TRAK2	R196Q	C	1016	T	UBTD1	R154C	C	796	T	WIPF1	D60H	C	342	G
TGOLN2	K288T	T	925	G	TRAM1L1	L218F	C	841	A	UBTD1	R64H	G	527	A	WIPF1	P458S	G	1536	A
TGOLN2	G186S	C	618	T	TRAM1L1	V358A	A	1260	G	UBTD2	R28H	C	489	T	WIPF1	P458L	G	1537	A

TGS1	L43*	T	605	G	TRANK1	E1320*	C	3958	A	UBTF	L365M	G	1160	T	WIPF3	P309S	C	1175	T
TGS1	I790M	T	2847	G	TRANK1	A1729T	C	5185	T	UBTF	D689G	T	2133	C	WIPF3	R409*	C	1475	T
TH1L	Q444P	A	1373	C	TRANK1	P723L	G	2168	A	UBTFL2	N50Y	T	157	A	WIPI1	V385I	C	1244	T
THADA	Y563H	A	1827	G	TRANK1	Q663R	T	1988	C	UBTFL2	K49T	T	155	G	WIPI2	S114I	G	573	T
THADA	K1633N	C	5039	A	TRANK1	D83N	C	247	T	UBXN10	R38M	G	197	T	WISP1	P279S	C	911	T
THADA	P1582S	G	4884	A	TRANK1	E1548D	C	4644	G	UBXN4	R463K	G	1699	A	WISP1	P60L	C	255	T
THADA	C1398G	A	4332	C	TRAP1	A571T	C	1767	T	UBXN4	L428F	A	1595	C	WISP2	L47M	C	482	A
THADA	F665L	G	2135	T	TRAP1	K126N	T	434	G	UBXN8	G39D	G	116	A	WISP3	K233T	A	743	C
THADA	I85M	A	395	C	TRAP1	R402Q	C	1261	T	UCHL5	L190F	T	570	G	WIZ	G1492D	C	4689	T
THADA	K67T	T	340	G	TRAP1	D395G	T	1240	C	UCK1	V179M	C	561	T	WIZ	R1332H	C	4209	T
THAP1	D15E	G	282	T	TRAPPC1	A103V	G	427	A	UCK1	A4V	G	37	A	WIZ	G42D	C	339	T
THAP11	K38N	G	359	T	TRAPPC1	R127H	C	499	T	UCK1	R177Q	C	556	T	WIZ	R1357W	G	4283	A
THAP2	R41H	G	628	A	TRAPPC10	S193Y	C	753	A	UCK2	L138R	T	716	G	WLS	P508Q	G	1769	T
THAP2	S88Y	C	769	A	TRAPPC10	F223L	C	844	A	UCKL1	M463T	A	1431	G	WLS	A539T	C	1861	T
THAP5	V338D	A	1167	T	TRAPPC10	R330C	C	1163	T	UCMA	A39V	G	189	A	WLS	R73*	G	463	A
THAP5	R73*	G	371	A	TRAPPC10	S1109L	C	3501	T	UCMA	E88*	C	335	A	WNK1	I1371S	T	4755	G
THAP7	T134I	G	576	A	TRAPPC10	E1255G	A	3939	G	UCN	L54F	G	459	A	WNK1	A1233V	C	4341	T
THAP9	D394N	G	1231	A	TRAPPC5	R72H	G	285	A	UCP2	V285M	C	1233	T	WNK1	S1686R	C	5701	A
THAP9	F607C	T	1871	G	TRAPPC5	A112V	C	405	T	UCP2	R71H	C	592	T	WNK1	A779T	G	2978	A
THBD	A555V	G	1901	A	TRAPPC5	G155A	G	534	C	UCP2	V289I	C	1245	T	WNK1	A1024E	C	3714	A
THBD	Y376C	T	1364	C	TRAPPC6A	A144T	C	439	T	UCP3	R119W	G	710	A	WNK2	S2093C	A	6277	T
THBD	T500A	T	1735	C	TRAPPC9	-	A	0	G	UCP3	R87H	C	615	T	WNK2	P885T	C	2653	A
THBD	R200C	G	835	A	TRAPPC9	R1091G	T	3271	C	UEVLD	G13D	C	118	T	WNK2	A837T	G	2509	A
THBS1	G1136*	G	3738	T	TRAPPC9	-	C	0	T	UEVLD	R313*	G	1017	A	WNK2	A1036T	G	3106	A
THBS1	A165V	C	826	T	TRAPPC9	E388D	T	1164	G	UFD1L	R292I	C	953	A	WNK2	Q1249*	C	3745	T
THBS2	P386L	G	1407	A	TRBC2	A68T	G	201	A	UFD1L	-	T	1110	G	WNK2	L1239M	C	3715	A
THBS2	R59H	C	426	T	TRBC2	-	A	0	C	UGCG	R246Q	G	1187	A	WNK3	E380*	C	1577	A
THBS2	P623L	G	2118	A	TRBC2	A68T	G	201	A	UGDH	F71L	A	556	C	WNK3	C120Y	C	798	T
THBS2	R496H	C	1737	T	TRBJ2-3	R12Q	G	35	A	UGGT1	R1552C	C	4701	T	WNK3	E1461D	C	4822	A
THBS2	C622Y	C	2115	T	TRBJ2-3	P9S	C	25	T	UGGT1	V451E	T	1399	A	WNK3	K443R	T	1767	C
THBS2	S162N	C	735	T	TRBJ2-6	G12S	G	32	A	UGGT2	R665C	G	2064	A	WNK4	R151Q	G	473	A
THBS2	P357S	G	1319	A	TRBJ2-6	S2Y	C	3	A	UGGT2	L810F	G	2499	A	WNK4	R469W	C	1426	T
THBS2	D551Y	C	1901	A	TRBV10-2	A70V	G	260	A	UGGT2	F711L	G	2204	T	WNT10A	F294L	T	1513	C
THBS2	T16M	G	297	A	TRBV10-2	T101A	T	352	C	UGGT2	K604Q	T	1881	G	WNT10A	T387M	C	1793	T
THBS2	K474N	C	1672	A	TRBV19	A111V	C	540	T	UGT1A1	L66V	T	236	G	WNT10B	F19L	A	404	G
THBS2	D687N	C	2309	T	TRBV28	R8H	G	43	A	UGT1A1	F145V	T	473	G	WNT16	L6P	T	307	C
THBS3	D540N	C	1639	T	TRBV29-1	G55E	G	231	A	UGT1A10	A25T	G	142	A	WNT16	A4V	C	301	T
THBS3	R401H	C	1223	T	TRBV5-1	L109I	C	634	A	UGT1A3	E72D	G	235	T	WNT16	F185V	T	843	G
THBS3	L59V	A	196	C	TRBV5-3	R86C	G	256	A	UGT1A7	D131Y	G	391	T	WNT16	S241Y	C	1012	A

WNT2	V334M	C	1300	T	ZFAT	N495I	T	1659	A	ZNF317	Q54H	G	450	T	ZNF616	R625I	C	2157	A
WNT2	E272D	C	1116	A	ZFC3H1	L1017P	A	3409	G	ZNF318	R525*	G	1651	A	ZNF616	E15*	C	326	A
WNT2	D232N	C	994	T	ZFC3H1	P1825L	G	5833	A	ZNF318	R225Q	C	752	T	ZNF618	A805V	C	2513	T
WNT2B	R112H	G	820	A	ZFC3H1	P549L	G	2005	A	ZNF318	K566M	T	1775	A	ZNF618	E823K	G	2566	A
WNT2B	G195S	G	1068	A	ZFC3H1	R696Q	C	2446	T	ZNF318	A766T	C	2374	T	ZNF620	R7H	G	169	A
WNT2B	R115H	G	829	A	ZFC3H1	Q388H	T	1523	G	ZNF318	L1400I	G	4276	T	ZNF621	H285N	C	1076	A
WNT2B	K330Q	A	1473	C	ZFC3H1	K294N	T	1241	G	ZNF318	G1912*	C	5812	A	ZNF622	A40D	G	246	T
WNT3	A223V	G	686	A	ZFC3H1	S40I	C	478	A	ZNF318	D2005G	T	6092	C	ZNF622	-	C	0	A
WNT4	T42M	G	169	A	ZFC3H1	N32T	T	454	G	ZNF318	R1196W	G	3664	A	ZNF623	R301C	C	990	T
WNT4	V288M	C	906	T	ZFHX3	C1988R	A	6635	G	ZNF319	Q354*	G	1683	A	ZNF624	S207F	G	703	A
WNT5A	V123G	A	890	C	ZFHX3	P192L	G	1248	A	ZNF319	Q61H	C	806	A	ZNF624	T684A	T	2133	C
WNT5A	R354H	C	1583	T	ZFHX3	R60C	G	851	A	ZNF319	A569V	G	2329	A	ZNF624	S568Y	G	1786	T
WNT7A	R90L	C	574	A	ZFHX3	R2149H	C	7119	T	ZNF320	Q100R	T	447	C	ZNF624	N184K	A	635	C
WNT7A	C200W	A	905	C	ZFHX3	V907A	A	3393	G	ZNF320	R313*	G	1085	A	ZNF625	E218D	C	654	A
WNT7A	T338M	G	1318	A	ZFHX3	A102V	G	978	A	ZNF324	D87G	A	354	G	ZNF625	D190Y	C	568	A
WNT7A	G303S	C	1212	T	ZFHX3	R990H	C	3642	T	ZNF324	R161Q	G	576	A	ZNF626	R361S	T	1233	A
WNT7B	C218Y	C	1131	T	ZFHX3	L1788R	A	6036	C	ZNF324	V482M	G	1538	A	ZNF626	K124E	T	520	C
WNT7B	R246W	G	1214	A	ZFHX3	Y3066C	T	9870	C	ZNF324B	R152C	C	561	T	ZNF627	R351*	C	1259	T
WNT7B	K224T	T	1149	G	ZFHX4	R2917*	C	9128	T	ZNF324B	C198Y	G	700	A	ZNF627	R435Q	G	1512	A
WNT8A	L90F	C	504	T	ZFHX4	R104H	G	690	A	ZNF326	A288V	C	863	T	ZNF627	R271*	C	1019	T
WNT8A	E128K	G	618	A	ZFHX4	A1707T	G	5498	A	ZNF329	R528Q	C	1819	T	ZNF628	P91H	C	837	A
WNT8A	K240R	A	955	G	ZFHX4	A2547T	G	8018	A	ZNF329	R223Q	C	904	T	ZNF628	A783V	C	2913	T
WNT8A	G134W	G	636	T	ZFHX4	P395L	C	1563	T	ZNF329	N495K	G	1721	T	ZNF628	T221M	C	1227	T
WNT8A	K333T	A	1234	C	ZFHX4	F1872V	T	5993	G	ZNF329	Y483C	T	1684	C	ZNF628	A734T	G	2765	A
WNT8B	T101P	A	429	C	ZFHX4	N2181T	A	6921	C	ZNF329	K378N	T	1370	G	ZNF629	E528G	T	1791	C
WNT8B	R239H	G	844	A	ZFHX4	S122I	G	744	T	ZNF331	K437E	A	2642	G	ZNF630	T598P	T	2019	G
WNT9A	R70H	C	220	T	ZFHX4	A2394T	G	7559	A	ZNF331	R225W	C	2006	T	ZNF641	R124W	G	1079	A
WNT9A	G240D	C	730	T	ZFHX4	A366T	G	1475	A	ZNF333	R360H	G	1213	A	ZNF642	E12K	G	1040	A
WNT9B	R30Q	G	126	A	ZFHX4	L363V	T	1466	G	ZNF333	G418R	G	1386	A	ZNF643	R300I	G	898	T
WRN	R499I	G	2284	T	ZFHX4	D883Y	G	3026	T	ZNF333	V523M	G	1701	A	ZNF644	E519*	C	1773	A
WRN	K934Q	A	3588	C	ZFHX4	L1355S	T	4443	C	ZNF333	R554Q	G	1795	A	ZNF644	R1099H	C	3514	T
WRNIP1	R624G	A	2079	G	ZFHX4	S1564Y	C	5070	A	ZNF334	E648D	C	3138	A	ZNF644	M1082L	T	3462	G
WRNIP1	A621T	G	2070	A	ZFHX4	N2468S	A	7782	G	ZNF334	R615Q	C	3038	T	ZNF646	R1300C	C	4162	T
WRNIP1	D9N	G	234	A	ZFHX4	S2789L	C	8745	T	ZNF334	R420I	C	2453	A	ZNF646	P1374H	C	4385	A
WRNIP1	A149E	C	655	A	ZFP1	F184C	T	715	G	ZNF334	E136D	C	1602	A	ZNF646	G1432*	G	4558	T
WSB1	A306T	G	1232	A	ZFP1	R288I	G	1027	T	ZNF335	R1131M	C	3493	A	ZNF646	P45T	C	397	A
WSB1	F70S	T	525	C	ZFP106	S1509Y	G	4853	T	ZNF335	R505C	G	1614	A	ZNF646	A1408V	C	4487	T
WSB1	I109V	A	641	G	ZFP106	R935*	G	3130	A	ZNF335	R1092Q	C	3376	T	ZNF646	H832Y	C	2758	T
WSB2	F58L	A	172	G	ZFP106	K1354Q	T	4387	G	ZNF335	A1064V	G	3292	A	ZNF646	R1062H	G	3449	A

WSCD1	A2V	C	332	T	ZFP112	H586Y	G	1836	A	ZNF335	A702T	C	2205	T	ZNF648	E96D	T	496	G
WSCD1	T275A	A	1150	G	ZFP112	R556G	T	1746	C	ZNF337	H342Y	G	1564	A	ZNF648	R272H	C	1023	T
WSCD2	C300Y	G	1643	A	ZFP112	K901T	T	2782	G	ZNF33A	E563K	G	1760	A	ZNF648	R384H	C	1359	T
WSCD2	Y583*	C	2493	A	ZFP112	E595D	C	1865	A	ZNF33A	E647K	G	2012	A	ZNF649	G108R	C	590	T
WSCD2	Y583*	C	2493	A	ZFP112	N350T	T	1129	G	ZNF33A	K319*	A	1028	T	ZNF649	P129A	G	653	C
WSCD2	D69G	A	950	G	ZFP112	S182I	C	625	A	ZNF33A	D149A	A	519	C	ZNF653	F509L	G	1580	T
WSCD2	F349S	T	1790	C	ZFP14	R75I	C	317	A	ZNF33B	T753I	G	2258	A	ZNF653	A580V	G	1792	A
WT1	C484G	A	1735	C	ZFP14	W36R	A	199	G	ZNF33B	G559V	C	1676	A	ZNF653	Q564P	T	1744	G
WT1	T346M	G	1322	A	ZFP14	R385C	G	1246	A	ZNF33B	R461K	C	1382	T	ZNF654	R454I	G	1568	T
WT1	R485W	G	1738	A	ZFP161	T194A	T	919	C	ZNF34	I351M	A	1155	C	ZNF655	L458R	T	1470	G
WTAP	T148M	C	2200	T	ZFP161	E32K	C	433	T	ZNF345	H112N	C	334	A	ZNF658	E998G	T	3096	C
WWC1	R661*	C	2047	T	ZFP161	S74L	G	560	A	ZNF345	R194I	G	581	T	ZNF658	K254N	T	865	G
WWC2	F150L	C	450	A	ZFP2	K417N	A	1760	C	ZNF345	R250K	G	749	A	ZNF658	H205N	G	716	T
WWC2	-	G	0	T	ZFP2	E239K	G	1224	A	ZNF347	T643A	T	1992	C	ZNF660	R173C	C	850	T
WWC3	P433H	C	1689	A	ZFP2	E271*	G	1320	T	ZNF347	K381E	T	1206	C	ZNF662	P165S	C	679	T
WWC3	T323M	C	1359	T	ZFP2	R402I	G	1714	T	ZNF347	R302C	G	969	A	ZNF662	R341Q	G	1208	A
WWC3	R1027W	C	3470	T	ZFP2	R455Q	G	1873	A	ZNF347	Y374S	T	1186	G	ZNF662	R172H	G	701	A
WWC3	R423*	C	1658	T	ZFP28	R581I	G	1813	T	ZNF35	E130K	G	623	A	ZNF662	R172C	C	700	T
WWP1	K33N	G	109	T	ZFP28	R693I	G	2149	T	ZNF354A	R523*	G	1765	A	ZNF662	K210I	A	815	T
WWP1	R427W	C	1289	T	ZFP28	K702T	A	2176	C	ZNF354A	K121T	T	560	G	ZNF662	R294I	G	1067	T
WWP1	R394C	C	1190	T	ZFP28	E754D	A	2333	C	ZNF354B	V19M	G	281	A	ZNF665	H308N	G	1022	T
WWP1	G610D	G	1839	A	ZFP28	K755Q	A	2334	C	ZNF354B	I120T	T	585	C	ZNF665	R562T	C	1785	G
WWP2	R330Q	G	1090	A	ZFP3	R133K	G	523	A	ZNF354B	I144L	A	656	C	ZNF667	R310G	T	928	C
WWP2	L794P	T	2482	C	ZFP30	R170Q	C	1067	T	ZNF354C	R348S	A	1350	C	ZNF668	R141H	C	1042	T
WWP2	D759N	G	2376	A	ZFP36	D244Y	G	822	T	ZNF358	C380Y	G	1309	A	ZNF668	A206V	G	1237	A
WWP2	A294V	C	982	T	ZFP36L1	A188T	C	692	T	ZNF358	D107N	G	489	A	ZNF668	A206E	G	1237	T
WWP2	G691S	G	2172	A	ZFP36L2	G128S	C	676	T	ZNF362	A108V	C	342	T	ZNF668	R570H	C	2329	T
WWTR1	R248*	G	999	A	ZFP37	R313I	C	966	A	ZNF365	Q14*	C	320	T	ZNF669	E331*	C	1164	A
WWTR1	S307L	G	1177	A	ZFP37	R453S	T	1387	G	ZNF365	S379G	A	1415	G	ZNF670	R120G	T	517	C
WWTR1	K148N	T	701	G	ZFP37	D50N	C	176	T	ZNF365	H51N	C	431	A	ZNF670	E135*	C	562	A
XAB2	A600T	C	1824	T	ZFP37	K229*	T	713	A	ZNF365	S151A	T	731	G	ZNF671	R7Q	C	119	T
XAB2	G701D	C	2128	T	ZFP41	A118V	C	711	T	ZNF365	-	G	0	T	ZNF671	R286M	C	956	A
XAB2	D14H	C	66	G	ZFP42	G16D	G	455	A	ZNF366	D716E	A	2639	C	ZNF672	A55D	C	910	A
XAB2	R154H	C	487	T	ZFP42	V136G	T	815	G	ZNF366	E103D	C	800	A	ZNF673	K158T	A	1104	C
XAB2	A802T	C	2430	T	ZFP62	Q39H	C	453	A	ZNF366	N89H	T	756	G	ZNF676	E340K	C	1336	T
XAB2	G498S	C	1518	T	ZFP62	K79T	T	572	G	ZNF367	E179D	C	834	A	ZNF676	E29D	C	405	A
XAB2	E322V	T	991	A	ZFP64	R359C	G	1425	A	ZNF367	S163*	G	785	T	ZNF677	E484D	C	1618	A
XAF1	R211C	C	873	T	ZFP64	R441H	C	1672	T	ZNF37A	F420L	C	1605	A	ZNF677	W363L	C	1254	A
XAF1	R132C	C	636	T	ZFP64	G405R	C	1620	T	ZNF37A	G333R	G	1342	A	ZNF677	R479I	C	1602	A

XBP1	T65M	G	226	A	ZFP64	G616C	C	2196	A	ZNF37A	E157D	G	816	T	ZNF678	R229I	G	1031	T
XBP1	N277H	T	861	G	ZFP64	D274E	G	965	T	ZNF37A	R487I	G	1805	T	ZNF678	E353*	G	1402	T
XCR1	R139H	C	773	T	ZFP82	E63*	C	187	A	ZNF382	W21*	G	175	A	ZNF680	K257T	T	922	G
XCR1	I166V	T	853	C	ZFP90	C499G	T	1530	G	ZNF382	E168D	G	617	T	ZNF680	E319*	C	1107	A
XCR1	I166V	T	853	C	ZFP90	R601I	G	1837	T	ZNF382	Y242C	A	838	G	ZNF680	K510I	T	1681	A
XCR1	R127H	C	737	T	ZFP90	R536L	G	1642	T	ZNF382	E377K	G	1242	A	ZNF681	E109D	C	469	A
XCR1	A33T	C	454	T	ZFP91	R161H	G	653	A	ZNF382	S491A	T	1584	G	ZNF681	A10D	G	171	T
XDH	T954A	T	2909	C	ZFP91	R326H	G	1148	A	ZNF383	G390D	G	1752	A	ZNF681	K149N	T	589	G
XDH	D430G	T	1338	C	ZFPL1	R222Q	G	830	A	ZNF384	R410Q	C	1437	T	ZNF681	S94A	A	422	C
XDH	V931D	A	2841	T	ZFPM1	V291I	G	1193	A	ZNF384	D209G	T	834	C	ZNF682	E109D	C	450	A
XDH	I403M	T	1258	C	ZFPM1	T151M	C	774	T	ZNF385A	Q278R	T	888	C	ZNF682	E226D	C	801	A
XIRP1	G491V	C	1701	A	ZFPM2	D39Y	G	138	T	ZNF385B	Q335H	C	1609	A	ZNF682	R55C	G	286	A
XIRP1	A265T	C	1022	T	ZFPM2	V538I	G	1635	A	ZNF385D	A96V	G	806	A	ZNF683	L211I	G	709	T
XIRP1	R379C	G	1364	A	ZFPM2	Y540N	T	1641	A	ZNF385D	-	A	0	G	ZNF684	V313M	G	1188	A
XIRP2	S203G	A	696	G	ZFPM2	T804M	C	2434	T	ZNF385D	T280M	G	1358	A	ZNF684	N180K	T	791	G
XIRP2	A990V	C	3058	T	ZFPM2	S581P	T	1764	C	ZNF385D	G237E	C	1229	T	ZNF687	R1154C	C	3606	T
XIRP2	A3258T	G	9861	A	ZFPM2	R787I	G	2383	T	ZNF385D	S207L	G	1139	A	ZNF687	L579F	C	1881	T
XIRP2	R793*	C	2466	T	ZFPM2	N919Y	A	2778	T	ZNF394	R560H	C	1883	T	ZNF687	R1152*	C	3600	T
XIRP2	E215*	G	732	T	ZFR	R647*	G	2042	A	ZNF394	R356I	C	1271	A	ZNF687	V445M	G	1479	A
XIRP2	C3199G	T	9684	G	ZFR	S855*	G	2667	T	ZNF394	E473*	C	1621	A	ZNF687	R1033H	G	3244	A
XIRP2	V1370I	G	4197	A	ZFR	S9Y	G	129	T	ZNF395	R503W	G	1639	A	ZNF687	D313H	G	1083	C
XIRP2	L1605I	C	4902	A	ZFR2	A171V	G	524	A	ZNF395	R487C	G	1591	A	ZNF689	R380C	G	1476	A
XIRP2	R1497Q	G	4579	A	ZFR2	V656I	C	1978	T	ZNF395	R158K	C	605	T	ZNF689	R331H	C	1330	T
XIRP2	Q2695R	A	8173	G	ZFR2	A507T	C	1531	T	ZNF397	P424S	C	1426	T	ZNF689	V422M	C	1602	T
XIRP2	R1018M	G	3142	T	ZFR2	R73Q	C	230	T	ZNF397OS	E25D	T	303	G	ZNF689	Q162R	T	823	C
XIRP2	K3055N	A	9254	T	ZFX	F557L	T	2096	C	ZNF398	R570Q	G	1709	A	ZNF69	Y444D	T	1470	G
XIRP2	S73L	C	307	T	ZFY	R760Q	G	2473	A	ZNF398	L28I	C	82	A	ZNF69	H500R	A	1639	G
XIRP2	M529I	G	1676	T	ZFYVE16	R1260Q	G	3959	A	ZNF404	R504C	G	1510	A	ZNF69	P331L	C	1132	T
XIRP2	Q606H	A	1907	C	ZFYVE16	M1353I	G	4239	T	ZNF407	G793R	G	2434	A	ZNF691	H189Y	C	565	T
XIRP2	D746Y	G	2325	T	ZFYVE19	Q122*	C	878	T	ZNF407	R1413*	C	4294	T	ZNF697	D293N	C	991	T
XIRP2	R3223C	C	9756	T	ZFYVE19	D436N	G	1820	A	ZNF407	G2140E	G	6476	A	ZNF697	T516M	G	1661	A
XIRP2	F3516C	T	10636	G	ZFYVE20	R566H	C	2311	T	ZNF407	R1705H	G	5171	A	ZNF699	E448G	T	1343	C
XKR3	F88S	A	366	G	ZFYVE26	R1378*	G	4271	A	ZNF407	Q1965*	C	5950	T	ZNF699	V205M	C	613	T
XKR3	R59Q	C	279	T	ZFYVE26	P136S	G	545	A	ZNF407	S293A	T	934	G	ZNF699	D468E	A	1404	T
XKR4	P588L	C	1763	T	ZFYVE26	C247Y	C	879	T	ZNF407	N1774S	A	5378	G	ZNF699	H353Y	G	1057	A
XKR4	S303T	G	908	C	ZFYVE26	G633V	C	2037	A	ZNF407	S1262R	A	3841	C	ZNF699	K472N	C	1416	A
XKR4	S584*	C	1751	A	ZFYVE26	F2317L	G	7090	T	ZNF408	E151K	G	681	A	ZNF699	K417T	T	1250	G
XKR4	G155S	G	463	A	ZFYVE26	A1353S	C	4196	A	ZNF408	R608H	G	2053	A	ZNF7	V135I	G	403	A
XKR5	A214T	C	791	T	ZFYVE26	H1176N	G	3665	T	ZNF408	R352W	C	1284	T	ZNF7	A177T	G	529	A

XKR5	L409P	A	1377	G	ZFYVE26	E361*	C	1220	A	ZNF408	V75L	G	453	C	ZNF7	S122F	C	365	T
XKR5	N275D	T	974	C	ZFYVE27	P311L	C	1132	T	ZNF414	P279L	G	938	A	ZNF7	K542Q	A	1624	C
XKR6	L606M	G	1816	T	ZFYVE27	R338Q	G	1213	A	ZNF414	A306T	C	1018	T	ZNF70	R327L	C	1441	A
XKR6	T572N	G	1715	T	ZFYVE27	A104T	G	510	A	ZNF415	N180S	T	708	C	ZNF70	R436H	C	1768	T
XKR6	T555M	G	1664	A	ZFYVE28	V86I	C	596	T	ZNF415	R359Q	C	1245	T	ZNF700	K567E	A	1825	G
XKR6	R439*	G	1315	A	ZFYVE28	R389C	G	1505	A	ZNF415	I207S	A	789	C	ZNF700	E387D	G	1287	T
XKR6	S374Y	G	1121	T	ZFYVE9	R118I	G	525	T	ZNF416	A66V	G	368	A	ZNF703	G333C	G	1186	T
XKR7	P293L	C	1052	T	ZG16	R140C	C	463	T	ZNF416	T312I	G	1106	A	ZNF704	R386W	G	1388	A
XKR7	V420I	G	1432	A	ZG16	G77C	G	274	T	ZNF417	R540I	C	1818	A	ZNF705A	R154H	G	584	A
XKR9	A160V	C	1013	T	ZG16B	P190L	C	648	T	ZNF417	A465V	G	1593	A	ZNF705E	S173*	G	590	T
XKR9	P360Q	C	1613	A	ZGPAT	-	T	0	A	ZNF417	V453I	C	1556	T	ZNF705G	K63Q	T	469	G
XKRX	H441R	T	1888	C	ZGPAT	L459I	C	1502	A	ZNF417	K331N	T	1192	G	ZNF709	R576Q	C	1899	T
XKRX	P110L	G	895	A	ZHX1	E106K	C	746	T	ZNF418	Q549E	G	1937	C	ZNF709	R496M	C	1659	A
XPA	A199V	G	661	A	ZHX1	K190E	T	998	C	ZNF418	R368I	C	1395	A	ZNF709	T385A	T	1325	C
XPC	T169M	G	721	A	ZHX1	P309S	G	1355	A	ZNF419	A97V	C	530	T	ZNF709	R188I	C	735	A
XPC	G802S	C	2619	T	ZHX1	E129D	C	817	A	ZNF419	-	T	0	C	ZNF709	R156Q	C	639	T
XPNPEP1	F514V	A	1660	C	ZHX1	R741W	T	2651	A	ZNF419	A5T	G	253	A	ZNF71	G192S	G	812	A
XPNPEP1	-	C	0	T	ZHX2	E504*	G	2077	T	ZNF419	R503Q	G	1748	A	ZNF71	P25L	C	312	T
XPNPEP1	K137T	T	530	G	ZHX3	N249K	G	747	T	ZNF420	H497N	C	1704	A	ZNF710	V464M	G	1641	A
XPNPEP2	Q208K	C	814	A	ZHX3	R933C	G	2797	A	ZNF420	S483Y	C	1663	A	ZNF710	P79L	C	487	T
XPNPEP2	G671D	G	2204	A	ZHX3	R646I	C	1937	A	ZNF423	S15L	G	342	A	ZNF710	L563P	T	1939	C
XPNPEP2	R89H	G	458	A	ZHX3	N249K	G	747	T	ZNF423	R380C	G	1436	A	ZNF710	R172W	C	765	T
XPNPEP2	A2T	G	196	A	ZIC1	N50K	C	879	A	ZNF423	L681M	G	2339	T	ZNF710	K576E	A	1977	G
XPNPEP2	-	G	0	A	ZIC1	K320R	A	1688	G	ZNF423	A508T	C	1820	T	ZNF711	R625H	G	2760	A
XPNPEP3	R242C	C	808	T	ZIC1	R294H	G	1610	A	ZNF423	A434V	G	1599	A	ZNF711	L215I	T	1529	A
XPNPEP3	S81Y	C	326	A	ZIC1	M249V	A	1474	G	ZNF423	D144N	C	728	T	ZNF713	R340H	G	1865	A
XPO1	T1030S	G	3817	C	ZIC1	G338S	G	1741	A	ZNF423	A842G	G	2823	C	ZNF714	K282N	A	1206	C
XPO1	R749Q	C	2974	T	ZIC1	D368N	G	1831	A	ZNF425	G532S	C	1727	T	ZNF714	V19L	G	415	C
XPO4	R384*	G	1186	A	ZIC2	P269H	C	1099	A	ZNF425	G298R	C	1025	T	ZNF716	E349D	G	1159	T
XPO4	M1T	A	38	G	ZIC2	S430P	T	1581	C	ZNF425	R297C	G	1022	A	ZNF716	G330D	G	1101	A
XPO4	N960H	T	2914	G	ZIC3	R30C	C	638	T	ZNF425	C587Y	C	1893	T	ZNF716	R11Q	G	144	A
XPO5	L939R	A	3027	C	ZIC3	D366G	A	1647	G	ZNF425	T236M	G	840	A	ZNF716	E121D	G	475	T
XPO6	R566C	G	2197	A	ZIC4	R55Q	C	164	T	ZNF425	C218F	C	786	A	ZNF716	K232T	A	807	C
XPO6	P745S	G	2734	A	ZIC4	R320C	G	958	A	ZNF426	R548Q	C	1907	T	ZNF716	R316I	G	1059	T
XPO6	V564M	C	2191	T	ZIC4	V325A	A	974	G	ZNF426	V165M	C	757	T	ZNF724P	N488H	T	1580	G
XPO6	K431T	T	1793	G	ZIC4	K224E	T	670	C	ZNF429	R67Q	G	337	A	ZNF724P	R358I	C	1191	A
XPO7	Y818C	A	2555	G	ZIC5	G55D	C	398	T	ZNF43	K501T	T	1639	G	ZNF725	L3V	A	7	C
XPO7	R97W	C	391	T	ZIC5	R556*	G	1900	A	ZNF431	E544*	G	1777	T	ZNF726	G132*	G	479	T
XPO7	R672Q	G	2117	A	ZIC5	Y476*	G	1662	T	ZNF433	S518L	G	1724	A	ZNF729	L1007P	T	3020	C

XPO7	L141V	T	523	G	ZIK1	P189T	C	662	A	ZNF433	R522*	G	1735	A	ZNF729	V56A	T	167	C
XPOT	R705C	C	2539	T	ZIK1	E299K	G	992	A	ZNF433	R274I	C	992	A	ZNF733	M82I	C	517	T
XPOT	I570M	A	2136	G	ZKSCAN1	R248W	C	976	T	ZNF438	T47M	G	470	A	ZNF735	E12*	G	303	T
XPOT	A378V	C	1559	T	ZKSCAN1	R296K	G	1121	A	ZNF438	P251L	G	1082	A	ZNF735	S149P	T	714	C
XPOT	V285G	T	1280	G	ZKSCAN1	S183L	C	782	T	ZNF439	R203I	G	808	T	ZNF735	P87S	C	528	T
XPR1	K422R	A	1463	G	ZKSCAN1	R528H	G	1817	A	ZNF439	R398*	C	1392	T	ZNF735	Q157L	A	739	T
XPR1	P431A	C	1489	G	ZKSCAN2	G542S	C	2031	T	ZNF439	K380N	A	1340	C	ZNF735	-	G	0	T
XRCC1	P270A	G	928	C	ZKSCAN2	R586W	G	2163	A	ZNF439	A422V	C	1465	T	ZNF735	T250A	A	1017	G
XRCC1	A214V	G	761	A	ZKSCAN2	T852M	G	2962	A	ZNF439	F52C	T	355	G	ZNF736	R352C	C	1176	T
XRCC1	E424*	C	1390	A	ZKSCAN3	A63V	C	404	T	ZNF439	E233A	A	898	C	ZNF736	Q58H	A	296	C
XRCC2	V256G	A	853	C	ZKSCAN3	V531I	G	1807	A	ZNF44	Y469H	A	1524	G	ZNF736	F381L	C	1265	A
XRCC3	T340S	T	1341	A	ZKSCAN5	C460Y	G	1502	A	ZNF44	S510F	G	1648	A	ZNF74	G251S	G	1265	A
XRCC4	F88L	T	363	G	ZKSCAN5	A61T	G	304	A	ZNF44	P607H	G	1939	T	ZNF74	N320S	A	1473	G
XRCC5	A372T	G	1575	A	ZKSCAN5	I749T	T	2369	C	ZNF440	R297H	G	1054	A	ZNF74	R239H	G	1230	A
XRCC5	G63D	G	649	A	ZMAT1	E275G	T	872	C	ZNF440	G112*	G	498	T	ZNF74	A585D	C	2268	A
XRCC6	-	A	0	C	ZMIZ1	N905D	A	3285	G	ZNF440	T479A	A	1599	G	ZNF746	R159C	G	642	A
XRCC6	A151V	C	694	T	ZMIZ1	D885N	G	3225	A	ZNF441	E675*	G	2125	T	ZNF746	R347Q	C	1207	T
XRCC6	M1T	T	244	C	ZMIZ1	S237N	G	1282	A	ZNF442	R180H	C	1122	T	ZNF746	K271E	T	978	C
XRCC6BP1	E89K	G	390	A	ZMIZ1	S939I	G	3388	T	ZNF442	R449*	G	1928	A	ZNF746	T278M	G	1000	A
XRN1	R73H	C	336	T	ZMIZ2	R605C	C	1936	T	ZNF442	R309*	G	1508	A	ZNF749	P223H	C	918	A
XRN1	V1064D	A	3309	T	ZMIZ2	I787L	A	2482	C	ZNF442	R624I	C	2454	A	ZNF749	T155M	C	714	T
XRN2	E28*	G	177	T	ZMYM1	R814C	C	2590	T	ZNF442	R393Q	C	1761	T	ZNF750	H39R	T	427	C
XRN2	-	T	0	C	ZMYM1	K313Q	A	1087	C	ZNF442	S335N	C	1587	T	ZNF750	R693S	C	2390	A
XRRA1	R433*	G	1629	A	ZMYM1	K98R	A	443	G	ZNF442	R313I	C	1521	A	ZNF750	A86V	G	568	A
XYLB	V65L	G	283	T	ZMYM1	K801T	A	2552	C	ZNF442	R309Q	C	1509	T	ZNF75A	N76H	A	699	C
XYLB	R476Q	G	1517	A	ZMYM1	L1097V	T	3439	G	ZNF443	H303L	T	1106	A	ZNF75A	N115H	A	816	C
XYLB	G107R	G	409	A	ZMYM2	G461D	G	1633	A	ZNF443	E306D	C	1116	A	ZNF75D	C74*	G	2932	T
XYLB	K435N	G	1395	T	ZMYM2	M558V	A	1923	G	ZNF444	T76M	C	594	T	ZNF75D	S490T	A	4178	T
XYLT1	S908L	G	2808	A	ZMYM2	C750R	T	2499	C	ZNF445	R931Q	C	2943	T	ZNF76	R253H	G	1024	A
XYLT1	W416C	C	1333	A	ZMYM2	F237V	T	960	G	ZNF445	Y433H	A	1448	G	ZNF764	E200K	C	679	T
XYLT1	F355L	G	1150	T	ZMYM2	K384E	A	1401	G	ZNF446	S408L	C	1340	T	ZNF765	E324D	G	1089	T
XYLT2	R406C	C	1265	T	ZMYM3	N1071D	T	3298	C	ZNF446	R46Q	G	254	A	ZNF765	E463D	G	1506	T
XYLT2	-	G	0	T	ZMYM3	T417A	T	1336	C	ZNF446	P309L	C	1043	T	ZNF765	G361V	G	1199	T
XYLT2	G862R	G	2633	A	ZMYM4	V300A	T	979	C	ZNF45	F512L	G	2627	T	ZNF768	R259W	G	958	A
YAP1	R319W	C	1325	T	ZMYM4	E1532K	G	4674	A	ZNF451	K301N	G	1147	T	ZNF768	C350R	A	1231	G
YAP1	D194N	G	950	A	ZMYM4	L759F	C	2355	T	ZNF451	L530I	C	1832	A	ZNF77	R456*	G	1497	A
YARS2	L20I	G	124	T	ZMYM4	E1338*	G	4092	T	ZNF454	N303T	A	1129	C	ZNF77	R424Q	C	1402	T
YBX2	R232W	G	751	A	ZMYM5	C475Y	C	1689	T	ZNF454	R348I	G	1264	T	ZNF770	L440S	A	1650	G
YDJC	F88V	A	312	C	ZMYM5	-	A	2273	G	ZNF454	R376I	G	1348	T	ZNF770	K510E	T	1859	C

YEATS2	P386Q	C	1352	A	ZMYM5	L488*	A	1728	C	ZNF454	R401Q	G	1423	A	ZNF772	R305H	C	1175	T
YEATS2	L78P	T	428	C	ZMYM6	-	A	0	G	ZNF460	A51V	C	474	T	ZNF773	R351H	G	1192	A
YEATS2	T1009A	A	3220	G	ZMYM6	Y106H	A	544	G	ZNF460	R272Q	G	1137	A	ZNF773	F339L	C	1157	A
YEATS2	T44A	A	325	G	ZMYM6	-	C	0	A	ZNF460	E127K	G	701	A	ZNF775	E2K	G	111	A
YEATS2	P613L	C	2033	T	ZMYND10	E171D	C	1786	A	ZNF461	G528V	C	1583	A	ZNF775	R201C	C	708	T
YEATS2	V106A	T	512	C	ZMYND11	R453Q	G	1567	A	ZNF461	K420R	T	1259	C	ZNF775	L96M	C	393	A
YES1	-	C	0	T	ZMYND11	Q587*	C	1968	T	ZNF461	R388W	G	1162	A	ZNF777	E692D	C	2239	A
YIF1A	R297W	G	1053	A	ZMYND11	Q429P	A	1495	C	ZNF462	E361G	A	1371	G	ZNF777	T180M	G	702	A
YIF1A	P24S	G	234	A	ZMYND11	E67K	G	408	A	ZNF462	E2473K	G	7706	A	ZNF777	R567H	C	1863	T
YIPF1	R159Q	C	813	T	ZMYND11	F119V	T	564	G	ZNF462	G2107R	G	6608	A	ZNF778	R581Q	G	2081	A
YIPF1	S116R	G	685	T	ZMYND12	E278*	C	1102	A	ZNF462	E725D	G	2464	T	ZNF780A	-	C	0	A
YIPF1	A216T	C	983	T	ZMYND15	D522Y	G	1621	T	ZNF462	G1425D	G	4563	A	ZNF780A	T497A	T	1637	C
YIPF2	E253A	T	858	G	ZMYND15	G457C	G	1426	T	ZNF462	A1290T	G	4157	A	ZNF780A	R239C	G	863	A
YIPF6	G70W	G	952	T	ZMYND8	R375M	C	1151	A	ZNF462	A2078V	C	6522	T	ZNF780B	G395R	C	1249	T
YIPF6	K72T	A	959	C	ZMYND8	F1058L	A	3201	C	ZNF462	Q556H	G	1957	T	ZNF780B	R680C	G	2104	A
YKT6	R71W	C	298	T	ZMYND8	A406T	C	1243	T	ZNF462	G325C	G	1262	T	ZNF780B	L292I	G	940	T
YLPM1	R1126*	C	3500	T	ZMYND8	R1229Q	C	3713	T	ZNF462	S1737N	G	5499	A	ZNF780B	R131*	G	457	A
YLPM1	R1665C	C	5117	T	ZMYND8	S464C	G	1418	C	ZNF462	S339L	C	1305	T	ZNF781	E165*	C	1235	A
YLPM1	P153S	C	581	T	ZMYND8	D108Y	C	349	A	ZNF462	K668N	G	2293	T	ZNF781	R81K	C	984	T
YLPM1	R1261*	C	3905	T	ZNF100	Y426C	T	1277	C	ZNF467	S340Y	G	1433	T	ZNF781	G136V	C	1149	A
YLPM1	E266G	A	921	G	ZNF100	S245*	G	734	T	ZNF467	P156Q	G	881	T	ZNF781	A46V	G	879	A
YLPM1	S2075N	G	6348	A	ZNF101	T33M	C	266	T	ZNF467	A328V	G	1397	A	ZNF781	E249*	C	1487	A
YLPM1	R1032Q	G	3219	A	ZNF107	Q234*	C	1152	T	ZNF469	G1358R	G	4072	A	ZNF782	Q685*	G	2715	A
YME1L1	R177C	G	678	A	ZNF114	T303I	C	1132	T	ZNF469	S1491L	C	4472	T	ZNF782	R414I	C	1903	A
YME1L1	M91T	A	421	G	ZNF117	E386D	C	2443	A	ZNF469	R1601C	C	4801	T	ZNF783	P402H	C	1368	A
YME1L1	F525C	A	1723	C	ZNF12	R626I	C	2260	A	ZNF469	R2853C	C	8557	T	ZNF783	V98M	G	455	A
YME1L1	R512Q	C	1684	T	ZNF12	F614L	G	2225	T	ZNF469	V3591M	G	10771	A	ZNF783	R456H	G	1530	A
YOD1	P111L	G	379	A	ZNF121	L271P	A	1044	G	ZNF469	Q2021P	A	6062	C	ZNF784	L282P	A	859	G
YOD1	R143G	T	474	C	ZNF124	A218V	G	1115	A	ZNF469	P485A	C	1453	G	ZNF784	R250H	C	763	T
YOD1	R245I	C	781	A	ZNF132	E596*	C	2187	A	ZNF469	R2607K	G	7820	A	ZNF786	F406C	A	1282	C
YSK4	K862N	C	2617	A	ZNF133	R635I	G	2153	T	ZNF470	R445I	G	2011	T	ZNF787	G351R	C	1170	T
YSK4	N526H	T	1607	G	ZNF133	N482S	A	1694	G	ZNF470	E513*	G	2214	T	ZNF789	H219Q	T	927	A
YSK4	I512L	T	1565	G	ZNF133	H542Y	C	1873	T	ZNF470	R669I	G	2683	T	ZNF789	H219Q	T	927	A
YSK4	N431D	T	1322	C	ZNF134	S40Y	C	420	A	ZNF470	M88T	T	940	C	ZNF789	R312H	G	1205	A
YTHDC1	-	C	0	T	ZNF134	Y176C	A	828	G	ZNF470	R445I	G	2011	T	ZNF789	F105C	T	584	G
YTHDC1	R679H	C	2372	T	ZNF135	G238R	G	711	A	ZNF470	E478D	G	2111	T	ZNF79	P84R	C	657	G
YTHDC1	R687Q	C	2396	T	ZNF135	D628N	G	1881	A	ZNF470	E534D	G	2279	T	ZNF79	R170H	G	915	A
YTHDC2	E183*	G	760	T	ZNF135	Q495*	C	1482	T	ZNF470	R641I	G	2599	T	ZNF790	R358I	C	1192	A
YTHDC2	E201*	G	814	T	ZNF135	R364*	C	1089	T	ZNF471	E45D	G	268	T	ZNF790	T218R	G	772	C

YTHDC2	F793C	T	2591	G	ZNF135	K426E	A	1275	G	ZNF471	E322*	G	1097	T	ZNF791	K98N	A	456	C
YTHDC2	R169*	C	718	T	ZNF135	R672I	G	2014	T	ZNF471	A383S	G	1280	T	ZNF791	R484W	C	1612	T
YTHDC2	R1137Q	G	3623	A	ZNF136	R324*	C	1110	T	ZNF471	D439Y	G	1448	T	ZNF792	D370N	C	1495	T
YTHDF1	K266R	T	1091	C	ZNF136	R408*	C	1362	T	ZNF471	R619I	G	1989	T	ZNF792	C483Y	C	1835	T
YTHDF1	S156R	T	760	G	ZNF136	R412I	G	1375	T	ZNF473	K9T	A	385	C	ZNF793	E398*	G	1227	T
YTHDF1	R327H	C	1274	T	ZNF136	R380Q	G	1279	A	ZNF474	N319K	T	1340	G	ZNF793	R24W	C	105	T
YTHDF1	R542H	C	1919	T	ZNF136	R436*	C	1446	T	ZNF474	H349R	A	1429	G	ZNF793	K144N	G	467	T
YTHDF1	L56M	G	460	T	ZNF138	I188N	T	744	A	ZNF48	R716C	C	2144	T	ZNF799	S235Y	G	905	T
YWHAG	E114K	C	563	T	ZNF138	K221N	A	844	C	ZNF48	E184*	G	548	T	ZNF80	R124C	G	397	A
YWHAG	D202N	C	827	T	ZNF138	I133T	T	579	C	ZNF480	N97D	A	355	G	ZNF804A	P799Q	C	2990	A
YWHAQ	-	C	0	A	ZNF138	G110C	G	509	T	ZNF480	N97H	A	355	C	ZNF804A	Y5C	A	608	G
YWHAQ	G147*	C	595	A	ZNF138	E192D	G	757	T	ZNF480	R360Q	G	1145	A	ZNF804A	G514R	G	2134	A
YWHAQ	M121T	A	518	G	ZNF14	R547*	G	1793	A	ZNF483	K9N	G	185	T	ZNF804A	D165Y	G	1087	T
YWHAQ	-	T	0	C	ZNF14	I524M	A	1726	C	ZNF483	R408I	G	1381	T	ZNF804A	S277Y	C	1424	A
YY1	R375Q	G	1384	A	ZNF14	R631*	G	2045	A	ZNF484	M836V	T	2506	C	ZNF804A	F1163V	T	4081	G
ZADH2	R265C	G	1083	A	ZNF14	R547*	G	1793	A	ZNF484	R742I	C	2225	A	ZNF804B	E430*	G	1897	T
ZAN	S2187L	C	6725	T	ZNF14	H114N	G	494	T	ZNF484	R496I	C	1487	A	ZNF804B	S941*	C	3431	A
ZAN	A2468V	C	7568	T	ZNF141	F292C	T	1024	G	ZNF485	Y86C	A	451	G	ZNF804B	H1032N	C	3703	A
ZAN	T693M	C	2243	T	ZNF141	R303Q	G	1057	A	ZNF488	R94H	G	508	A	ZNF804B	Q938P	A	3422	C
ZAN	R1590C	C	4933	T	ZNF142	R1165H	C	3916	T	ZNF490	F334C	A	1124	C	ZNF804B	E243D	A	1338	C
ZAN	A2526T	G	7741	A	ZNF142	K169N	C	929	A	ZNF490	R214I	C	764	A	ZNF804B	K21T	A	671	C
ZAN	E659*	G	2140	T	ZNF142	R1472H	C	4837	T	ZNF490	R210Q	C	752	T	ZNF804B	S233Y	C	1307	A
ZAN	E799*	G	2560	T	ZNF142	R879C	G	3057	A	ZNF490	A232T	C	817	T	ZNF805	P370S	C	1315	T
ZAP70	R306Q	G	1132	A	ZNF142	R834Q	C	2923	T	ZNF491	K132T	A	726	C	ZNF808	Q411R	A	1412	G
ZAP70	E225K	G	888	A	ZNF142	R834*	G	2922	A	ZNF491	A251S	G	1082	T	ZNF808	H893Y	C	2857	T
ZAP70	R465H	G	1609	A	ZNF142	R236C	G	1128	A	ZNF491	K241N	A	1054	C	ZNF808	I419M	A	1437	G
ZAP70	G113R	G	552	A	ZNF142	R287C	G	1281	A	ZNF491	R175*	C	854	T	ZNF808	T794A	A	2560	G
ZAP70	K75N	A	440	C	ZNF143	Q315H	G	1063	T	ZNF491	K35Q	A	434	C	ZNF808	R363I	G	1268	T
ZAP70	D285N	G	1068	A	ZNF143	R238*	C	830	T	ZNF491	R343Q	G	1359	A	ZNF812	D122Y	C	883	A
ZAP70	R514H	G	1756	A	ZNF146	E213K	G	2045	A	ZNF491	R403I	G	1539	T	ZNF812	A34T	C	619	T
ZAP70	E567A	A	1915	C	ZNF148	N629K	G	2373	T	ZNF493	K536E	A	1715	G	ZNF812	K218N	C	1173	A
ZAR1L	R267*	G	828	A	ZNF148	E117D	T	837	G	ZNF493	K711N	A	2242	C	ZNF813	Q128K	C	510	A
ZAR1L	R297*	G	918	A	ZNF157	N221H	A	747	C	ZNF493	S362A	T	1193	G	ZNF814	D636N	C	2178	T
ZBBX	E544D	C	1916	A	ZNF160	G683V	C	2464	A	ZNF493	F22L	C	175	A	ZNF814	H213R	T	910	C
ZBBX	S261P	A	1065	G	ZNF160	H51N	G	567	T	ZNF496	R480Q	C	1964	T	ZNF814	K779Q	T	2607	G
ZBBX	A166T	C	780	T	ZNF160	E261V	T	1198	A	ZNF496	W110C	C	855	A	ZNF816A	V429A	A	1587	G
ZBBX	R240H	C	1003	T	ZNF160	L101V	A	717	C	ZNF497	A415T	C	1432	T	ZNF816A	T89S	T	566	A
ZBBX	E819D	C	2741	A	ZNF165	S13P	T	1121	C	ZNF497	E347G	T	1229	C	ZNF816A	R141*	G	722	A
ZBBX	D767Y	C	2583	A	ZNF165	G274E	G	1905	A	ZNF497	C416R	A	1435	G	ZNF816A	E590D	C	2071	A

ZBBX	K742T	T	2509	G	ZNF167	A198T	G	999	A	ZNF498	R506I	G	1844	T	ZNF821	E92K	C	654	T
ZBBX	E474*	C	1704	A	ZNF167	D337N	G	1416	A	ZNF498	A54V	C	488	T	ZNF823	K553N	T	1813	G
ZBBX	R424L	C	1555	A	ZNF167	R487I	G	1867	T	ZNF500	P289L	G	1113	A	ZNF823	I380V	T	1292	C
ZBBX	K416T	T	1531	G	ZNF167	R655I	G	2371	T	ZNF500	R429Q	C	1533	T	ZNF823	A396S	C	1340	A
ZBED2	E207D	C	1630	A	ZNF169	D171N	G	601	A	ZNF502	R117H	G	511	A	ZNF823	R376Q	C	1281	T
ZBED4	P1100L	C	3776	T	ZNF17	L80V	T	238	G	ZNF502	A27V	C	241	T	ZNF823	K193T	T	732	G
ZBED4	A943V	C	3305	T	ZNF17	Q239P	A	716	C	ZNF502	R424W	C	1431	T	ZNF827	E734K	C	2428	T
ZBTB1	N172T	A	906	C	ZNF174	E92G	A	860	G	ZNF503	A580T	C	2225	T	ZNF827	R692Q	C	2303	T
ZBTB1	I325T	T	1365	C	ZNF180	R625I	C	2156	A	ZNF503	A568T	C	2189	T	ZNF827	L290I	G	1096	T
ZBTB1	L526*	T	1968	G	ZNF180	K435N	C	1587	A	ZNF503	S321P	A	1448	G	ZNF827	S362P	A	1312	G
ZBTB10	E763*	G	3066	T	ZNF180	H655Q	A	2247	C	ZNF507	R482W	C	1716	T	ZNF827	A882V	G	2873	A
ZBTB10	K515N	G	2324	T	ZNF180	R541I	C	1904	A	ZNF507	E56*	G	438	T	ZNF828	P333H	C	1307	A
ZBTB11	H725R	T	2755	C	ZNF180	Q525P	T	1856	G	ZNF507	A826V	C	2749	T	ZNF828	A643V	C	2237	T
ZBTB16	K572N	A	2096	C	ZNF180	R265I	C	1076	A	ZNF507	E56*	G	438	T	ZNF828	R420C	C	1567	T
ZBTB16	S471L	C	1792	T	ZNF180	E154*	C	742	A	ZNF510	R452I	C	2006	A	ZNF83	S243N	C	1129	T
ZBTB17	R389C	G	1404	A	ZNF181	S373Y	C	1286	A	ZNF510	V83I	C	898	T	ZNF83	C462Y	C	1786	T
ZBTB17	D452N	C	1593	T	ZNF182	R226I	C	1028	A	ZNF510	N145T	T	1085	G	ZNF83	E174D	C	923	A
ZBTB17	R477*	G	1668	A	ZNF184	R624*	G	2155	A	ZNF512B	D646N	C	1990	T	ZNF830	P214H	C	678	A
ZBTB2	R482*	G	1585	A	ZNF184	R207S	T	906	G	ZNF512B	R585C	G	1807	A	ZNF831	L154P	T	461	C
ZBTB2	A232V	G	836	A	ZNF185	D435Y	G	1340	T	ZNF512B	-	C	0	T	ZNF831	V501I	G	1501	A
ZBTB20	T107M	G	499	A	ZNF185	G468D	G	1440	A	ZNF512B	R676Q	C	2081	T	ZNF831	C607Y	G	1820	A
ZBTB20	R4W	G	189	A	ZNF185	R638Q	G	1950	A	ZNF512B	G193E	C	632	T	ZNF831	T193M	C	578	T
ZBTB20	R654C	G	2139	A	ZNF185	A217V	C	687	T	ZNF514	E341*	C	1484	A	ZNF831	S1003N	G	3008	A
ZBTB20	V379I	C	1314	T	ZNF189	R420I	G	1388	T	ZNF516	A598T	C	2022	T	ZNF831	D1025G	A	3074	G
ZBTB26	E79K	C	309	T	ZNF189	E453D	G	1488	T	ZNF516	D545V	T	1864	A	ZNF831	S1412N	G	4235	A
ZBTB3	R168Q	C	625	T	ZNF189	L527I	C	1708	A	ZNF516	A316T	C	1176	T	ZNF831	S1412I	G	4235	T
ZBTB32	P170S	C	718	T	ZNF189	R529Q	G	1715	A	ZNF516	A1141T	C	3651	T	ZNF831	G736D	G	2207	A
ZBTB32	P170S	C	718	T	ZNF189	K541T	A	1751	C	ZNF516	A373T	C	1347	T	ZNF831	D1391N	G	4171	A
ZBTB34	V475M	G	1508	A	ZNF19	E45D	C	391	A	ZNF517	A290V	C	976	T	ZNF835	R289C	G	865	A
ZBTB37	R26C	C	352	T	ZNF19	M43L	T	383	A	ZNF517	R486W	C	1563	T	ZNF835	T463M	G	1388	A
ZBTB37	F448V	T	1618	G	ZNF19	R349I	C	1302	A	ZNF518A	F570I	T	2539	A	ZNF835	G380R	C	1138	T
ZBTB38	D690G	A	2348	G	ZNF19	E45D	C	391	A	ZNF518A	V1174I	G	4351	A	ZNF835	R301C	G	901	A
ZBTB39	D463Y	C	1473	A	ZNF192	R426I	G	1461	T	ZNF518A	T532S	A	2425	T	ZNF835	H318R	T	953	C
ZBTB39	G37E	C	196	T	ZNF192	R563*	C	1871	T	ZNF518B	R991H	C	3411	T	ZNF836	E579D	C	2259	A
ZBTB39	A446T	C	1422	T	ZNF195	A24T	C	115	T	ZNF519	E401D	C	1356	A	ZNF836	F145Y	A	956	T
ZBTB39	S85N	C	340	T	ZNF195	Q283K	G	892	T	ZNF521	L1071P	A	3459	G	ZNF836	L317I	G	1471	T
ZBTB4	E648K	C	2217	T	ZNF195	V43A	A	173	G	ZNF521	R159H	C	723	T	ZNF836	E803D	C	2931	A
ZBTB4	E641*	C	2196	A	ZNF197	R76H	G	412	A	ZNF521	L1083H	A	3495	T	ZNF837	G277C	C	1152	A
ZBTB4	A771T	C	2586	T	ZNF20	R218Q	C	799	T	ZNF521	R163H	C	735	T	ZNF839	D843G	A	2535	G

ZBTB40	A1174V	C	4032	T	ZNF200	R246W	G	1006	A	ZNF521	E836K	C	2753	T	ZNF839	G327*	G	986	T
ZBTB40	A1174V	C	4032	T	ZNF202	R107W	G	719	A	ZNF521	S526Y	G	1824	T	ZNF839	L831P	T	2499	C
ZBTB40	T1164M	C	4002	T	ZNF205	L215I	C	848	A	ZNF524	R131C	C	474	T	ZNF839	A721V	C	2169	T
ZBTB41	R826C	G	2545	A	ZNF205	E333K	G	1202	A	ZNF526	R583H	G	1904	A	ZNF839	P902L	C	2712	T
ZBTB41	E377K	C	1198	T	ZNF205	E473K	G	1622	A	ZNF526	S638P	T	2068	C	ZNF841	N611H	T	1918	G
ZBTB45	M450I	C	1642	G	ZNF205	A493V	C	1683	T	ZNF526	F149S	T	602	C	ZNF843	H51Y	G	151	A
ZBTB46	A137T	C	565	T	ZNF208	K454T	T	1510	G	ZNF527	H380N	C	1249	A	ZNF844	S304N	G	1072	A
ZBTB46	S194N	C	737	T	ZNF208	K507N	T	1670	G	ZNF528	A199T	G	996	A	ZNF844	R447H	G	1501	A
ZBTB47	F73C	T	499	G	ZNF208	K843T	T	2677	G	ZNF528	I318N	T	1354	A	ZNF844	L209R	T	787	G
ZBTB47	A92T	G	555	A	ZNF208	L85H	A	403	T	ZNF528	R232*	C	1095	T	ZNF844	D436N	G	1467	A
ZBTB47	K193N	G	860	T	ZNF208	E58D	T	323	G	ZNF528	R289I	G	1267	T	ZNF844	S570Y	C	1870	A
ZBTB47	S44L	C	412	T	ZNF211	R486I	G	1637	T	ZNF528	I600S	T	2200	G	ZNF845	H261R	A	899	G
ZBTB47	R399Q	G	1477	A	ZNF211	A218T	G	832	A	ZNF529	C538R	A	1612	G	ZNF845	R682H	G	2162	A
ZBTB47	R448C	C	1623	T	ZNF211	R486K	G	1637	A	ZNF530	R256*	C	986	T	ZNF845	A903T	G	2824	A
ZBTB47	R584C	C	2031	T	ZNF213	R441H	G	1769	A	ZNF530	R287I	G	1080	T	ZNF846	F123L	G	900	T
ZBTB48	P199L	C	754	T	ZNF214	R510H	C	1832	T	ZNF532	E341D	G	1799	T	ZNF846	D92Y	C	805	A
ZBTB49	E702K	G	2225	A	ZNF217	C133Y	C	824	T	ZNF532	K1137E	A	4185	G	ZNF846	Y310H	A	1459	G
ZBTB6	P238S	G	801	A	ZNF217	K121N	C	789	A	ZNF532	R638Q	G	2689	A	ZNF846	H416Y	G	1777	A
ZBTB6	Q252R	T	844	C	ZNF217	K54Q	T	586	G	ZNF532	S388P	T	1938	C	ZNF846	R330*	G	1519	A
ZBTB7A	L463M	G	1539	T	ZNF219	G642V	C	2337	A	ZNF534	R545C	C	1694	T	ZNF846	R302K	C	1436	T
ZBTB7A	C412Y	C	1387	T	ZNF219	A423V	G	1680	A	ZNF536	E899D	G	2835	T	ZNF846	K196N	T	1119	G
ZBTB7A	C387F	C	1312	A	ZNF222	C246Y	G	832	A	ZNF536	R90W	C	406	T	ZNF846	Q91H	T	804	G
ZBTB7B	V317A	T	950	C	ZNF222	Q124E	C	465	G	ZNF536	S1235I	G	3842	T	ZNF852	R235K	C	865	T
ZBTB7C	P204H	G	627	T	ZNF222	R477H	G	1525	A	ZNF536	P60S	C	316	T	ZNF860	I97N	T	839	A
ZBTB7C	E175*	C	539	A	ZNF223	P84H	C	504	A	ZNF536	A272T	G	952	A	ZNF860	R492H	G	2024	A
ZBTB8A	L105R	T	543	G	ZNF224	D164Y	G	792	T	ZNF536	V248I	G	880	A	ZNF860	F159V	T	1024	G
ZBTB8B	L384M	C	1240	A	ZNF224	R467W	C	1701	T	ZNF536	P161L	C	620	T	ZNF860	F434L	T	1851	G
ZBTB8B	A283V	C	938	T	ZNF224	F185L	T	857	G	ZNF536	A841T	G	2659	A	ZNF862	E90K	G	513	A
ZC3H10	A296T	G	1075	A	ZNF224	R588I	G	2065	T	ZNF536	R221Q	G	800	A	ZNF862	V588E	T	2008	A
ZC3H10	R250W	C	937	T	ZNF226	R285C	C	997	T	ZNF536	G852E	G	2693	A	ZNF862	A938T	G	3057	A
ZC3H11A	P150H	C	1446	A	ZNF226	H773N	C	2461	A	ZNF536	D1200Y	G	3736	T	ZNF862	A875T	G	2868	A
ZC3H11A	E528*	G	2579	T	ZNF227	M84T	T	456	C	ZNF540	R451C	C	1670	T	ZNF862	E123K	G	612	A
ZC3H12A	Q529R	A	1702	G	ZNF227	R400S	G	1405	T	ZNF541	R566Q	C	1697	T	ZNF878	R111*	T	331	A
ZC3H12C	R29C	C	85	T	ZNF229	L51M	G	585	T	ZNF541	G747D	C	2240	T	ZNF878	R462Q	C	1385	T
ZC3H12C	V642M	G	1924	A	ZNF229	N268S	T	1237	C	ZNF541	P615T	G	1843	T	ZNF878	Y344C	T	1031	C
ZC3H12C	P585L	C	1754	T	ZNF229	G580D	C	2173	T	ZNF541	I673T	A	2018	G	ZNF878	E46K	C	136	T
ZC3H12C	P705L	C	2114	T	ZNF23	P419H	G	2070	T	ZNF541	E1188*	C	3562	A	ZNF879	C430W	T	1455	G
ZC3H12D	R112W	G	653	A	ZNF23	R412I	C	2049	A	ZNF543	S239N	G	1061	A	ZNF880	R307I	G	969	T
ZC3H13	E190*	C	917	A	ZNF23	R384I	C	1965	A	ZNF543	W356*	G	1413	A	ZNF880	P169L	C	555	T

ZC3H13	R1343*	G	4376	A	ZNF230	D116Y	G	589	T	ZNF543	E539A	A	1961	C	ZNF880	R257*	C	818	T
ZC3H13	R711C	G	2480	A	ZNF230	I376S	T	1455	G	ZNF543	G140D	G	764	A	ZNF880	K105R	A	363	G
ZC3H13	R493H	C	1827	T	ZNF230	K351N	A	1296	C	ZNF544	R81*	C	715	T	ZNF90	L100P	T	410	C
ZC3H13	R784Q	C	2700	T	ZNF230	C452R	T	1682	C	ZNF544	K415E	A	1717	G	ZNF90	R326H	G	1088	A
ZC3H13	S1217G	T	3998	C	ZNF230	R503C	C	1750	T	ZNF544	T182A	A	1018	G	ZNF90	K156T	A	578	C
ZC3H13	R1224Q	C	4020	T	ZNF230	R283I	G	1145	T	ZNF544	V125E	T	848	A	ZNF90	R333I	G	1109	T
ZC3H13	E623Q	C	2216	G	ZNF230	R426I	G	1279	T	ZNF544	F200L	C	1074	A	ZNF90	E360*	G	1189	T
ZC3H13	R629Q	C	2235	T	ZNF232	R94Q	C	936	T	ZNF544	R540Q	G	2093	A	ZNF90	R436I	G	1605	T
ZC3H13	P1103L	G	3657	A	ZNF233	F112C	T	462	G	ZNF546	L344P	T	1287	C	ZNF90	R112I	G	672	T
ZC3H13	E722D	C	2515	A	ZNF235	R254C	G	760	A	ZNF546	K246T	A	993	C	ZNF91	K1051T	T	3265	G
ZC3H13	V142A	A	774	G	ZNF235	R254H	C	761	T	ZNF547	R182I	G	738	T	ZNF92	H387R	A	1359	G
ZC3H13	R681W	G	2390	A	ZNF235	A532V	G	1595	A	ZNF548	F301L	C	1106	A	ZNF92	S94Y	C	480	A
ZC3H14	E316G	A	1103	G	ZNF235	E173*	C	517	A	ZNF548	N251K	T	956	A	ZNF92	E289*	G	1064	T
ZC3H3	A657V	G	1999	A	ZNF236	T321I	C	1160	T	ZNF549	E157D	G	652	T	ZNF99	K409N	C	1227	A
ZC3H3	H473Y	G	1446	A	ZNF236	S198L	C	791	T	ZNF549	C277R	T	1010	C	ZNF99	K130N	C	390	A
ZC3H4	G626S	C	1914	T	ZNF236	A154D	C	659	A	ZNF549	C529R	T	1766	C	ZNF99	L349P	A	1046	G
ZC3H4	R245W	G	771	A	ZNF236	R1148H	G	3641	A	ZNF551	R383I	G	1323	T	ZNF99	R958H	C	2873	T
ZC3H4	P1242T	G	3762	T	ZNF236	A154V	C	659	T	ZNF551	C589Y	G	1941	A	ZNF99	S402P	A	1204	G
ZC3H4	E779Q	C	2373	G	ZNF236	A1764V	C	5489	T	ZNF551	Q436E	C	1481	G	ZNF99	L209H	A	626	T
ZC3H6	N372H	A	1515	C	ZNF236	R499H	G	1694	A	ZNF551	P200H	C	774	A	ZNFX1	F148L	G	529	T
ZC3H6	E831*	G	2892	T	ZNF236	A154T	G	658	A	ZNF554	R359*	C	1273	T	ZNFX1	R1517C	G	4634	A
ZC3H7A	E657D	T	2125	G	ZNF236	Y971*	T	3111	G	ZNF554	A210V	C	827	T	ZNHIT1	R114H	G	869	A
ZC3H7A	R760H	C	2433	T	ZNF238	R195*	C	732	T	ZNF554	G246D	G	935	A	ZNHIT3	V49A	T	211	C
ZC3H7A	R40C	G	272	A	ZNF238	Y432C	A	1444	G	ZNF554	R484I	G	1649	T	ZNHIT3	R47H	G	205	A
ZC3H7B	G720W	G	2262	T	ZNF239	S249R	A	1400	C	ZNF555	S69Y	C	304	A	ZNRF3	R102*	C	469	T
ZC3H7B	F568L	C	1808	G	ZNF24	R148W	G	622	A	ZNF556	V306M	G	1003	A	ZNRF3	R102*	C	469	T
ZC3H7B	A125T	G	477	A	ZNF24	R271I	C	992	A	ZNF557	L109F	C	798	T	ZNRF3	R111*	C	496	T
ZC3H7B	P301S	C	1005	T	ZNF24	E75K	C	403	T	ZNF559	I206M	T	1014	G	ZNRF3	-	T	0	C
ZC3H7B	Q772L	A	2419	T	ZNF248	Q440R	T	1870	C	ZNF559	R373I	G	1514	T	ZNRF3	R502Q	G	1670	A
ZC3H7B	H403N	C	1311	A	ZNF248	E70*	C	759	A	ZNF560	R542I	C	1835	A	ZNRF3	P743S	C	2392	T
ZC3H7B	A354V	C	1165	T	ZNF25	K424N	C	1485	A	ZNF560	R694Q	C	2291	T	ZNRF3	N476K	C	1593	G
ZC3H8	F90V	A	398	C	ZNF25	C347R	A	1252	G	ZNF560	R536Q	C	1817	T	ZNRF4	R68W	C	279	T
ZC3H8	E4D	C	142	A	ZNF250	R546C	G	1726	A	ZNF561	K99N	C	661	A	ZNRF4	H249R	A	823	G
ZC3HAV1	G334S	C	1023	T	ZNF251	R281H	C	1098	T	ZNF561	N292I	T	1239	A	ZNRF4	R46Q	G	214	A
ZC3HAV1L	D161Y	C	493	A	ZNF252	R637I	C	1910	A	ZNF561	K254N	C	1126	A	ZP1	A605V	C	1834	T
ZC4H2	E34A	T	208	G	ZNF254	N135D	A	537	G	ZNF563	E278D	C	1040	A	ZP2	L414R	A	1241	C
ZCCHC11	E378D	T	1368	G	ZNF254	E459G	A	1510	G	ZNF563	Q313*	G	1143	A	ZP3	C46R	T	194	C
ZCCHC11	G922D	C	2999	T	ZNF256	R343I	C	1263	A	ZNF563	R437Q	C	1516	T	ZP4	L518R	A	1712	C
ZCCHC11	R1554H	C	4895	T	ZNF256	L184I	G	785	T	ZNF563	A3T	C	213	T	ZPBP2	N84T	A	390	C

ZCCHC11	M741I	C	2457	T	ZNF256	A2V	G	240	A	ZNF564	R157Q	C	651	T	ZPLD1	L26R	T	177	G
ZCCHC11	K1322T	T	4199	G	ZNF256	Y211H	A	866	G	ZNF565	P46S	G	181	A	ZPLD1	P32L	C	195	T
ZCCHC11	D1070N	C	3442	T	ZNF256	P490S	G	1703	A	ZNF565	V76I	C	271	T	ZPLD1	V193M	G	677	A
ZCCHC11	E754*	C	2494	A	ZNF256	K324R	T	1206	C	ZNF565	G436S	C	1351	T	ZRANB1	R549Q	G	2017	A
ZCCHC11	H288P	T	1097	G	ZNF256	S533R	T	1832	G	ZNF565	G67*	C	244	A	ZRANB1	E708*	G	2493	T
ZCCHC12	R85H	G	761	A	ZNF257	-	A	0	G	ZNF566	N416H	T	1381	G	ZRANB1	D369N	G	1476	A
ZCCHC14	A647T	C	1966	T	ZNF257	R448Q	G	1512	A	ZNF567	K201T	A	602	C	ZRANB1	R671Q	G	2383	A
ZCCHC14	A807T	C	2446	T	ZNF257	E198D	G	763	T	ZNF568	R494I	G	1987	T	ZRANB2	R230H	C	991	T
ZCCHC14	P564H	G	1718	T	ZNF257	R526C	C	1745	T	ZNF568	Q347K	C	1545	A	ZRANB3	P266L	G	914	A
ZCCHC17	K242N	G	934	T	ZNF259	I219V	T	715	C	ZNF568	E331D	G	1499	T	ZRANB3	I202S	A	722	C
ZCCHC17	R89*	C	473	T	ZNF263	R404I	G	1582	T	ZNF568	R491*	C	1977	T	ZRSR1	R434H	G	1325	A
ZCCHC17	N54D	A	368	G	ZNF263	G136R	G	777	A	ZNF568	R524*	C	2053	T	ZRSR1	R37W	C	133	T
ZCCHC2	A150V	C	449	T	ZNF264	E456K	G	1779	A	ZNF569	E463G	T	1946	C	ZRSR2	R216M	G	671	T
ZCCHC2	T409P	A	1225	C	ZNF264	I420T	T	1672	C	ZNF569	F123C	A	926	C	ZSCAN1	R229Q	G	933	A
ZCCHC3	G177V	G	554	T	ZNF266	T250A	T	1380	C	ZNF57	M106T	T	465	C	ZSCAN1	A49V	C	393	T
ZCCHC4	M484V	A	1474	G	ZNF266	R344Q	C	1663	T	ZNF57	F110L	C	478	A	ZSCAN1	T188A	A	809	G
ZCCHC6	A526T	C	1749	T	ZNF267	C450Y	G	1558	A	ZNF570	L203V	T	1136	G	ZSCAN1	R260C	C	1025	T
ZCCHC6	I864S	A	2764	C	ZNF267	R596Q	G	1996	A	ZNF570	K181N	G	1072	T	ZSCAN1	M408T	T	1470	C
ZCCHC6	N63T	T	361	G	ZNF268	D120G	A	545	G	ZNF570	S231A	T	1220	G	ZSCAN1	V384I	G	1397	A
ZCWPW1	K518T	T	1801	G	ZNF268	E45D	G	321	T	ZNF571	G369R	C	1224	T	ZSCAN10	R486W	G	1544	A
ZCWPW1	N35T	T	352	G	ZNF268	S357Y	C	1256	A	ZNF572	R289H	G	1021	A	ZSCAN10	P154L	G	549	A
ZCWPW2	S308G	A	1110	G	ZNF268	K431Q	A	1477	C	ZNF572	W81*	G	398	A	ZSCAN10	G661V	C	2070	A
ZCWPW2	E76*	G	414	T	ZNF268	S9F	C	356	T	ZNF573	R330I	C	1088	A	ZSCAN10	V468M	C	1490	T
ZDBF2	R198I	G	979	T	ZNF268	K132T	A	725	C	ZNF573	R218I	C	752	A	ZSCAN10	P131S	G	479	A
ZDBF2	E1645D	G	5321	T	ZNF268	I460S	T	1709	G	ZNF574	V139M	G	415	A	ZSCAN12	R46H	C	283	T
ZDBF2	V1028I	G	3468	A	ZNF268	R940I	G	3149	T	ZNF575	A178V	C	533	T	ZSCAN12	Q458R	T	1519	C
ZDBF2	E1183D	G	3935	T	ZNF273	D41Y	G	192	T	ZNF575	K169N	G	507	T	ZSCAN12	L75P	A	370	G
ZDBF2	R2040W	C	6504	T	ZNF274	R464H	G	1391	A	ZNF575	R163C	C	487	T	ZSCAN18	D400N	C	1228	T
ZDBF2	T581I	C	2128	T	ZNF274	S417L	C	1250	T	ZNF577	E402*	C	1570	A	ZSCAN20	R1007I	G	3173	T
ZDBF2	R641M	G	2308	T	ZNF274	N107S	A	320	G	ZNF577	E402K	C	1570	T	ZSCAN20	R750H	G	2402	A
ZDBF2	E888K	G	3048	A	ZNF274	P305L	C	914	T	ZNF577	L398S	A	1559	G	ZSCAN20	P958H	C	3026	A
ZDBF2	E256*	G	1152	T	ZNF274	C595Y	G	1784	A	ZNF581	E116K	G	520	A	ZSCAN20	R943C	C	2980	T
ZDBF2	K444I	A	1717	T	ZNF275	R272W	C	814	T	ZNF581	R171C	C	685	T	ZSCAN20	L408M	C	1375	A
ZDBF2	G1141V	G	3808	T	ZNF275	P352S	C	1054	T	ZNF581	L102I	C	478	A	ZSCAN20	L204P	T	764	C
ZDBF2	E1387*	G	4545	T	ZNF276	V364I	G	1187	A	ZNF583	K462N	A	1579	C	ZSCAN20	W326R	T	1129	C
ZDBF2	N1433H	A	4683	C	ZNF276	R562Q	G	1782	A	ZNF583	E328*	G	1175	T	ZSCAN20	A706V	C	2270	T
ZDBF2	D1711A	A	5518	C	ZNF276	-	T	0	C	ZNF583	G460R	G	1571	A	ZSCAN22	A384V	C	1298	T
ZDBF2	E1782*	G	5730	T	ZNF28	R626H	C	1998	T	ZNF583	E517*	G	1742	T	ZSCAN22	G117R	G	496	A
ZDBF2	V1999A	T	6382	C	ZNF28	Q646L	T	2058	A	ZNF583	R540I	G	1812	T	ZSCAN23	D163Y	C	633	A

ZDHHC1	E173K	C	859	T	ZNF280A	V40A	A	372	G	ZNF585A	G210R	C	859	T	ZSCAN4	G265C	G	1490	T
ZDHHC1	T224M	G	1013	A	ZNF280B	E400K	C	1941	T	ZNF585A	S731P	A	2422	G	ZSCAN5A	R173H	C	1214	T
ZDHHC11	F328V	A	982	C	ZNF280B	G456E	C	2110	T	ZNF585B	G20D	C	59	T	ZSCAN5B	P340L	G	1019	A
ZDHHC12	S205L	G	644	A	ZNF280B	S90R	A	1013	C	ZNF585B	E330K	C	988	T	ZSCAN5B	R477H	C	1430	T
ZDHHC13	F390L	T	1275	G	ZNF280B	K277T	T	1573	G	ZNF585B	G210E	C	629	T	ZSWIM1	R88G	A	357	G
ZDHHC13	L202F	C	709	T	ZNF280C	P78T	G	386	T	ZNF589	A45T	G	501	A	ZSWIM2	-	C	0	G
ZDHHC14	P400L	C	1696	T	ZNF281	G34S	C	225	T	ZNF589	V274A	T	1189	C	ZSWIM3	M189V	A	774	G
ZDHHC14	E189*	G	1062	T	ZNF281	A233T	C	822	T	ZNF589	M330V	A	1356	G	ZSWIM3	M1T	T	211	C
ZDHHC15	N301K	A	1134	T	ZNF282	R613C	C	1942	T	ZNF592	E36D	G	130	T	ZSWIM3	A476T	G	1635	A
ZDHHC15	A179S	C	766	A	ZNF285	R560I	C	1744	A	ZNF592	S451N	G	1374	A	ZSWIM3	L645P	T	2143	C
ZDHHC16	R5Q	G	203	A	ZNF285	E173D	C	584	A	ZNF592	H542R	A	1647	G	ZSWIM4	S458N	G	1562	A
ZDHHC16	W287*	G	1050	A	ZNF287	Q749R	T	2699	C	ZNF592	L395P	T	1206	C	ZSWIM4	Q332*	C	1183	T
ZDHHC16	V154I	G	649	A	ZNF287	E185*	C	1006	A	ZNF594	Q380H	C	1296	G	ZSWIM4	A755T	G	2452	A
ZDHHC17	T373M	C	1767	T	ZNF287	R64*	G	643	A	ZNF594	A337S	C	1165	A	ZSWIM4	P348L	C	1232	T
ZDHHC18	V279M	G	930	A	ZNF292	E63D	G	230	T	ZNF594	R753I	C	2414	A	ZSWIM5	N464D	T	1596	C
ZDHHC18	R354W	C	1155	T	ZNF292	C456*	T	1409	A	ZNF596	R355Q	G	1170	A	ZSWIM5	A681T	C	2247	T
ZDHHC19	R181C	G	621	A	ZNF292	R633*	C	1938	T	ZNF597	K92T	T	506	G	ZSWIM5	R761C	G	2487	A
ZDHHC2	A2V	C	402	T	ZNF292	T1017A	A	3090	G	ZNF597	R222C	G	895	A	ZSWIM6	V1119L	G	3355	T
ZDHHC2	A111T	G	728	A	ZNF292	R1349Q	G	4087	A	ZNF598	V301I	C	916	T	ZSWIM6	A273T	G	817	A
ZDHHC2	R139C	C	812	T	ZNF292	T1294R	C	3922	G	ZNF598	R274C	G	835	A	ZSWIM6	Q712R	A	2135	G
ZDHHC22	F173L	G	722	T	ZNF292	E825G	A	2515	G	ZNF599	R275H	C	1212	T	ZSWIM6	K309T	A	926	C
ZDHHC23	P9H	C	325	A	ZNF292	A2209V	C	6667	T	ZNF599	H142Q	G	814	C	ZSWIM6	W1074R	T	3220	C
ZDHHC3	R96W	G	544	A	ZNF292	T927A	A	2820	G	ZNF600	R350I	C	1317	A	ZW10	A411S	C	1268	A
ZDHHC5	R592I	G	3137	T	ZNF292	A1182T	G	3585	A	ZNF600	K160N	T	748	G	ZWILCH	K520N	G	1806	T
ZDHHC5	A60T	G	1540	A	ZNF292	E393*	G	1218	T	ZNF605	R556I	C	1667	A	ZWINT	E2*	C	43	A
ZDHHC6	R317C	G	1373	A	ZNF292	E582D	A	1787	C	ZNF606	R476I	C	2045	A	ZWINT	I22T	A	104	G
ZDHHC6	R364*	G	1514	A	ZNF292	S1004Y	C	3052	A	ZNF606	Q684H	C	2670	A	ZXDA	D87Y	C	472	A
ZDHHC6	P80L	G	663	A	ZNF292	L1063V	T	3228	G	ZNF606	K678N	T	2652	G	ZXDC	R386Q	C	1211	T
ZDHHC8	G378D	G	1133	A	ZNF292	L1454I	C	4401	A	ZNF606	K569T	T	2324	G	ZXDC	A739T	C	2269	T
ZDHHC8	P668H	C	2003	A	ZNF292	R2270Q	G	6850	A	ZNF607	E453*	C	1953	A	ZYG11A	R411C	C	1379	T
ZDHHC8	R523H	G	1568	A	ZNF295	E741K	C	2405	T	ZNF608	H979Y	G	3058	A	ZYG11A	-	G	0	A
ZEB1	K507R	A	1558	G	ZNF295	A896S	C	2870	A	ZNF608	H1339R	T	4139	C	ZYG11A	N446H	A	1484	C
ZEB1	A604V	C	1849	T	ZNF295	R742W	G	2408	A	ZNF609	R462C	C	1384	T	ZYG11A	K469N	G	1555	T
ZEB1	S976F	C	2965	T	ZNF295	P998H	G	3177	T	ZNF609	R240H	G	719	A	ZYG11B	M355V	A	1208	G
ZEB1	A1015V	C	3082	T	ZNF295	F1043C	A	3312	C	ZNF609	D1164G	A	3491	G	ZYG11B	Y334*	C	1147	G
ZEB1	R968C	C	2940	T	ZNF295	N949H	T	3029	G	ZNF609	S626Y	C	1877	A	ZYG11B	A101D	C	447	A
ZEB1	P96S	C	324	T	ZNF296	K107T	T	377	G	ZNF610	G350D	G	1505	A	ZYG11B	E573*	G	1862	T
ZEB2	Q3*	G	529	A	ZNF3	S409L	G	1533	A	ZNF610	V29M	G	541	A	ZZEF1	A2169V	G	6631	A
ZER1	R35W	G	510	A	ZNF30	H283N	C	1291	A	ZNF610	W251*	G	1208	A	ZZEF1	L2237R	A	6835	C

ZER1	S79N	C	643	T	ZNF30	H615Y	C	2287	T	ZNF611	E451D	C	1670	A	ZZEF1	V991M	C	3096	T
ZER1	-	C	0	T	ZNF30	H335Y	C	1447	T	ZNF613	G542C	G	1822	T	ZZEF1	R2584C	G	7875	A
ZER1	F473V	A	1824	C	ZNF30	-	G	0	A	ZNF613	V205G	T	812	G	ZZEF1	E2486K	C	7581	T
ZFAND1	R91H	C	286	T	ZNF300	D229V	T	686	A	ZNF613	E369D	G	1305	T	ZZEF1	G1818S	C	5577	T
ZFAND2A	R156C	G	701	A	ZNF300	K395N	T	1185	G	ZNF614	L10M	G	430	T	ZZEF1	R898H	C	2818	T
ZFAND3	S48P	T	589	C	ZNF300	R529I	C	1586	A	ZNF614	R335Q	C	1406	T	ZZEF1	Y1864C	T	5716	C
ZFAT	R419H	C	1431	T	ZNF300	G375R	C	1123	T	ZNF615	R711I	C	2429	A	ZZEF1	R1228H	C	3808	T
ZFAT	R787H	C	2535	T	ZNF302	C425Y	G	1274	A	ZNF615	R674H	C	2318	T	ZZEF1	R1539*	G	4740	A
ZFAT	G690A	C	2244	G	ZNF304	Q181P	A	930	C	ZNF615	T630A	T	2185	C	ZZZ3	G350R	C	1524	T
ZFAT	R474C	G	1595	A	ZNF304	R317I	G	1338	T	ZNF615	R515Q	C	1841	T	ZZZ3	R584H	C	2227	T
ZFAT	A1190V	G	3744	A	ZNF304	H544R	A	2019	G	ZNF615	K387T	T	1457	G	ZZZ3	R118I	C	829	A
ZFAT	A650T	C	2123	T	ZNF317	M521I	G	1851	A	ZNF615	R263I	C	1085	A	ZZZ3	E110*	C	804	A

[0302] Exons were captured using Nimblegen SeqCap EZ human exome library v2.0 and sequenced on HiSeq 2000 (Illumina, CA) to generate 75 bp paired-end sequencing reads. The targeted regions had a mean coverage of 179x with 97.4% bases covered at ≥10 times. 95,075 somatic mutations in the 72 colon tumor samples analyzed were identified of which 36,303 were protein-altering. Two MSS samples showed an unusually large number of mutations (24,830 and 5,780 mutations of which 9,479 and 2,332 were protein-altering mutations respectively). These were designated as hypermutated samples and were not considered for calculating the background mutation rate. 52,312 somatic mutations in the 15 MSI samples (18,436 missense, 929 nonsense, 22 stop lost, 436 essential splice site, 363 protein-altering indels, 8,065 synonymous, 16,675 intronic and 7,386 others) and 12,153 somatic mutations in the 55 MSS samples (3,922 missense, 289 nonsense, 6 stop lost, 69 essential splice site, 20 protein-altering indels 1,584 synonymous, 4,375 intronic and 1,888 others) studied (Table 2 and 3) were found. About 98% (35,524/36,303) of the protein altering single nucleotide variants reported in these examples are novel and have not been reported in COSMIC v54 (Forbes, S. A. *et al.*, *Nucleic Acids Res.* 38:D652-657 (2010)). Thirty seven percent of the somatic mutations reported were validated using RNA-seq data or mass spectrometry genotyping with a validation rate of 93% (Table 2). All the indels reported were confirmed somatic using Sanger sequencing (Table 3-Somatic Indels). A mean non-synonymous mutation rate of 2.8/Mb (31-149 coding region mutations in the 55 samples) in the MSS samples and 40/Mb (764-3113 coding region mutations in the 15 samples) in the MSI samples was observed, consistent with the MMR defect in the later.

Table 3 – Somatic Indels

Gene	Location	Pos. cDNA	Pos. protein	AA chg	Ref	Var
PRMT6	1:107599370	70	11	-	CG	C
KCNA10	1:111060763	1035	216	-	AC	A
CSDE1	1:115262367	0	0	-	GA	G
SIKE1	1:115316998	0	0	-	GA	G
SYCP1	1:115537601	3132	964	-	GA	G
VANGL1	1:116206586	780	170	-	CT	C
PRDM2	1:14108749	5315	1487	-	CA	C
PIAS3	1:145585533	1888	600	-	TG	T
BCL9	1:147091501	2280	514	-	AC	A
BCL9	1:147092681-147092680	3459	907	-	-	C
ZNF687	1:151261079	2337	731	-	AC	A
RFX5	1:151318741	235	19	-	TG	T
RFX5	1:151318741	235	19	-	TG	T
PYGO2	1:154932028	620	150	-	TG	T
UBQLN4	1:156020953	519	142	-	GC	G
NES	1:156640235	3878	1249	-	AC	A
KIRREL	1:158057655	0	0	-	AG	A
BRP44	1:167893779	0	0	-	GA	G
CACYBP	1:174976327	874	142	-	CA	C
RASAL2	1:178426849-178426857	2774	808	DNT/-	GGACAACACA	G

					(SEQ ID NO:84)	
ASPM	1:197059222	0	0	-	GA	G
UBE2T	1:202304824	209	20	-	TG	T
PLEKHA6	1:204228411	1359	348	-	AC	A
PLEKHA6	1:204228411	1359	348	-	AC	A
PLEKHA6	1:204228411	1359	348	-	AC	A
PLEKHA6	1:204228411	1359	348	-	AC	A
DYRK3	1:206821441	1066	300	-	TA	T
RPS6KC1	1:213414598	1929	593	-	CA	C
CENPF	1:214815702	4189	1341	-	GA	G
TGFB2	1:218609371	1365	300	-	GA	G
ITPKB	1:226924541	619	207	-	TC	T
OBSCN	1:228481047	0	0	-	TC	T
CHRM3	1:240071597	1625	282	-	AC	A
TCEB3	1:24078404	1658	463	-	TA	T
AHCTF1	1:247014550	4872	1624	-	CA	C
RHD	1:25599125	145	29	-	AT	A
FAM54B	1:26156056	741	203	-	TC	T
EPHA10	1:38185238	2690	868	-	TG	T
PTCH2	1:45293652-45293653	2051	640	-	GAC	G
FAM151A	1:55078268-55078270	850	230	KM/M	ATCT	A
L1TD1	1:62675692-62675694	1541	416	E/-	GGAA	G
RPE65	1:68904737	940	296	-	CT	C
ZNF644	1:91406040	1089	291	-	CT	C
ADD3	10:111893350	2462	699	-	CA	C
DHTKD1	10:12139966-12139967	1704	548	-	GCA	G
TACC2	10:123842278	603	88	-	AG	A
KIAA1217	10:24783491	1772	581	-	CT	C
PTCHD3	10:27702951	347	77	-	CG	C
SVIL	10:29760116	6036	1862	-	TC	T
ZEB1	10:31815887-31815886	3107	1023	-	-	GA
ANK3	10:61831290-61831289	9541	3117	-	-	T
SIRT1	10:69648852	813	254	-	CA	C
DDX50	10:70666693-70666692	420	105	-	-	A
USP54	10:75290284	0	0	-	TA	T
BTAF1	10:93756247	3443	1144	-	AT	A
MYOF	10:95079629	5598	1866	-	CT	C
HELLS	10:96352051-96352050	1937	611	-	-	A
GOLGA7B	10:99619319-99619318	181	39	-	-	C
AP2A2	11:1000475	2184	668	-	GC	G
ZBED5	11:10875781	1211	238	-	AT	A
C11orf57	11:111953460	769	216	-	CA	C
SIDT2	11:117052572	876	119	-	GC	G
MFRP	11:119213688	1297	384	-	TG	T
PKNOX2	11:125237794	454	47	-	GC	G
ZBTB44	11:130131353	710	139	-	CT	C
COPB1	11:14504704	0	0	-	TA	T
MYOD1	11:17742463-17742462	864	215	-	-	C
KCNC1	11:17794004	1418	455	-	GA	G
PTPN5	11:18751286-18751285	1840	470	-	-	G
PAX6	11:31812317	1635	389	-	TG	T
CCDC73	11:32635625	2283	747	-	GT	G
UBQLN3	11:5529015	1922	592	-	GA	G

TNKS1BP1	11:57080526	1801	546	-	TC	T
FAM111B	11:58892377	998	269	-	CA	C
PATL1	11:59434440	0	0	-	TA	T
PRPF19	11:60666410	0	0	-	GA	G
STX5	11:62598585	285	44	-	TG	T
RIN1	11:66102953-66102955	597	157	LP/P	GGGA	G
SPTBN2	11:66457417	0	0	-	TG	T
PC	11:66617803	2655	869	-	GC	G
SWAP70	11:9735070	397	100	-	CA	C
NCOR2	12:124846685	3240	1028	-	CG	C
SFRS8	12:132210169	966	276	-	GA	G
GOLGA3	12:133375067	0	0	-	TA	T
ATF7IP	12:14578133-14578134	1437	428	-	ACT	A
KDM5A	12:416953	3960	1199	-	CT	C
FAM113B	12:47628998	883	51	-	AG	A
MLL2	12:49434492	7061	2354	-	AG	A
ACVR1B	12:52374795	665	208	-	GT	G
ESPL1	12:53677181	3027	979	-	CA	C
DGKA	12:56347514	2434	724	-	AC	A
BAZ2A	12:57004252	1920	576	-	TC	T
GLI1	12:57860075	893	272	-	TG	T
LRIG3	12:59279691	0	0	-	GA	G
ATN1	12:7045535	1342	369	-	GC	G
PTPRB	12:70981054	0	0	-	GA	G
ZFC3H1	12:72021721	0	0	-	TA	T
ZFC3H1	12:72021721	0	0	-	TA	T
PTPRQ	12:80904230-80904229	0	0	-	-	T
PTPRQ	12:81063246	0	0	-	TA	T
MGAT4C	12:86373479	1112	371	-	AG	A
ELK3	12:96641029	798	173	-	GC	G
TMPO	12:98921672	492	96	-	CA	C
UPF3A	13:115057211	846	264	-	CA	C
KL	13:33628153-33628152	1076	356	-	-	A
SPG20	13:36909782-36909783	246	62	-	CTT	C
MRPS31	13:41323308-41323307	961	308	-	-	C
NAA16	13:41892982	504	60	-	GA	G
ZC3H13	13:46543661-46543660	3367	1006	-	-	T
DIAPH3	13:60348388	0	0	-	TA	T
DYNC1H1	14:102483256	7932	2590	-	GC	G
TPPP2	14:21498757-21498756	140	6	-	-	A
CHD8	14:21862450	5180	1727	-	TG	T
ACIN1	14:23549379	1667	447	-	GC	G
CBLN3	14:24898079	653	61	-	TC	T
CTAGE5	14:39788502	0	0	-	CT	C
C14orf106	14:45693722	2527	690	-	CT	C
MAP4K5	14:50952368	0	0	-	CA	C
SPTB	14:65259995	2440	800	-	CG	C
ISM2	14:77948984-77948983	711	218	-	-	A
PTPN21	14:88940113	2750	849	-	AT	A
DICER1	14:95583036	0	0	-	GA	G
NIPA2	15:23021236	714	34	-	GC	G
DUOXA2	15:45406932	414	43	-	CG	C
ADAM10	15:59009931	0	0	-	TA	T

TLN2	15:63054019	4811	1593	-	GA	G
HERC1	15:64015557	0	0	-	TA	T
ISL2	15:76633583-76633582	1063	301	-	-	A
KIAA1024	15:79750586	2172	699	-	TA	T
BNC1	15:83933100	989	301	-	CT	C
ANPEP	15:90334189	2978	888	-	TA	T
SV2B	15:91832792-91832791	2219	583	-	-	T
UBE2I	16:1370650	662	182	-	CG	C
ARHGAP17	16:24942180	2533	814	-	TG	T
GTF3C1	16:27509009	2339	767	-	CT	C
ZNF785	16:30594709-30594710	433	130	-	CTT	C
ZNF434	16:3433715	0	0	-	GA	G
CREBBP	16:3817721	4055	1084	-	CT	C
CTCF	16:67645339-67645338	1047	201	-	-	A
CDH1	16:68863582	2512	774	-	AG	A
FTSJD1	16:71318173-71318172	1988	551	-	-	A
ZFHX3	16:72992483	2235	521	-	CT	C
USP7	16:9017275	0	0	-	CA	C
NUFIP2	17:27614342	759	224	-	CT	C
EVI2B	17:29632035	741	198	-	GT	G
MED1	17:37564512	4168	1321	-	AC	A
WIPF2	17:38420993	805	189	-	AC	A
FKBP10	17:39975559	929	275	-	TC	T
COL1A1	17:48271492	1786	556	-	AG	A
SFRS1	17:56083739	553	115	-	TG	T
RNF43	17:56435161	2464	659	-	AC	A
RNF43	17:56438159-56438161	1320	278	E/-	ACTC	A
USP32	17:58300952	0	0	-	TA	T
SMURF2	17:62602763	0	0	-	TA	T
TP53	17:7578222-7578223	816	209	-	TTC	T
TP53	17:7578262-7578263	776	196	-	TCG	T
TP53	17:7578475	645	152	-	CG	C
TP53	17:7579420	457	89	-	AG	A
DNAH2	17:7697598-7697597	7609	2532	-	-	C
CBX8	17:77768662	1060	314	-	TG	T
TEX19	17:80320302-80320301	585	92	-	-	G
RNF138	18:29709075-29709074	0	0	-	-	T
KLHL14	18:30350229-30350231	712	108	SS/S	GGAA	G
RTTN	18:67697249	5812	1915	-	CT	C
SMARCA4	19:11141498	3759	1159	-	TG	T
DAZAP1	19:1430254	953	255	-	GC	G
CLEC17A	19:14698433-14698435	167	43	ME/M	TGGA	T
NOTCH3	19:15302611	823	249	-	TC	T
TMEM59L	19:18727842-18727841	680	198	-	-	G
C19orf12	19:30193879	326	67	-	GC	G
TLE2	19:3028804	0	0	-	TG	T
CLIP3	19:36509879	1332	368	-	AG	A
ZNF585A	19:37644213-37644212	819	196	-	-	A
RYR1	19:38979989	5850	1907	-	GA	G
SUPT5H	19:39961164-39961163	1856	559	-	-	GT
C19orf69	19:41949132	70	20	-	AC	A
ZNF284	19:44590645	1172	338	-	CA	C
ZNF230	19:44635227	703	154	-	TA	T

ZNF541	19:48025197	3682	1228	-	AT	A
GRIN2D	19:48908418	981	298	-	GC	G
TEAD2	19:49850473	974	295	-	TG	T
SLC17A7	19:49933867	1764	531	-	CG	C
PPP1R12C	19:55607456	1132	372	-	TG	T
IL11	19:55877466	645	170	-	GC	G
MAP2K7	19:7968894-7968893	64	22	-		
MAP2K7	19:7975006	325	109	-	CG	C
GCC2	2:109087914	2176	710	-	GT	G
LYPD1	2:133426062-133426061	170	57	-	-	T
RIF1	2:152319747	3874	1238	-	TC	T
NEB	2:152471104	0	0	-	TA	T
PXDN	2:1670168	1160	370	-	CG	C
NOSTRIN	2:169721406	2367	538	-	GA	G
GAD1	2:171702015	0	0	-	AG	A
RAD51AP2	2:17698737	970	316	-	GT	G
CERKL	2:182430854	0	0	-	TA	T
AOX1	2:201469483	975	245	-	TC	T
BMPR2	2:203420130	2281	581	-	GA	G
BMPR2	2:203420130	2281	581	-	GA	G
AAMP	2:219132279	427	112	-	AC	A
ZNF142	2:219507691-219507692	3969	1183	-	GCT	G
RNF25	2:219528925	1576	379	-	AG	A
NGEF	2:233785196	905	209	-	CG	C
HJURP	2:234746304	0	0	-	GA	G
AGAP1	2:236649677	1672	392	-	GC	G
HDAC4	2:240002823	3495	901	-	TG	T
EMILIN1	2:27305819	1879	460	-	TG	T
FAM82A1	2:38178783	541	142	-	AT	A
SLC8A1	2:40656343	1239	360	-	CT	C
OXER1	2:42991089	313	77	-	AC	A
STON1-GTF2A1L	2:48808425	764	218	-	CA	C
PCYOX1	2:70502282	714	229	-	AC	A
DNAH6	2:84752697	371	78	-	TA	T
TXNDC9	2:99936266-99936270	0	0	-	TAAAAA	T
ESF1	20:13740507	0	0	-	GA	G
POFUT1	20:30804473	553	164	-	CT	C
ASXL1	20:31022442	2353	643	-	AG	A
ROMO1	20:34287672	298	40	-	CT	C
RBL1	20:35663914	0	0	-	TA	T
ZNF831	20:57766220	146	49	-	GC	G
SYCP2	20:58467047	2501	788	-	AT	A
NRIP1	21:16338330	2788	728	-	CT	C
CXADR	21:18933045	1345	199	-	TA	T
KRTAP25-1	21:31661780	53	10	-	GA	G
DOPEY2	21:37619932	0	0	-	AT	A
BRWD1	21:40558989	7254	2309	-	TA	T
ZNF295	21:43412316-43412315	2073	630	-	-	TC
TRPM2	21:45837907	3257	1082	-	GC	G
SMARCB1	22:24175857-24175859	1319	371	EK/E	GAGA	G
ZNRF3	22:29445999-29445998	1694	510	-	-	G
TIMP3	22:33255324	897	199	-	GC	G

LARGE	22:33733727-33733726	1764	398	-	-	G
TRIOBP	22:38130773	4685	1477	-	TG	T
ATF4	22:39917951	1172	134	-	GC	G
CERK	22:47086002	1541	476	-	TC	T
CERK	22:47103788	780	223	-	CG	C
PLXNB2	22:50714395	0	0	-	TG	T
MORC1	3:108813922	0	0	-	TA	T
KIAA2018	3:113375178	5762	1784	-	TG	T
POLQ	3:121248570-121248569	1429	477	-	-	A
NPHP3	3:132420382-132420381	0	0	-	-	A
TMEM108	3:133099024-133099023	678	156	-	-	C
HDAC11	3:13538268	468	95	-	TC	T
ATR	3:142274740	2442	774	-	AT	A
SLC9A9	3:143567076-143567075	298	30	-	-	A
C3orf16	3:149485161-149485160	1745	430	-	-	T
NR2C2	3:15084406	1956	580	-	CT	C
DHX36	3:154007619	0	0	-	TA	T
METTL6	3:15466599	0	0	-	TG	T
SMC4	3:160134209-160134210	0	0	-	GTT	G
SMC4	3:160143940	3008	853	-	CA	C
FAM131A	3:184062513-184062512	1034	285	-	-	C
TGFBR2	3:30691872	732	150	-	GA	G
TRAK1	3:42242450	1731	444	-	AC	A
PTH1R	3:46930537	0	0	-	TG	T
SETD2	3:47165283	886	281	-	CT	C
PLXNB1	3:48465485	639	179	-	AC	A
COL7A1	3:48612871	6189	2027	-	CG	C
APEH	3:49713809-49713808	0	0	-	-	A
HESX1	3:57232526	0	0	-	GA	G
ATXN7	3:63981832	2887	778	-	GC	G
UBA3	3:69111085	0	0	-	TA	T
EMCN	4:101337124	0	0	-	GA	G
GSTCD	4:106640295	725	169	-	GC	G
TBCK	4:106967842	0	0	-	GA	G
ANK2	4:114280135	10414	3454	-	AG	A
KIAA1109	4:123192271-123192270	7964	2531	-	-	C
SLC7A11	4:139153539	0	0	-	TA	T
UCP1	4:141484372-141484373	0	0	-	GAA	G
FGFBP1	4:15938178	373	26	-	CT	C
FGFBP1	4:15938178	373	26	-	CT	C
SNX25	4:186272695	2200	636	-	GA	G
FAT1	4:187549521	0	0	-	TA	T
LGI2	4:25005321	1576	464	-	GC	G
SH3BP2	4:2831451-2831450	901	301	-	-	C
RGS12	4:3432431	4767	1288	-	AC	A
KLF3	4:38690460	617	104	-	TA	T
ZBTB49	4:4304019-4304018	576	152	-	-	C
TEC	4:48169933-48169935	689	177	ED/D	ATCT	A
KIAA1211	4:57179443	826	145	-	TC	T
UGT2A2	4:70512968-70512967	451	132	-	-	T
APC	5:112116587-112116586	1011	211	-		
APC	5:112164566	2020	547	-	GT	G
APC	5:112173784-112173783	2872	831	-		

APC	5:112173987	3076	899	-	AC	A
APC	5:112174659-112174658	3747	1123	-		
APC	5:112175162	4251	1291	-	TC	T
APC	5:112175212-112175216	4301	1307	-	TAAAAG	T
APC	5:112175530-112175529	4618	1413	-		
APC	5:112175548-112175549	4637	1419	-	GCC	G
APC	5:112175746	4835	1485	-	CT	C
APC	5:112175752	4841	1487	-	CT	C
APC	5:112175752-112175755	4841	1487	-	CTTTA	C
ZNF608	5:123983544	2656	845	-	GC	G
FSTL4	5:132534947-132534946	2619	790	-	-	C
PCDHB1	5:140431111	151	19	-	AT	A
PCDHGC3	5:140857742	2173	687	-	GA	G
PCDH1	5:141244531-141244533	1511	455	K/-	ACTT	A
PDE6A	5:149301270	981	287	-	AT	A
C5orf52	5:157106903	438	126	-	GA	G
GABRA6	5:161115971-161115970	516	81	-	-	T
DOCK2	5:169081434	123	24	-	GC	G
LCP2	5:169677853	1567	454	-	GT	G
FAM193B	5:176958525	0	0	-	TG	T
CANX	5:179149920	1403	468	-	AT	A
TBC1D9B	5:179306627	0	0	-	AC	A
CDH10	5:24488219-24488218	2428	640	-	-	T
NIPBL	5:37064899	8819	2774	-	CA	C
KIAA0947	5:5464626	5401	1727	-	TG	T
DEPDC1B	5:59893744-59893743	0	0	-	-	A
COL4A3BP	5:74807153	558	88	-	TG	T
CHD1	5:98236745	779	210	-	CT	C
GRIK2	6:102503432	3029	847	-	CA	C
C6orf203	6:107361137	863	58	-	CT	C
KIAA1919	6:111587361	949	199	-	AT	A
LAMA4	6:112440366-112440365	5105	1605	-	-	T
PHACTR1	6:13206135	504	168	-	TG	T
IYD	6:150690252	225	29	-	GA	G
IGF2R	6:160485488	4090	1314	-	CG	C
ATXN1	6:16327163	2317	460	-	AG	A
THBS2	6:169641977	1021	257	-	TG	T
LRRC16A	6:25600800	3746	1126	-	TA	T
TEAD3	6:35446237	753	189	-	TG	T
DLK2	6:43418413	1267	339	-	AG	A
DSP	6:7581583-7581585	5501	1720	LE/L	TAGA	T
SENP6	6:76331349	0	0	-	AT	A
CYB5R4	6:84634231	874	245	-	CA	C
MANEA	6:96053922	1164	344	-	AT	A
SFRS18	6:99849343	1696	497	-	CT	C
DNAJC2	7:102964992	841	197	-	AT	A
RELN	7:103301977	0	0	-	TA	T
DOCK4	7:111368605	5724	1909	-	AG	A
IFRD1	7:112112339	1577	369	-	TA	T
WNT16	7:120971879	784	165	-	TG	T
TRIM24	7:138264224-138264223	2746	844	-	-	C
ETV1	7:13978876	0	0	-	GA	G
DENND2A	7:140218541	0	0	-	TA	T

PRKAG2	7:151372597-151372596	1098	198	-	-	G
BAGE3	7:151845524	13878	4553	-	TA	T
NEUROD6	7:31378635	571	83	-	CT	C
AEBP1	7:44146447	861	186	-	AC	A
AUTS2	7:70236570	2091	590	-	TC	T
CLIP2	7:73731913	364	13	-	TG	T
STYXL1	7:75651314	0	0	-	TA	T
PION	7:76950143	0	0	-	TA	T
MAGI2	7:77762294	3369	1039	-	AG	A
LMTK2	7:97784092	766	158	-	AC	A
CSMD3	8:113516210	0	0	-	GA	G
EIF2C2	8:141561430	1415	459	-	TG	T
MAPK15	8:144803436-144803437	1178	353	-	CGA	C
BIN3	8:22487477	435	113	-	CT	C
C8orf80	8:27888776	2035	631	-	AT	A
MYBL1	8:67488453-67488452	1259	420	-	-	T
NR4A3	9:102607096	1497	485	-	CT	C
INVS	9:103054983	2629	815	-	CG	C
ZNF618	9:116770795	814	239	-	GA	G
NR6A1	9:127287159-127287160	0	0	-	GAA	G
BRD3	9:136918529	257	24	-	CG	C
MTAP	9:21815490	143	48	-	GA	G
LINGO2	9:27949751	1373	307	-	GC	G
IL33	9:6254556	0	0	-	TA	T
ZCCHC6	9:88937823	3015	948	-	TA	T
HNRNPH2	X:100668112	1294	379	-	CT	C
CLDN2	X:106171948-106171952	816	164	-	TCTTTA	T
APLN	X:128782615	529	37	-	TG	T
BCORL1	X:129190011	5372	1753	-	TC	T
BCORL1	X:129190011	5372	1753	-	TC	T
BCORL1	X:129190011	5372	1753	-	TC	T
ARHGEF6	X:135790933	0	0	-	GA	G
ATP11C	X:138840030	0	0	-	GA	G
AFF2	X:148037457	2361	628	-	GA	G
PNMA3	X:152225667	591	85	-	AG	A
F8	X:154159223	3043	948	-	AG	A
PHKA2	X:18942259-18942258	0	0	-	-	A
DMD	X:32366648	0	0	-	TA	T
PRRG1	X:37312611-37312610	555	131	-	-	C
RP2	X:46713008	361	67	-	TG	T
WNK3	X:54328300-54328299	0	0	-	-	A
VSIG4	X:65242709	0	0	-	GA	G
EFNB1	X:68060323-68060322	1646	289	-	-	G
IL2RG	X:70327614	1174	361	-	TG	T
RGAG4	X:71350840	912	184	-	GC	G
ZDHHC15	X:74649036	0	0	-	TA	T
FAM9A	X:8759221	0	0	-	CA	C

[0303] The analysis of the base level transitions and transversions at mutated sites revealed that in CRCs C to T transitions to be predominant, regardless of the MMR status, both in the whole exome and whole genome analysis. This was consistent with previous mutation reports (Wood, L. D. *et al.*, *Science* 318:1108-1113 (2007); Sjoblom, T. *et al.*, *Science* 314:268-274 (2006); Bass, A. J. *et al.*, *Nat. Genet.*

43:964-968 (2011)). The two hyper mutated tumors samples examined also showed higher proportion of C to A and T to G transversions, consistent with the much higher mutation rate observed for these samples.

[0304] Consistent with the exome mutation data, the MSS whole genome analyzed showed 17,651 mutations compared to the 97,968 mutations observed in the MSI whole genome. The average whole genome mutation rate was 6.2/Mb and 34.5/Mb for the MSS and MSI genome respectively. A mutation rate of 4.0-9.8/Mb was previously reported for MSS CRC genomes (Bass, A. J. *et al., Nat. Genet.* 43:964-968 (2011)).

Example 2-Analysis of Mutated Genes

[0305] The mutation analysis identified protein altering somatic single nucleotide variants in 12,956 genes including 3,257 in the MSS samples, 9,851 in the MSI samples and 6,891 in the two hyper mutated samples. Among the frequently mutated class of proteins are human kinases including RTKs, G-protein coupled receptors, and nuclear hormone receptors. In an effort to understand the impact of the mutations on gene function SIFT (Ng, P. C. & Henikoff, S., *Genome Res* 12:436-446 (2002)), Polyphen (Ramensky, V. *et al.*, *Nucleic Acids Res* 30:3894-3900 (2002)) and mCluster (Yue, P. *et al., Hum. Mutat.* 31:264-271 (2010)) was applied and 36.7% of the mutations were found likely to have a functional consequence, in contrast to 12% for germline variants from the normal samples, based on at least two of the three methods (Table 2).

[0306] To further understand the relevance of the mutated genes, a previously described q-score metric was applied to rank significantly mutated cancer genes (Kan, Z. *et al.*, *Nature* 466:869-873 (2010)). In MSS samples, 18 significant cancer genes (q-score >=1; ≤10% false discovery rate) were identified (*KRAS, TP53, APC, PIK3CA, SMAD4, FBXW7, CSMD1, NRXN1, DNAH5, MRVI1, TRPS1, DMD, KIF2B, ATM, FAM5C, EVC2, OR2W3, TMPRSS11A,* and *SCN10A*). The significantly mutated MSS colon cancer genes included previously reported genes including *KRAS*, *APC*, *TP53*, *SMAD4*, *FBXW7*, and *PIK3CA* and several new genes including the cell cycle checkpoint gene *ATM*. Genes like *KRAS* and *TP53* were among the top mutated MSI colon cancer genes, however, none of the genes achieved statistical significance due to the limited number of MSI samples analyzed.

[0307] In an effort to establish the relevance of the mutated genes, the mutated genes were compared against 399 candidate colon cancer genes identified in screens involving mouse models of cancer (Starr, T. K. *et al.*, *Science* 323, 1747-1750 (2009); March, H. N. *et al.*, *Nat. Genet.* 43, 1202-1209 (2011)). Of the 399 genes mutations were found in 327. When the data sets were analyzed via an alternative method, of the 432 genes, mutations were found in 356. The frequently mutated genes in the data set that overlapped with mouse colon cancer model hits included *KRAS*, *APC*, *SMAD4*, *FBXW7* and *EP400*. Additionally, genes involved in chromatin remodeling like *SIN3A*, *SMARCA5* and *NCOR1* and histone modifying enzyme *JARID2* found in the mouse CRC screen (Starr, T. K. *et al.*, *Science* 323, 1747-1750

(2009); March, H. N. *et al.*, *Nat. Genet.* 43, 1202-1209 (2011)) were also mutated in our exome screen. Further, *TCF12*, identified in the mouse colon cancer model screen, was mutated in 5 (Q179*, G444*, and R603W/Q) of our samples (7%) and contained a hotspot mutation at R603 (3 of 5 mutations; R603W/Q). This hotspot mutation within the TCF12 helix-loop-helix domain will likely abolish its ability to bind DNA, suggesting a loss-function mutation. Interestingly, all of the TCF12 mutations were identified in MSI samples. The TCF12 transcription factor has been previously implicated in colon cancer metastasis (Lee, C. C. *et al.*, *J. of Biol. Chem.* 287:2798-2809 (2011)). The presence of hotspots in this gene and its identification in mouse CRC model screen indicates that it likely functions as a CRC driver gene.

[0308] Mutational hotspots, where the same position in a gene was mutated across independent samples, are indicative of functionally relevant driver cancer gene. In this study, 270 genes were identified with hotspot mutation (Table 4). Seventy of these genes were not previously reported in COSMIC. Comparison of our mutations with those reported in COSMIC identified an additional 245 hotspot mutations in 166 genes (Table 5). Utilizing an alternative data analysis method, 274 genes were identified with hotspot mutations with forty of these genes not previously in COSMI and an additional 435 hotspot mutations in 361 genes. Genes with novel hotspot mutations include transcriptional regulators (*TCF12*, *TCF7L2* and *PHF2*), Ras/Rho related regulators (*SOS1* (*e.g.*, R547W, T614M R854*, G1129V), *SOS2* (*e.g.*, R225*, R854C,and Q1296H), *RASGRF2*, *ARHGAP10*, *ARHGEF33* and *Rab40c (e.g.*, G251S*)*), chromatin modifying enzymes (*TET2*, *TET3*, *EP400* and *MLL*), glutamate receptors (*GRIN3A* and *GRM8*), receptor tyrosine kinases (*ERBB3*, *EPHB4*, *EFNB3*, *EPHA1*, *TYRO3*, *TIE1* and *FLT4*), other kinases (*RIOK3*, *PRKCB*, *MUSK*, *MAP2K7* and *MAP4K5*), protein phosphatase (*PTPRN2*), GPRCs (*GPR4* and *GPR98*) and E3-ligase (*TOPORS*). Of further interest in this gene set are *TET2* and *TET3*, both of which encode methylcytosine dioxygenase involved in DNA methylation (Mohr, F. *et al.*, *Exp. Hematol.* 39:272-281 (2011)). While mutations in *TET2* have been reported in myeloid cancers, thus far mutations in *TET3* or *TET1* have not been reported in solid tumors, especially, in CRC (Mohr, F. *et al.*, *Exp. Hematol.* 39:272-281 (2011)). All the three family members *TET1 (e.g.*, R81H, E417A, K540T, K792T, S879L, S1012*, Q1322*, C1482Y, A1896V, and A2129V), *TET2 (e.g.*, K108T, T118I, S289L, F373L, K1056N, Y1169*, A1497V, and V1857M), and *TET3 (e.g.*, T165M, A874T, M977V, G1398R, and R1576Q/W) are mutated in these examples.

Table 4 – Hotspot mutations

Gene	Pos. Prot.	Mutation	Locations	Gene	Pos. Prot.	Mutation	Locations
SEPT14	157	R157H	7:55910723, 7:55910723	MAP7D2	546	E546*	X:20031734, X:20031734
ACMSD	162	A162V	2:135621200, 2:135621200	MDN1	3240	R3240C	6:90405377, 6:90405377
ACRV1	257	R257Q	11:125542516, 11:125542516	MGST3	13	R13H	1:165619080, 1:165619080

ADAMTS12	604	R604W	5:33637760, 5:33637760	MID1	178	H178Q	X:10535054, X:10535054
ADAMTS14	297	D297N	10:72489068, 10:72489068	MLL	933	R933W	11:118344671, 11:118344672
ALDH16A1	581	A581V	19:49969344, 19:49969344	MPP3	257	R257H	17:41898416, 17:41898416
ALK	551	R551Q	2:29519919, 2:29519920	MRPL18	108	R108H	6:160218402, 6:160218402
ANGPTL4	136	R136Q	19:8430926, 19:8430926	MRVI1	517	P517H	11:10628314, 11:10628314
ANKRD28	401	R401H	3:15753727, 3:15753728	MUSK	842	R842H	9:113563165, 9:113563165
ANKRD28	208	R208C	3:15776944, 3:15776944	MYH2	445	R445H	17:10442604, 17:10442605
APC	1450	R1450*	5:112175639, 5:112175639	NBEA	203	R203*	13:35619164, 13:35619164
APC	232	R232*	5:112128191, 5:112128191	NKAIN4	110	R110C	20:61879073, 20:61879073
APC	564	R564*	5:112164616, 5:112164616	NLRP12	656	R656C	19:54312947, 19:54312946
APC	876	R876*	5:112173917, 5:112173917, 5:112173918, 5:112173917	NLRP2	467	R467Q	19:55494466, 19:55494465
APC	1378	Q1378*	5:112175423, 5:112175423	NMUR2	108	R108H	5:151784352, 5:151784352
APC	653	R653M	5:112170862, 5:112170862	NUDCD1	521	R521H	8:110255428, 8:110255428
APOB	3036	S3036Y	2:21230633, 2:21230633	NUP93	77	R77*	16:56792499, 16:56792499
APOB	1513	R1513Q	2:21235202, 2:21235202	OIT3	506	R506H	10:74692161, 10:74692161
ARHGAP10	348	V348I	4:148827796, 4:148827796	OLFML2B	679	V679I	1:161953686, 1:161953686
ARHGEF33	48	Q48K	2:39156114, 2:39156114	OR10A7	261	R261Q	12:55615590, 12:55615589
ASB10	242	A242V	7:150878540, 7:150878540	OR2D2	122	R122H	11:6913367, 11:6913368
ASPG	270	R270C	14:104569983, 14:104569983	OR4N4	290	R290H	15:22383341, 15:22383341, 15:22383341
ATF7IP	159	P159A	12:14577324, 12:14577324	OR5D18	237	R237C	11:55587808, 11:55587808
BCL6	594	R594Q	3:187443345, 3:187443345	OR6P1	201	L201R	1:158532793, 1:158532793
BDKRB2	128	T128M	14:96707048, 14:96707048	PCBP1	100	L100Q	2:70315174, 2:70315174
BEST3	388	R388Q	12:70049531, 12:70049532	PCDHA13	301	E301*	5:140262754, 5:140262756
BNC2	575	S575R	9:16436469, 9:16436469	PCDHA4	266	A266T	5:140187568, 5:140187568
BRAF	600	V600E	7:140453136, 7:140453136, 7:140453136, 7:140453136	PCDHA7	681	R681W	5:140216009, 5:140216010
BRIP1	745	A745T	17:59821817, 17:59821817	PCMTD1	200	R200Q	8:52744111, 8:52744111
BTBD7	667	T667M	14:93714943, 14:93714943	PDE8B	436	R436H	5:76703224, 5:76703223
C10orf90	84	A84T	10:128193519, 10:128193519	PDZRN3	971	R971H	3:73432805, 3:73432806
C12orf35	235	N235K	12:32134594, 12:32134592	PER2	1049	A1049T	2:239160369, 2:239160369
C12orf4	335	R335Q	12:4627253, 12:4627253	PHF2	700	P700L	9:96428129, 9:96428129
C13orf1	58	A58T	13:50505205, 13:50505205	PHLDB2	438	R438M	3:111604237, 3:111604236
C20orf132	57	Q57E	20:35807795, 20:35807795	PIK3CA	545	E545A	3:178936092, 3:178936091, 3:178936091, 3:178936092, 3:178936091, 3:178936091
C2orf86	227	R227Q	2:63661024, 2:63661024	PIK3CA	1025	T1025A	3:178952018, 3:178952018
C5orf49	66	Y66H	5:7835563, 5:7835563	PIK3CA	1047	H1047R	3:178952085, 3:178952085, 3:178952085, 3:178952085, 3:178952085
C6orf118	212	A212T	6:165715177, 6:165715176	PIK3CA	111	K111E	3:178916944, 3:178916946, 3:178916944
C6orf174	368	G368C	6:127768362, 6:127768362	PKD2L2	448	R448Q	5:137257339, 5:137257339
C7orf63	125	K125N	7:89894633, 7:89894633	PLEKHA4	204	R204H	19:49362807, 19:49362808
C8A	484	R484C	1:57378145, 1:57378146	PLEKHH3	155	G155S	17:40825688, 17:40825688
C9orf167	145	A145V	9:140173575, 9:140173575	PNKD	222	R222Q	2:219206751, 2:219206751
CACNA1A	110	A110V	19:13565991, 19:13565991	POLE	286	P286R	12:133253184, 12:133253184
CACNA1D	1278	A1278T	3:53787695, 3:53787695	PRDM2	282	E282D	1:14105136, 1:14105136
CACNA1E	398	E398*	1:181684494, 1:181684494	PRKCB	161	R161C	16:24046820, 16:24046821
CACNA1I	601	R601Q	22:40045722, 22:40045721	PRKCH	465	S465L	14:61952335, 14:61952335
CBX6	199	R199C	22:39262858, 22:39262857	PROM1	472	R472Q	4:16008200, 4:16008200
CCDC117	277	M277I	22:29182305, 22:29182305	PSKH2	32	A32T	8:87081758, 8:87081758
CCDC157	469	R469Q	22:30769656, 22:30769655	PTGS2	600	R600H	1:186643501, 1:186643501

CCDC6	139	E139*	10:61612349, 10:61612349	PTHLH	94	R94Q	12:28116524, 12:28116524
CCRL1	26	Q26*	3:132319317, 3:132319317	PTPRN2	545	R545H	7:157903599, 7:157903599
CDH8	291	L291H	16:61854981, 16:61854981	PXDN	1198	R1198W	2:1651960, 2:1651960
CLEC2L	145	E145A	7:139226768, 7:139226767	RAB40C	251	G251S	16:677527, 16:677527, 16:677527
CLEC3A	156	R156C	16:78064610, 16:78064610	RASGRF2	244	R244I	5:80369115, 5:80369115
COL14A1	1048	F1048S	8:121282343, 8:121282343	RBM22	216	R216W	5:150075168, 5:150075168
CRISP2	88	R88C	6:49667526, 6:49667525	RBMXL2	287	G287R	11:7111210, 11:7111210
CSNK1G2	263	R263W	19:1979336, 19:1979336	RBP3	967	G967S	10:48387979, 10:48387979
CYP11A1	86	G86D	15:74659670, 15:74659670	RECQL5	872	R872H	17:73624488, 17:73624488
CYP2E1	328	E328*	10:135350581, 10:135350581	RETSAT	125	R125C	2:85578127, 2:85578126
DAB2IP	333	R333H	9:124522546, 9:124522545	RIOK3	306	I306S	18:21053494, 18:21053494
DDX21	440	R440C	10:70730038, 10:70730039	RNF43	132	R132*	17:56440943, 17:56440943
DENND2A	572	S572Y	7:140266950, 7:140266950	SAMSN1	235	R235C	21:15882693, 21:15882692
DICER1	1813	E1813Q	14:95557630, 14:95557630	SCRN2	250	R250W	17:45916181, 17:45916181
DLGAP2	912	R912Q	8:1645425, 8:1645424	SEMA3F	477	R477C	3:50222220, 3:50222220
DNAH11	1281	A1281V	7:21646341, 7:21646341	SEMA7A	261	R261H	15:74708935, 15:74708935
DNAJC10	180	R180Q	2:183593627, 2:183593626	SETD2	1322	R1322Q	3:47162161, 3:47162161
DPYD	561	R561Q	1:97981340, 1:97981340	SFMBT2	617	R617W	10:7218087, 10:7218086
DSEL	56	K56R	18:65181709, 18:65181709	SLC13A3	169	R169Q	20:45239120, 20:45239121
DSP	2586	R2586*	6:7585251, 6:7585252	SLC13A4	111	R111H	7:135392895, 7:135392896
DVL1L1	227	R227C	1:1275810, 1:1275809	SLC15A1	677	E677D	13:99337074, 13:99337074
EFNB3	106	R106H	17:7611470, 17:7611469	SLC1A6	365	V365F	19:15067364, 19:15067364
EGFR	671	R671C	7:55240767, 7:55240767	SLC28A3	154	R154*	9:86917179, 9:86917179
EMR1	887	A887T	19:6937648, 19:6937648	SLC35B2	333	R333*	6:44222745, 6:44222745
ENOX1	298	R298H	13:43918817, 13:43918818	SLC45A3	81	R81H	1:205632677, 1:205632678
EP400	1786	R1786C	12:132512700, 12:132512700	SLC6A1	342	V342M	3:11067991, 3:11067991
EP400	2523	A2523T	12:132537755, 12:132537755	SMAD4	361	R361H	18:48591919, 18:48591918, 18:48591918, 18:48591918, 18:48591919, 18:48591918
EPHA1	844	R844W	7:143090930, 7:143090929	SMARCAL1	541	T541N	2:217300197, 2:217300196, 2:217300197
EPHB4	866	R866H	7:100403204, 7:100403204	SMC4	1056	S1056L	3:160149483, 3:160149483
EPHB4	535	R535W	7:100411629, 7:100411629	SNW1	198	R198L	14:78203359, 14:78203359
EPS8	571	R571Q	12:15793746, 12:15793747	SOS2	824	R824C	14:50612229, 14:50612229
ERC2	619	R619Q	3:56044541, 3:56044541	SPTA1	268	R268*	1:158648201, 1:158648201
EXOC6B	785	R785Q	2:72406546, 2:72406547	SULT4A1	32	R32C	22:44258169, 22:44258169
F8	2166	R2166*	X:154091436, X:154091436	SUV39H1	230	I230M	X:48558973, X:48558973
FAM110B	160	A160V	8:59059268, 8:59059267	TCF12	603	R603W	15:57565289, 15:57565290, 15:57565290
FAM43B	273	D273E	1:20880285, 1:20880285	TCF7L2	465	R465C	10:114925333, 10:114925334
FAM90A1	71	P71L	12:8376723, 12:8376724	TECR	66	R66H	19:14674503, 19:14674503
FAT4	132	A132T	4:126237960, 4:126237960	TEKT2	268	R268W	1:36552859, 1:36552860
FBXL17	216	R216*	5:107216863, 5:107216863	TET3	1576	R1576Q	2:74328921, 2:74328920
FBXW7	465	R465C	4:153249385, 4:153249385, 4:153249384, 4:153249384	TFIP11	386	R386Q	22:26895242, 22:26895242
FBXW7	582	S582L	4:153245446, 4:153245446	TIE1	583	R583C	1:43778092, 1:43778093
FBXW7	505	R505C	4:153247289, 4:153247289	TMC7	375	A375P	16:19049313, 16:19049313
FBXW7	369	E369*	4:153251901, 4:153251901	TMEM175	335	R335C	4:951772, 4:951772
FCAR	110	R110W	19:55396904, 19:55396904	TMEM201	474	R474H	1:9669925, 1:9669924
FHOD3	1353	R1353C	18:34340727, 18:34340727	TMEM71	83	D83N	8:133764098, 8:133764098
FKBP1C	19	R19C	6:63921516, 6:63921516	TNRC18	811	A811T	7:5417032, 7:5417032
FLT4	1031	R1031*	5:180043905, 5:180043905	TOPORS	188	R188Q	9:32543960, 9:32543961

FRMD4A	851	R851C	10:13699038, 10:13699037	TP53	176	C176Y	17:7578403, 17:7578403
FRY	2194	T2194M	13:32813912, 13:32813912	TP53	175	R175H	17:7578406, 17:7578406, 17:7578406, 17:7578406
FSTL5	404	R404C	4:162459420, 4:162459420	TP53	213	R213*	17:7578212, 17:7578212
FSTL5	252	D252Y	4:162577620, 4:162577620	TP53	248	R248L	17:7577538, 17:7577539, 17:7577538, 17:7577539
FUBP1	451	R451C	1:78428511, 1:78428511	TP53	273	R273H	17:7577120, 17:7577121, 17:7577120, 17:7577120, 17:7577121
GAL3ST2	326	G326S	2:242743360, 2:242743360	TP53	282	R282W	17:7577094, 17:7577094
GALNTL2	395	E395K	3:16252734, 3:16252734	TP53	196	R196*	17:7578263, 17:7578263
GBF1	1243	A1243V	10:104135186, 10:104135186	TP53	257	L257Q	17:7577511, 17:7577511
GCG	65	Y65*	2:163003931, 2:163003931	TP53	245	G245S	17:7577548, 17:7577547
GCM2	265	R265I	6:10874955, 6:10874955	TP53BP1	1405	R1405*	15:43713260, 15:43713260
GDF3	84	R84C	12:7848075, 12:7848075	TRBC2	68	A68T	7:142498925, 7:142498925
GNAS	844	R844C	20:57484420, 20:57484421, 20:57484420	TRIM22	262	W262C	11:5729415, 11:5729414
GPR4	14	R14H	19:46095084, 19:46095085	TRIM23	525	E525*	5:64887748, 5:64887748
GPR98	2200	S2200Y	5:89985786, 5:89985786	TRIM66	895	R895Q	11:8643322, 11:8643322
GRHL1	434	R434*	2:10130854, 2:10130855	TSHZ2	222	A222V	20:51870662, 20:51870662
GRIN3A	225	R225C	9:104499589, 9:104499589	TSPAN17	266	A266T	5:176083806, 5:176083806
GRLF1	1187	R1187Q	19:47425492, 19:47425492	TYRO3	0	-	15:41870082
GRM8	30	R30I	7:126883170, 7:126883170	UBQLN3	624	R624W	11:5528919, 11:5528919
GSR	233	R233C	8:30553995, 8:30553994	UNC13A	285	R285H	19:17769048, 19:17769049
GYLTL1B	267	R267W	11:45947619, 11:45947619	UROC1	656	G656S	3:126207045, 3:126207044
HAO1	84	R84H	20:7915169, 20:7915169	USP6NL	492	A492T	10:11505504, 10:11505504
HCFC2	191	E191*	12:104473320, 12:104473320	WDFY4	1091	R1091C	10:49986751, 10:49986751
HERC2	4634	A4634V	15:28359770, 15:28359770	WDR16	549	E549*	17:9545080, 17:9545080
HGF	234	R234C	7:81374362, 7:81374361	WHSC1	104	E104K	4:1902691, 4:1902691
HHIPL2	303	K303N	1:222716944, 1:222716944	WIPF1	458	P458S	2:175431882, 2:175431881
HIST1H1T	167	G167W	6:26107823, 6:26107823	WSCD2	583	Y583*	12:108642111, 12:108642111
HIVEP2	1028	R1028*	6:143092794, 6:143092794, 6:143092794	XCR1	166	I166V	3:46062944, 3:46062944
HMCN1	1647	T1647M	1:185985120, 1:185985120	ZBTB32	170	P170S	19:36206036, 19:36206036
HRASLS5	118	K118T	11:63256365, 11:63256365	ZBTB40	1174	A1174V	1:22850933, 1:22850933
HSD17B3	184	S184Y	9:99007682, 9:99007682	ZHX3	249	N249K	20:39832810, 20:39832810
HTR1A	50	A50T	5:63257399, 5:63257398	ZNF14	547	R547*	19:19822451, 19:19822451
HYI	118	R118Q	1:43917949, 1:43917949	ZNF142	834	R834*	2:219508739, 2:219508738
IGDCC3	132	R132C	15:65667450, 15:65667450	ZNF19	45	E45D	16:71512807, 16:71512807
IGLL5	176	A176V	22:23237753, 22:23237753	ZNF211	486	R486I	19:58153272, 19:58153272
IKZF4	255	R255Q	12:56426393, 12:56426392	ZNF235	254	R254C	19:44792828, 19:44792827
ITGAD	669	V669I	16:31424528, 16:31424528	ZNF236	154	A154D	18:74580744, 18:74580744, 18:74580743
KBTBD3	356	R356Q	11:105924349, 11:105924350	ZNF442	309	R309*	19:12461474, 19:12461473
KBTBD6	670	R670H	13:41704639, 13:41704640	ZNF470	445	R445I	19:57089131, 19:57089131
KCNA3	105	R105H	1:111217118, 1:111217118	ZNF480	97	N97H	19:52819176, 19:52819176
KCND2	247	R247H	7:119915426, 7:119915425	ZNF507	56	E56*	19:32843902, 19:32843902
KIAA0895	282	A282T	7:36396534, 7:36396534	ZNF577	402	E402*	19:52376039, 19:52376039
KIAA1024	73	V73A	15:79748707, 15:79748707	ZNF662	172	R172H	3:42956002, 3:42956001
KIF21A	911	G911C	12:39726518, 12:39726518	ZNF668	206	A206V	16:31075164, 16:31075164
KIF27	623	R623Q	9:86504110, 9:86504110	ZNF789	219	H219Q	7:99084490, 7:99084490
KIF7	841	R841W	15:90176988, 15:90176988	ZNF831	1412	S1412I	20:57828999, 20:57828999

LAMB3	367	R367H	1:209803114, 1:209803115	ZNRF3	102	R102*	22:29439389, 22:29439389
LASS3	95	E95D	15:101031058, 15:101031058	LSM14A	272	R272C	19:34710328, 19:34710328
LCT	694	A694S	2:136570154, 2:136570154	MAP2	905	R905*	2:210559607, 2:210559607
LDLRAD2	148	L148M	1:22141247, 1:22141247	MAP2K7	195	R195L	19:7975348, 19:7975348
LRP2	3726	R3726C	2:170028612, 2:170028611	MAP4K5	172	R172*	14:50941823, 14:50941823
LRP2	2095	R2095*	2:170066149, 2:170066149	LRRC8D	588	R588W	1:90400389, 1:90400390
KRAS	12	G12V	12:25398284, 12:25398284, 12:25398284, 12:25398284, 12:25398285, 12:25398284, 12:25398284, 12:25398285, 12:25398284, 12:25398284, 12:25398285, 12:25398284	KRAS	13	G13D	12:25398281, 12:25398281, 12:25398281, 12:25398281, 12:25398281

Table 5 – Hotspot mutations identified through metanalysis using COSMIC mutation data

Gene	Prot.	Mut.	Locations	Gene	Prot.	Mut.	Locations
SEPT9	346	T346M	17:75483629	MYT1	503	T503M	20:62843482
ABP1	660	N660S	7:150557654	NBEA	2219	R2219H	13:36124684
ACSL4	133	R133H	X:108926079	NCAN	871	T871M	19:19339041
ADAMTS14	682	V682I	10:72503414	NEB	3538	R3538W	2:152471050
AGRN	0	-	1:985612	NEURL4	366	R366H	17:7229863
ALDH18A1	64	R64H	10:97402861	NF1	416	R416*	17:29528489
ALDH8A1	69	R69C	6:135265038	NF1	1858	A1858T	17:29654820
ALK	401	R401*	2:29606679	NF2	459	Q459H	22:30070861
ALOX15	500	R500*	17:4536198	NGEF	259	R259W	2:233785047
ANO2	704	R704*	12:5708776	NHS	373	R373*	X:17742490
ANO2	657	D657N	12:5722087	NLRP4	442	G442R	19:56370083
ANTXR1	192	A192V	2:69304553	NOS3	474	R474C	7:150698505
APC	1705	T1705A	5:112176404	NPSR1	85	F85L	7:34724271
APC	1400	S1400L	5:112175490	NRAS	61	Q61L	1:115256529
APC	1355	S1355Y	5:112175355	NRAS	12	G12A	1:115258747
APC	117	S117*	5:112103015	NTN3	440	D440N	16:2523319
APC	499	R499*	5:112162891	NUP98	493	Y493H	11:3756486
APC	302	R302*	5:112151261	OR5T1	322	F322L	11:56044078
APC	283	R283*	5:112151204	OR6Y1	214	I214S	1:158517255
APC	1386	R1386*	5:112175447	OXGR1	252	V252I	13:97639260
APC	1114	R1114*	5:112174631	PALB2	1008	P1008T	16:23632774
APC	1367	Q1367*	5:112175390	PBRM1	0	-	3:52678719
APC	1338	Q1338*	5:112175303	PGR	740	R740Q	11:100922293
APC	1009	H1009R	5:112174317	PIK3CA	1052	T1052K	3:178952100
APC	1312	G1312*	5:112175225	PIK3CA	88	R88Q	3:178916876
APC	1408	E1408*	5:112175513	PIK3CA	546	Q546K	3:178936094
APC	1379	E1379*	5:112175426	PIK3CA	986	K986N	3:178951903
APC	1306	E1306*	5:112175207	PIK3CA	594	K594E	3:178937392
ARHGAP20	987	D987Y	11:110450711	PIK3CA	542	E542K	3:178936082

ARID1A	1276	R1276Q	1:27099948	PIK3CA	420	C420R	3:178927980
ASPM	1610	V1610D	1:197073552	PIK3R1	574	R574I	5:67591128
ATM	352	I352N	11:108117844	PIK3R1	543	R543I	5:67591035
ATP10A	793	R793W	15:25953415	PIK3R1	348	R348*	5:67588951
ATP10A	1211	A1211T	15:25926004	PIK3R1	162	R162*	5:67569823
ATP6V1E2	135	R135C	2:46739448	PIK3R1	564	N564D	5:67591097
AZGP1	46	A46T	7:99569570	PIK3R1	527	N527K	5:67590988
B3GAT1	11	V11I	11:134257523	PIK3R1	285	N285H	5:67576771
BAP1	128	G128*	3:52441470	PKHD1	1081	R1081H	6:51897950
BCL11B	358	S358A	14:99642101	PNLIPRP1	129	S129F	10:118354297
BTBD3	218	L218H	20:11900472	PPP1R3A	948	T948M	7:113518304
CARD11	353	T353A	7:2977627	PPP1R3A	554	G554V	7:113519486
CC2D1B	534	R534Q	1:52823367	PPP5C	242	D242E	19:46887063
CD40LG	11	R11Q	X:135730439	PRPS1L1	58	S58G	7:18067234
CDC73	54	Y54H	1:193094270	PTCH1	563	A563T	9:98238357
CDK5RAP1	169	R169Q	20:31979986	PTEN	233	R233*	10:89717672
CDKN2A	80	R80*	9:21971120	PTEN	130	R130Q	10:89692905
CDKN2A	124	R124H	9:21970987	PTEN	125	K125T	10:89692890
CDKN2A	107	R107H	9:21971038	PTEN	28	I28M	10:89653786
CDKN2A	76	A76T	9:21971132	PTEN	93	H93Y	10:89692793
CDKN2B	60	R60H	9:22006224	PTEN	3	A3D	10:89624234
COL11A1	1770	A1770V	1:103345240	PTPN11	76	E76G	12:112888211
COL3A1	420	G420S	2:189859023	PTPRC	582	F582Y	1:198697493
CORO2B	113	R113Q	15:69003075	RAD50	1109	I1109T	5:131953923
CREB3L1	235	A235V	11:46332691	RAP1GAP	609	V609M	1:21926031
CTNNB1	41	T41A	3:41266124	RASGEF1C	293	G293S	5:179546376
CTNNB1	45	S45P	3:41266136	RBM14	505	G505R	11:66392860
CYTH1	386	A386T	17:76672214	RNF175	221	S221R	4:154636784
DAPK3	454	R454C	19:3959104	RPN1	263	R263C	3:128350847
DAXX	306	R306Q	6:33288635	RPS6KA5	263	S263Y	14:91386568
DGKB	466	R466H	7:14647098	SAMD7	67	R67W	3:169639114
DLEC1	844	S844L	3:38139094	SEC23IP	770	G770R	10:121685734
DMTF1	315	T315A	7:86813835	SETD4	90	R90Q	21:37420633
DNAH3	3772	Y3772C	16:20959833	SF3B1	568	R568C	2:198268326
DNAH5	4200	K4200R	5:13717530	SIK1	68	L68V	21:44845358
DOCK1	1665	A1665T	10:129224219	SLC24A3	82	R82W	20:19261704
DPF3	79	R79H	14:73220034	SLC27A3	462	G462S	1:153749660
DSCAML1	1762	V1762I	11:117303143	SLC2A5	238	R238C	1:9100032
ECE2	438	R438C	3:184001714	SLC45A3	272	R272C	1:205632105
EPHB6	106	R106*	7:142561874	SMAD4	509	W509*	18:48604705
ERBB2	755	L755M	17:37880219	SMAD4	356	P356S	18:48591903
ERBB3	104	V104M	12:56478854	SMAD4	386	G386V	18:48593406
ERBB3	284	G284R	12:56481922	SMAD4	493	D493A	18:48604656
FAM184A	723	T723M	6:119301436	SMAD4	351	D351G	18:48591889
FAM71B	318	I318N	5:156590323	SMARCA4	966	R966W	19:11134230
FBLN7	407	T407M	2:112944983	SMARCB1	383	R383W	22:24176329
FBXL7	160	T160M	5:15928350	SMO	324	A324T	7:128846040
FBXW7	367	R367*	4:153251907	SNTB1	401	R401Q	8:121561133
FBXW7	224	R224Q	4:153268137	SOX6	93	R93*	11:16340160
FBXW7	470	H470R	4:153249369	SPCS2	4	A4S	11:74660340
FER1L6	810	G810D	8:125047660	SPEN	907	T907I	1:16255455
FREM2	484	V484A	13:39262932	STK11	314	P314H	19:1223004
FTSJ2	53	R53W	7:2279194	SYNE1	3671	V3671M	6:152674795

FZD7	390	A390T	2:202900538	TAF1B	519	F519C	2:10059940
GJD4	340	A340T	10:35897459	TAS1R2	707	R707H	1:19166493
GKN1	118	K118N	2:69206110	TDRD9	564	R564H	14:104471720
GPR113	771	A771V	2:26534284	TET2	1857	V1857M	4:106197173
GPR149	542	R542C	3:154056060	TET2	108	K108T	4:106155359
GRIK2	723	E723*	6:102483297	TET2	373	F373L	4:106156155
GRM3	271	V271I	7:86415919	TEX11	639	R639*	X:69828950
GRM8	219	S219L	7:126746621	TFDP1	115	G115D	13:114287470
GTF3C1	733	G733W	16:27509111	THSD7A	1526	S1526L	7:11419270
HCFC2	239	G239V	12:104474557	TLR9	901	R901C	3:52255631
HCK	389	V389F	20:30681738	TMEM132C	563	G563S	12:129180490
HCN3	293	S293L	1:155254337	TMEM38A	53	A53T	19:16790827
HEPHL1	687	F687L	11:93819336	TP53	234	Y234H	17:7577581
HERC2	3384	L3384I	15:28414709	TP53	125	T125M	17:7579313
HSD17B7	245	P245L	1:162773312	TP53	241	S241Y	17:7577559
IQUB	735	R735H	7:123092969	TP53	337	R337L	17:7574017
ITGA8	895	R895*	10:15600156	TP53	158	R158H	17:7578457
ITGB2	439	V439M	21:46311821	TP53	152	P152L	17:7578475
ITPR3	1849	R1849H	6:33653483	TP53	151	P151H	17:7578478
JAG1	959	A959V	20:10622148	TP53	254	I254S	17:7577520
JUNB	250	R250L	19:12903334	TP53	232	I232T	17:7577586
KIAA0100	804	N804T	17:26962194	TP53	193	H193Y	17:7578272
KIAA1109	0	-	4:123201138	TP53	244	G244C	17:7577551
KIAA1377	68	R68*	11:101793445	TP53	238	C238F	17:7577568
KIF26B	2024	R2024H	1:245862232	TP53	0	-	17:7577018
KIT	52	D52G	4:55561765	TP53	0	-	17:7577156
KL	920	R920H	13:33638043	TP53	0	-	17:7577157
KRAS	19	L19F	12:25398262	TP53	0	-	17:7578555
KRAS	146	A146T	12:25378562	TPO	585	D585N	2:1491748
KRTAP21-1	15	G15S	21:32127654	TREX2	7	P7H	X:152713281
LAMC1	327	P327S	1:183079747	TRIM37	895	A895V	17:57089700
LRFN5	445	R445H	14:42357162	UBR5	1978	R1978*	8:103292691
MAEA	357	R357H	4:1332266	VHL	127	G127V	3:10188237
MAGI1	971	V971M	3:65365020	WT1	346	T346M	11:32421555
MAK	272	R272*	6:10802142	YIPF1	159	R159Q	1:54337050
MARK4	418	R418H	19:45783969	YSK4	512	I512L	2:135744908
MKNK2	149	F149L	19:2043171	ZDBF2	888	E888K	2:207171914
MKRN3	76	P76Q	15:23811156	ZFHX4	2394	A2394T	8:77766385
MSH2	580	E580*	2:47698180	ZNF429	67	R67Q	19:21713460
MUC16	2683	E2683*	19:9083768	ZNF564	157	R157Q	19:12638452
MYST4	1373	E1373G	10:76788700				

Example 3-Expression and Copy Number Alteration

[0309] The RNA-seq data was used to compute differentially expressed genes between tumor and normal samples (Table 6). The top differentially overexpressed genes include FOXQ1 and CLND1 which have both been implicated in tumorigenesis (Kaneda, H. *et al.*, *Cancer Res.* 70:2053-2063 (2010)). Importantly, in analyzing the RNA-seq data, IGF2 upregulation was identified in 12% (8/68) of the colon tumors examined. A majority (7/8) of the tumors with *IGF2* overexpression also showed focal amplification of the IGF2 locus as measured by Illumina 2.5M array. Overall the differentially expressed genes affect multiple signaling pathways including Calcium Signaling, cAMP-mediated signaling,

Glutamate Receptor Signaling, Amyotrophic Lateral Sclerosis Signaling, Nitrogen Metabolism, Axonal Guidance Signaling, Role of IL-17A in Psoriasis, Serotonin Receptor Signaling, Airway Pathology in Chronic Obstructive Pulmonary Disease, Protein Kinase A Signaling, Bladder Cancer Signaling, HIF1α Signaling, Cardiac β-adrenergic Signaling, Synaptic Long Term Potentiation, Atherosclerosis Signaling, Circadian Rhythm Signaling, CREB Signaling in Neurons, G-Protein Coupled Receptor Signaling, Leukocyte Extravasation Signaling, Complement System, Eicosanoid Signaling, Tyrosine Metabolism, Cysteine Metabolism, Synaptic Long Term Depression, Role of IL-17A in Arthritis, Cellular Effects of Sildenafil (Viagra), Neuropathic Pain Signaling In Dorsal Horn Neurons, D-arginine and D-ornithine Metabolism, Role of IL-17F in Allergic Inflammatory Airway Diseases, Thyroid Cancer Signaling, Hepatic Fibrosis / Hepatic Stellate Cell Activation, Dopamine Receptor Signaling, Role of NANOG in Mammalian Embryonic Stem Cell Pluripotency, Chondroitin Sulfate Biosynthesis, Endothelin-1 Signaling, Keratan Sulfate Biosynthesis, Phototransduction Pathway, Wnt/β-catenin Signaling, Chemokine Signaling, Alanine and Aspartate Metabolism, Glycosphingolipid Biosynthesis – Neolactoseries, Bile Acid Biosynthesis, Role of Macrophages, Fibroblasts and Endothelial Cells in Rheumatoid Arthritis, α-Adrenergic Signaling, Taurine and Hypotaurine Metabolism, LPS/IL-1 Mediated Inhibition of RXR Function, Colorectal Cancer Metastasis Signaling, CCR3 Signaling in Eosinophils, and O-Glycan Biosynthesis.

Table 6 – Differentially Expressed Genes

Gene	Med. Ratio	Gene	Med. Ratio	Gene	Med. Ratio	Gene	Med. Ratio
GRIN2D	5.527911151	ULBP2	3.251373	TMEM35	-5.87287	UBE2QL1	-3.20056
ESM1	5.8492323	PDZRN4	-5.95469	NEGR1	-4.18072	GPT	-3.45351
SCARA5	-5.385767469	KLK6	6.329258	LDB3	-6.44118	CORO6	-3.60142
CLEC3B	-4.299952709	TNS1	-4.19155	ELANE	-3.01674	PKIB	-3.53135
CDH3	5.215804799	TLX2	-3.09629	ABCA6	-3.1197	TRIM9	-3.56341
FAM107A	-3.972772143	PGR	-4.27086	ZNF471	-3.10221	MORN5	-6.87885
ETV4	5.202149185	FXYD6	-3.75281	GFRA1	-4.85831	TRPM6	-4.2107
LIFR	-3.797126397	ENSG00000186198	-3.577	DCLK1	-4.28576	AP3B2	-3.96509
CFD	-3.553187855	CA10	-3.80922	PAPPA2	-4.80217	DYNC1I1	-3.84378
ABCA8	-5.344364012	P2RX2	-3.60054	SFTA2	3.697678	TLX1	3.90657
ADH1B	-6.387892211	SNTG2	-3.04582	MYOCD	-5.20677	SMYD1	-6.92391
CLDN1	5.012197386	ADD2	-3.37298	HMGCLL1	-3.57011	TPO	-3.03245
PCSK2	-6.510043576	C7orf58	-3.71657	SYT9	-3.72752	FEZF1	4.145292
CADM3	-5.656232948	NTNG1	-4.33834	MMP11	3.476176	STXBP5L	-4.38119
GCNT2	-3.893699055	MT1M	-3.55477	PKNOX2	-3.41966	C15orf59	-3.11512
NFE2L3	3.030392992	PPP1R1A	-6.04336	ATP2B2	-3.50563	CSPG4	-3.24734
PLP1	-6.925097821	SPEG	-4.57945	PLIN4	-6.50771	HOXB8	3.758374
GREM2	-4.936580737	RBFOX3	-6.45602	RGS9	-3.41372	DNASE1L3	-3.78422
KRT80	5.779751934	MYL9	-4.27584	GALNTL1	-3.71028	STK32A	-3.58912
GNG7	-3.111266907	GRIK1	-3.25517	VWA2	4.684454	NIPAL4	-3.75232
FIGF	-5.893082321	LRP1B	-3.73288	EPHA7	-5.68169	SYPL2	-3.51243

ABI3BP	-3.927046547	SLC4A11	3.038906	KHDRBS2	-3.32022	BTNL8	-3.56206
BMP3	-6.026497259	FRMPD4	-5.18841	SLC9A9	-3.02137	GDF1	-3.06235
FAM135B	-5.249518149	SALL4	3.82405	CEND1	-3.89797	KRT16	3.228284
TMEM100	-4.113484387	SORBS1	-3.59918	ADH1A	-3.53935	LRRTM4	-3.28156
FOXQ1	5.961706421	LRFN5	-3.93986	FAM70A	-3.22263	CA9	4.115683
PRIMA1	-6.536400714	GDNF	-3.38792	ATP2B3	-4.40254	BEND4	-3.23908
RXRG	-5.17454591	LRRC55	-3.23821	SLC5A7	-5.54508	PENK	-5.56339
NPY2R	-5.14798919	PALM	-3.04045	BCHE	-5.9095	TRPV3	-3.25367
STMN2	-4.313406115	POU5F1B	3.400104	NRG2	-4.68132	ST6GAL2	-3.08256
FGL2	-3.470259436	MSRB3	-3.5926	EPHA5	-4.17595	C9orf71	-4.08237
XKR4	-5.330615225	NACAD	-3.3653	SEMA6D	-3.01017	FLNA	-3.69003
PMP2	-5.699849035	SLC30A10	-5.73614	HAND2	-5.22194	SLC26A3	-5.74678
LGI1	-5.654013059	PRICKLE2	-3.00229	CNN1	-5.8107	TPM2	-3.48339
OGN	-5.532547559	CORO2B	-3.16284	GPC5	-3.57394	C8orf85	-3.63174
STMN4	-5.165270827	JPH2	-4.49583	TUB	-3.23422	MMP3	4.001157
CNTN2	-5.725939567	RNF150	-4.85505	PRKG2	-3.49777	MS4A12	-5.72245
MAL	-4.946126006	SCARA3	-3.1352	ACTG2	-6.10699	NPY	-4.33465
CMA1	-4.728693462	SALL2	-3.43114	SLC25A34	-3.9354	MPPED2	-3.44536
TRIB3	3.512044792	SLC17A8	-4.17524	ZNF229	-3.21126	ALPI	-4.27169
C16orf89	-4.647446159	MAOB	-3.46607	SLC35F1	-3.74017	KCNC1	-3.18694
NKX2-3	-3.772558945	ADAMTS8	-4.17885	RASGEF1C	-4.3263	TMEM72	-4.72328
NRXN1	-6.423571094	OTOP3	-4.14905	ZNF727	-3.30848	FAM163B	-3.57859
SGCG	-4.315399416	PACSIN1	-3.12832	ABCB5	-3.98259	DPP10	-4.59947
ASPA	-4.85466365	UCHL1	-3.37593	LRRK2	-3.12594	CLEC5A	3.260118
PRPH	-5.709414092	TNNI3	3.475204	FAM176A	3.177313	CPNE6	-3.37143
SCGN	-5.617899565	MFAP5	-3.73929	RBM20	-4.1105	ITGB1BP2	-3.00778
FXYD1	-4.366726331	ITGA7	-3.5897	MEIS1	-3.19375	SLITRK5	-3.90369
PDK4	-3.783018003	DNAJB5	-3.77773	DES	-6.69236	PLA2G5	-3.71785
SCN9A	-4.210073456	C14orf180	-3.28894	C1QTNF9	-3.92526	UCN3	-3.72869
LYVE1	-4.003213022	CA1	-6.9112	SLC17A7	-3.3932	CALD1	-3.05258
ADCY5	-4.897621234	ATP2B4	-3.48549	EFHC2	-3.27123	STON1-GTF2A1L	-3.0375
SCN11A	-4.89796532	MRVI1	-3.02877	TMEM130	-4.36447	PDE6A	-3.60006
LGI4	-3.654270687	SIGLEC6	-3.16606	DIRAS1	-3.16403	KRT6B	4.798528
TNXB	-4.618096417	CCBE1	-5.06789	ZMAT4	-3.40709	GPIHBP1	-3.50724
TUBB4	-5.392668311	BVES	-4.20565	PTPRZ1	-5.77615	KLK10	3.487382
AFF3	-4.544564729	TMIGD1	-6.41231	CPEB1	-4.46103	C4orf39	-3.02818
PDX1	4.962327216	KCNQ5	-4.00333	PHOX2A	-4.23422	STAC	-3.35799
FHL1	-5.16962219	L1CAM	-4.14268	NLGN4X	-3.04296	CRLF1	-3.20379
TMEFF2	-4.698800032	PTH1R	-3.19452	ATP6V1G2	-3.55979	SLC4A10	-3.13074
SLCO4A1	3.054897403	MYEOV	3.166568	BEST4	-5.95684	AKR1B10	-3.46237
MGAT4C	-3.527256991	SLC2A4	-4.46266	THRB	-3.20412	CST2	3.483231
MMRN1	-4.358473391	ZCCHC12	-3.49788	WISP2	-5.3983	NKX3-2	-3.21332
KIAA1199	4.989222927	VIPR2	-3.68461	GRIK5	-4.77377	REEP1	-3.46272
PLAC9	-3.544659302	PSD	-5.87501	DARC	-3.24148	HRASLS5	-4.03008
PI16	-6.329320626	CHRNA3	-3.10067	C6orf174	-3.92882	TUSC5	-4.62354

MAMDC2	-6.16899378	NRXN2	-3.13659	GUCA2A	-5.3278	KRT23	4.884049
SFRP1	-5.719553754	C8orf46	-4.37921	SLC6A15	-4.37144	TUBB2B	-3.24294
ANK2	-4.698529299	GPR17	-3.52967	AOC3	-3.97636	CPLX2	-3.94707
SPHKAP	-3.648224781	CACNA1H	-3.64108	NGFR	-3.93572	DSCR6	3.028702
SCN7A	-7.144549308	DKK4	3.476871	LGI3	-4.24132	FCER2	-4.78069
ENSG000 00170091	-5.71036492	PDLIM3	-3.71073	NFASC	-3.11179	MYADML2	3.209455
CDH19	-6.322889292	SCN3B	-3.3718	GRIA1	-3.57011	KCNA2	-3.13365
SCG2	-3.422093337	GYLTL1B	4.082537	SYP	-3.15922	SV2C	-3.78632
CXCL12	-3.487164375	AGTR1	-4.79524	EPHX4	3.512462	DCHS2	-4.2511
CDH10	-3.421342024	ULBP1	3.320975	DUSP26	-4.13989	PCYT1B	-3.17282
RERGL	-5.731261829	AQP8	-7.23747	CTHRC1	3.080178	ZNF385B	-3.25358
MPZ	-3.920611558	ARL4D	-3.38549	PCDH9	-4.11247	PTGIS	-3.7594
SYT10	-4.190609336	FAM46B	-4.53516	CA7	-6.19335	C6orf168	-3.30589
RELN	-3.986177885	RND2	-3.61077	EGFL6	3.166084	SNCA	-3.01935
CMTM5	-4.756084449	ARHGEF25	-3.24015	FBXO32	-3.02151	LRAT	-3.89481
CTNND2	-4.740498304	PRKAA2	-4.51677	PYY	-6.36724	TMEM74	-3.406
NOVA1	-5.061410431	TACR1	-3.80639	KIAA1644	-5.0075	SCN4A	-3.72869
CADM2	-5.485961881	NBEA	-3.79003	NRSN1	-4.23319	CA2	-5.11198
ZNF536	-4.571820763	FABP4	-5.42586	SEMA3E	-5.7604	SLC8A2	-4.48591
RBM24	-3.569579564	ODZ1	-3.89586	C1orf173	-3.89609	KCNA5	-3.45695
S100B	-3.827538343	C5orf4	-3.0289	CCL23	-4.10995	TPH1	-3.20483
ADHFE1	-3.662707626	PPP1R14A	-4.03457	ATP1B2	-3.35903	WSCD2	-4.87618
GLP2R	-4.345544907	HTR1D	3.884431	DIRAS2	-4.285	KCNMB2	-3.10173
PHOX2B	-5.937887122	MMP13	3.671083	CXCL3	3.414119	ENSG000 00241186	3.118557
VAT1L	-3.228136479	RPH3A	-3.35741	PCP4L1	-5.84118	CIDEA	-3.26865
PIRT	-6.031181735	SGCA	-4.55537	C2orf70	3.623413	GABRB3	-4.50283
SDPR	-4.38545828	MAPK15	3.320975	NPTX1	-6.3263	KCNIP1	-3.16613
GRIK3	-5.197048843	FEV	-4.02478	PCOLCE2	-3.83253	C6orf105	-3.61541
GSTM5	-3.615514934	GDF15	3.02245	HEPACAM	-4.285	NOTUM	4.401768
SST	-5.824093007	RIMS4	-4.24267	CNTNAP3	-4.46258	KLHL34	-3.1504
PKHD1L1	-4.242036298	SULT1A2	-3.79483	CAV1	-3.2595	C1orf70	-3.00556
SLC7A14	-5.520042397	C6orf186	-4.60198	KIAA1045	-4.0874	CLDN8	-4.97278
CHRDL1	-5.107430525	TTYH1	-3.33098	LRRTM1	-4.44609	DPEP1	6.134526
DPT	-5.051072538	HSPB7	-4.74217	SEZ6L	-4.32666	SCNN1G	-4.65465
NAP1L2	-4.961540922	SLITRK3	-6.10753	CRYAB	-3.85914	STRA6	3.757395
SOX10	-5.724445462	CD1C	-3.12922	ADAMTSL3	-4.67756	OMD	-3.85155
CTSG	-4.258813557	GPR133	-3.04867	ELAVL3	-4.63805	CARTPT	-5.03476
KIAA1257	3.264630691	EDN3	-3.70756	CCL21	-3.44647	CCL24	3.328538
CNR1	-5.472912411	KCNA1	-4.65058	SYT5	-4.12123	SLCO1B3	4.350979
C2orf88	-3.489231209	RERG	-3.17221	GFRA3	-5.01204	PLIN1	-4.0474
VIP	-4.860630378	CA14	-3.58713	FIGN	-3.00533	TMEM82	-3.60685
TMEM151B	-5.008283549	SORCS3	-4.02347	PCDH10	-4.341	CALB2	-3.70005
ANO5	-4.232602678	ZG16	-5.39174	MMP7	6.216617	CES1	-3.1966
PTN	-3.44306466	CNTNAP3B	-3.6873	SPARCL1	-3.36702	DAO	-4.48241

ST8SIA3	-4.79377543	DOCK3	-3.39657	OTOP2	-8.12168	INSL5	-5.05983
MUSTN1	-3.245149184	DACT3	-3.71844	CNTD2	4.300648	AK5	-3.0314
GFRA2	-3.811511174	SIM2	3.536988	SFRP5	-5.11522	KRTAP13-2	-4.63517
ATP1A2	-7.307217248	CHRM2	-7.34891	ABCA9	-3.81151	NXPH3	-3.40456
PRKCB	-3.797860637	PTPRT	-3.37251	BEND5	-3.66782	GTF2A1L	-3.15117
FAM123A	-3.035990832	ADH1C	-3.51198	FAM163A	-3.67521	CWH43	-4.40603
ANGPTL7	-5.947492322	FAM189A1	-3.40677	TMEM132B	-3.32426	CDO1	-3.38273
WNT2	4.717355945	ASCL2	3.879815	COL11A1	4.703239	DSG3	3.778247
ARPP21	-3.941970851	SERTM1	-3.06772	IGFBP6	-3.05252	TMEM211	3.460662
DNER	-4.314790344	POPDC2	-4.95848	PYGM	-5.86766	PRUNE2	-3.08848
VSTM2A	-5.109872721	WBSCR17	-3.51278	LYNX1	-3.79672	PKP1	3.65574
GPM6B	-4.031255119	SULT4A1	-5.00147	ST8SIA1	-3.0922	NPPC	-3.53724
MYOM1	-4.650824187	HLF	-3.91765	TLL1	-3.01592	RAET1L	3.027935
ASTN1	-5.126882925	DDN	3.337204	EML1	-3.36098	DHRS9	-3.13217
RASGRP2	-3.503626906	MAP1B	-3.10167	SLC4A4	-4.54921	CCDC136	-3.33404
C6orf223	4.226814021	CLDN11	-3.45731	MAP2	-3.16049	CDON	-3.00288
ANGPTL1	-5.424044031	PLCXD3	-4.84211	CCNO	3.479898	PRDM6	-3.28755
ENPP6	-3.963010538	MAP6	-3.67268	COL19A1	-3.66553	PCSK1N	-4.0894
LRRN2	-3.5025362	MADCAM1	-3.50743	HTR3A	-4.72177	CCL19	-3.40271
BAALC	-3.426625507	CTNNA2	-4.70269	CNTN1	-4.35232	DLX1	-3.38643
C2orf40	-5.929905648	RET	-3.70964	ADRA1A	-3.46392	NKAIN2	-3.32274
ATCAY	-5.088408777	AZGP1	3.513263	DMD	-3.60911	KLK7	3.937762
ADAM33	-3.969644735	VWC2	-3.11767	TMEM179	-3.23581	GPR15	-3.81204
IGSF10	-4.187581248	GCG	-5.94559	TACR2	-5.57163	FAM19A4	-3.27095
INHBA	3.61816183	STK31	3.869912	DPYSL5	-4.68945	TMEM236	-3.94135
ADCYAP1R1	-5.525027043	OSR1	-3.8245	CSRP1	-3.16604	RGS13	-3.26189
GRIN2A	-4.44436921	TAGLN	-3.54734	SCNN1B	-4.78493	ADAMTS19	-3.28724
CHL1	-3.413871889	RAB9B	-3.67691	CNTFR	-5.48107	AFF2	-3.37251
NTN1	-3.354856128	FBXL22	-3.44664	GPM6A	-7.05382	HS6ST2	3.561665
MYLK	-4.40930035	NPAS3	-3.21742	CASQ2	-6.97291	MMP10	3.376316
FOXF2	-3.273857064	FGF10	-3.65639	CHGB	-4.37302	ADRA1D	-3.54704
USP2	-3.134670717	ADCY2	-3.40603	EEF1A2	-4.32423	COMP	3.932262
CNGB1	-3.796951333	GRHL3	3.473116	RBPMS2	-5.2819	SMPX	-5.10753
PTGS1	-3.928784334	DDR2	-3.12621	MMP1	4.611965	CYP4B1	-3.06758
JAM2	-3.225588456	EPHA6	-5.87065	TAGLN3	-5.51147	LGALS9C	-3.00879
SETBP1	-3.299570168	WNT7B	3.107819	ASXL3	-3.25378	FAM150A	3.651605
C2CD4A	4.171923278	TNS4	3.872147	CNKSR2	-3.76265	TG	3.001709
MAB21L1	-4.648224781	ENSG00000172901	-3.34783	FGFBP2	-3.4953	ANPEP	-3.23022
HBB	-3.10879867	CACNA2D1	-3.1969	GHR	-3.12319	TNFRSF13B	-3.86004
VSNL1	3.375999204	AQP4	-3.03599	CELF4	-4.19572	HSPB3	-3.48254
NGB	-5.687368193	TWIST2	-3.06429	CUX2	-3.78755	CD22	-3.53242
MYOC	-6.743818793	SCRG1	-5.53503	DLG2	-3.41983	HSD17B2	-3.25123
KIF1A	-5.583478047	FNDC9	-3.67385	GRIA2	-3.13335	CLEC17A	-3.32539
LEMD1	5.429399854	C11orf86	-4.68391	SPIB	-4.95933	FAM5C	-3.97373
KRT24	-5.939566634	SULT2B1	3.1843	AR	-3.46973	RPRM	-4.18572

CHODL	-4.306804825	PNCK	-5.38004	LMX1A	-3.07579	PCP4	-4.67099
MYH11	-6.614033693	ZDHHC15	-3.06835	NAP1L3	-3.15647	PIWIL1	3.12939
SCN2B	-5.019950619	CLDN2	5.310113	HEPN1	-3.48966	BLK	-3.69271
BAI3	-5.029545504	FILIP1	-3.78534	SLITRK2	-3.62411	SLC17A4	-3.31472
SORCS1	-5.345853041	ABCC8	-3.0022	FAM181B	-4.05256	PEG10	-3.43391
SYNPO2	-5.938491333	CAP2	-3.2824	KRT222	-3.88727	ZIC2	3.206285
C9orf4	-3.946781299	LIX1	-4.29903	RASD2	-3.08403	UGT2A3	-3.67931
C7	-4.817175938	PRRT4	-3.06141	ENSG00000156475	-3.70456	TF	-4.10524
HSPB6	-5.759563929	B3GALT1	-3.69549	ABCG2	-4.10507	THBS4	-4.81204
OLFM3	-5.152622362	CPNE4	-3.60054	AKAP6	-3.99525	ENSG00000181495	-3.35886
SNAP91	-5.039150058	STAC2	-3.70576	KCNMB1	-5.21732	FCRLA	-3.79316
ASB2	-4.463866848	PPP1R3C	-3.27984	FOXD3	-4.61265	TLR10	-3.13859
HPSE2	-3.786836392	NECAB2	-3.2714	MRGPRF	-3.788	CXCL5	4.082364
C12orf53	-3.50784602	ASB5	-6.21444	ANKRD35	-3.15042	PRSS33	3.145979
CHGA	-5.718288794	PTPRN	-3.45244	HSPB8	-5.19288	PHYHIP	-3.00667
KIF5A	-4.179157002	NNAT	-4.58578	IBSP	3.429821	ASPG	-3.38654
CCDC69	-3.785092508	MGP	-3.10442	CFL2	-3.60155	C6	-3.27127
PPP1R12B	-3.964688977	WDR72	4.380471	CNGA3	-4.70795	MYPN	-3.1019
GPER	-3.374629722	CLMP	-3.01603	KCNB1	-5.91463	B4GALNT2	-3.65998
RIC3	-5.121450191	KRT6A	3.797132	PRELP	-4.32292	B3GALT5	-3.27156
CAMK2A	-3.315318636	MPP2	-3.37321	KIRREL3	-3.7696	MT1H	-3.33951
UNC5D	-3.456610995	PCK1	-3.24127	CST1	6.01139	SLC6A19	-5.20458
NLGN1	-5.36205776	KCNK2	-3.80447	CNTN3	-3.89004	WFIKKN2	-3.02818
CBLN2	-4.410205906	IL11	3.803898	LIMS2	-3.73614	HRASLS2	-3.11679
CLU	-3.575663389	LGR5	3.195895	BEX1	-5.05729	FCRL1	-3.96835
C1orf95	-5.541950034	CRABP1	-4.05718	FOXP2	-4.26963	PNPLA3	3.007076
ENTPD3	-3.440071356	UNC80	-3.71831	BHMT2	-4.36555	TEX11	-3.50005
ZBTB16	-5.143639363	CASQ1	-4.56195	TCEAL2	-5.6985	CNR2	-3.60619
MAPK4	-6.268370446	UST	-3.03978	FLNC	-5.09657	UNC93A	3.098461
ENSG00000234602	3.542010519	NOS1	-6.01896	SYNGR1	-3.54338	MS4A1	-4.05133
PDE2A	-3.622736206	JPH3	-3.656	CXCL1	3.08057	FAM129C	-3.4555
CPNE7	4.696574774	CPB1	-3.22272	SEMA3D	-3.33337	PTGDR	-3.38298
RALYL	-3.54986467	ATRNL1	-4.89143	CAND2	-3.47155	SOX2	-3.87896
CHST9	-3.858149202	LRRC4C	-3.78069	GRIA4	-3.67598	TCL1A	-4.87298
SLIT3	-3.701786983	KCNK3	-4.66311	KIAA0408	-4.1775	NEUROD1	-3.91126
SRPX	-3.676380924	KY	-4.27669	KLK8	4.906754	FCRL4	-3.59163
ALK	-4.400128747	SNAP25	-4.69627	REEP2	-3.92231	ABCB11	-3.61699
FMN2	-5.931523283	AKAP12	-3.03021	CILP	-4.88337	OR51E2	-3.21721
MED12L	-3.505446576	ADRB3	-3.86996	COL10A1	6.229643	MSLN	3.156575
GNAO1	-5.424519258	NPTXR	-3.0905	PTCHD1	-5.72018	NTSR1	-4.19058
GABRG2	-4.48694237	C10orf140	-3.44724	FGF13	-3.1075	SFRP2	-3.06381
PLEKHN1	3.36299512	EXTL1	-3.23226	TCEAL6	-3.90028	CR2	-4.33926
PGM5	-5.403079028	TCN1	5.883899	PRSS22	3.796724	CNTNAP5	-3.28156
IGSF11	-5.005562617	SOHLH2	-3.7527	CD300LG	-4.20088	HS3ST5	-3.32274

RYR3	-4.359671118	SLC26A2	-3.4259	ZDHHC22	-4.05715	GDF5	-3.6779
FAM189A2	-3.291843764	ANO3	-3.40677	GPRASP1	-3.07048	IGJ	-3.37943
SCN3A	-3.249263581	SERPINB5	3.010596	SV2B	-3.47286	SLC6A17	-3.03858
ZIM2	-3.923857044	TACSTD2	3.803266	NDE1	-4.07805	CEACAM7	-3.71794
MUSK	-4.806618761	COL21A1	-3.21866	CTNNA3	-4.63484	NPR3	-3.0056
PDZD4	-4.652064044	CLCA4	-5.73343	DMRTA1	-3.4379	HSD3B2	-3.65443
LCN6	-3.528251776	WNT9A	-3.10701	HTR4	-4.20483	SLC6A20	3.640564
IL8	3.733680463	SCG3	-4.84991	CA4	-5.90306	PITX2	3.733959
OTX1	5.606699636	DSCAML1	-4.05228	NPAS4	-3.90303	VPREB3	-3.55929
NTRK3	-4.190549367	WDR17	-4.00891	NECAB1	-4.4301	CLCA1	-4.54287
SPOCK3	-5.313979085	ADIPOQ	-6.95511	MAPT	-4.07028	SI	-3.14912
FAM129A	-4.00370568	TESC	3.379012	TNNT3	-3.6104	PLA2G2D	-3.10473
NEFM	-4.972634341	HAND1	-7.23383	INA	-4.86742	FSTL5	-3.95247
TMEM59L	-4.351475682	ART4	-3.18603	LMO3	-6.04405	FCRL3	-3.28603
TCEAL5	-4.044195288	GLDN	-3.09313	CLIP4	-3.26924	C4orf7	-4.10287
SNCG	-3.194688135	KCNIP3	-3.54139	MASP1	-5.93003	SERPINA9	-3.05435
SLC27A6	-3.944375846	SLIT2	-3.26504	SEZ6	-3.81918	LEP	-3.10313
GAD1	4.607492087	RNF183	3.39193	SYT4	-5.08841	PAX5	-3.45097
CAMK2B	-3.748134652	LRCH2	-3.28776	CLVS2	-3.44001	CNNM1	-3.01846
ARHGAP20	-3.301303729	SH3GL2	-3.57011	TCEAL7	-3.00191	MEP1B	-3.1861
GUCA2B	-7.224954766	KCTD8	-3.83424	PLN	-4.77387	OTC	-3.16879
MYOT	-4.653308928	CHRNB4	-3.62563	KCTD4	-3.30001	ITLN1	-3.06475
VIT	-3.54751268	CERS1	-3.17135	SLC10A4	-3.7343	GALNT13	-3.23173
LONRF2	-6.377805944	CHD5	-3.20136	C1QTNF7	-4.12134	FCGBP	-3.06625
LMOD1	-5.04599233	DTNA	-3.82362	RSPO2	-5.33522	REG1A	3.21229
CALY	-5.271272834	CCDC80	-3.0985	P2RY12	-3.56585	GP2	-3.17456
GAP43	-4.71341546	ENSG00000166869	-3.90266	CHST8	-3.13524	APOB	-4.0069
MYT1L	-3.629480911	CPXM2	-4.17959	STOX2	-3.05401	FABP6	4.971592
ELAVL4	-4.406765367	DAND5	-3.98467	MAB21L2	-5.0333	REG3A	4.052759
JPH4	-3.596788653	DGKB	-4.15446	SLC18A3	-3.99774	GDF10	-3.18603
RGMA	-3.985267039	HIF3A	-3.6805	IL17B	-3.26935	TTR	-3.00706
KCNMA1	-4.992859998	HPCAL4	-3.24851	SHISA3	-3.12044	MTTP	-3.07406
KIAA2022	-5.25714319	CCDC169	-3.48135	RAB3C	-3.7531		

[0310] Copy number alterations in 74 tumor/normal pairs were assessed by applying GISTIC to the PICNIC segmented copy number data. In addition to the *IGF2* amplifications, known amplifications were found involving *KRAS* (13%; 10/74) and *MYC* (31%; 23/74) located in a broad amplicon on chromosome 8q (Table 7). Focal deletion involving *FHIT*, a tumor suppressor was observed in 21% (16/74) of the samples (Table 8). *FHIT*, which encodes a diadenosine 5',5'''-P1,P3-triphosphate hydrolase involved in purine metabolism, has previously been reported to be lost in other cancers (Pichiorri, F. *et al.*, *Future Oncol.* 4:815-824 (2008)). Deletion of *APC* (18%; 14/74) and *SMAD4* (29%; 22/74) was also observed. Finally, chromosome 20q was found to be frequently gained and in contrast, 18q to be lost.

[0311] When copy number alterations were analyzed using PICNIC probe-level copy number calling, CBS segmentation of the copy number tumor/normal ratios and GISTIC on these tumor/normal ratios, the top set of genes with copy number alterations were similar though the percentages varied slightly. Known amplifications involving KRAS (13%; 10/74) and MYC (23%; 17/74) located in a broad amplicon on chromosome 8q. Deletion involving FHIT, a tumor suppressor was observed in 30% (22/74) of the samples. Deletion of APC (8%; 6/74), PTEN (4%, 3/74) and SMAD3 (9%, 10/74). SMAD4 and SMAD2 are both altered in 27% (20/74) of the samples and are located within 3 Mb from each other on 18q which is frequently lost.

Table 7 - Genes with significant copy number gain

GeneName	Freq.	GeneName	Freq.	GeneName	Freq.	GeneName	Freq.
LYZL1	0.040541	SMOX	0.216216	OSR2	0.27027	ANGPT1	0.256757
TH	0.108108	MRPS33P4	0.364865	SYBU	0.243243	FAM91A1	0.297297
IGF2	0.108108	SUMO1P1	0.364865	GPR20	0.243243	PLEKHF2	0.202703
INS-IGF2	0.108108	C20orf112	0.351351	SQLE	0.324324	C8orf37	0.202703
INS	0.108108	COMMD7	0.351351	VPS13B	0.324324	RALYL	0.243243
ERC1	0.121622	DNMT3B	0.337838	KIAA0196	0.324324	ATAD2	0.256757
RAD52	0.121622	CDK5RAP1	0.337838	MMP16	0.243243	C8orf34	0.216216
CASC1	0.135135	RALY	0.351351	STAU2	0.256757	ZFPM2	0.27027
LRMP	0.121622	EIF2S2	0.351351	NSMCE2	0.324324	KCNK9	0.27027
C12orf77	0.108108	ASIP	0.364865	CSMD3	0.283784	TRAPPC9	0.27027
IFLTD1	0.162162	AHCY	0.364865	TRIB1	0.256757	OXR1	0.310811
C12orf5	0.094595	ITCH	0.405405	FAM84B	0.283784	CHMP4C	0.243243
SLCO1A2	0.121622	KIF16B	0.256757	POU5F1B	0.351351	SCRIB	0.243243
IAPP	0.121622	CHRNA4	0.378378	MYC	0.310811	TMED10P1	0.243243
PYROXD1	0.121622	KCNQ2	0.378378	TOX	0.27027	RHPN1	0.283784
RECQL	0.121622	EEF1A2	0.378378	TMEM75	0.283784	MAFA	0.27027
GOLT1B	0.108108	C20orf203	0.351351	GSDMC	0.256757	ZC3H3	0.27027
C12orf39	0.108108	BAK1P1	0.351351	FAM49B	0.27027	GSDMD	0.256757
GYS2	0.108108	BPIFB5P	0.337838	COX6C	0.27027	C8orf73	0.256757
LDHB	0.108108	BPIFB9P	0.337838	RGS22	0.283784	PUF60	0.243243
NECAP1	0.135135	TPM3P2	0.351351	ASAP1	0.256757	NAPRT1	0.256757
SLC2A14	0.135135	RPS2P1	0.351351	TRPS1	0.22973	NRBP2	0.243243
NANOGP1	0.135135	XPOTP1	0.364865	FBXO43	0.27027	EEF1D	0.243243
SLC2A3	0.135135	CDC42P1	0.391892	POLR2K	0.27027	EPPK1	0.243243
LYRM5	0.135135	ITCH-AS1	0.391892	ADCY8	0.27027	PLEC	0.22973
KRAS	0.135135	ITCH-IT1	0.391892	GDAP1	0.256757	SLC39A4	0.22973
POTEM	0.067568	FDX1P1	0.391892	EIF3H	0.22973	VPS28	0.22973
OR4N2	0.067568	HMGB3P1	0.378378	SPAG1	0.297297	TONSL	0.22973
OR4Q3	0.067568	MT1P3	0.378378	RNF19A	0.310811	CYHR1	0.22973
OR4M1	0.067568	NCRNA00154	0.378378	EFR3A	0.256757	WISP1	0.22973
OR4K2	0.067568	SYS1-DBNDD2	0.351351	CRISPLD1	0.256757	NDRG1	0.22973
OR4K5	0.067568	SRMP1	0.351351	UTP23	0.22973	ODF1	0.310811
OR4K1	0.067568	TOP3B	0.081081	ANKRD46	0.297297	KLF10	0.310811
C14orf17	0.067568	IGLVI-70	0.081081	HNF4G	0.27027	COL14A1	0.27027
OR11K2P	0.067568	IGLV4-69	0.081081	OC90	0.256757	AZIN1	0.310811
OR4H12P	0.067568	IGLVI-68	0.081081	NKAIN3	0.256757	ESRP1	0.283784
OR4K6P	0.067568	IGLV10-67	0.081081	HHLA1	0.256757	ST3GAL1	0.256757
MIR193B	0.108108	IGLVIV-66-1	0.081081	ZFHX4	0.243243	ZBTB10	0.283784

MIR365-1	0.108108	IGLVV-66	0.081081	SNX31	0.297297	ZFAT	0.256757
SHISA9	0.081081	IGLVIV-65	0.081081	KCNQ3	0.256757	ATP6V1C1	0.310811
ERCC4	0.108108	IGLVIV-64	0.081081	PABPC1	0.310811	ZNF704	0.243243
MKL2	0.094595	IGLVI-63	0.081081	MED30	0.22973	ZNF7	0.202703
MIR144	0.081081	IGLV1-62	0.081081	PEX2	0.243243	MRPL13	0.243243
MIR451	0.081081	IGLV8-61	0.081081	EXT1	0.27027	C8orf56	0.310811
C17orf63	0.081081	IGLV4-60	0.081081	PKIA	0.283784	MTBP	0.243243
ERAL1	0.081081	IGLVIV-59	0.081081	LRRC6	0.216216	BAALC	0.310811
NUFIP2	0.081081	IGLVV-58	0.081081	FAM164A	0.283784	PMP2	0.283784
TAOK1	0.081081	IGLV6-57	0.081081	IL7	0.283784	SNTB1	0.310811
ABHD15	0.081081	IGLVI-56	0.081081	SAMD12	0.256757	FABP9	0.283784
TP53I13	0.081081	IGLV11-55	0.081081	TNFRSF11B	0.27027	HAS2	0.324324
GIT1	0.081081	IGLV10-54	0.081081	STMN2	0.256757	FABP4	0.283784
ANKRD13B	0.081081	IGLVIV-53	0.081081	YWHAZ	0.297297	FZD6	0.310811
CORO6	0.081081	PRAMEL	0.081081	TMEM71	0.216216	FABP12	0.283784
SSH2	0.081081	FAM108A6P	0.081081	COLEC10	0.27027	COMMD5	0.202703
TRAF4	0.081081	SOCS2P2	0.081081	NOV	0.243243	IMPA1	0.283784
ZNF761	0.135135	BMP6P1	0.081081	ENPP2	0.283784	ZNF250	0.202703
TPM3P6	0.135135	SPINK5	0.027027	PHF20L1	0.216216	ZHX2	0.27027
ZNF813	0.148649	SPINK14	0.027027	ZNF706	0.27027	CTHRC1	0.283784
ZNF331	0.135135	SNORA9	0.202703	GRHL2	0.297297	DERL1	0.22973
GHRH	0.337838	SNORA5A	0.202703	TG	0.22973	SLC25A32	0.283784
CTNNBL1	0.351351	SNORA5C	0.202703	TAF2	0.283784	DCAF13	0.283784
KIAA1755	0.337838	SNORA5B	0.202703	TPD52	0.22973	WDR67	0.22973
BPI	0.337838	RNU7-35P	0.216216	NCALD	0.297297	ZNF16	0.243243
LBP	0.337838	DNAH11	0.216216	DSCC1	0.27027	SLC10A5	0.283784
PTPRT	0.297297	RAMP3	0.202703	DEPTOR	0.27027	RIMS2	0.243243
TOX2	0.378378	NACAD	0.202703	RRM2B	0.283784	ZNF252	0.243243
JPH2	0.364865	TBRG4	0.202703	SLA	0.22973	KHDRBS3	0.202703
MATN4	0.351351	C7orf40	0.202703	UBR5	0.310811	C8orf77	0.243243
RBPJL	0.351351	CCM2	0.202703	ENY2	0.27027	C8orf33	0.243243
SDC4	0.351351	GLCCI1	0.22973	EYA1	0.27027	CPA6	0.22973
SYS1	0.351351	ICA1	0.216216	NDUFB9	0.297297	C8orf38	0.202703
TP53TG5	0.351351	MYO1G	0.202703	DENND3	0.256757	ZFAND1	0.283784
DBNDD2	0.351351	CDCA7L	0.216216	POP1	0.243243	FAM135B	0.243243
PIGT	0.351351	AQP1	0.202703	MTSS1	0.283784	PREX2	0.256757
WFDC2	0.351351	STEAP1B	0.216216	PKHD1L1	0.27027	FAM83A	0.243243
C20orf123	0.351351	POU6F2	0.22973	NIPAL2	0.256757	TM7SF4	0.22973
SLC13A3	0.351351	HECW1	0.216216	STK3	0.310811	C8orf76	0.256757
ZFP64	0.405405	KIAA0087	0.216216	NUDCD1	0.27027	DPYS	0.22973
TSHZ2	0.364865	CREB5	0.216216	RSPO2	0.310811	COL22A1	0.256757
BCAS1	0.364865	CHN2	0.216216	TSPYL5	0.22973	LRP12	0.22973
MIR499	0.378378	HECW1-IT1	0.216216	MTDH	0.216216	ZHX1	0.256757
MIR644	0.391892	RNU7-67P	0.256757	LAPTM4B	0.256757	FAM83H	0.243243
EDEM2	0.378378	RNU7-84P	0.256757	EIF3E	0.310811	TRAPPC2P2	0.27027
PROCR	0.378378	RNY4P5	0.22973	FER1L6	0.310811	PRKRIRP7	0.283784
MMP24	0.378378	MIR1208	0.283784	TMEM65	0.324324	RPL3P9	0.256757
EIF6	0.378378	MIR548D1	0.256757	TRMT12	0.310811	RPSAP47	0.283784
FAM83C	0.378378	MIR1204	0.310811	RNF139	0.310811	MCART5P	0.243243
DYNLRB1	0.391892	MIR1205	0.283784	TATDN1	0.310811	CKS1BP7	0.243243
MAP1LC3A	0.391892	MIR1207	0.283784	TTC35	0.256757	HMGB1P41	0.243243
PIGU	0.391892	MIR30B	0.243243	TMEM74	0.27027	BOP1	0.22973
TP53INP2	0.378378	MIR30D	0.243243	TRHR	0.310811	HSF1	0.22973

NCOA6	0.378378	MIR937	0.243243	WDYHV1	0.256757	DGAT1	0.22973
GGT7	0.378378	MIR939	0.22973	C8orf17	0.202703	PTP4A3	0.283784
ACSS2	0.378378	MIR1234	0.22973	CHRAC1	0.189189	SCRT1	0.22973
GSS	0.378378	MIR2053	0.27027	EIF2C2	0.22973	GPR172A	0.22973
MYH7B	0.378378	MIR548A3	0.22973	FBXO32	0.297297	TSNARE1	0.216216
TRPC4AP	0.378378	MIR1273	0.256757	KLHL38	0.310811	FBXL6	0.22973
EBAG9	0.22973	MIR875	0.283784	ANXA13	0.310811	BAI1	0.243243
KCNS2	0.243243	MIR599	0.283784	ABRA	0.256757	ARC	0.243243
ZNF572	0.310811	SLC45A4	0.243243	PTK2	0.22973	ADCK5	0.22973
CPSF1	0.22973	LY6H	0.256757	MAL2	0.27027	TSTA3	0.22973
PSCA	0.256757	ZNF707	0.243243	RPL35AP19	0.256757	LY6E	0.256757
LY6K	0.256757	GPIHBP1	0.22973	MRPS36P3	0.256757	ZNF623	0.243243
C8orf55	0.256757	ZFP41	0.256757	HMGB1P19	0.22973	AK3P2	0.256757
SLURP1	0.256757	GLI4	0.256757	UBA52P5	0.256757	C8orf31	0.256757
LYPD2	0.256757	ZNF696	0.256757	DUTP2	0.256757	C8orf51	0.283784
LYNX1	0.27027	TOP1MT	0.283784	IMPDH1P6	0.256757	MTND2P7	0.256757
LY6D	0.27027	CCDC166	0.243243	FER1L6-AS1	0.310811	MAPRE1P1	0.22973
GML	0.27027	MAPK15	0.243243	ARF1P3	0.310811	TMCC1P1	0.27027
CYP11B1	0.256757	FTH1P11	0.283784	RPL19P14	0.283784	NCRNA00051	0.22973
TIGD5	0.243243	IMPA1P	0.283784	MRP63P7	0.27027	JRK	0.243243
PYCRL	0.243243	NIPA2P4	0.283784	GAPDHP62	0.297297	HPYR1	0.216216
CYP11B2	0.256757	RPS26P34	0.283784	RPS26P6	0.297297	ST13P6	0.256757
HNRNPA1P4	0.27027	PVT1	0.310811	RPS10P16	0.22973	RPL5P24	0.310811
TAGLN2P1	0.256757	NACAP1	0.256757	RPS26P35	0.243243	MTND1P5	0.310811
HMGB1P46	0.256757	RPS12P15	0.310811	RPS17P14	0.27027		
PGAM1P13	0.27027	POU5F1P2	0.310811	TPM3P3	0.243243		

Table 8 - Genes with significant copy number loss

GeneName	Freq.	GeneName	Freq.	GeneName	Freq.	GeneName	Freq.
ZNF29P	0.216216	APC	0.189189	CDH20	0.297297	PBK	0.175676
CDRT15L1	0.216216	MRO	0.297297	NEFL	0.162162	INTS10	0.243243
IL6STP1	0.216216	ME2	0.310811	RNF152	0.297297	FBXO16	0.189189
MEIS3P1	0.216216	ELAC1	0.297297	PIGN	0.297297	FZD3	0.202703
NCRNA00188	0.243243	TRAPPC8	0.297297	KIAA1468	0.310811	EXTL3	0.189189
HS3ST3A1	0.243243	SMAD4	0.297297	PHLPP1	0.297297	RBFOX1	0.121622
COX10	0.22973	MEX3C	0.283784	ZNF521	0.297297	IRF2	0.202703
CDRT15	0.22973	DCC	0.364865	VPS4B	0.283784	PPP2CB	0.216216
PMP22	0.216216	MBD2	0.351351	SERPINB7	0.27027	CASP3	0.202703
TEKT3	0.22973	POLI	0.351351	SERPINB2	0.310811	TEX15	0.22973
MACROD2-AS1	0.189189	STARD6	0.364865	SERPINB10	0.310811	PURG	0.22973
GAS7	0.243243	C18orf54	0.364865	HMSD	0.310811	WRN	0.22973
MYH13	0.216216	C18orf26	0.324324	SERPINB8	0.297297	NRG1	0.202703
TRIM16	0.216216	RAB27B	0.310811	CHST9	0.297297	CCDC111	0.202703
ZNF286A	0.216216	KIAA1456	0.216216	CDH7	0.405405	MLF1IP	0.202703
TBC1D26	0.216216	MTND4P7	0.22973	CDH2	0.297297	SORBS2	0.22973
TTC19	0.22973	RNF138	0.297297	CDH19	0.391892	MIR1539	0.243243
DSEL	0.418919	ADAM3A	0.283784	ARHGEF10	0.175676	MIR744	0.243243
TMX3	0.364865	SYT4	0.337838	ADAMDEC1	0.216216	MIR1288	0.22973
CCDC102B	0.405405	SLC14A2	0.256757	FHIT	0.216216	MIR1305	0.22973
DOK6	0.391892	SLC14A1	0.27027	ADAM7	0.216216	MIR596	0.175676
CD226	0.364865	PSTPIP2	0.283784	CSMD1	0.256757	MIR383	0.256757
RTTN	0.337838	ATP5A1	0.283784	NEFM	0.162162	MIR1261	0.22973
SOCS6	0.324324	HAUS1	0.283784	RPL23AP53	0.202703	SNORD58C	0.243243

CBLN2	0.364865	DYM	0.310811	FAM87A	0.202703	SNORA37	0.324324
NETO1	0.391892	C18orf32	0.243243	MCPH1	0.189189	SNORD49B	0.243243
ZNF407	0.351351	RPL17	0.243243	ARHGAP28	0.216216	SNORD49A	0.243243
GALR1	0.351351	BHLHA9	0.216216	ANGPT2	0.189189	SNORD65	0.243243
ATP9B	0.27027	TUSC5	0.216216	HLA-H	0.094595	LONRF1	0.202703
LSM12P1	0.189189	SLC25A37	0.202703	HLA-T	0.148649	DLC1	0.256757
KIAA1328	0.310811	OR4F21	0.202703	DDX39BP1	0.148649	C8orf48	0.256757
ADAM5P	0.283784	ZNF596	0.202703	MCCD1P1	0.148649	SGCZ	0.283784
ADNP2	0.27027	FBXO25	0.202703	HLA-K	0.135135	PSD3	0.216216
PARD6G	0.27027	C8orf42	0.202703	DEFA6	0.202703	CSGALNACT1	0.202703
PIK3C3	0.337838	ADAM28	0.216216	PAICSP4	0.256757	ESCO2	0.175676
CHST9-AS1	0.310811	ERICH1	0.202703	MSRA	0.22973	ODZ3	0.22973
RIT2	0.310811	DLGAP2	0.202703	RAP1GAP2	0.216216	FUT10	0.189189
CTSB	0.189189	NAT2	0.22973	ROBO1	0.162162	CADM2	0.162162
CCDC110	0.22973	UNC5D	0.189189				

[0312] Besides assessing expression, the RNA-seq data can be exploited to examine splicing patterns. Among the mutated genes there are several that carry somatic mutations in canonical splice sites that will likely affect their splicing. 112 genes were found with canonical splice site mutations that show evidence for splicing defects based on RNA-seq data. The affected genes include *TP53*, *NOTCH2* and *EIF5B* (Table 9). RNA-seq data was also used to analyze tumor specific expression of certain exons in gene coding regions. Two novel tumor specific exons upstream of the first 5'annotated exon of a mitochondrial large subunit *MRPL33* gene were identified (Figure 1). Analysis of this genomic region identified transcription factor binding sites 5' of these novel exons, further supporting our observation.

Table 9 – Splice Site Mutation Effects

GeneName	Position	Ref.	Var.	GeneName	Position	Ref.	Var.	GeneName	Position	Ref.	Var.
TP53	7577157	T	A	IVNS1ABP	185274666	A	G	PDXDC2	70072890	T	C
EYA3	28369163	T	C	EPRS	220191851	C	A	PRPF8	1554252	T	G
RAD54L	46739138	G	A	KIF13B	29024889	C	A	TP53	7578555	C	T
RAD54L	46743654	T	C	PKD1	2156679	C	T	PER1	8050991	C	T
TBCD	80895237	G	A	ASPHD1	29916287	G	T	HDAC5	42155785	T	C
MYO5B	47380018	C	A	INPP5K	1417274	C	A	MED16	871254	C	A
ZNF780A	40590706	C	A	DUS3L	5788189	T	C	SAE1	47712415	G	T
NAV1	201757595	G	A	SFRS15	33078671	C	T	TTC3L	38572531	A	G
EIF5B	100010862	G	A	PRKCZ	2106661	A	G	USP11	47099703	G	T
KNTC1	123042146	G	T	SLC2A5	9098566	C	A	FANCC	97887468	C	A
ANKS1A	35054827	G	A	LEPRE1	43213085	T	C	OTUD7B	149949513	T	C
IP6K2	48728917	T	G	ARNT	150790507	C	A	C1orf9	172554157	G	T
ATP13A1	19757157	C	T	ARHGEF11	156915955	C	A	SLC4A3	220500394	G	T
YWHAQ	9728458	C	A	YWHAQ	9731646	T	C	CLASP2	33614847	C	A
SETD2	47127805	C	A	USP40	234451010	C	A	LRRFIP2	37100402	C	A
REEP5	112238216	C	A	METTL6	15455670	C	A	SLC2A9	9909970	C	A
PHF19	123631609	C	T	GLB1	33055803	C	A	ACSL1	185678862	T	C
TAF10	6632535	C	A	USP19	49149716	C	T	FAT1	187527368	C	A
YES1	756836	C	T	LPCAT1	1474801	C	A	C5orf42	37125512	C	A
LAMP2	119575751	T	G	LHFPL2	77784977	C	A	SFRS18	99858841	C	A
SETD7	140439198	T	C	SNX2	122153070	T	G	FAM184A	119332597	C	A
FAM102A	130707645	C	T	AARS2	44278899	C	A	PPP3CC	22380264	T	C
BRAP	112093368	A	G	PHIP	79727301	C	T	RAB11FIP1	37720632	C	A

SEL1L3	25785913	C	A	TECPR1	97863225	T	C	CDH17	95143103	C	T
TEC	48140840	C	A	TRAPPC9	141321346	C	T	EXT1	119122323	C	A
PTPRB	70932795	C	A	NAPRT1	144659348	C	A	ALDH1A1	75527039	C	A
TP53	7577156	C	A	ANXA1	75778390	A	G	DNLZ	139256633	C	A
NOTCH2	120529707	T	C	PTCH1	98239040	C	T	MTPAP	30604966	C	A
MRPS2	138393821	T	C	PKN3	131475777	G	A	TFAM	60147949	G	A
CORO1B	67206140	A	G	ZER1	131493674	C	T	RSL1D1	11933550	A	C
C2CD3	73768590	C	T	DNMBP	101667853	T	C	GPCPD1	5545725	C	A
ALG8	77820487	C	A	SUV420H1	67953396	C	A	CXADR	18933019	G	A
POLG	89865248	T	G	USP28	113683227	C	A	KIF13A	17799672	T	C
LIMD2	61776073	T	G	KIRREL3	126299185	T	C	CELSR2	109815787	G	A
VAPA	9931961	T	C	CHD4	6688084	C	A	MTO1	74189850	G	C
TFCP2	51497987	C	A	CAPRIN2	30869611	C	A	SOS2	50655420	T	C
ABI3BP	100469455	C	A	CSAD	53566434	T	C	RPS10	34389506	C	T
ABCD4	74753521	T	G	PDS5B	33347464	T	C	XPNPEP1	111640599	C	T
CNOT1	58573864	C	T	SIN3A	75682164	T	C				

Example 4- Recurrent R-spondin fusions activate Wnt pathway signaling

[0313] RNA-seq data was next used to identify intra- and inter-chromosomal rearrangements such as gene fusions that occur in cancer genomes (Ozsolak, F. & Milos, P. M. *Nature Rev Genet.* 12:87-98 (2011)). In mapping the paired-end RNA-seq data, 36 somatic gene fusions, including two recurrent ones, were indentified in the analyzed CRC transcriptomes. The somatic nature of the fusions was established by confirming it presence in the tumors and absence in corresponding matched normal using RT-PCR. Further, all fusions reported in these examples were Sanger sequenced and validated (Table 10). The majority of predicted somatic fusions identified were intra-chromosomal (89%; 32/36).

Table 10 – Gene Fusions

5' GeneName	3' GeneName	Type	Genomic position	5' PCR primer	3' PCR primer	bp
PVT1	ENST00000502082	intrachrom.	8:128806980-8:128433074	CTTGCGGAAAGGATGTTGG (SEQ ID NO:11)	TGGTGATCCAGAGAAGAAGC (SEQ ID NO:40)	150
EIF3E(e1)	RSPO2(e2)	deletion	8:109260842-8:109095035	ACTACTCGCATCGCGCACT (SEQ ID NO:12)	GGGAGGACTCAGAGGGAGAC (SEQ ID NO:41)	155
EIF3E(e1)	RSPO2(e2)	deletion	8:109260842-8:109095035	ACTACTCGCATCGCGCACT (SEQ ID NO:12)	GGGAGGACTCAGAGGGAGAC (SEQ ID NO:41)	155
EIF3E(e1)	RSPO2(e3)	deletion	8:109260842-8:109001472	ACTACTCGCATCGCGCACT (SEQ ID NO:12)	TGCAGGCACTCTCCATACTG (SEQ ID NO:42)	205
EIF3E(e1)	RSPO2(e3)	deletion	8:109260842-8:109001472	ACTACTCGCATCGCGCACT (SEQ ID NO:12)	TGCAGGCACTCTCCATACTG (SEQ ID NO:42)	205
PTPRK(e1)	RSPO3(e2)	inversion	6:128841404-6:127469793	AAACTCGGCATGGATACGAC (SEQ ID NO:13)	GCTTCATGCCAATTCTTTCC (SEQ ID NO:43)	226
PTPRK(e1)	RSPO3(e2)	inversion	6:128841404-6:127469793	AAACTCGGCATGGATACGAC (SEQ ID NO:13)	GCTTCATGCCAATTCTTTCC (SEQ ID NO:43)	226
PTPRK(e1)	RSPO3(e2)	inversion	6:128841404-6:127469793	AAACTCGGCATGGATACGAC (SEQ ID NO:13)	GCTTCATGCCAATTCTTTCC (SEQ ID NO:43)	226
PTPRK(e1)	RSPO3(e2)	inversion	6:128841404-6:127469793	AAACTCGGCATGGATACGAC (SEQ ID NO:13)	GCTTCATGCCAATTCTTTCC (SEQ ID NO:43)	226
PTPRK(e7)	RSPO3(e2)	inversion	6:128505577-6:127469793	TGCAGTCAATGCTCCAACTT (SEQ ID NO:14)	GCCAATTCTTTCCAGAGCAA (SEQ ID NO:44)	250
ETV6	NTRK3	translocation	12:12022903-15:88483984	AAGCCCATCAACCTCTCTCA (SEQ ID NO:15)	GGGCTGAGGTTGTAGCACTC (SEQ ID NO:45)	206
ANXA2	RORA	intrachrom.	15:60674541-15:60824050	CTCTACACCCCCAAGTGCAT (SEQ ID NO:16)	TGACACCATAATGGATTCCTG (SEQ ID NO:46)	164
TUBGCP3	PDS5B	inversion	13:113200013-13:33327470	AACAGGAGACCCGTACATGC (SEQ ID NO:17)	AAAGGGCACAGATTGCCATA (SEQ ID NO:47)	221
ARHGEF18	NCRNA00157	translocation	19:7460133-21:19212970	CCAGCTGCTAGCTACTGTGGA (SEQ ID NO:18)	ACTAGGTGGTCCAGGGTGTG (SEQ ID NO:48)	186
NT5C2	ASAH2	deletion	10:104899163-10:51978390	TGAACCGAAGTTTAGCAATGG (SEQ ID NO:19)	TGCTCAAGCAGGTAAGATGC (SEQ ID NO:49)	156
NRBP2	VPS28	intrachrom.	8:144919211-8:145649651	TGATGAACTTTGCAGCCACT (SEQ ID NO:20)	ATGGTCTCCATCAGCTCTCG (SEQ ID NO:50)	208
CDC42SE2	KIAA0146	translocation	5:130651837-8:48612965	AGGGCCAGATTTGAGTGTGT (SEQ ID NO:21)	AAACTGAAAATCCCCGCTGT (SEQ ID NO:51)	188
MED13L	LAG3	inversion	12:116675273-12:6886957	GTGTATGGCGTCGTGATGTC (SEQ ID NO:22)	GCTCCAGTCACCAAAAGGAG (SEQ ID NO:52)	205
PEX5	LOC389634	inversion	12:7362838-12:8509737	CATGTCGGAGAACATCTGGA (SEQ ID NO:23)	TGTGGAGTCTCTTGCGTGTC (SEQ ID NO:53)	230
PLCE1	CYP2C19	deletion	10:95792009-10:96602594	CCTTACTGCCTTGTGGGAGA (SEQ ID NO:24)	TGGGGATGAGGTCGATGTAT (SEQ ID NO:54)	224
TPM3	NTRK1	inversion	1:154142876-1:156844363	CAGAGACCCGTGCTGAGTTT (SEQ ID NO:25)	CCAAAAGGTGTTTCGTCCTT (SEQ ID NO:55)	124
PAN3	RFC3	deletion	13:28752072-13:34395269	GACTTTGGTGCCCTCAACAT (SEQ ID NO:26)	CAATTTTTCCACTCCAACACC (SEQ ID NO:56)	150
CWC27	RNF180	intrachrom.	5:64181373-5:63665442	AACGGGAACTCTTAGCAGCA (SEQ ID NO:27)	CATGTCAAACCACCATCCAC (SEQ ID NO:57)	182
CAPN1	SPDYC	intrachrom.	11:64956217-11:64939414	GAGACTTCATGCGGGAGTTC (SEQ ID NO:28)	ATCTGGAAGCAGGGGTCTTT (SEQ ID NO:58)	199
COG8	TERF2	intrachrom.	16:69373079-16:69391464	TGGCCTTCGCTAACTACAAGA (SEQ ID NO:29)	TCCCCATATTTCTGCACTCC (SEQ ID NO:59)	233
TADA2A	MEF2B	translocation	17:35767040-19:19293492	GCTCTTTGGCGCGGATTA (SEQ ID NO:30)	GGAGCTACCTGTGGCCCT (SEQ ID NO:60)	152
STRBP	DENND1A	intrachrom.	9:125935956-9:126220176	GTTGCAAAAGGCTTGCTGAT (SEQ ID NO:31)	ACGAAGGCTTCCTCACAGAA (SEQ ID NO:61)	155
CXorf56	UBE2A	inversion	X:118694231-X:118717090	TGATTGATGCTGCCAAACAT (SEQ ID NO:32)	CACGCTTTTCATATTCCCGT (SEQ ID NO:62)	161
MED13L	CD4	inversion	12:116675273-12:6923308	GTGTATGGCGTCGTGATGTC (SEQ ID NO:22)	TCCCAAAGGCTTCTTCTTGA (SEQ ID NO:63)	151
PRR12	PRRG2	intrachrom.	19:50097872-19:50093157	ATGAACCTTATCTCGGCCCT (SEQ ID NO:33)	GTCGTGTACCCCAGAGGCT (SEQ ID NO:64)	227
ATP9A	ARFGEF2	inversion	20:50307278-20:47601266	ATGTGTACGCAGAAGAGCCA (SEQ ID NO:34)	GTGCAGGAATTGGGCTATGT (SEQ ID NO:65)	150
ANKRD17	HS3ST1	deletion	4:73956384-4:11401737	GGAAAATCCTCATATTTGCCA (SEQ ID NO:35)	AGCAGGGAAGCCTCCTAGTC (SEQ ID NO:66)	158
RBM47	ATP8A1	intrachrom.	4:40517884-4:42629126	AGACCCAGGAGGAGTGAGGT (SEQ ID NO:36)	GGTCAGCCAGTGAGGTCTTC (SEQ ID NO:67)	151
FRS2	RAP1B	intrachrom.	12:69924740-12:69042479	AGATGCCCAGATGCAAAAGT (SEQ ID NO:37)	CAAAGCAGACTTTCCAACGC (SEQ ID NO:68)	161
CHEK2	PARVB	inversion	22:29137757-22:44553862	GGCTGAGGGTGGAGTTTGTA (SEQ ID NO:38)	CTTCTGATCGAAGCTTTCCG (SEQ ID NO:69)	191
SFI1	TPST2	inversion	22:31904362-22:26940641	CCCCAGTTAGAAGGGGAAGA (SEQ ID NO:39)	CACTCTCATCTCTGGGCTCC (SEQ ID NO:70)	190

[0314] The recurrent fusions identified in these examples involve the R-spondin family members, *RSPO2* (3%; 2/68) and *RSPO3* (8%; 5/68; Figure 2A) found in MSS CRC samples. R-spondins are secreted proteins known to potentiate canonical Wnt signaling (Yoon, J. K. & Lee, J. S. *Cell Signal.* 24(2):369-77 (2012)), potentially by binding to the LGR family of GPCRs (Carmon, K. S. *et al.*, *Proceedings of the National Academy of Sciences of the United States of America* 108:11452-11457 (2011); de Lau, W. *et al.*, *Nature* 476:293-297 (2011); Glinka, A. *et al., EMBO Reports* 12:1055-1061 (2011)). The recurrent *RSPO2* fusion identified in two tumor samples involves *EIF3E* (eukaryotic translation initiation factor 3) exon 1 and RSPO2 exon 2 (Figure 2B). This fusion transcript was expected to produce a functional RSPO2 protein driven by *EIF3E* promoter (Figure 2D). A second *RSPO2* fusion detected in the same samples involves *EIF3E* exon 1 and *RSPO2* exon 3 (Table 10). However, this *EIF3E(e1)-RSPO2(e3)* was not expected to produce a functional protein. To confirm the nature of the alteration at the genome level, whole genome sequencing (WGS) of the tumors was performed containing RSPO2 fusions. Analysis of junction spanning reads, mate-pair reads and copy number data derived from the WGS data, identified a 158kb deletion in one sample and a 113kb deletion in the second sample, both of which places exon 1 of EIF3E in close proximity to the 5' end of RSPO2.

[0315] *RSPO3* translocations were observed in 5 of 68 tumors and they involve *PTPRK* (protein tyrosine kinase receptor kappa) as its 5' partner. WGS reads from the 5 tumors expressing the RSPO3fusions showed rearrangements involving a simple (3 samples) or a complex (2 samples) inversion that places RSPO3 in proximity to PTPRK on the same strand as PTPRK on chromosome 6q. Two different *RSPO3* fusion variants were identified consisting either of exon 1 (e1) or exon 7 (e7) of *PTPRK* and exon 2 (e2) of *RSPO3* (Figure 3 and Figure 4). The *RSPO3* fusions likely arise from a deletion-inversion event at the chromosomal level as normally *PTPRK* and *RSPO3* are 850 Kb apart on opposing strands on chromosome 6q. The *PTPRK*(e1)-*RSPO3*(e2), found in four samples, was an in-frame fusion that preserves the entire coding sequence of *RSPO3* and replaces its secretion signal sequence with that of *PTPRK* (Figure 3C). The *PTPRK*(e7)-*RSPO3*(e2), detected in one sample, was also an in-frame fusion that encodes a ~70 KDa protein consisting of the first 387 amino acids of PTPRK, including its secretion signal sequence, and the RSPO3 amino acids 34-272 lacking its native signal peptide (Figure 4C). Interestingly, PTPRK contains a much stronger secretion signal sequence compared to RSPO3 and potentially leads to more efficient secretion of the fusion variants identified. Additionally, RNA-seq data showed that the mRNA expression of *RSPO2* and *RSPO3* in colon tumor samples containing the fusions was elevated compared to their matched normal samples and tumor samples lacking R-spondin fusions (Figure 2E). Further, all the RSPO positive fusion tumors expressed the potential R-spondin receptors LGR4/5/623-25, though LGR6 expression was lower compared to LGR4/5.

[0316] To determine if the predicted R-spondin fusion proteins were functional, expression constructs containing a C-terminal flag tag were generated and tested their expression following transfecting into mammalian 293T cells. Western blot analysis of the conditioned media showed that the fusion proteins were expressed and secreted (Figure 5A). The R-spondin fusion products were biologically active as determined by their ability to potentiate Wnt signaling using a Wnt luciferase reporter. As observed with the wildtype *RSPO2/3*, stimulation with conditioned media of cells transfected with RSPO fusion expression constructs led to activation of the Wnt luciferase reporter (Figure 5B) compared to that of control transfected cells. The observed activation, while apparent in the absence of exogenous WNT, was further potentiated in the presence of recombinant WNT, consistent with the known role of R-spondins in Wnt signaling (Carmon, K. S. *et al.*, *Proceedings of the National Academy of Sciences of the United States of America* 108:11452-11457 (2011); de Lau, W. *et al.*, *Nature* 476:293-297 (2011); Glinka, A. *et al., EMBO Reports* 12:1055-1061 (2011)).

[0317] To further characterize the *RSPO* gene fusions, *RSPO* gene fusions were analyzed in the context of mutations and other alterations that occur in components of cellular signaling pathways including the Wnt signaling cascade (Figure 6B). The *RSPO2* and *RSPO3* fusions were mutually exclusive between themselves, besides being mutually exclusive with *APC* mutations (Figure 5E), except for one sample that had a single copy deletion in the *APC* coding region (Figure 5E). Also, the *RSPO* gene fusions were mutually exclusive with *CTNNB1*, another Wnt pathway gene that was mutated in CRC. Further, all of the samples with *RSPO* gene fusions also carried mutation in *KRAS* or *BRAF* (Figure 6A). The majority of *APC* mutant samples had *RAS* pathway gene mutations, indicating that the *RSPO* gene fusions are likely to play the same role as *APC* mutations by promoting Wnt signaling during colon tumor development. In data not shown, tumors with RSPO gene fusions were shown to exhibit a WNT expression signature similar to that of APC mutant tumors indicating that R-Spondins can activate the WNT pathway in colon tumors in the absence of downstream WNT mutations. These findings indicate that the R-spondins likely function as drivers in human CRCs.

[0318] In these examples, an in-depth extensive genomic analysis of human primary colon tumors was reported. In sequencing and analyzing human CRC exomes and transcriptomes, multiple new recurrent somatic mutations were found. Many of the significantly mutated genes in these examples (APC, KRAS, PIK3CA, SMAD4, FBXW7, TP53, TCF7L2) agree with the previous findings. In addition, multiple mutations in 111 out of the 140 genes they highlighted in their study were reported. Further, 11 additional significant colon cancer genes including ATM and TMPRSS11A have been identified that have not been previously reported. The examples identified multiple hotspot containing genes including *TCF12* and *ERBB3*. The *ERBB3* oncogenic mutants identified here potentially provide new opportunities for therapeutic intervention in CRC. Combined analysis of expression and copy number data identified *IGF2* overexpression in a subset of our human CRC samples.

[0319] Finally, using RNA-seq data, new recurrent fusions involving R-spondins have been identified that occur at a frequency of approximately 10%. The fusions results in functional R-spondin proteins that potentiate Wnt signaling. R-spondins provide attractive targets for antibody based therapy in colon cancer patients that harbor them. Besides directly targeting R-spondins, other therapeutic strategies that block Wnt signaling will likely be effective against tumors positive for R-spondin fusions.

RSPO1 Nuclic Acid Sequence (SEQ ID NO:1)
ATGCGGCTTGGGCTGTGTGTGGTGGCCCTGGTTCTGAGCTGGACGCACCTCACCATCAGCAGCCGGGGGA
TCAAGGGGAAAAGGCAGAGGCGGATCAGTGCCGAGGGGAGCCAGGCCTGTGCCAAAGGCTGTGAGCTCTG
CTCTGAAGTCAACGGCTGCCTCAAGTGCTCACCCAAGCTGTTCATCCTGCTGGAGAGGAACGACATCCGC
CAGGTGGGCGTCTGCTTGCCGTCCTGCCCACCTGGATACTTCGACGCCCGCAACCCCGACATGAACAAGT
GCATCAAATGCAAGATCGAGCACTGTGAGGCCTGCTTCAGCCATAACTTCTGCACCAAGTGTAAGGAGGG
CTTGTACCTGCACAAGGGCCGCTGCTATCCAGCTTGTCCCGAGGGCTCCTCAGCTGCCAATGGCACCATG
GAGTGCAGTAGTCCTGCGCAATGTGAAATGAGCGAGTGGTCTCCGTGGGGGCCCTGCTCCAAGAAGCAGC
AGCTCTGTGGTTTCCGGAGGGGCTCCGAGGAGCGGACACGCAGGGTGCTACATGCCCCTGTGGGGGACCA
TGCTGCCTGCTCTGACACCAAGGAGACCCGGAGGTGCACAGTGAGGAGAGTGCCGTGTCCTGAGGGGCAG
AAGAGGAGGAAGGGAGGCCAGGGCCGGCGGGAGAATGCCAACAGGAACCTGGCCAGGAAGGAGAGCAAGG
AGGCGGGTGCTGGCTCTCGAAGACGCAAGGGGCAGCAACAGCAGCAGCAGCAAGGGACAGTGGGGCCACT
CACATCTGCAGGGCCTGCCTAG

RSPO1 Amino Acid Sequence (SEQ ID NO:2)
MRLGLCVVALVLSWTHLTISSRGIKGKRQRRISAEGSQACAKGCELCSEVNGCLKCSPKLFILLERNDIR
QVGVCLPSCPPGYFDARNPDMNKCIKCKIEHCEACFSHNFCTKCKEGLYLHKGRCYPACPEGSSAANGTM
ECSSPAQCEMSEWSPWGPCSKKQQLCGFRRGSEERTRRVLHAPVGDHAACSDTKETRRCTVRRVPCPEGQ
KRRKGGQGRRENANRNLARKESKEAGAGSRRRKGQQQQQQQGTVGPLTSAGPA

RSPO2 Nucleic Acid Sequence (SEQ ID NO:3)
ATGCAGTTTCGCCTTTTCTCCTTTGCCCTCATCATTCTGAACTGCATGGATTACAGCCACTGCCAAGGCA
ACCGATGGAGACGCAGTAAGCGAGCTAGTTATGTATCAAATCCCATTTGCAAGGGTTGTTTGTCTTGTTC
AAAGGACAATGGGTGTAGCCGATGTCAACAGAAGTTGTTCTTCTTCCTTCGAAGAGAAGGGATGCGCCAG
TATGGAGAGTGCCTGCATTCCTGCCCATCCGGGTACTATGGACACCGAGCCCCAGATATGAACAGATGTG
CAAGATGCAGAATAGAAAACTGTGATTCTTGCTTTAGCAAAGACTTTTGTACCAAGTGCAAAGTAGGCTT
TTATTTGCATAGAGGCCGTTGCTTTGATGAATGTCCAGATGGTTTTGCACCATTAGAAGAAACCATGGAA
TGTGTGGAAGGATGTGAAGTTGGTCATTGGAGCGAATGGGGAACTTGTAGCAGAAATAATCGCACATGTG
GATTTAAATGGGGTCTGGAAACCAGAACACGGCAAATTGTTAAAAAGCCAGTGAAAGACACAATACTGTG
TCCAACCATTGCTGAATCCAGGAGATGCAAGATGACAATGAGGCATTGTCCAGGAGGGAAGAGAACACCA
AAGGCGAAGGAGAAGAGGAACAAGAAAAAGAAAAGGAAGCTGATAGAAAGGGCCCAGGAGCAACACAGCG
TCTTCCTAGCTACAGACAGAGCTAACCAATAA

RSPO2 Amino Acid Sequence (SEQ ID NO:4)
MQFRLFSFALIILNCMDYSHCQGNRWRRSKRASYVSNPICKGCLSCSKDNGCSRCQQKLFFFLRREGMRQ
YGECLHSCPSGYYGHRAPDMNRCARCRIENCDSCFSKDFCTKCKVGFYLHRGRCFDECPDGFAPLEETME
CVEGCEVGHWSEWGTCSRNNRTCGFKWGLETRTRQIVKKPVKDTILCPTIAESRRCKMTMRHCPGGKRTP
KAKEKRNKKKKRKLIERAQEQHSVFLATDRANQ

RSPO3 Nucleic Acid Sequence (SEQ ID NO:5)
ATGCACTTGCGACTGATTTCTTGGCTTTTTATCATTTTGAACTTTATGGAATACATCGGCAGCCAAAACG
CCTCCCGGGGAAGGCGCCAGCGAAGAATGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGCAAC
ATGCTCAGATTACAATGGATGTTTGTCATGTAAGCCCAGACTATTTTTTGCTCTGGAAAGAATTGGCATG
AAGCAGATTGGAGTATGTCTCTCTTCATGTCCAAGTGGATATTATGGAACTCGATATCCAGATATAAATA
AGTGTACAAAATGCAAAGCTGACTGTGATACCTGTTTCAACAAAAATTTCTGCACAAAATGTAAAAGTGG
ATTTTACTTACACCTTGGAAAGTGCCTTGACAATTGCCCAGAAGGGTTGGAAGCCAACAACCATACTATG
GAGTGTGTCAGTATTGTGCACTGTGAGGTCAGTGAATGGAATCCTTGGAGTCCATGCACGAAGAAGGGAA
AAACATGTGGCTTCAAAAGAGGGACTGAAACACGGGTCCGAGAAATAATACAGCATCCTTCAGCAAAGGG
TAACCTGTGTCCCCCAACAAATGAGACAAGAAAGTGTACAGTGCAAAGGAAGAAGTGTCAGAAGGGAGAA
CGAGGAAAAAAAGGAAGGGAGAGGAAAAGAAAAAAACCTAATAAAGGAGAAAGTAAAGAAGCAATACCTG

ACAGCAAAAGTCTGGAATCCAGCAAAGAAATCCCAGAGCAACGAGAAAACAAACAGCAGCAGAAGAAGCG
AAAAGTCCAAGATAAACAGAAATCGGTATCAGTCAGCACTGTACACTAG

RSPO3 Amino Acid Sequence (SEQ ID NO:6)
MHLRLISWLFIILNFMEYIGSQNASRGRRQRRMHPNVSQGCQGGCATCSDYNGCLSCKPRLFFALERIGM
KQIGVCLSSCPSGYYGTRYPDINKCTKCKADCDTCFNKNFCTKCKSGFYLHLGKCLDNCPEGLEANNHTM
ECVSIVHCEVSEWNPWSPCTKKGKTCGFKRGTETRVREIIQHPSAKGNLCPPTNETRKCTVQRKKCQKGE
RGKKGRERK

RSPO4 Nucleic Acid Sequence (SEQ ID NO:7)
ATGCGGGCGCCACTCTGCCTGCTCCTGCTCGTCGCCCACGCCGTGGACATGCTCGCCCTGAACCGAAGGA
AGAAGCAAGTGGGCACTGGCCTGGGGGGCAACTGCACAGGCTGTATCATCTGCTCAGAGGAGAACGGCTG
TTCCACCTGCCAGCAGAGGCTCTTCCTGTTCATCCGCCGGGAAGGCATCCGCCAGTACGGCAAGTGCCTG
CACGACTGTCCCCCTGGGTACTTCGGCATCCGCGGCCAGGAGGTCAACAGGTGCAAAAAATGTGGGGCCA
CTTGTGAGAGCTGCTTCAGCCAGGACTTCTGCATCCGGTGCAAGAGGCAGTTTTACTTGTACAAGGGGAA
GTGTCTGCCCACCTGCCCGCCGGGCACTTTGGCCCACCAGAACACACGGGAGTGCCAGGGGGAGTGTGAA
CTGGGTCCCTGGGGCGGCTGGAGCCCCTGCACACACAATGGAAAGACCTGCGGCTCGGCTTGGGGCCTGG
AGAGCCGGGTACGAGAGGCTGGCCGGGCTGGGCATGAGGAGGCAGCCACCTGCCAGGTGCTTTCTGAGTC
AAGGAAATGTCCCATCCAGAGGCCCTGCCCAGGAGAGAGGAGCCCCGGCCAGAAGAAGGGCAGGAAGGAC
CGGCGCCCACGCAAGGACAGGAAGCTGGACCGCAGGCTGGACGTGAGGCCGCGCCAGCCCGGCCTGCAGC
CCTGA

RSPO4 Amino Acid Sequence (SEQ ID NO:8)
MRAPLCLLLLVAHAVDMLALNRRKKQVGTGLGGNCTGCIICSEENGCSTCQQRLFLFIRREGIRQYGKCL
HDCPPGYFGIRGQEVNRCKKCGATCESCFSQDFCIRCKRQFYLYKGKCLPTCPPGTLAHQNTRECQGECE
LGPWGGWSPCTHNGKTCGSAWGLESRVREAGRAGHEEAATCQVLSESRKCPIQRPCPGERSPGQKKGRKD
RRPRKDRKLDRRLDVRPRQPGLQP

EIF3E(e1)-RSPO2(e2) translocation fusion polynucleotide (SEQ ID NO:74)
GAGCACAGACTCCCTTTTCTTTGGCAAGATGGCGGAGTACGACTTGACTACTCGCATCGCGCACTTTTTG
GATCGGCATCTAGTCTTTCCGCTTCTTGAATTTCTCTCTGTAAAGGAGGTTCGTGGCGGAGAGATGCTGA
TCGCGCTGAACTGACCGGTGCGGCCCGGGGGTGAGTGGCGAGTCTCCCTCTGAGTCCTCCCCAGCAGCGC
GGCCGGCGCCGGCTCTTTGGGCGAACCCTCCAGTTCCTAGACTTTGAGAGGCGTCTCTCCCCCGCCCGAC
CGCCCAGATGCAGTTTCGCCTTTTCTCCTTTGCCCTCATCATTCTGAACTGCATGGATTACAGCCACTGC
CAAGGCAACCGATGGAGACGCAGTAAGCGAGCTAGTTATGTATCAAATCCCATTTGCAAGGGTTGTTTGT
CTTGTTCAAAGGACAATGGGTGTAGCCGATGTCAACAGAAGTTGTTCTTCTTCCTTCGAAGAGAAGGGAT
GCGCCAGTATGGAGAGTGCCTGCATTCCTGCCCATCCGGGTACTATGGACACCGAGCCCCAGATATGAAC
AGATGTGCAAGATGCAGAATAGAAAACTGTGATTCTTGCTTTAGCAAAGACTTTTGTACCAAGTGCAAAG
TAGGCTTTTATTTGCATAGAGGCCGTTGCTTTGATGAATGTCCAGATGGTTTTGCACCATTAGAAGAAAC
CATGGAATGTGTGGAAGGATGTGAAGTTGGTCATTGGAGCGAATGGGGAACTTGTAGCAGAAATAATCGC
ACATGTGGATTTAAATGGGGTCTGGAAACCAGAACACGGCAAATTGTTAAAAAGCCAGTGAAAGACACAA
TACTGTGTCCAACCATTGCTGAATCCAGGAGATGCAAGATGACAATGAGGCATTGTCCAGGAGGGAAGAG
AACACCAAAGGCGAAGGAGAAGAGGAACAAGAAAAAGAAAAGGAAGCTGATAGAAAGGGCCCAGGAGCAA
CACAGCGTCTTCCTAGCTACAGACAGAGCTAACCAATAA

EIF3E(e1)-RSPO2(e2) translocation fusion polypeptide sequence (SEQ ID NO:75)
MAEYDLTTRIAHFLDRHLVFPLLEFLSVKEVRGGEMLIALNMQFRLFSFALIILNCMDYSHCQGNRWRRS
KRASYVSNPICKGCLSCSKDNGCSRCQQKLFFFLRREGMRQYGECLHSCPSGYYGHRAPDMNRCARCRIE
NCDSCFSKDFCTKCKVGFYLHRGRCFDECPDGFAPLEETMECVEGCEVGHWSEWGTCSRNNRTCGFKWGL
ETRTRQIVKKPVKDTILCPTIAESRRCKMTMRHCPGGKRTPKAKEKRNKKKKRKLIERAQEQHSVFLATD
RANQ

PTPRK(e1)-RSPO3(e2) translocation fusion polynucleotide sequence (SEQ ID NO:76)
ATGGATACGACTGCGGCGGCGGCGCTGCCTGCTTTTGTGGCGCTCTTGCTCCTCTCTCCTTGGCCTCTCC
TGGGATCGGCCCAAGGCCAGTTCTCCGCAGTGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGC
AACATGCTCAGATTACAATGGATGTTTGTCATGTAAGCCCAGACTATTTTTTGCTCTGGAAAGAATTGGC
ATGAAGCAGATTGGAGTATGTCTCTCTTCATGTCCAAGTGGATATTATGGAACTCGATATCCAGATATAA

ATAAGTGTACAAAATGCAAAGCTGACTGTGATACCTGTTTCAACAAAAATTTCTGCACAAAATGTAAAAG
TGGATTTTACTTACACCTTGGAAAGTGCCTTGACAATTGCCCAGAAGGGTTGGAAGCCAACAACCATACT
ATGGAGTGTGTCAGTATTGTGCACTGTGAGGTCAGTGAATGGAATCCTTGGAGTCCATGCACGAAGAAGG
GAAAAACATGTGGCTTCAAAAGAGGGACTGAAACACGGGTCCGAGAAATAATACAGCATCCTTCAGCAAA
GGGTAACCTGTGTCCCCCAACAAATGAGACAAGAAAGTGTACAGTGCAAAGGAAGAAGTGTCAGAAGGGA
GAACGAGGAAAAAAAGGAAGGGAGAGGAAAAGAAAAAAACCTAATAAAGGAGAAAGTAAAGAAGCAATAC
CTGACAGCAAAAGTCTGGAATCCAGCAAAGAAATCCCAGAGCAACGAGAAAACAAACAGCAGCAGAAGAA
GCGAAAAGTCCAAGATAAACAGAAATCGGTATCAGTCAGCACTGTACACTAG

PTPRK(e1)-RSPO3(e2) translocation fusion polypeptide sequence (SEQ ID NO:77)
MDTTAAAALPAFVALLLLSPWPLLGSAQGQFSAVHPNVSQGCQGGCATCSDYNGCLSCKPRLFFALERIG
MKQIGVCLSSCPSGYYGTRYPDINKCTKCKADCDTCFNKNFCTKCKSGFYLHLGKCLDNCPEGLEANNHT
MECVSIVHCEVSEWNPWSPCTKKGKTCGFKRGTETRVREIIQHPSAKGNLCPPTNETRKCTVQRKKCQKG
ERGKKGR

PTPRK(e7)-RSPO3(e2) translocation fusion polynucleotide sequence (SEQ ID NO:78)
ATGGATACGACTGCGGCGGCGGCGCTGCCTGCTTTTGTGGCGCTCTTGCTCCTCTCTCCTTGGCCTCTCC
TGGGATCGGCCCAAGGCCAGTTCTCCGCAGGTGGCTGTACTTTTGATGATGGTCCAGGGGCCTGTGATTA
CCACCAGGATCTGTATGATGACTTTGAATGGGTGCATGTTAGTGCTCAAGAGCCTCATTATCTACCACCC
GAGATGCCCCAAGGTTCCTATATGATAGTGGACTCTTCAGATCACGACCCTGGAGAAAAAGCCAGACTTC
AGCTGCCTACAATGAAGGAGAACGACACTCACTGCATTGATTTCAGTTACCTATTATATAGCCAGAAAGG
ACTGAATCCTGGCACTTTGAACATATTAGTTAGGGTGAATAAAGGACCTCTTGCCAATCCAATTTGGAAT
GTGACTGGATTCACGGGTAGAGATTGGCTTCGGGCTGAGCTAGCAGTGAGCACCTTTTGGCCCAATGAAT
ATCAGGTAATATTTGAAGCTGAAGTCTCAGGAGGGAGAAGTGGTTATATTGCCATTGATGACATCCAAGT
ACTGAGTTATCCTTGTGATAAATCTCCTCATTTCCTCCGTCTAGGGGATGTAGAGGTGAATGCAGGGCAA
AACGCTACATTTCAGTGCATTGCCACAGGGAGAGATGCTGTGCATAACAAGTTATGGCTCCAGAGACGAA
ATGGAGAAGATATACCAGTAGCCCAGACTAAGAACATCAATCATAGAAGGTTTGCCGCTTCCTTCAGATT
GCAAGAAGTGACAAAAACTGACCAGGATTTGTATCGCTGTGTAACTCAGTCAGAACGAGGTTCCGGTGTG
TCCAATTTTGCTCAACTTATTGTGAGAGAACCGCCAAGACCCATTGCTCCTCCTCAGCTTCTTGGTGTTG
GGCCTACATATTTGCTGATCCAACTAAATGCCAACTCGATCATTGGCGATGGTCCTATCATCCTGAAAGA
AGTAGAGTACCGAATGACATCAGGATCCTGGACAGAAACCCATGCAGTCAATGCTCCAACTTACAAATTA
TGGCATTTAGATCCAGATACCGAATATGAGATCCGAGTTCTACTTACAAGACCTGGTGAAGGTGGAACGG
GGCTCCCAGGACCTCCACTAATCACCAGAACAAAATGTGCAGTGCATCCTAACGTTAGTCAAGGCTGCCA
AGGAGGCTGTGCAACATGCTCAGATTACAATGGATGTTTGTCATGTAAGCCCAGACTATTTTTTGCTCTG
GAAAGAATTGGCATGAAGCAGATTGGAGTATGTCTCTCTTCATGTCCAAGTGGATATTATGGAACTCGAT
ATCCAGATATAAATAAGTGTACAAAATGCAAAGCTGACTGTGATACCTGTTTCAACAAAAATTTCTGCAC
AAAATGTAAAAGTGGATTTTACTTACACCTTGGAAAGTGCCTTGACAATTGCCCAGAAGGGTTGGAAGCC
AACAACCATACTATGGAGTGTGTCAGTATTGTGCACTGTGAGGTCAGTGAATGGAATCCTTGGAGTCCAT
GCACGAAGAAGGGAAAAACATGTGGCTTCAAAAGAGGGACTGAAACACGGGTCCGAGAAATAATACAGCA
TCCTTCAGCAAAGGGTAACCTGTGTCCCCCAACAAATGAGACAAGAAAGTGTACAGTGCAAAGGAAGAAG
TGTCAGAAGGGAGAACGAGGAAAAAAAGGAAGGGAGAGGAAAAGAAAAAAACCTAATAAAGGAGAAAGTA
AAGAAGCAATACCTGACAGCAAAAGTCTGGAATCCAGCAAAGAAATCCCAGAGCAACGAGAAAACAAACA
GCAGCAGAAGAAGCGAAAAGTCCAAGATAAACAGAAATCGGTATCAGTCAGCACTGTACACTAG

PTPRK(e7)-RSPO3(e2) translocation fusion polypeptide sequence (SEQ ID NO:79)
MDTTAAAALPAFVALLLLSPWPLLGSAQGQFSAGGCTFDDGPGACDYHQDLYDDFEWVHVSAQEPHYLPP
EMPQGSYMIVDSSDHDPGEKARLQLPTMKENDTHCIDFSYLLYSQKGLNPGTLNILVRVNKGPLANPIWN
VTGFTGRDWLRAELAVSTFWPNEYQVIFEAEVSGGRSGYIAIDDIQVLSYPCDKSPHFLRLGDVEVNAGQ
NATFQCIATGRDAVHNKLWLQRRNGEDIPVAQTKNINHRRFAASFRLQEVTKTDQDLYRCVTQSERGSGV
SNFAQLIVREPPRPIAPPQLLGVGPTYLLIQLNANSIIGDGPIILKEVEYRMTSGSWTETHAVNAPTYKL
WHLDPDTEYEIRVLLTRPGEGGTGLPGPPLITRTKCAVHPNVSQGCQGGCATCSDYNGCLSCKPRLFFAL
ERIGMKQIGVCLSSCPSGYYGTRYPDINKCTKCKADCDTCFNKNFCTKCKSGFYLHLGKCLDNCPEGLEA
NNHTMECVSIVHCEVSEWNPWSPCTKKGKTCGFKRGTETRVREIIQHPSAKGNLCPPTNETRKCTVQRKK
CQKGERGKKGRERKRKKPNKGESKEAIPDSKSLESSKEIPEQRENKQQQKKRKVQDKQKSVSVSTVH

[0320] Although the foregoing invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, the descriptions and examples should not be construed as limiting the scope of the invention. The disclosures of all patent and scientific literature cited herein are expressly incorporated in their entirety by reference.

Claims

1. A method of treating colorectal cancer in an individual comprising administering to the individual an effective amount of an anti-R-spondin 2 (RSPO2) antibody, wherein treatment is based upon the individual having cancer comprising an R-spondin (RSPO) translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2.

2. A method of treating a colorectal cancer cell, wherein the cancer cell comprises an R-spondin (RSPO) translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2 and wherein the method comprises providing an effective amount of an anti-RSPO2 antibody.

3. A method of treating colorectal cancer in an individual provided that the individual has been found to have colorectal cancer comprising an R-spondin (RSPO) translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2 the method comprising administering to the individual an effective amount of an anti-RSPO2 antibody.

4. A method for treating colorectal cancer in an individual, the method comprising determining that a sample obtained from the individual comprises an R-spondin (RSPO) translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2 and administering an effective amount of an anti-cancer therapy comprising an anti-RSPO2 to the individual.

5. A method of treating colorectal cancer, comprising selecting an individual having colorectal cancer, wherein the colorectal cancer comprises an R-spondin translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2 and administering to the individual thus selected an effective amount of an anti-RSPO2 antibody.

6. A method of identifying an individual with colorectal cancer who is more or less likely to exhibit benefit from treatment with an anti-cancer therapy comprising an anti-RSPO2 antibody, the method comprising determining presence or absence of an R-spondin (RSPO) translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2 in a sample obtained from the individual, wherein presence of the RSPO translocation in the sample indicates that the individual is more likely to exhibit benefit from treatment with the anti-cancer therapy comprising the anti-RSPO2 antibody, and wherein absence of the RSPO translocation

indicates that the individual is less likely to exhibit benefit from treatment with the anti-cancer therapy comprising the anti-RSPO2 antibody.

7. A method for predicting whether an individual with colorectal cancer is more or less likely to respond effectively to treatment with an anti-cancer therapy comprising an anti-RSPO2 antibody, the method comprising determining an R-spondin (RSPO) translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2, wherein presence of the RSPO translocation indicates that the individual is more likely to respond effectively to treatment with the anti-RSPO2 antibody and absence of the RSPO translocation indicates that the individual is less likely to respond effectively to treatment with the anti-RSPO2 antibody.

8. A method of predicting response or lack of response of an individual with colorectal cancer to an anti-cancer therapy comprising an anti-RSPO2 antibody comprising detecting in a sample obtained from the individual presence or absence of an R-spondin (RSPO) translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2, wherein presence of the RSPO translocation is predictive of response of the individual to the anti-cancer therapy comprising the anti-RSPO2 antibody and absence of the RSPO translocation is predictive of lack of response of the individual to the anti-cancer therapy comprising the anti-RSPO2 antibody.

9. The method of any one of claims 6-8, wherein the method further comprises administering to the individual an effective amount of an anti-RSPO2 antibody.

10. The method of any one of claims 1-9, wherein the RSPO translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2 comprises the sequence of SEQ ID NO:71.

11. A method of treating colorectal cancer in an individual comprising administering to the individual an effective amount of an anti-R-spondin 3 (RSPO3) antibody, wherein treatment is based upon the individual having cancer comprising an R-spondin (RSPO) translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b) *PTPRK* exon 7 and *RSPO3* exon 2.

12. A method of treating a colorectal cancer cell, wherein the cancer cell comprises an R-spondin (RSPO) translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b) PTPRK exon 7 and RSPO3 exon 2, and wherein the method comprises providing an effective amount of an anti-RSPO3 antibody.

13. A method of treating colorectal cancer in an individual provided that the individual has been found to have colorectal cancer comprising an R-spondin (RSPO) translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b) *PTPRK* exon 7 and *RSPO3* exon 2, the method comprising administering to the individual an effective amount of an anti-RSPO3 antibody.

14. A method for treating colorectal cancer in an individual, the method comprising: determining that a sample obtained from the individual comprises an R-spondin (RSPO) translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b) *PTPRK* exon 7 and *RSPO3* exon 2, and administering an effective amount of an anti-cancer therapy comprising an anti-RSPO3 to the individual.

15. A method of treating colorectal cancer, comprising: (a) selecting an individual having colorectal cancer, wherein the colorectal cancer comprises an R-spondin translocation comprising (i) *PTPRK* exon 1 and *RSPO3* exon 2 or (ii) *PTPRK* exon 7 and *RSPO3* exon 2, and administering to the individual thus selected an effective amount of an anti-RSPO3 antibody.

16. A method of identifying an individual with colorectal cancer who is more or less likely to exhibit benefit from treatment with an anti-cancer therapy comprising an anti-RSPO3 antibody, the method comprising: determining presence or absence of an R-spondin (RSPO) translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b) *PTPRK* exon 7 and *RSPO3* exon 2 in a sample obtained from the individual, wherein presence of the RSPO translocation in the sample indicates that the individual is more likely to exhibit benefit from treatment with the anti-cancer therapy comprising the anti-RSPO3 antibody, and wherein absence of the RSPO translocation indicates that the individual is less likely to exhibit benefit from treatment with the anti-cancer therapy comprising the anti-RSPO3 antibody.

17. A method for predicting whether an individual with colorectal cancer is more or less likely to respond effectively to treatment with an anti-cancer therapy comprising an anti-RSPO3 antibody, the method comprising determining an R-spondin (RSPO) translocation, the RSPO translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b) *PTPRK* exon 7 and *RSPO3* exon 2, wherein presence of the RSPO translocation indicates that the individual is more likely to respond effectively to treatment with the anti-RSPO3 antibody and absence of the RSPO translocation indicates that the individual is less likely to respond effectively to treatment with the anti-RSPO3 antibody.

18. A method of predicting response or lack of response of an individual with colorectal cancer to an anti-cancer therapy comprising an anti-RSPO3 antibody comprising detecting in a sample obtained from the individual presence or absence of an R-spondin (RSPO) translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b) *PTPRK* exon 7 and *RSPO3* exon 2, wherein presence of the RSPO translocation is predictive of response of the individual to the anti-cancer therapy comprising the anti-RSPO3 antibody and absence of the RSPO translocation is predictive of lack of response of the individual to the anti-cancer therapy comprising the anti-RSPO3 antibody.

19. The method of any one of claims 16-18, wherein the method further comprises administering to the individual an effective amount of an anti-RSPO3 antibody.

20. The method of any one of claims 11-19, wherein the RSPO translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b) *PTPRK* exon 7 and *RSPO3* exon 2 comprises the sequence of SEQ ID NO:72 or SEQ ID NO:73.

21. The method of any one of claims 1-20, wherein the RSPO translocation is detected at the chromosomal level, optionally by FISH; DNA level or RNA level, optionally by detecting a RSPO-translocation fusion transcript; and/or protein level, optionally by detecting a RSPO-translocation fusion polypeptide.

22. The method of any one of claims 1-20, wherein the colorectal cancer or colorectal cancer cell is colon cancer or a colon cancer cell.

23. The method of any one of claims 1-20, wherein the colorectal cancer or colorectal cancer cell is rectal cancer or a rectal cancer cell.

24. The method of any one of claims 1-23, wherein the method further comprises administering an additional therapeutic agent.

25. Use of an anti-R-spondin 2 (RSPO2) antibody in the manufacture of a medicament for treating colorectal cancer or a colorectal cancer cell, wherein the colorectal cancer or colorectal cancer cell comprises an R-spondin (RSPO) translocation comprising *EIF3E* exon 1 and *RSPO2* exon 2.

26. Use of an anti-R-spondin 3 (RSPO3) antibody in the manufacture of a medicament for treating colorectal cancer or a colorectal cancer cell, wherein the colorectal cancer or colorectal cancer cell comprises an R-spondin (RSPO) translocation comprising (a) *PTPRK* exon 1 and *RSPO3* exon 2 or (b) *PTPRK* exon 7 and *RSPO3* exon 2.

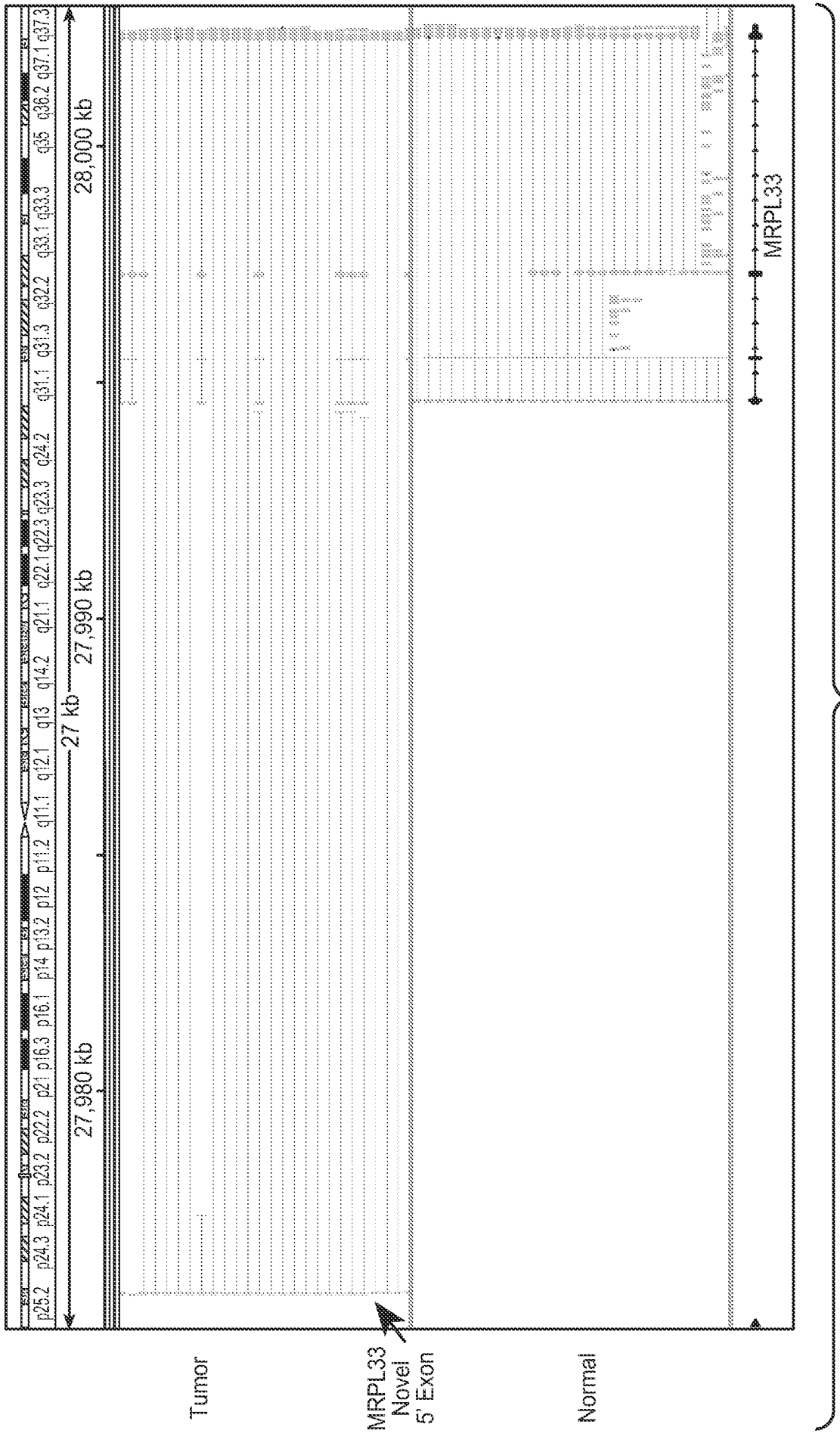

p25.2 p24.3 p24.1 p23.2 p22.2 p21 p16.3 p16.1 p14 p13.2 p12 p11.2 q11.1 q12.1 q13 q14.2 q21.1 q22.1 q22.3 q23.3 q24.2 q31.1 q31.3 q32.2 q33.1 q33.3 q35 q36.2 q37.1 q37.3
27,980 kb
27 kb
27,990 kb
28,000 kb
MRPL33
Tumor
MRPL33 Novel 5' Exon
Normal

FIG. 1A

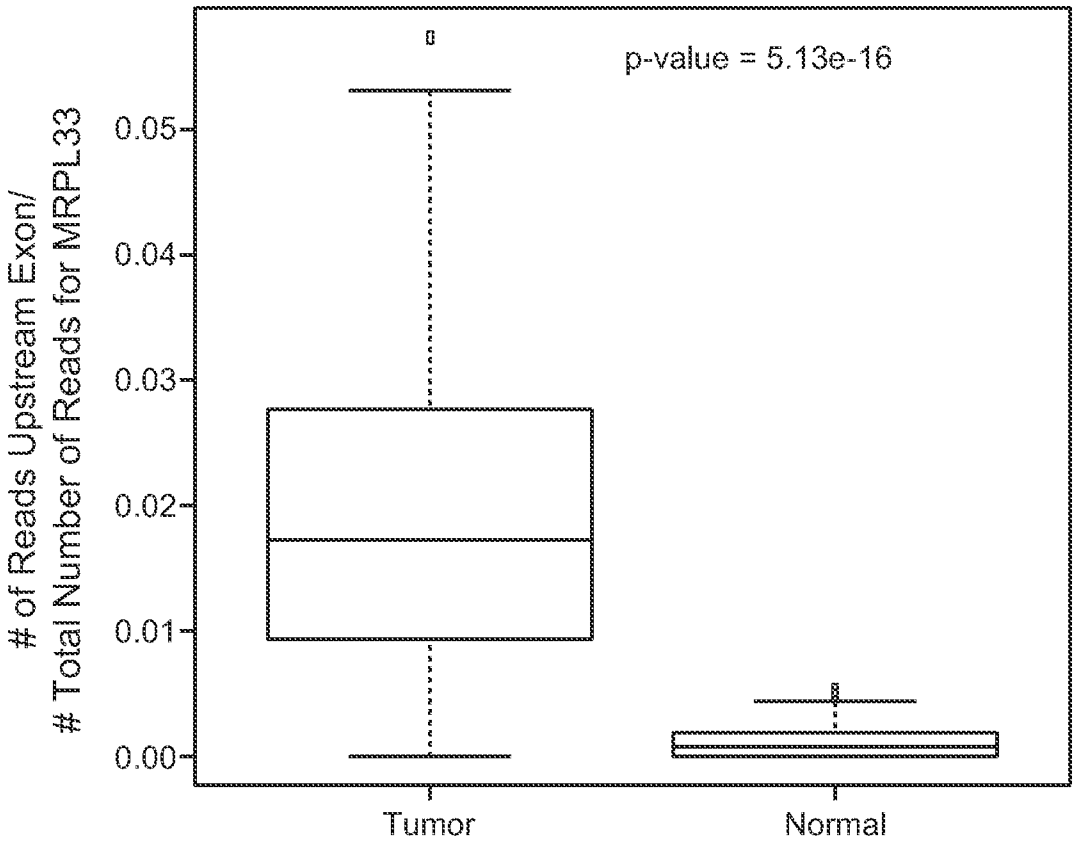


FIG. 1B

Fusion	Frequency
EIF3E(e1)-RSPO2(e2)	2.9% (2/68)
PTPRK(e1)-RSPO3(e2)	5.9% (4/68)
PTPRK(e7)-RSPO3(e2)	1.5% (1/68)

FIG. 2A

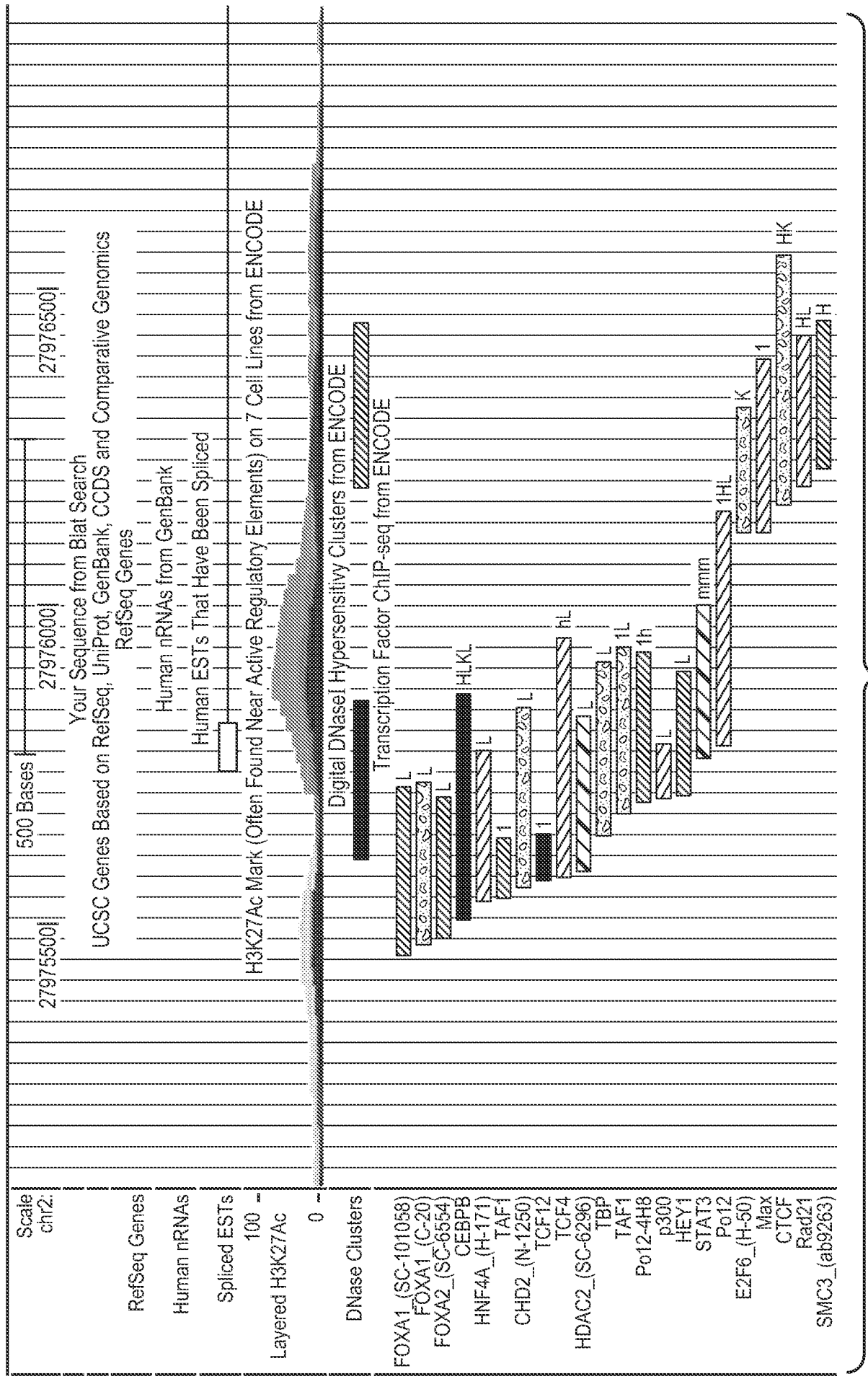

Scale
chr2:
27975500
500 Bases
27976000
27976500
RefSeq Genes
Your Sequence from Blat Search
UCSC Genes Based on RefSeq, UniProt, GenBank, CCDS and Comparative Genomics
RefSeq Genes
Human nRNAs
Human nRNAs from GenBank
Spliced ESTs
Human ESTs That Have Been Spliced
100
Layered H3K27Ac
H3K27Ac Mark (Often Found Near Active Regulatory Elements) on 7 Cell Lines from ENCODE
0
DNase Clusters
Digital DNaseI Hypersensitivy Clusters from ENCODE
Transcription Factor ChIP-seq from ENCODE
FOXA1_(SC-101058)
FOXA1_(C-20)
FOXA2_(SC-6554)
CEBPB
HNF4A_(H-171)
TAF1
CHD2_(N-1250)
TCF12
TCF4
HDAC2_(SC-6296)
TBP
TAF1
Pol2-4H8
p300
HEY1
STAT3
Pol2
E2F6_(H-50)
Max
CTCF
Rad21
SMC3_(ab9263)

FIG. 1C

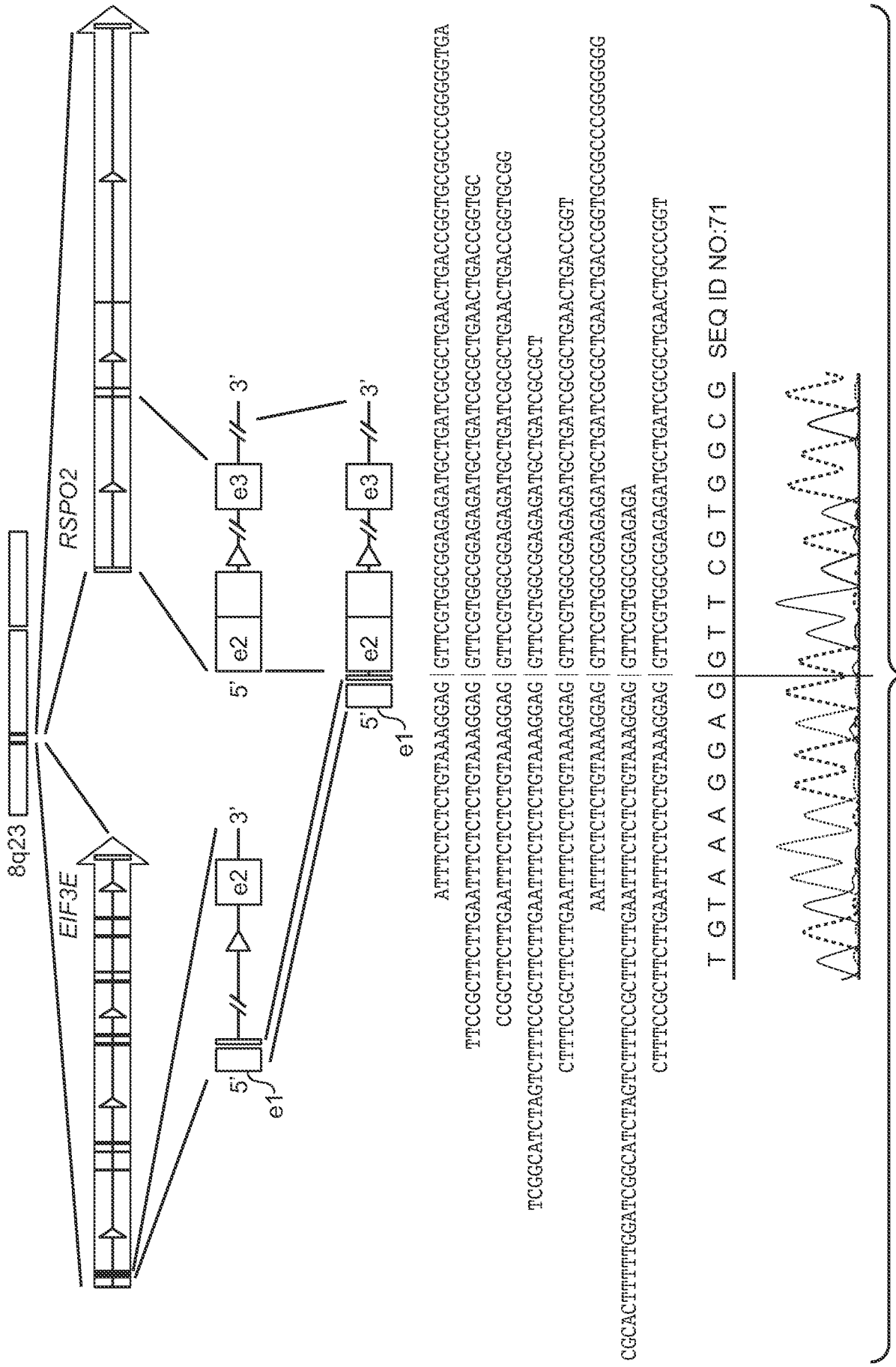

8q23
EIF3E
RSPO2
5'
e1
e2
3'
e3
ATTTCTCTCTGTAAAGGAG GTTCGTGGGCGGAGAGATGCTGATCGCGCTGAACTGACCGGTGCGGCCCGGGGGTGA
TTCCGCTTCTTGAATTTCTCTCTGTAAAGGAG GTTCGTGGGCGGAGAGATGCTGATCGCGCTGAACTGACCGGTGC
CCGCTTCTTGAATTTCTCTCTGTAAAGGAG GTTCGTGGGCGGAGAGATGCTGATCGCGCTGAACTGACCGGTGCGG
TCGGCATCTAGTCTTTCCGCTTCTTGAATTTCTCTCTGTAAAGGAG GTTCGTGGGCGGAGAGATGCTGATCGCGCTGAACTGACCGGT
CTTTCCGCTTCTTGAATTTCTCTCTGTAAAGGAG GTTCGTGGGCGGAGAGATGCTGATCGCGCTGAACTGACCGGT
AATTTCTCTCTGTAAAGGAG GTTCGTGGGCGGAGAGATGCTGATCGCGCTGAACTGACCGGTGCGGCCCGGGGGGG
CGCACTTTTTTGGATCGGCATCTAGTCTTTCCGCTTCTTGAATTTCTCTCTGTAAAGGAG GTTCGTGGGCGGAGAGATGCTGATCGCGCTGAACTGACCGGT
CTTTCCGCTTCTTGAATTTCTCTCTGTAAAGGAG GTTCGTGGGCGGAGAGATGCTGATCGCGCTGAACTGCCCGGT
T G T A A A G G A G G T T C G T G G C G SEQ ID NO:71

FIG. 2B

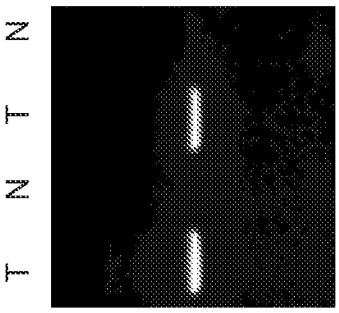


FIG. 2C

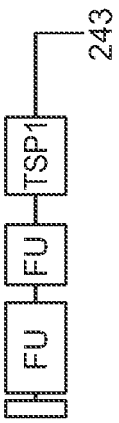


FIG. 2D

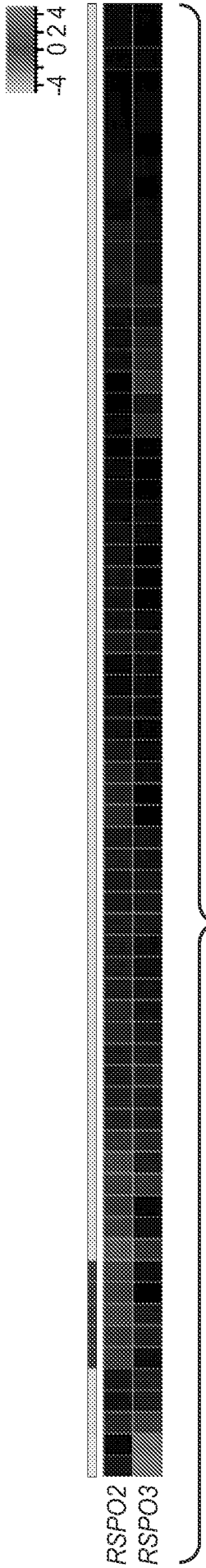


FIG. 2E

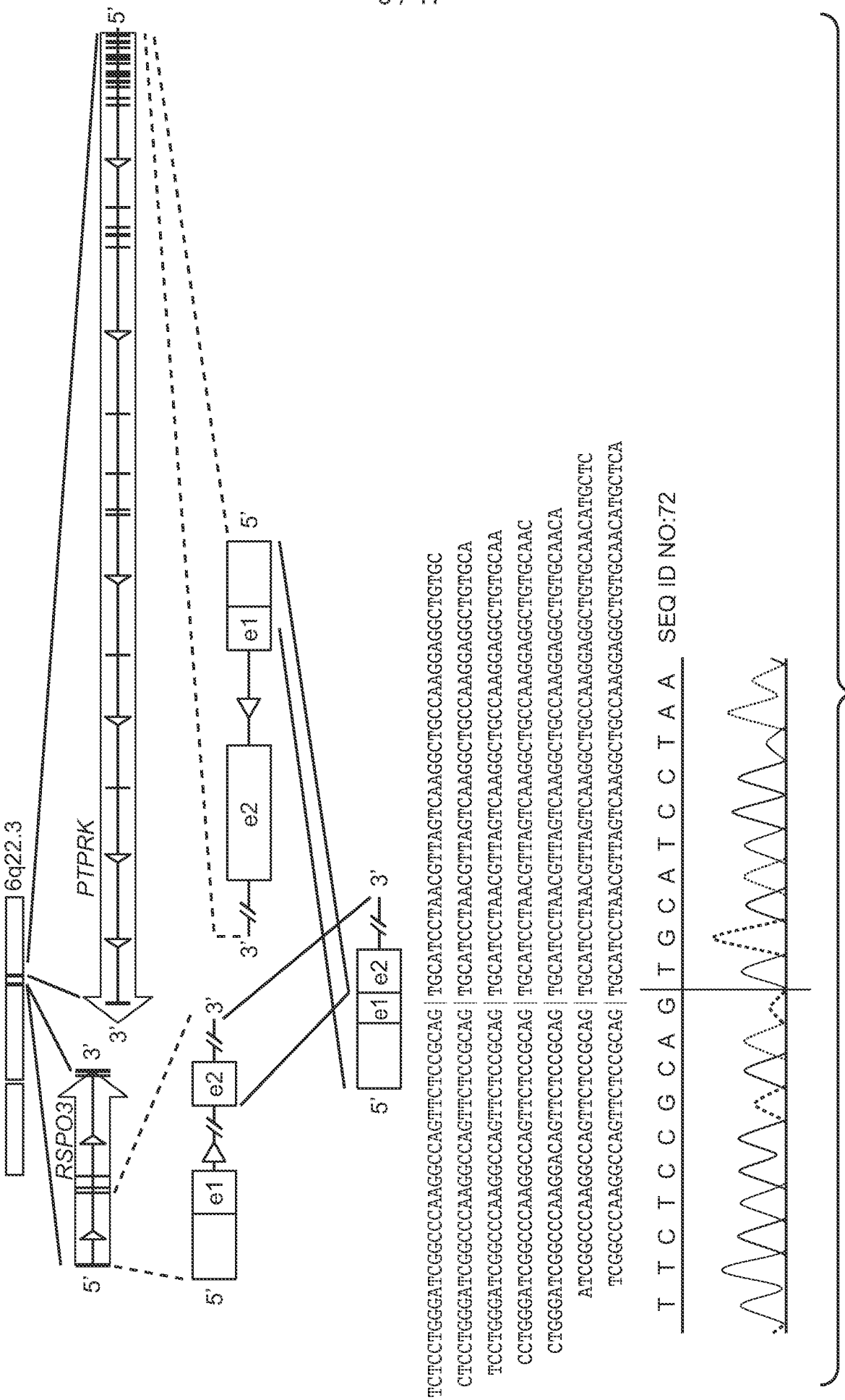

6q22.3
PTPRK
RSPO3
5'
3'
e1
e2
TCTCCTGGGATCGGGCCCAAGGCCAGTTCTCCGCAG
CTCCTGGGATCGGGCCCAAGGCCAGTTCTCCGCAG
TCCTGGGATCGGGCCCAAGGCCAGTTCTCCGCAG
CCTGGGATCGGGCCCAAGGCCAGTTCTCCGCAG
CTGGGATCGGGCCCAAGGACAGTTCTCCGCAG
ATCGGGCCCAAGGCCAGTTCTCCGCAG
TCGGGCCCAAGGCCAGTTCTCCGCAG
TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGC
TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGCA
TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGCAA
TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGCAAC
TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGCAACA
TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGCAACATGCTC
TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGCAACATGCTCA
T T C T C C G G C A G T G C A T C C T A A SEQ ID NO:72

FIG. 3A

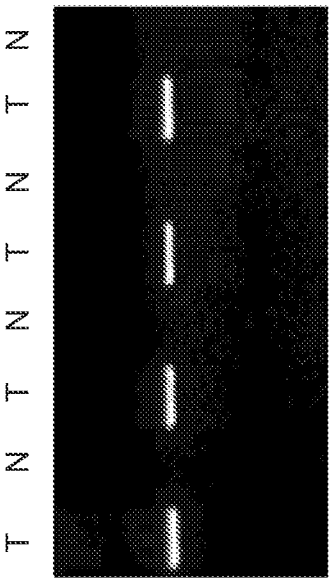

T
N
T
N
T
N
T
N

FIG. 3B

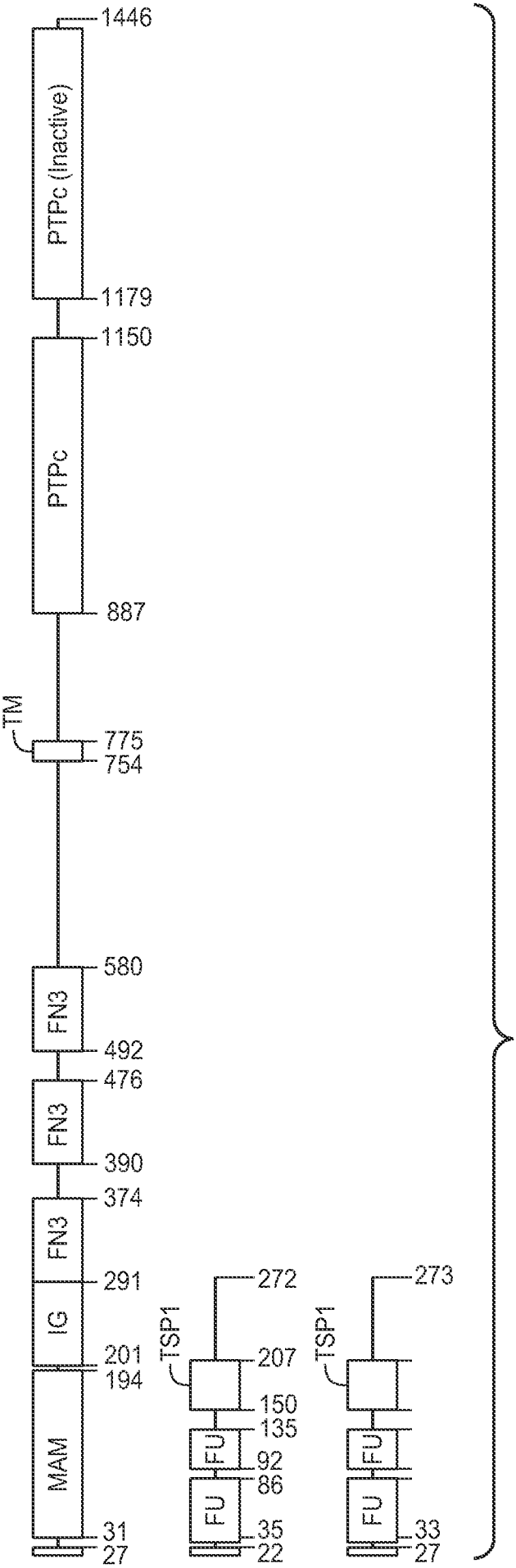

1446
PTPc (Inactive)
1179
1150
PTPc
887
TM
775
754
580
FN3
492
476
FN3
390
374
FN3
291
IG
201
194
MAM
31
27
TSP1
272
207
150
135
FU
92
86
FU
35
22
TSP1
273
FU
33
FU
27

FIG. 3C

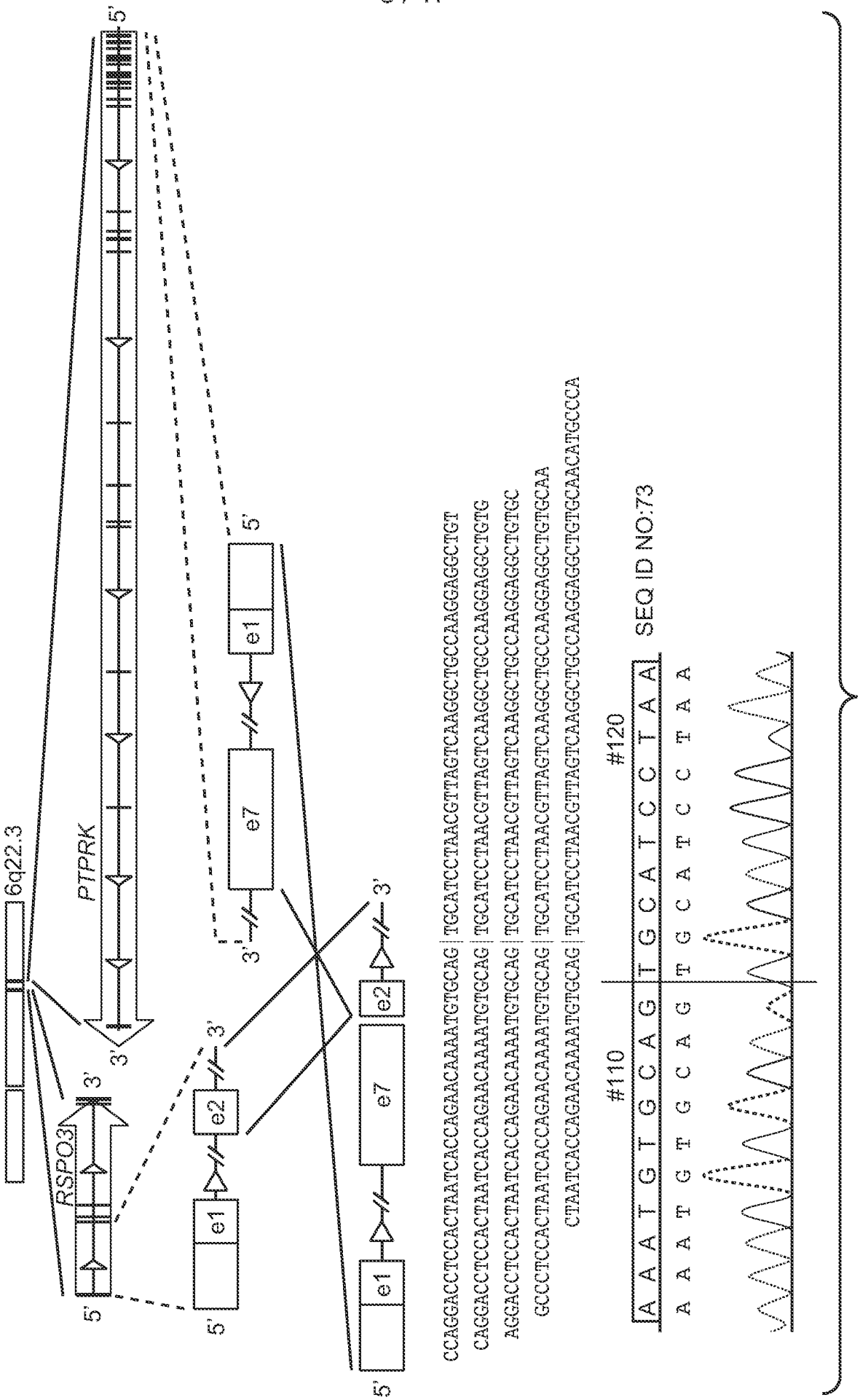

6q22.3
PTPRK
RSPO3
5'
3'
e1
e2
e7
CCAGGACCTCCACTAATCACCAGAACAAAATGTGCAG TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGT
CAGGACCTCCACTAATCACCAGAACAAAATGTGCAG TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTG
AGGACCTCCACTAATCACCAGAACAAAATGTGCAG TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGC
GCCCTCCACTAATCACCAGAACAAAATGTGCAG TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGCAA
CTAATCACCAGAACAAAATGTGCAG TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGCAACATGCCCA
#110
#120
A A A T G T G C A G T G C A T C C T A A
A A A T G T G C A G T G C A T C C T A A
SEQ ID NO:73

FIG. 4A

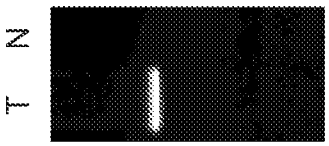

T
N

FIG. 4B

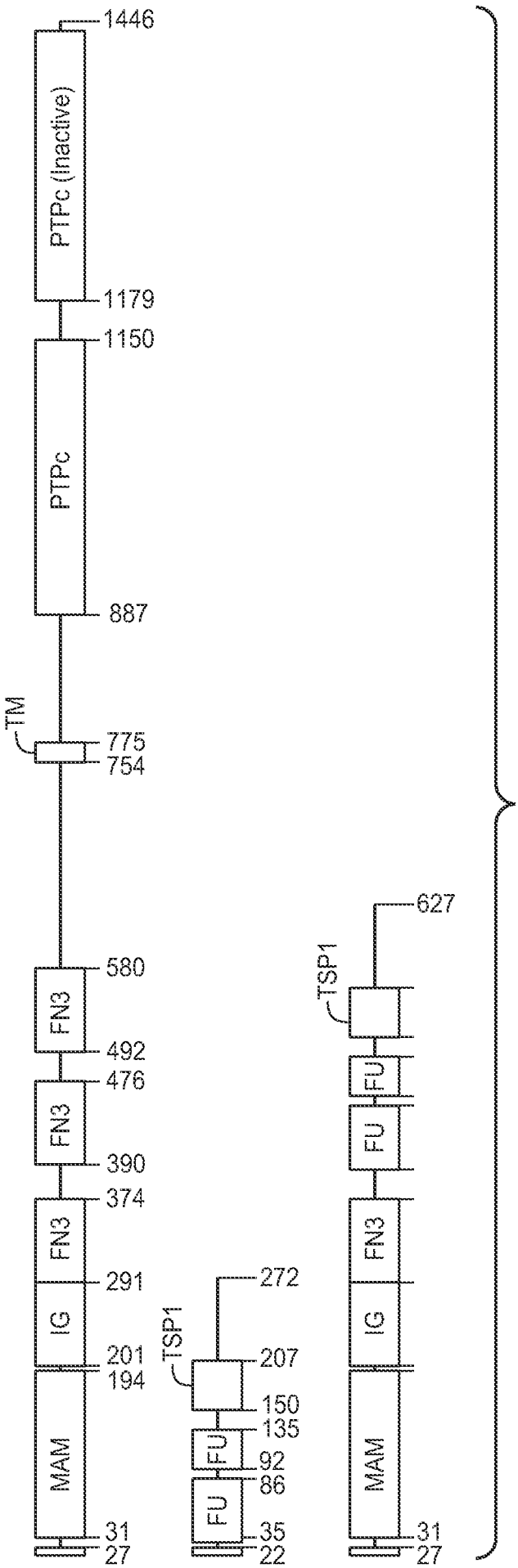
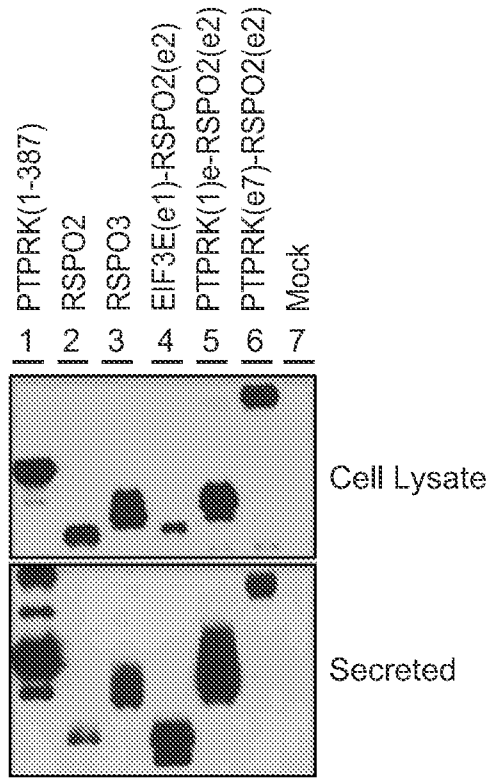

1446
PTPc (Inactive)
1179
1150
PTPc
887
TM
775
754
580
FN3
492
476
FN3
390
374
FN3
291
IG
201
194
MAM
31
27
TSP1
272
207
150
135
FU
92
86
FU
35
22
627
TSP1
FU
FU
FN3
IG
MAM
31
27

FIG. 4C

FIG. 5A


1 PTPRK(1-387)
2 RSPO2
3 RSPO3
4 EIF3E(e1)-RSPO2(e2)
5 PTPRK(1)e-RSPO2(e2)
6 PTPRK(e7)-RSPO2(e2)
7 Mock
Cell Lysate
Secreted

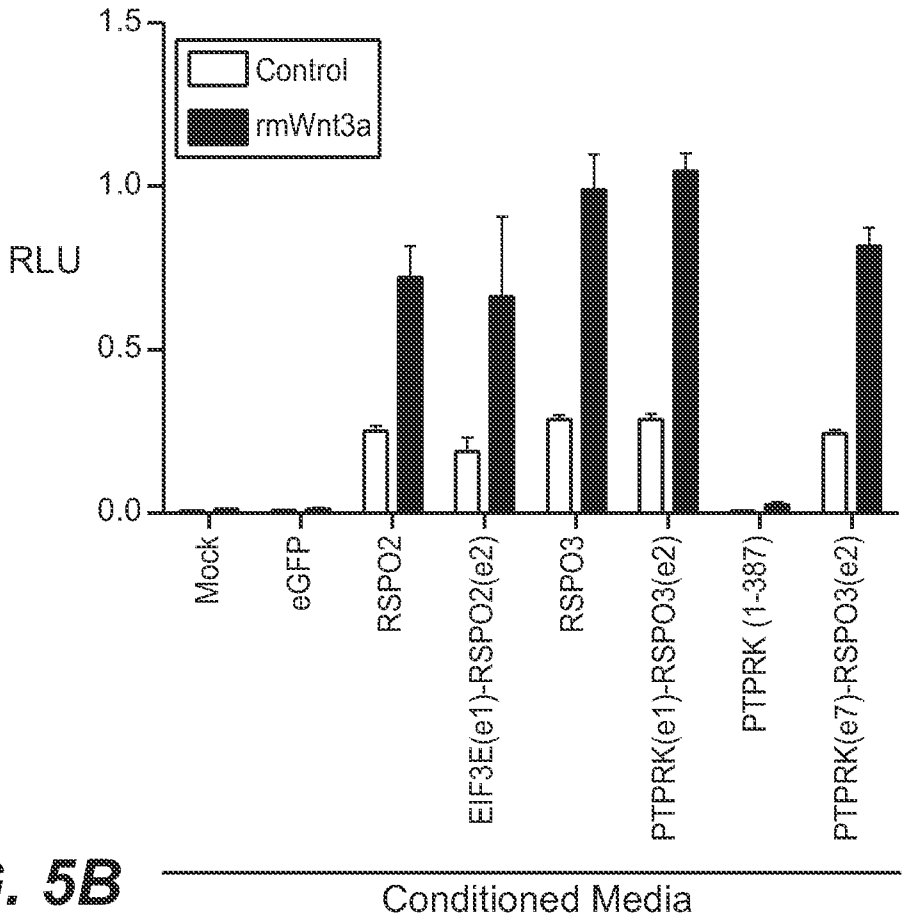

1.5
1.0
0.5
0.0
RLU
Control
rmWnt3a
Mock
eGFP
RSPO2
EIF3E(e1)-RSPO2(e2)
RSPO3
PTPRK(e1)-RSPO3(e2)
PTPRK (1-387)
PTPRK(e7)-RSPO3(e2)
Conditioned Media

FIG. 5B

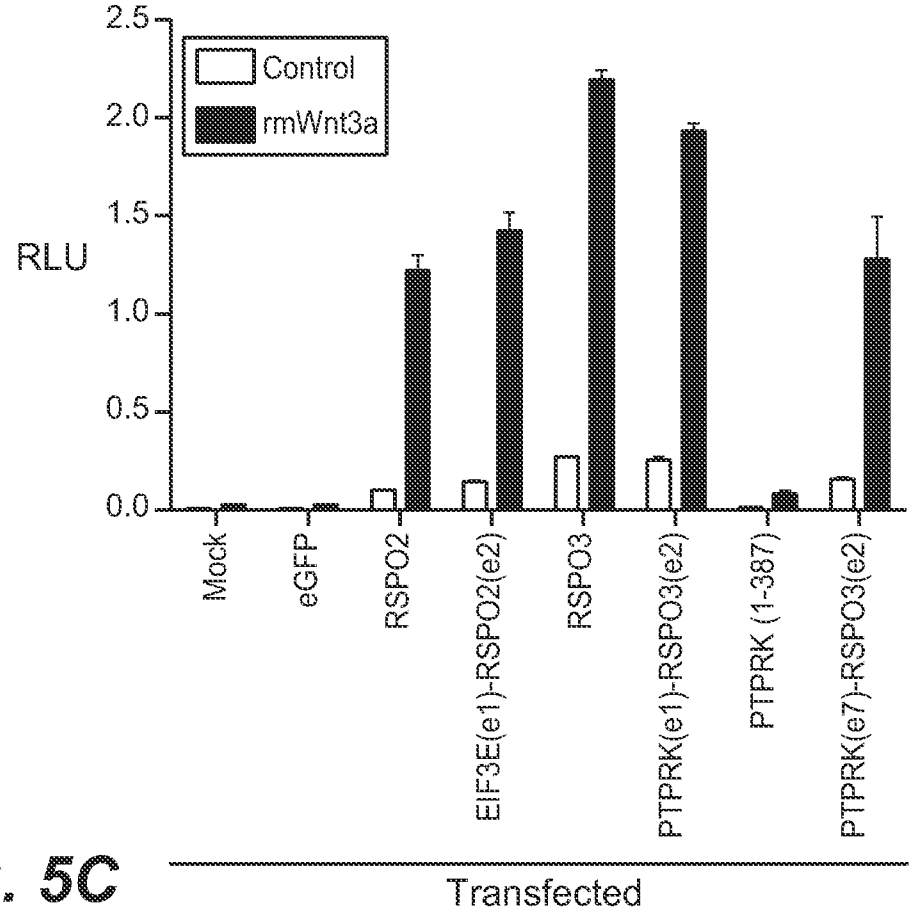

2.5
2.0
1.5
1.0
0.5
0.0
RLU
Control
rmWnt3a
Mock
eGFP
RSPO2
EIF3E(e1)-RSPO2(e2)
RSPO3
PTPRK(e1)-RSPO3(e2)
PTPRK (1-387)
PTPRK(e7)-RSPO3(e2)
Transfected

FIG. 5C

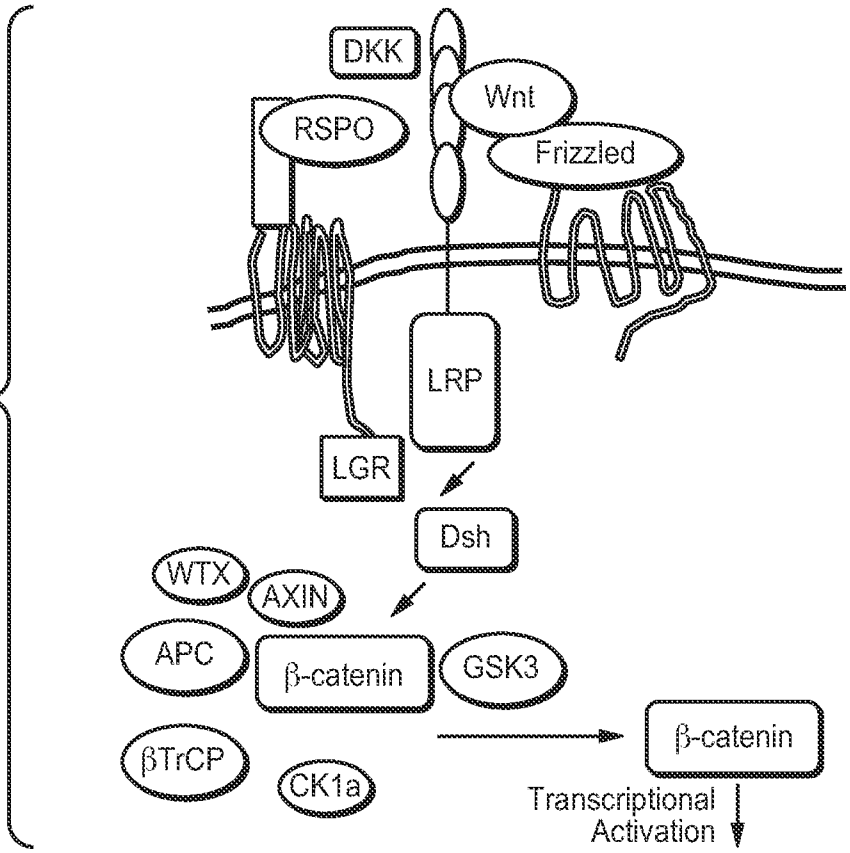

DKK
Wnt
RSPO
Frizzled
LRP
LGR
Dsh
WTX
AXIN
APC
β-catenin
GSK3
βTrCP
CK1a
β-catenin
Transcriptional
Activation

FIG. 5D

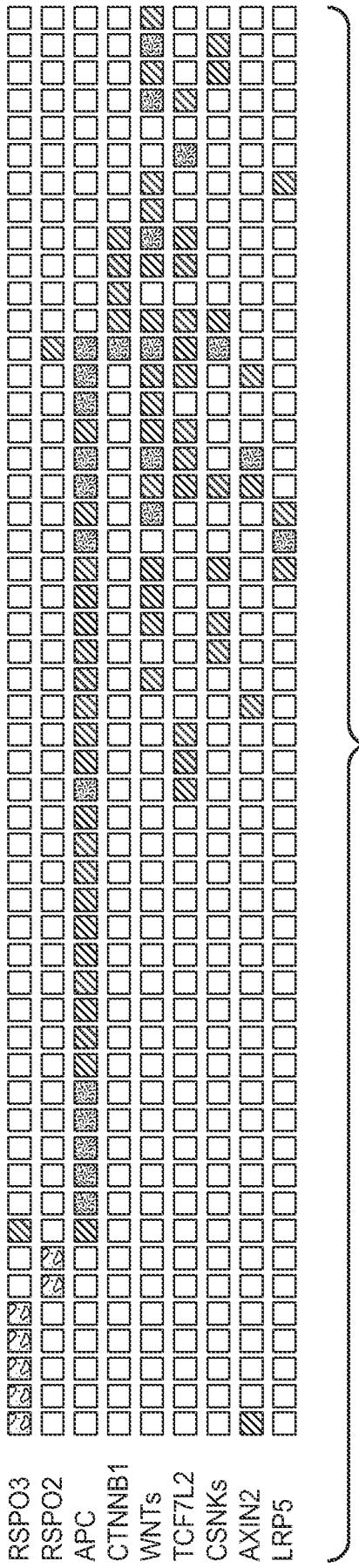


FIG. 5E

RSPO2
RSPO3
APC
CTNNB1
KRAS
BRAF
Mutation
Fusion

FIG. 6A

KRAS
BRAF
NRAS
RAF1
ARAF
EGFR
ERBB4
ERBB3
ERBB2
Mutation
Co-occuring Mutation
Fusion

FIG. 6B

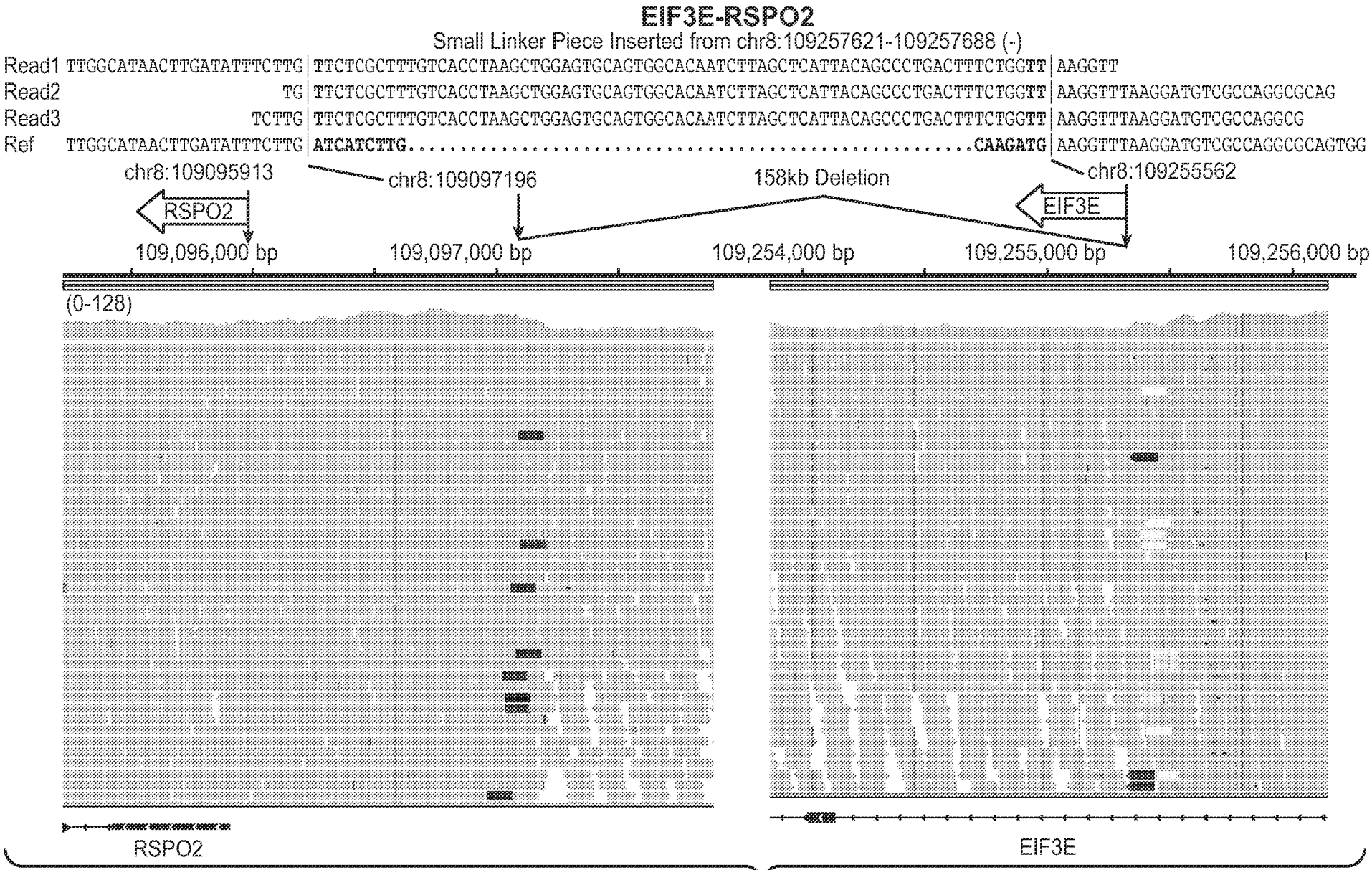

EIF3E-RSPO2
Small Linker Piece Inserted from chr8:109257621-109257688 (-)
Read1 TTGGCATAACTTGATATTTCTTG TTCTCGCTTTGTCACCTAAGCTGGAGTGCAGTGGCACAATCTTAGCTCATTACAGCCCTGACTTTCTGGTT AAGGTT
Read2 TG TTCTCGCTTTGTCACCTAAGCTGGAGTGCAGTGGCACAATCTTAGCTCATTACAGCCCTGACTTTCTGGTT AAGGTTTAAGGATGTCGCCAGGCGCAG
Read3 TCTTG TTCTCGCTTTGTCACCTAAGCTGGAGTGCAGTGGCACAATCTTAGCTCATTACAGCCCTGACTTTCTGGTT AAGGTTTAAGGATGTCGCCAGGCG
Ref TTGGCATAACTTGATATTTCTTG ATCATCTTG.....CAAGATG AAGGTTTAAGGATGTCGCCAGGCGCAGTGG
chr8:109095913
chr8:109097196
158kb Deletion
chr8:109255562
RSPO2
EIF3E
109,096,000 bp
109,097,000 bp
109,254,000 bp
109,255,000 bp
109,256,000 bp
(0-128)
RSPO2
EIF3E

FIG. 7

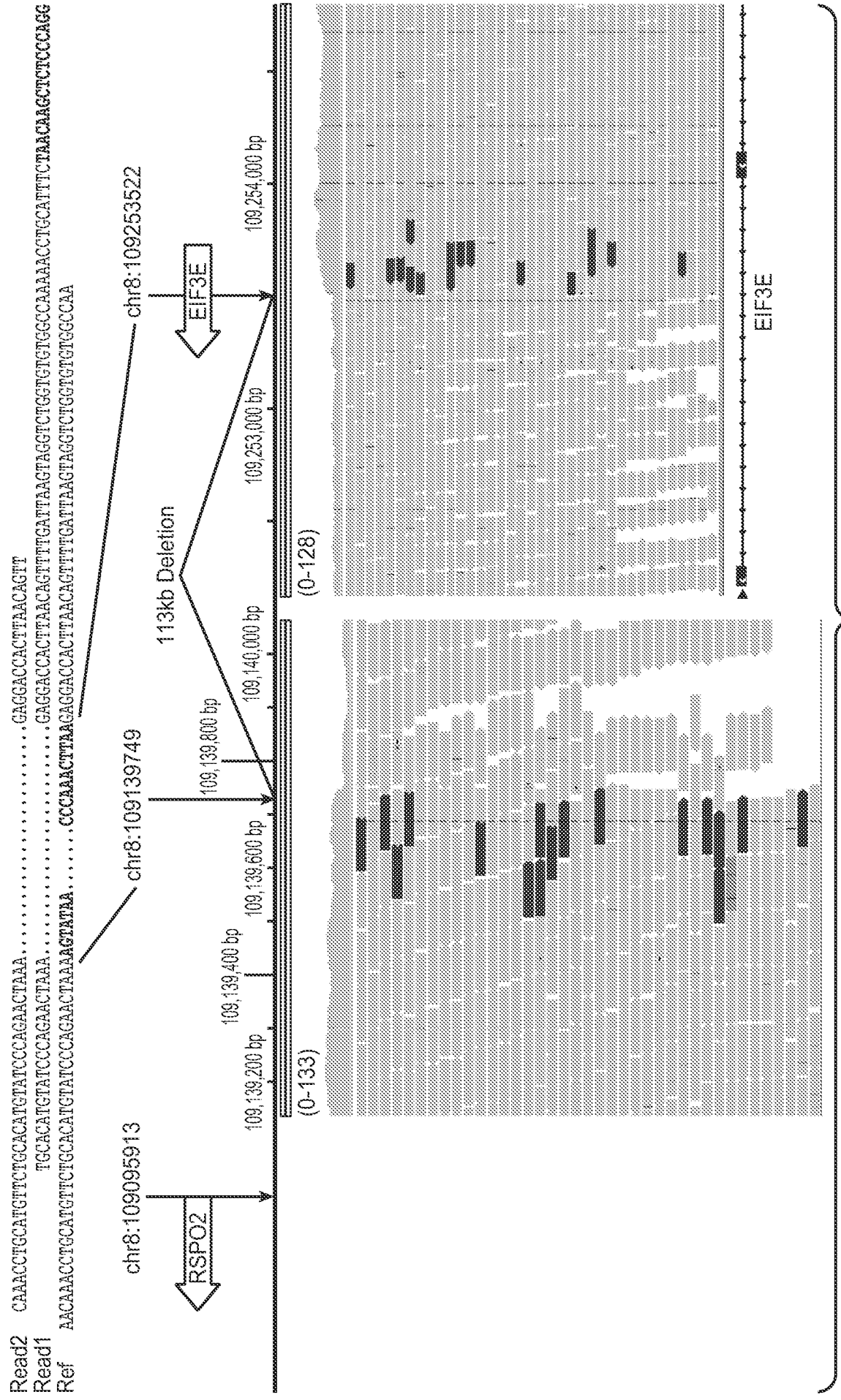

EIF3E-RSPO2
Read2 CAAACCTGCATGTTCTGCACATGTATCCCAGAACTAAA.....GAGGACCACTTAACAGTT
Read1 TGCACATGTATCCCAGAACTAAA.....GAGGACCACTTAACAGTTTGATTAAGTAGGTCTGGTGTGTGGCCAAAAACCTGCATTTCTAACAAGCTCTCCCAGG
Ref AACAAACCTGCATGTTCTGCACATGTATCCCAGAACTAAAAGTATAA.....CCCAAACTTTAAGAGGACCACTTAACAGTTTGATTAAGTAGGTCTGGTGTGTGGCCAA
chr8:109095913
RSPO2
109,139,200 bp
109,139,400 bp
109,139,600 bp
chr8:109139749
109,139,800 bp
109,140,000 bp
113kb Deletion
chr8:109253522
EIF3E
109,253,000 bp
109,254,000 bp
(0-133)
(0-128)
EIF3E

FIG. 8

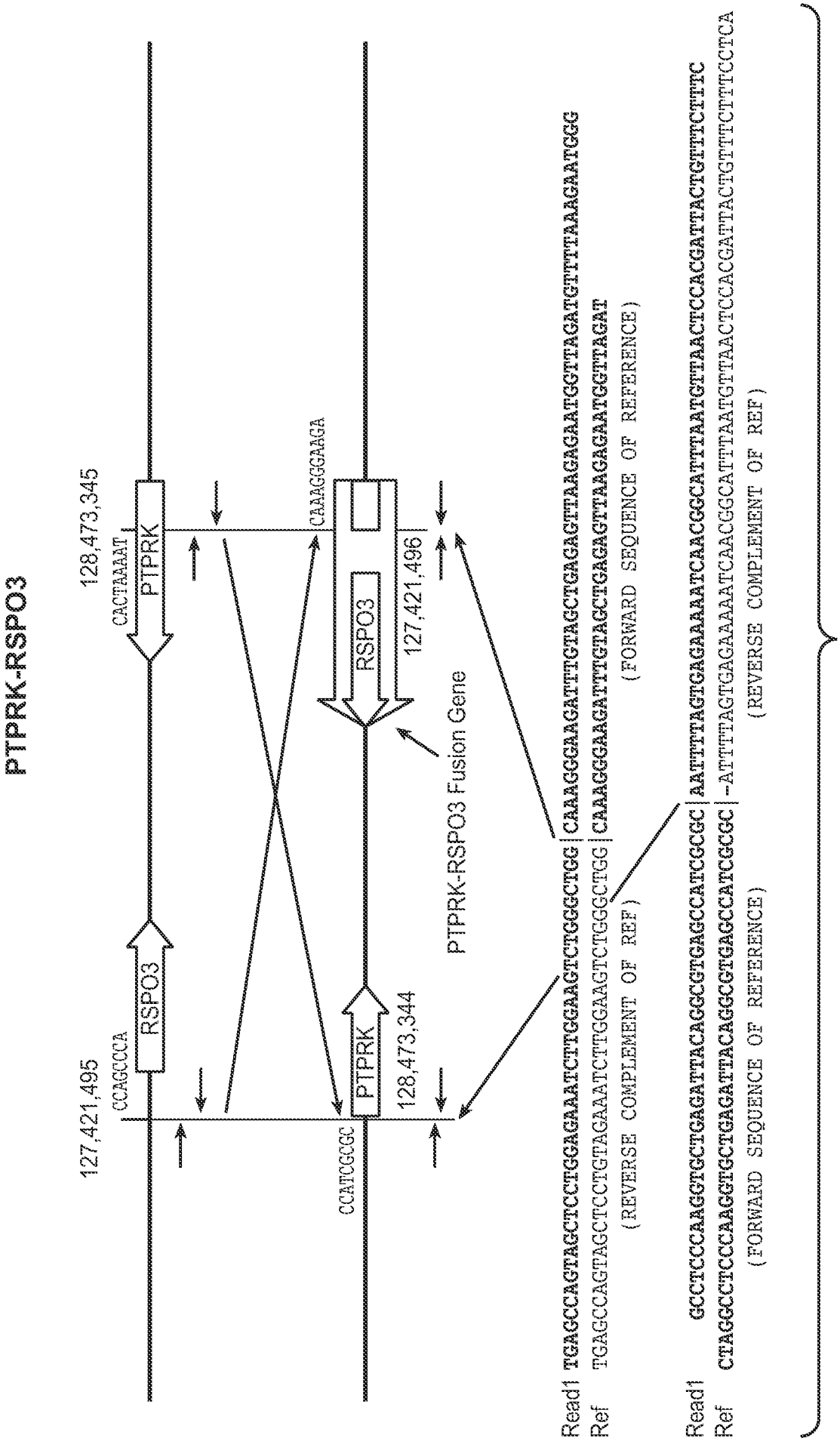

PTPRK-RSPO3
127,421,495
CCAGCCCA
RSPO3
128,473,345
CACTAAAT
PTPRK
CCATCGCGC
PTPRK
128,473,344
CAAAGGGAAGA
RSPO3
127,421,496
PTPRK-RSPO3 Fusion Gene
Read1 TGAGCCAGTAGCTCCTGGAGAAATCTTGGAAGTCTGGGCTGG
Ref TGAGCCAGTAGCTCCTGTAGAAATCTTGGAAGTCTGGGCTGG
(REVERSE COMPLEMENT OF REF)
CAAAGGGAAGATTTGTAGCTGAGAGTTAAGAGAATGGTTAGATGTTTTAAAGAATGGG
CAAAGGGAAGATTTGTAGCTGAGAGTTAAGAGAATGGTTAGAT
(FORWARD SEQUENCE OF REFERENCE)
Read1 GCCTCCCAAGGTGCTGAGATTACAGGCGTGAGCCATCGCGC
Ref CTAGGCCTCCCAAGGTGCTGAGATTACAGGCGTGAGCCATCGCGC
(FORWARD SEQUENCE OF REFERENCE)
AATTTTAGTGAGAAAAATCAACGGCATTTAATGTTAACTCCACGATTACTGTTTCTTTC
-ATTTTAGTGAGAAAAATCAACGGCATTTAATGTTAACTCCACGATTACTGTTTCTTTCCTCA
(REVERSE COMPLEMENT OF REF)

FIG. 9

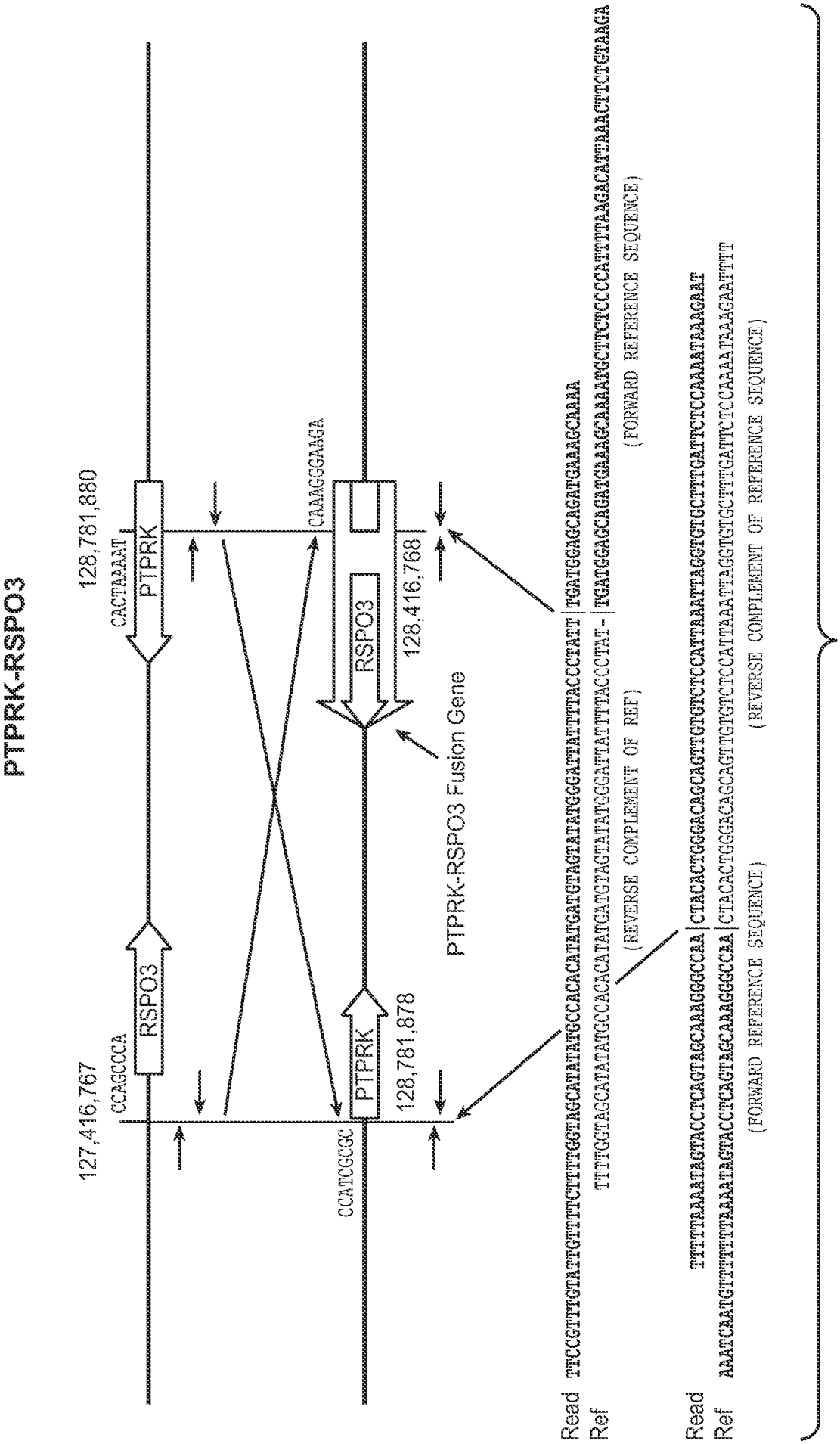

PTPRK-RSPO3
127,416,767
CCAGCCCA
RSPO3
128,781,880
CACTAAAT
PTPRK
CCATCGCGC
PTPRK
128,781,878
CAAAGGGAAGA
RSPO3
128,416,768
PTPRK-RSPO3 Fusion Gene
Read TTCCGTTTGTATTGTTTTCTTTTGGTAGCATATATGCCACACATATCATGTAGTATATGGGATTATTTTACCCTATT|TGATGGAGCAGATGAAAGCAAA
Ref TTTTGGTAGCATATATGCCACACATATCATGTAGTATATGGGATTATTTTACCCTAT-|TGATGGAGCAGATGAAAGCAAAATGCTTCTCCCCATTTTAAGACATTAAACTTCTGTAAGA
(REVERSE COMPLEMENT OF REF)
(FORWARD REFERENCE SEQUENCE)
Read TTTTTAAAATAGTACCTCAGTAGCAAAGGGCCAA|CTACACTGGGACAGCAGTTGTGTCTCCATTAAATTAGGTGTGCTTTGATTCTCCAAAATAAAGAAT
Ref AAATCAATGTTTTTTAAAATAGTACCTCAGTAGCAAAGGGCCAA|CTACACTGGGACAGCAGTTGTGTCTCCATTAAATTAGGTGTTTGATTCTCCAAATAAAGAATTTT
(FORWARD REFERENCE SEQUENCE)
(REVERSE COMPLEMENT OF REFERENCE SEQUENCE)

FIG. 10

SEQUENCE LISTING

<110> GENENTECH, INC. ET AL.

<120> R-SPONDIN TRANSLOCATIONS AND METHODS USING THE SAME

<130> P4853R1-WO

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<150> 61/674,763
<151> 2012-07-23

<150> 61/597,746
<151> 2012-02-11

<160> 120

<170> PatentIn version 3.5

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<212> DNA
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gccaaaggct gtgagctctg ctctgaagtc aacggctgcc tcaagtgctc acccaagctg 180

ttcatcctgc tggagaggaa cgacatccgc caggtgggcg tctgcttgcc gtcctgccca 240

cctggatact tcgacgcccg caaccccgac atgaacaagt gcatcaaatg caagatcgag 300

cactgtgagg cctgcttcag ccataacttc tgcaccaagt gtaaggaggg cttgtacctg 360

cacaagggcc gctgctatcc agcttgtccc gagggctcct cagctgccaa tggcaccatg 420

gagtgcagta gtcctgcgca atgtgaaatg agcgagtggt ctccgtgggg gccctgctcc 480

aagaagcagc agctctgtgg tttccggagg ggctccgagg agcggacacg cagggtgcta 540

catgcccctg tgggggacca tgctgcctgc tctgacacca aggagacccg gaggtgcaca 600

gtgaggagag tgccgtgtcc tgaggggcag aagaggagga agggaggcca gggccggcgg 660

gagaatgcca acaggaacct ggccaggaag gagagcaagg aggcgggtgc tggctctcga 720

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<210> 2
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<213> Homo sapiens

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Leu Thr Ile Ser Ser Arg Gly Ile Lys Gly Lys Arg Gln Arg Arg Ile
20 25 30

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Ser Ala Glu Gly Ser Gln Ala Cys Ala Lys Gly Cys Glu Leu Cys Ser
        35                  40                  45

Glu Val Asn Gly Cys Leu Lys Cys Ser Pro Lys Leu Phe Ile Leu Leu
    50                  55                  60

Glu Arg Asn Asp Ile Arg Gln Val Gly Val Cys Leu Pro Ser Cys Pro
65                  70                  75                  80

Pro Gly Tyr Phe Asp Ala Arg Asn Pro Asp Met Asn Lys Cys Ile Lys
                85                  90                  95

Cys Lys Ile Glu His Cys Glu Ala Cys Phe Ser His Asn Phe Cys Thr
            100                 105                 110

Lys Cys Lys Glu Gly Leu Tyr Leu His Lys Gly Arg Cys Tyr Pro Ala
        115                 120                 125

Cys Pro Glu Gly Ser Ser Ala Ala Asn Gly Thr Met Glu Cys Ser Ser
    130                 135                 140

Pro Ala Gln Cys Glu Met Ser Glu Trp Ser Pro Trp Gly Pro Cys Ser
145                 150                 155                 160

Lys Lys Gln Gln Leu Cys Gly Phe Arg Arg Gly Ser Glu Glu Arg Thr
                165                 170                 175

Arg Arg Val Leu His Ala Pro Val Gly Asp His Ala Ala Cys Ser Asp
            180                 185                 190

Thr Lys Glu Thr Arg Arg Cys Thr Val Arg Arg Val Pro Cys Pro Glu
        195                 200                 205

Gly Gln Lys Arg Arg Lys Gly Gly Gln Gly Arg Arg Glu Asn Ala Asn
    210                 215                 220

Arg Asn Leu Ala Arg Lys Glu Ser Lys Glu Ala Gly Ala Gly Ser Arg
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Arg Arg Lys Gly Gln Gln Gln Gln Gln Gln Gly Thr Val Gly Pro
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aagggttgtt tgtcttgttc aaaggacaat gggtgtagcc gatgtcaaca gaagttgttc 180

ttcttccttc gaagagaagg gatgcgccag tatggagagt gcctgcattc ctgcccatcc 240

gggtactatg gacaccgagc cccagatatg aacagatgtg caagatgcag aatagaaaac 300

tgtgattctt gctttagcaa agacttttgt accaagtgca aagtaggctt ttatttgcat 360

agaggccgtt gctttgatga atgtccagat ggttttgcac cattagaaga aaccatggaa 420

tgtgtggaag gatgtgaagt tggtcattgg agcgaatggg gaacttgtag cagaaataat 480

cgcacatgtg gatttaaatg gggtctggaa accagaacac ggcaaattgt taaaaagcca 540

gtgaaagaca caatactgtg tccaaccatt gctgaatcca ggagatgcaa gatgacaatg 600

aggcattgtc caggagggaa gagaacacca aaggcgaagg agaagaggaa caagaaaaag 660

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gctaaccaat aa 732

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<212> PRT
<213> Homo sapiens

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20 25 30

Ser Tyr Val Ser Asn Pro Ile Cys Lys Gly Cys Leu Ser Cys Ser Lys
35 40 45

Asp Asn Gly Cys Ser Arg Cys Gln Gln Lys Leu Phe Phe Phe Leu Arg
50 55 60

Arg Glu Gly Met Arg Gln Tyr Gly Glu Cys Leu His Ser Cys Pro Ser
65 70 75 80

Gly Tyr Tyr Gly His Arg Ala Pro Asp Met Asn Arg Cys Ala Arg Cys
85 90 95

Arg Ile Glu Asn Cys Asp Ser Cys Phe Ser Lys Asp Phe Cys Thr Lys
100 105 110

Cys Lys Val Gly Phe Tyr Leu His Arg Gly Arg Cys Phe Asp Glu Cys
115 120 125

Pro Asp Gly Phe Ala Pro Leu Glu Glu Thr Met Glu Cys Val Glu Gly
130 135 140

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Cys Glu Val Gly His Trp Ser Glu Trp Gly Thr Cys Ser Arg Asn Asn
145                 150                 155                 160

Arg Thr Cys Gly Phe Lys Trp Gly Leu Glu Thr Arg Thr Arg Gln Ile
                165                 170                 175

Val Lys Lys Pro Val Lys Asp Thr Ile Leu Cys Pro Thr Ile Ala Glu
            180                 185                 190

Ser Arg Arg Cys Lys Met Thr Met Arg His Cys Pro Gly Gly Lys Arg
        195                 200                 205

Thr Pro Lys Ala Lys Glu Lys Arg Asn Lys Lys Lys Lys Arg Lys Leu
    210                 215                 220

Ile Glu Arg Ala Gln Glu Gln His Ser Val Phe Leu Ala Thr Asp Arg
225                 230                 235                 240

Ala Asn Gln
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tgccaaggag gctgtgcaac atgctcagat tacaatggat gtttgtcatg taagcccaga 180

ctatttttg ctctggaaag aattggcatg aagcagattg gagtatgtct ctcttcatgt 240

ccaagtggat attatggaac tcgatatcca gatataaata agtgtacaaa atgcaaagct 300

gactgtgata cctgtttcaa caaaaatttc tgcacaaaat gtaaaagtgg attttactta 360

caccttggaa agtgccttga caattgccca gaagggttgg aagccaacaa ccatactatg 420

gagtgtgtca gtattgtgca ctgtgaggtc agtgaatgga atccttggag tccatgcacg 480

aagaagggaa aaacatgtgg cttcaaaaga gggactgaaa cacgggtccg agaaataata 540

cagcatcctt cagcaaaggg taacctgtgt cccccaacaa atgagacaag aaagtgtaca 600

gtgcaaagga agaagtgtca gaagggagaa cgaggaaaaa aaggaaggga gaggaaaaga 660

aaaaaaccta ataaaggaga aagtaaagaa gcaatacctg acagcaaaag tctggaatcc 720

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gataaacaga aatcggtatc agtcagcact gtacactag 819

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<212> PRT
<213> Homo sapiens

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20 25 30

Met His Pro Asn Val Ser Gln Gly Cys Gln Gly Gly Cys Ala Thr Cys
35 40 45

Ser Asp Tyr Asn Gly Cys Leu Ser Cys Lys Pro Arg Leu Phe Phe Ala
50 55 60

Leu Glu Arg Ile Gly Met Lys Gln Ile Gly Val Cys Leu Ser Ser Cys
65 70 75 80

Pro Ser Gly Tyr Tyr Gly Thr Arg Tyr Pro Asp Ile Asn Lys Cys Thr
85 90 95

Lys Cys Lys Ala Asp Cys Asp Thr Cys Phe Asn Lys Asn Phe Cys Thr
100 105 110

Lys Cys Lys Ser Gly Phe Tyr Leu His Leu Gly Lys Cys Leu Asp Asn
115 120 125

Cys Pro Glu Gly Leu Glu Ala Asn Asn His Thr Met Glu Cys Val Ser
130 135 140

Ile Val His Cys Glu Val Ser Glu Trp Asn Pro Trp Ser Pro Cys Thr
145 150 155 160

Lys Lys Gly Lys Thr Cys Gly Phe Lys Arg Gly Thr Glu Thr Arg Val
165 170 175

Arg Glu Ile Ile Gln His Pro Ser Ala Lys Gly Asn Leu Cys Pro Pro
180 185 190

Thr Asn Glu Thr Arg Lys Cys Thr Val Gln Arg Lys Lys Cys Gln Lys
195 200 205

Gly Glu Arg Gly Lys Lys Gly Arg Glu Arg Lys
210 215

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<212> DNA
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aaccgaagga agaagcaagt gggcactggc ctgggggggca actgcacagg ctgtatcatc 120

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gaaggcatcc gccagtacgg caagtgcctg cacgactgtc cccctgggta cttcggcatc 240

cgcggccagg aggtcaacag gtgcaaaaaa tgtggggcca cttgtgagag ctgcttcagc 300

caggacttct gcatccggtg caagaggcag ttttacttgt acaaggggaa gtgtctgccc 360

acctgcccgc cgggcacttt ggcccaccag aacacacggg agtgccaggg ggagtgtgaa 420

ctgggtccct ggggcggctg gagcccctgc acacacaatg gaaagacctg cggctcggct 480

tggggcctgg agagccgggt acgagaggct ggccgggctg ggcatgagga ggcagccacc 540

tgccaggtgc tttctgagtc aaggaaatgt cccatccaga ggccctgccc aggagagagg 600

agccccggcc agaagaaggg caggaaggac cggcgcccac gcaaggacag gaagctggac 660

cgcaggctgg acgtgaggcc gcgccagccc ggcctgcagc cctga 705

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<212> PRT
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<400> 8

Met Arg Ala Pro Leu Cys Leu Leu Leu Leu Val Ala His Ala Val Asp
1 5 10 15

Met Leu Ala Leu Asn Arg Arg Lys Lys Gln Val Gly Thr Gly Leu Gly
20 25 30

Gly Asn Cys Thr Gly Cys Ile Ile Cys Ser Glu Glu Asn Gly Cys Ser
35 40 45

Thr Cys Gln Gln Arg Leu Phe Leu Phe Ile Arg Arg Glu Gly Ile Arg
50 55 60

Gln Tyr Gly Lys Cys Leu His Asp Cys Pro Pro Gly Tyr Phe Gly Ile
65 70 75 80

Arg Gly Gln Glu Val Asn Arg Cys Lys Lys Cys Gly Ala Thr Cys Glu
85 90 95

Ser Cys Phe Ser Gln Asp Phe Cys Ile Arg Cys Lys Arg Gln Phe Tyr
100 105 110

Leu Tyr Lys Gly Lys Cys Leu Pro Thr Cys Pro Pro Gly Thr Leu Ala
115 120 125

His Gln Asn Thr Arg Glu Cys Gln Gly Glu Cys Glu Leu Gly Pro Trp
130 135 140

Gly Gly Trp Ser Pro Cys Thr His Asn Gly Lys Thr Cys Gly Ser Ala
145 150 155 160

Trp Gly Leu Glu Ser Arg Val Arg Glu Ala Gly Arg Ala Gly His Glu

165 170 175

Glu Ala Ala Thr Cys Gln Val Leu Ser Glu Ser Arg Lys Cys Pro Ile
180 185 190

Gln Arg Pro Cys Pro Gly Glu Arg Ser Pro Gly Gln Lys Lys Gly Arg
195 200 205

Lys Asp Arg Arg Pro Arg Lys Asp Arg Lys Leu Asp Arg Arg Leu Asp
210 215 220

Val Arg Pro Arg Gln Pro Gly Leu Gln Pro
225 230

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<211> 54
<212> PRT
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<220>
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1 5 10 15

Lys Ser Pro Leu Arg Gly Lys Glu Lys Asn Thr Leu Pro Leu Asn Gly
20 25 30

Gly Leu Lys Met Thr Leu Ile Tyr Lys Glu Lys Thr Glu Gly Gly Asp
35 40 45

Thr Asp Ser Glu Ile Leu
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<210> 10
<211> 74
<212> PRT
<213> Artificial Sequence

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<400> 10
Met Met Ala His Leu Asp Phe Phe Leu Thr Tyr Lys Trp Arg Ala Pro
1 5 10 15

Lys Ser Lys Ser Leu Asp Gln Leu Ser Pro Asn Phe Leu Leu Arg Gly
20 25 30

Arg Ser Glu Thr Lys Ser Pro Leu Arg Gly Lys Glu Lys Asn Thr Leu
35 40 45

Pro Leu Asn Gly Gly Leu Lys Met Thr Leu Ile Tyr Lys Glu Lys Thr
50 55 60

Glu Gly Gly Asp Thr Asp Ser Glu Ile Leu
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<210> 11
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
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<223> /note="Description of Artificial Sequence: Synthetic primer"

<400> 11
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<210> 12
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<212> DNA
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<400> 12
actactcgca tcgcgcact 19

<210> 13
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<210> 14
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<212> DNA
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<400> 14
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<210> 15
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<400> 17
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<210> 18
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<212> DNA
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<223> /note="Description of Artificial Sequence: Synthetic
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<210> 20

<211> 20
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<400> 20
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<210> 23
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<210> 24
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<210> 25
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<400> 27
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<210> 29
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<210> 30
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<210> 31
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<210> 33
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<223> /note="Description of Artificial Sequence: Synthetic primer"

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<210> 41
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<210> 45
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<220>
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<210> 46
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<400> 49
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<210> 50
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<210> 52
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<210> 56
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catgtcaaac caccatccac 20

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ggagctacct gtggccct 18

<210> 61
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cacgcttttc atattcccgt 20

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<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic primer"

<400> 63

tcccaaaggc ttcttcttga 20

<210> 64
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic primer"

<400> 64
gtcgtgtacc ccagaggct 19

<210> 65
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic primer"

<400> 65
gtgcaggaat tgggctatgt 20

<210> 66
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic primer"

<400> 66
agcagggaag cctcctagtc 20

<210> 67
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic primer"

<400> 67
ggtcagccag tgaggtcttc 20

<210> 68
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic primer"

<400> 68
caaagcagac tttccaacgc 20

<210> 69
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic primer"

<400> 69
cttctgatcg aagctttccg 20

<210> 70
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic primer"

<400> 70
cactctcatc tctgggctcc 20

<210> 71
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic oligonucleotide"

<400> 71
tgtaaaggag gttcgtggcg 20

<210> 72
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic oligonucleotide"

<400> 72
ttctccgcag tgcatcctaa 20

<210> 73
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<221> source

<223> /note="Description of Artificial Sequence: Synthetic oligonucleotide"

<400> 73
aaatgtgcag tgcatcctaa 20

<210> 74
<211> 1019
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic polynucleotide"

<400> 74
gagcacagac tccctttct ttggcaagat ggcggagtac gacttgacta ctcgcatcgc 60

gcacttttg gatcggcatc tagtctttcc gcttcttgaa tttctctctg taaaggaggt 120

tcgtggcgga gagatgctga tcgcgctgaa ctgaccggtg cggcccgggg gtgagtggcg 180

agtctccctc tgagtcctcc ccagcagcgc ggccggcgcc ggctctttgg gcgaaccctc 240

cagttcctag actttgagag gcgtctctcc cccgcccgac cgcccagatg cagtttcgcc 300

ttttctcctt tgccctcatc attctgaact gcatggatta cagccactgc caaggcaacc 360

gatggagacg cagtaagcga gctagttatg tatcaaatcc catttgcaag ggttgtttgt 420

cttgttcaaa ggacaatggg tgtagccgat gtcaacagaa gttgttcttc ttccttcgaa 480

gagaagggat gcgccagtat ggagagtgcc tgcattcctg cccatccggg tactatggac 540

accgagcccc agatatgaac agatgtgcaa gatgcagaat agaaaactgt gattcttgct 600

ttagcaaaga cttttgtacc aagtgcaaag taggctttta tttgcataga ggccgttgct 660

ttgatgaatg tccagatggt tttgcaccat tagaagaaac catggaatgt gtggaaggat 720

gtgaagttgg tcattggagc gaatggggaa cttgtagcag aaataatcgc acatgtggat 780

ttaaatgggg tctggaaacc agaacacggc aaattgttaa aaagccagtg aaagacacaa 840

tactgtgtcc aaccattgct gaatccagga gatgcaagat gacaatgagg cattgtccag 900

gagggaagag aacaccaaag gcgaaggaga agaggaacaa gaaaaagaaa aggaagctga 960

tagaaagggc ccaggagcaa cacagcgtct tcctagctac agacagagct aaccaataa 1019

<210> 75
<211> 284
<212> PRT
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic polypeptide"

<400> 75
Met Ala Glu Tyr Asp Leu Thr Thr Arg Ile Ala His Phe Leu Asp Arg
1 5 10 15

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His Leu Val Phe Pro Leu Leu Glu Phe Leu Ser Val Lys Glu Val Arg
            20                  25                  30

Gly Gly Glu Met Leu Ile Ala Leu Asn Met Gln Phe Arg Leu Phe Ser
        35                  40                  45

Phe Ala Leu Ile Ile Leu Asn Cys Met Asp Tyr Ser His Cys Gln Gly
    50                  55                  60

Asn Arg Trp Arg Arg Ser Lys Arg Ala Ser Tyr Val Ser Asn Pro Ile
65                  70                  75                  80

Cys Lys Gly Cys Leu Ser Cys Ser Lys Asp Asn Gly Cys Ser Arg Cys
                85                  90                  95

Gln Gln Lys Leu Phe Phe Phe Leu Arg Arg Glu Gly Met Arg Gln Tyr
            100                 105                 110

Gly Glu Cys Leu His Ser Cys Pro Ser Gly Tyr Tyr Gly His Arg Ala
        115                 120                 125

Pro Asp Met Asn Arg Cys Ala Arg Cys Arg Ile Glu Asn Cys Asp Ser
    130                 135                 140

Cys Phe Ser Lys Asp Phe Cys Thr Lys Cys Lys Val Gly Phe Tyr Leu
145                 150                 155                 160

His Arg Gly Arg Cys Phe Asp Glu Cys Pro Asp Gly Phe Ala Pro Leu
                165                 170                 175

Glu Glu Thr Met Glu Cys Val Glu Gly Cys Glu Val Gly His Trp Ser
            180                 185                 190

Glu Trp Gly Thr Cys Ser Arg Asn Asn Arg Thr Cys Gly Phe Lys Trp
        195                 200                 205

Gly Leu Glu Thr Arg Thr Arg Gln Ile Val Lys Lys Pro Val Lys Asp
    210                 215                 220

Thr Ile Leu Cys Pro Thr Ile Ala Glu Ser Arg Arg Cys Lys Met Thr
225                 230                 235                 240

Met Arg His Cys Pro Gly Gly Lys Arg Thr Pro Lys Ala Lys Glu Lys
                245                 250                 255

Arg Asn Lys Lys Lys Lys Arg Lys Leu Ile Glu Arg Ala Gln Glu Gln
            260                 265                 270

His Ser Val Phe Leu Ala Thr Asp Arg Ala Asn Gln
        275                 280
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<210> 76
<211> 822
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic polynucleotide"

<400> 76
atggatacga ctgcggcggc ggcgctgcct gcttttgtgg cgctcttgct cctctctcct 60

tggcctctcc tgggatcggc ccaaggccag ttctccgcag tgcatcctaa cgttagtcaa 120

ggctgccaag gaggctgtgc aacatgctca gattacaatg gatgtttgtc atgtaagccc 180

agactatttt ttgctctgga aagaattggc atgaagcaga ttggagtatg tctctcttca 240

tgtccaagtg gatattatgg aactcgatat ccagatataa ataagtgtac aaaatgcaaa 300

gctgactgtg atacctgttt caacaaaaat ttctgcacaa aatgtaaaag tggattttac 360

ttacaccttg gaaagtgcct tgacaattgc ccagaagggt tggaagccaa caaccatact 420

atggagtgtg tcagtattgt gcactgtgag gtcagtgaat ggaatccttg gagtccatgc 480

acgaagaagg gaaaaacatg tggcttcaaa agagggactg aaacacgggt ccgagaaata 540

atacagcatc cttcagcaaa gggtaacctg tgtcccccaa caaatgagac aagaaagtgt 600

acagtgcaaa ggaagaagtg tcagaaggga gaacgaggaa aaaaaggaag ggagaggaaa 660

agaaaaaaac ctaataaagg agaaagtaaa gaagcaatac ctgacagcaa aagtctggaa 720

tccagcaaag aaatcccaga gcaacgagaa aacaaacagc agcagaagaa gcgaaaagtc 780

caagataaac agaaatcggt atcagtcagc actgtacact ag 822

<210> 77
<211> 217
<212> PRT
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic polypeptide"

<400> 77
Met Asp Thr Thr Ala Ala Ala Ala Leu Pro Ala Phe Val Ala Leu Leu
1 5 10 15

Leu Leu Ser Pro Trp Pro Leu Leu Gly Ser Ala Gln Gly Gln Phe Ser
20 25 30

Ala Val His Pro Asn Val Ser Gln Gly Cys Gln Gly Gly Cys Ala Thr
35 40 45

Cys Ser Asp Tyr Asn Gly Cys Leu Ser Cys Lys Pro Arg Leu Phe Phe
50 55 60

Ala Leu Glu Arg Ile Gly Met Lys Gln Ile Gly Val Cys Leu Ser Ser

65 70 75 80

Cys Pro Ser Gly Tyr Tyr Gly Thr Arg Tyr Pro Asp Ile Asn Lys Cys
85 90 95

Thr Lys Cys Lys Ala Asp Cys Asp Thr Cys Phe Asn Lys Asn Phe Cys
100 105 110

Thr Lys Cys Lys Ser Gly Phe Tyr Leu His Leu Gly Lys Cys Leu Asp
115 120 125

Asn Cys Pro Glu Gly Leu Glu Ala Asn Asn His Thr Met Glu Cys Val
130 135 140

Ser Ile Val His Cys Glu Val Ser Glu Trp Asn Pro Trp Ser Pro Cys
145 150 155 160

Thr Lys Lys Gly Lys Thr Cys Gly Phe Lys Arg Gly Thr Glu Thr Arg
165 170 175

Val Arg Glu Ile Ile Gln His Pro Ser Ala Lys Gly Asn Leu Cys Pro
180 185 190

Pro Thr Asn Glu Thr Arg Lys Cys Thr Val Gln Arg Lys Lys Cys Gln
195 200 205

Lys Gly Glu Arg Gly Lys Lys Gly Arg
210 215

<210> 78
<211> 1884
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic polynucleotide"

<400> 78
atggatacga ctgcggcggc ggcgctgcct gcttttgtgg cgctcttgct cctctctcct 60

tggcctctcc tgggatcggc ccaaggccag ttctccgcag gtggctgtac ttttgatgat 120

ggtccagggg cctgtgatta ccaccaggat ctgtatgatg actttgaatg ggtgcatgtt 180

agtgctcaag agcctcatta tctaccaccc gagatgcccc aaggttccta tatgatagtg 240

gactcttcag atcacgaccc tggagaaaaa gccagacttc agctgcctac aatgaaggag 300

aacgacactc actgcattga tttcagttac ctattatata gccagaaagg actgaatcct 360

ggcactttga acatattagt tagggtgaat aaaggacctc ttgccaatcc aatttggaat 420

gtgactggat tcacgggtag agattggctt cgggctgagc tagcagtgag caccttttgg 480

cccaatgaat atcaggtaat atttgaagct gaagtctcag gagggagaag tggttatatt 540

gccattgatg acatccaagt actgagttat ccttgtgata aatctcctca tttcctccgt 600

ctaggggatg tagaggtgaa tgcagggcaa aacgctacat ttcagtgcat tgccacaggg 660

agagatgctg tgcataacaa gttatggctc cagagacgaa atggagaaga tataccagta 720

gcccagacta agaacatcaa tcatagaagg tttgccgctt ccttcagatt gcaagaagtg 780

acaaaaactg accaggattt gtatcgctgt gtaactcagt cagaacgagg ttccggtgtg 840

tccaattttg ctcaacttat tgtgagagaa ccgccaagac ccattgctcc tcctcagctt 900

cttggtgttg ggcctacata tttgctgatc caactaaatg ccaactcgat cattggcgat 960

ggtcctatca tcctgaaaga agtagagtac cgaatgacat caggatcctg gacagaaacc 1020

catgcagtca atgctccaac ttacaaatta tggcatttag atccagatac cgaatatgag 1080

atccgagttc tacttacaag acctggtgaa ggtggaacgg ggctcccagg acctccacta 1140

atcaccagaa caaaatgtgc agtgcatcct aacgttagtc aaggctgcca aggaggctgt 1200

gcaacatgct cagattacaa tggatgtttg tcatgtaagc ccagactatt ttttgctctg 1260

gaaagaattg gcatgaagca gattggagta tgtctctctt catgtccaag tggatattat 1320

ggaactcgat atccagatat aaataagtgt acaaaatgca aagctgactg tgatacctgt 1380

ttcaacaaaa atttctgcac aaaatgtaaa agtggatttt acttacacct tggaaagtgc 1440

cttgacaatt gcccagaagg gttggaagcc aacaaccata ctatggagtg tgtcagtatt 1500

gtgcactgtg aggtcagtga atggaatcct tggagtccat gcacgaagaa gggaaaaaca 1560

tgtggcttca aaagagggac tgaaacacgg gtccgagaaa taatacagca tccttcagca 1620

aagggtaacc tgtgtccccc aacaaatgag acaagaaagt gtacagtgca aaggaagaag 1680

tgtcagaagg gagaacgagg aaaaaaagga agggagagga aaagaaaaaa acctaataaa 1740

ggagaaagta aagaagcaat acctgacagc aaaagtctgg aatccagcaa agaaatccca 1800

gagcaacgag aaaacaaaca gcagcagaag aagcgaaaag tccaagataa acagaaatcg 1860

gtatcagtca gcactgtaca ctag 1884

<210> 79
<211> 627
<212> PRT
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic polypeptide"

<400> 79
Met Asp Thr Thr Ala Ala Ala Ala Leu Pro Ala Phe Val Ala Leu Leu
1 5 10 15

Leu Leu Ser Pro Trp Pro Leu Leu Gly Ser Ala Gln Gly Gln Phe Ser
20 25 30

Ala Gly Gly Cys Thr Phe Asp Asp Gly Pro Gly Ala Cys Asp Tyr His
35 40 45

```
Gln Asp Leu Tyr Asp Asp Phe Glu Trp Val His Val Ser Ala Gln Glu
    50                  55                  60

Pro His Tyr Leu Pro Pro Glu Met Pro Gln Gly Ser Tyr Met Ile Val
65                  70                  75                  80

Asp Ser Ser Asp His Asp Pro Gly Glu Lys Ala Arg Leu Gln Leu Pro
                85                  90                  95

Thr Met Lys Glu Asn Asp Thr His Cys Ile Asp Phe Ser Tyr Leu Leu
            100                 105                 110

Tyr Ser Gln Lys Gly Leu Asn Pro Gly Thr Leu Asn Ile Leu Val Arg
        115                 120                 125

Val Asn Lys Gly Pro Leu Ala Asn Pro Ile Trp Asn Val Thr Gly Phe
    130                 135                 140

Thr Gly Arg Asp Trp Leu Arg Ala Glu Leu Ala Val Ser Thr Phe Trp
145                 150                 155                 160

Pro Asn Glu Tyr Gln Val Ile Phe Glu Ala Glu Val Ser Gly Gly Arg
                165                 170                 175

Ser Gly Tyr Ile Ala Ile Asp Asp Ile Gln Val Leu Ser Tyr Pro Cys
            180                 185                 190

Asp Lys Ser Pro His Phe Leu Arg Leu Gly Asp Val Glu Val Asn Ala
        195                 200                 205

Gly Gln Asn Ala Thr Phe Gln Cys Ile Ala Thr Gly Arg Asp Ala Val
    210                 215                 220

His Asn Lys Leu Trp Leu Gln Arg Arg Asn Gly Glu Asp Ile Pro Val
225                 230                 235                 240

Ala Gln Thr Lys Asn Ile Asn His Arg Arg Phe Ala Ala Ser Phe Arg
                245                 250                 255

Leu Gln Glu Val Thr Lys Thr Asp Gln Asp Leu Tyr Arg Cys Val Thr
            260                 265                 270

Gln Ser Glu Arg Gly Ser Gly Val Ser Asn Phe Ala Gln Leu Ile Val
        275                 280                 285

Arg Glu Pro Pro Arg Pro Ile Ala Pro Pro Gln Leu Leu Gly Val Gly
    290                 295                 300

Pro Thr Tyr Leu Leu Ile Gln Leu Asn Ala Asn Ser Ile Ile Gly Asp
305                 310                 315                 320
```

```
Gly Pro Ile Ile Leu Lys Glu Val Glu Tyr Arg Met Thr Ser Gly Ser
                325                 330                 335

Trp Thr Glu Thr His Ala Val Asn Ala Pro Thr Tyr Lys Leu Trp His
            340                 345                 350

Leu Asp Pro Asp Thr Glu Tyr Glu Ile Arg Val Leu Leu Thr Arg Pro
        355                 360                 365

Gly Glu Gly Gly Thr Gly Leu Pro Gly Pro Pro Leu Ile Thr Arg Thr
    370                 375                 380

Lys Cys Ala Val His Pro Asn Val Ser Gln Gly Cys Gln Gly Gly Cys
385                 390                 395                 400

Ala Thr Cys Ser Asp Tyr Asn Gly Cys Leu Ser Cys Lys Pro Arg Leu
                405                 410                 415

Phe Phe Ala Leu Glu Arg Ile Gly Met Lys Gln Ile Gly Val Cys Leu
            420                 425                 430

Ser Ser Cys Pro Ser Gly Tyr Tyr Gly Thr Arg Tyr Pro Asp Ile Asn
        435                 440                 445

Lys Cys Thr Lys Cys Lys Ala Asp Cys Asp Thr Cys Phe Asn Lys Asn
    450                 455                 460

Phe Cys Thr Lys Cys Lys Ser Gly Phe Tyr Leu His Leu Gly Lys Cys
465                 470                 475                 480

Leu Asp Asn Cys Pro Glu Gly Leu Glu Ala Asn Asn His Thr Met Glu
                485                 490                 495

Cys Val Ser Ile Val His Cys Glu Val Ser Glu Trp Asn Pro Trp Ser
            500                 505                 510

Pro Cys Thr Lys Lys Gly Lys Thr Cys Gly Phe Lys Arg Gly Thr Glu
        515                 520                 525

Thr Arg Val Arg Glu Ile Ile Gln His Pro Ser Ala Lys Gly Asn Leu
    530                 535                 540

Cys Pro Pro Thr Asn Glu Thr Arg Lys Cys Thr Val Gln Arg Lys Lys
545                 550                 555                 560

Cys Gln Lys Gly Glu Arg Gly Lys Lys Gly Arg Glu Arg Lys Arg Lys
                565                 570                 575

Lys Pro Asn Lys Gly Glu Ser Lys Glu Ala Ile Pro Asp Ser Lys Ser
            580                 585                 590
```

Leu Glu Ser Ser Lys Glu Ile Pro Glu Gln Arg Glu Asn Lys Gln Gln
595 600 605

Gln Lys Lys Arg Lys Val Gln Asp Lys Gln Lys Ser Val Ser Val Ser
610 615 620

Thr Val His
625

<210> 80
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic peptide"

<400> 80
Lys Trp Tyr Gly Trp Leu
1 5

<210> 81
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic peptide"

<400> 81
Gly Glu Ile Val Leu Trp Ser Asp Ile Pro Gly
1 5 10

<210> 82
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic oligonucleotide"

<400> 82
tcccatttgc aagggttgt 19

<210> 83
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic oligonucleotide"

<400> 83
agctgactgt gatacctgt 19

<210> 84
<211> 10
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic oligonucleotide"

<400> 84
ggacaacaca 10

<210> 85
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic oligonucleotide"

<400> 85
atttctctct gtaaaggagg ttcgtggcgg agagatgctg atcgcgctga actgaccggt 60

gcggcccggg ggtga 75

<210> 86
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic oligonucleotide"

<400> 86
ttccgcttct tgaatttctc tctgtaaagg aggttcgtgg cggagagatg ctgatcgcgc 60

tgaactgacc ggtgc 75

<210> 87
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic oligonucleotide"

<400> 87
ccgcttcttg aatttctctc tgtaaaggag gttcgtggcg gagagatgct gatcgcgctg 60

aactgaccgg tgcgg 75

<210> 88
<211> 75

<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 88
tcggcatcta gtctttccgc ttcttgaatt tctctctgta aaggaggttc gtggcggaga 60

gatgctgatc gcgct 75

<210> 89
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 89
ctttccgctt cttgaatttc tctctgtaaa ggaggttcgt ggcggagaga tgctgatcgc 60

gctgaactga ccggt 75

<210> 90
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 90
aatttctctc tgtaaaggag gttcgtggcg gagagatgct gatcgcgctg aactgaccgg 60

tgcggcccgg ggggg 75

<210> 91
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 91
cgcacttttt ggatcggcat ctagtctttc cgcttcttga atttctctct gtaaaggagg 60

ttcgtggcgg agaga 75

<210> 92
<211> 75
<212> DNA
<213> Artificial Sequence

<220>

<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 92
ctttccgctt cttgaatttc tctctgtaaa ggaggttcgt ggcggagaga tgctgatcgc 60

gctgaactgc ccggt 75

<210> 93
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 93
tctcctggga tcggcccaag gccagttctc cgcagtgcat cctaacgtta gtcaaggctg 60

ccaaggaggc tgtgc 75

<210> 94
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 94
ctcctgggat cggcccaagg ccagttctcc gcagtgcatc ctaacgttag tcaaggctgc 60

caaggaggct gtgca 75

<210> 95
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 95
tcctgggatc ggcccaaggc cagttctccg cagtgcatcc taacgttagt caaggctgcc 60

aaggaggctg tgcaa 75

<210> 96
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 96
cctgggatcg gcccaaggcc agttctccgc agtgcatcct aacgttagtc aaggctgcca 60

aggaggctgt gcaac 75

<210> 97
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 97
ctgggatcgg cccaaggaca gttctccgca gtgcatccta acgttagtca aggctgccaa 60

ggaggctgtg caaca 75

<210> 98
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 98
atcggcccaa ggccagttct ccgcagtgca tcctaacgtt agtcaaggct gccaaggagg 60

ctgtgcaaca tgctc 75

<210> 99
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 99
tcggcccaag gccagttctc cgcagtgcat cctaacgtta gtcaaggctg ccaaggaggc 60

tgtgcaacat gctca 75

<210> 100
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 100
ccaggacctc cactaatcac cagaacaaaa tgtgcagtgc atcctaacgt tagtcaaggc 60

tgccaaggag gctgt 75

<210> 101
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 101
caggacctcc actaatcacc agaacaaaat gtgcagtgca tcctaacgtt agtcaaggct 60

gccaaggagg ctgtg 75

<210> 102
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 102
aggacctcca ctaatcacca gaacaaaatg tgcagtgcat cctaacgtta gtcaaggctg 60

ccaaggaggc tgtgc 75

<210> 103
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 103
gccctccact aatcaccaga acaaaatgtg cagtgcatcc taacgttagt caaggctgcc 60

aaggaggctg tgcaa 75

<210> 104
<211> 75
<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
oligonucleotide"

<400> 104
ctaatcacca gaacaaaatg tgcagtgcat cctaacgtta gtcaaggctg ccaaggaggc 60

tgtgcaacat gccca 75

<210> 105
<211> 100

<212> DNA
<213> Artificial Sequence

<220>
<221> source
<223> /note="Description of Artificial Sequence: Synthetic
polynucleotide"

<400> 105
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aatcttagct cattacagcc ctgactttct ggttaaggtt 100

<210> 106
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<210> 107
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ccctgacttt ctggttaagg tttaaggatg tcgccaggcg 100

<210> 108
<211> 69
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<213> Artificial Sequence

<220>
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gcgcagtgg 69

<210> 109
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<220>

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gtgtggccaa aaacctgcat ttctaacaag ctctcccagg 100

<210> 111
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polynucleotide"

<400> 111
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ggaccactta acagttttga ttaagtaggt ctggtgtgtg gccaa 105

<210> 112
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<213> Artificial Sequence

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<400> 112
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<210> 113
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ctgagagtta agagaatggt tagatgtttt aaagaatggg 100

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<212> DNA
<213> Artificial Sequence

<220>
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ctgagagtta agagaatggt tagat 85

<210> 115
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<400> 115
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aacggcattt aatgttaact ccacgattac tgtttctttc 100

<210> 116
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<210> 117
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<212> DNA
<213> Artificial Sequence

<220>
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<400> 118
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tggagcagat gaaagcaaaa tgcttctccc cattttaaga cattaaactt ctgtaaga 118

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<211> 100
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polynucleotide"

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agttgtgtct ccattaaatt aggtgtgctt tgattctcca aaataaagaa tttt 114