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

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R-SPONDIN TRANSLOCATIONS AND METHODS USING THE SAME

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims benefit under 35 U.S.C. § 119 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 submitted via EFS-Web and hereby incorporated by reference in its entirety. Said ASCII copy, created on January 31, 2013, is named P4853R1WO_PCTSequenceListing.txt and is 58,980 bytes in size.

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.

SUMMARY

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

[0007] 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.

Further 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 of any of the methods, the cancer or cancer cell comprises an R-spondin translocation.

[0008] Provided 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. Provided 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 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.

[0009] Further, 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.

[0010] Provided 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] Provided 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] 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 the anti-cancer therapy comprising a wnt pathway antagonist.

[0013] Further 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 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.

1) 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] Provided 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

[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^{TM}); 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^{TM}) 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	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

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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	12673	T	ADAM21P1	F448Y	T	1343	A	AJAP1	N387T	A	1854	C	ANKRD34C	K367N	A	1101	C
ABCA13	V5028A	T	15107	C	ADAM22	M212V	A	634	G	AK1	K147E	T	535	C	ANKRD35	A512D	C	1622	A
ABCA13	V3662I	G	11008	A	ADAM23	G413*	G	1565	T	AK2	D112N	C	498	T	ANKRD36	C17*	C	239	A
ABCA13	R3489W	C	10489	T	ADAM23	I794M	A	2710	G	AK5	G146D	G	700	A	ANKRD36	K978N	A	3122	C
ABCA13	D4133A	A	12422	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

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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

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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

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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

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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

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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

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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

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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	12726	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	11274	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	13570	A
ACO2	G240S	G	735	A	AFF2	R927C	C	3258	T	ANAPC7	L274M	A	821	T	APOB	L4299I	G	13023	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

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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

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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

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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

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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

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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	11981	C
ARID3A	R476C	C	1716	T	ATP6V1C1	V183I	G	792	A	BICD2	E220K	C	726	T	C12orf51	R3638C	G	10930	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	11479	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

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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

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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

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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

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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

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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	10631	G	BAG4	Y321H	T	1037	C	BRSK2	S501G	A	1754	G	C17orf28	V58M	C	321	T
ASPM	K3080N	T	9497	A	BAGE3	K4315N	C	13164	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	1280 6	T	BRWD1	R1074C	G	3548	A	C17orf46	Q270H	C	906	A
ASPM	V1610D	A	5086	T	BAGE3	V4395A	A	1340 3	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	1211 8	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	1504 1	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	1313 0	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	G1038 W	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

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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

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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

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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

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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

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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

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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

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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	R186Q	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

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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	CAMSAP1L1	S375R	A	1393	C	CCDC88A	A305T	C	1755	T	CDKN2A	R107H	C	532	T
C4orf37	V21M	C	151	T	CAMSAP1L1	S282Y	C	1115	A	CCDC88A	R1412W	G	5076	A	CDKN2AIP	S151N	G	659	A
C4orf37	E151K	C	541	T	CAMSAP1L1	S1029*	C	3356	A	CCDC88A	T15A	T	885	C	CDKN2B	R60H	C	507	T
C4orf37	T253P	T	847	G	CAMSAP1L1	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	R335H	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

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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	CSGALNACT1	K380N	C	1794	A
CELSR3	G2104C	C	6591	A	CLC	G86D	C	333	T	COL22A1	P978L	G	3380	A	CSGALNACT2	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	10128	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	10602	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	11323	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	10965	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

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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

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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

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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

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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	3479	A	CP	D640Y	C	2181	A	CUBN	G3471E	C	10478	T
CHD6	A345T	C	1211	T	CNGB1	R729Q	C	2243	T	CP	R436Q	C	1570	T	CUBN	G818R	C	2518	T
CHD6	R155Q	C	642	T	CNGB1	P115L	G	401	A	CPA1	R386C	C	1306	T	CUEDC1	G92S	C	688	T
CHD6	V1274A	A	3999	G	CNGB3	R456C	G	1412	A	CPA1	K194N	G	732	T	CUEDC2	R264L	C	937	A
CHD6	R1595C	G	4961	A	CNGB3	P309Q	G	972	T	CPA2	-	G	0	T	CUL2	A516V	G	1782	A
CHD6	R810C	G	2606	A	CNGB3	-	C	0	G	CPA2	A193T	G	596	A	CUL2	S637L	G	2145	A
CHD6	T2204A	T	6788	C	CNIH	V52A	A	259	G	CPA3	K124N	G	424	T	CUL2	K629N	C	2122	A
CHD6	S2629Y	G	8064	T	CNIH	F130L	A	494	C	CPA3	A177T	G	581	A	CUL2	V184A	A	786	G
CHD6	G1915*	C	5921	A	CNIH3	S159N	G	1358	A	CPA3	I39T	T	168	C	CUL2	M566I	C	1933	A
CHD6	F1499L	A	4675	C	CNIH3	E71K	G	1093	A	CPA4	T405M	C	1242	T	CUL3	R305C	G	1252	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

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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

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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

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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

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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	13818	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	12232	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	10018	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	12119	C
DAB2IP	P94S	C	462	T	DHX34	L175P	T	873	C	DNAJC13	R1745H	G	5482	A	DYNC2H1	E4139G	A	12560	G
DAB2IP	R333C	C	1179	T	DHX34	S750T	G	2598	C	DNAJC13	V670I	G	2256	A	DYNC2H1	E4217*	G	12793	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

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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

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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

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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

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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	10681	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	10379	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

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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	11014	T	DPYD	R561Q	C	1783	T	EIF2A	K388N	A	1273	C
DDX42	R827Q	G	2715	A	DNAH1	R3776L	G	11327	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	11086	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	12780	A	DPYSL4	A260V	C	943	T	EIF2B3	K148E	T	569	C
DDX53	T561A	A	1769	G	DNAH10	R3394W	C	10205	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	1103	T	DST	E5770D	T	17310	G	ELOF1	A80V	G	303	A

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DEPDC7	A305V	C	1006	T	DNAH3	K3593N	C	10779	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	13492	T	DST	F3300L	A	9900	C	ELOVL3	F158L	T	695	G
DERL3	R18Q	C	72	T	DNAH5	R3743I	C	11333	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

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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

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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

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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	16546	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	13557	T	FZR1	R313Q	G	972	A	GPR98	R5246*	C	15832	T
EPB41L4B	E329K	C	1503	T	FAT1	E2924K	C	8958	T	FZR1	R477H	G	1464	A	GPR98	K4079N	G	12333	T
EPB41L5	T158A	A	686	G	FAT1	E1420*	C	4446	A	G2E3	S701F	C	2221	T	GPR98	G4416A	G	13343	C
EPB41L5	R378*	C	1346	T	FAT1	P509L	G	1714	A	G2E3	R161Q	G	601	A	GPR98	A6224V	C	18767	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	13552	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	11438	T	G6PC	K60T	A	258	C	GPR98	F1292L	C	3972	A
EPHA1	R844W	G	2617	A	FAT2	R3465Q	C	10407	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	11570	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	12924	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	11441	T
EPHA10	G238E	C	799	T	FAT2	V3004I	C	9023	T	GAA	E762K	G	2651	A	GPR98	L4323I	C	13063	A
EPHA10	A225V	G	760	A	FAT3	V301A	T	919	C	GAA	E748D	G	2611	T	GPR98	S5821Y	C	17558	A
EPHA10	R11H	C	118	T	FAT3	S3505L	C	10531	T	GAA	A452V	C	1722	T	GPR98	F6181C	T	18638	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	1296	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	1544	T	GABRA4	N47H	T	1122	G	GPS2	S214L	G	1156	A
EPHA7	L195S	A	769	G	FAT4	A2421T	G	7274	A	GABRA5	K190N	A	910	C	GPSM1	F551L	C	1873	A
EPHA7	T122A	T	549	C	FAT4	K945N	G	2848	T	GABRA5	N43S	A	468	G	GPSM2	Y65H	T	966	C
EPHA8	A665S	G	2065	T	FAT4	R2329C	C	6998	T	GABRA5	Q224H	G	1012	T	GPSM2	R400H	G	1972	A
EPHA8	G156C	G	538	T	FAT4	V1430I	G	4301	A	GABRA6	E320K	G	1233	A	GPT	R252H	G	978	A
EPHA8	R522H	G	1637	A	FAT4	D1883N	G	5660	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	9351	T	GABRB1	R405H	G	1506	A	GPX4	R39C	C	192	T
EPHA8	R992W	C	3046	T	FAT4	R1806H	G	5430	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	2056	T

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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

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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

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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

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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	14777	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	14367	T	GCFC1	G348S	C	1232	T	GSDMB	G304V	C	1042	A
ETS1	S228F	G	768	A	FCGBP	P4736S	G	14214	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

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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

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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

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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

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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

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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

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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

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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

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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	11562	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	10506	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	13311	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	14724	C
FAM184A	T723M	G	2263	A	FOXC2	A291G	C	957	G	GOLGA4	K374N	G	1421	T	HERC1	N3902D	T	11852	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	14526	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	14234	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	14010	A
FAM186A	I792M	T	2514	C	FOXG1	R281W	C	1210	T	GOLGB1	E889D	C	2778	A	HERC2	V3665I	C	11102	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	14309	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	13099	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	13406	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	13172	A
FAM189A2	L406R	T	1321	G	FOXK2	P478Q	C	1607	A	GOLIM4	R478Q	C	2123	T	HERC2	A4634V	G	14010	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	11825	A
FAM189B	R370C	G	1714	A	FOXK2	R544W	C	1804	T	GOLPH3	R269W	G	1121	A	HERC2	L3384I	G	10259	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	11401	A	GPBP1L1	K135R	T	1626	C	HGS	R328Q	G	1060	A
FAM25C	I54T	A	159	G	FRAS1	G3220C	G	10098	T	GPC1	R400H	G	1197	A	HGS	R518W	C	1629	T
FAM26D	T194N	C	625	A	FRAS1	A3904V	C	12151	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	K114N	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

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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	10098	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	10760	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

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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

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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

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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	11339	T	IQCA1	R436*	G	1306	A	KIAA1024	R816W	C	2521	T	LASS6	R121C	C	561	T
HMCN1	H4643N	C	14156	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	16259	T	IQCA1	L397I	G	1189	T	KIAA1024	V73A	T	293	C	LAT	L169P	T	542	C
HMCN1	A3972V	C	12144	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	11075	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	14765	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	10779	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	13400	T	IQGAP2	A398T	G	1489	A	KIAA1107	N775H	A	2323	C	LBXCOR1	H810R	A	2429	G
HMCN1	F4892V	T	14903	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

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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
HNRNPA2 B1	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
HNRNPCL 1	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

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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

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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	R495H	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

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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	10108	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	11340	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

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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	11746	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

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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

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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	14497	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	10177	A
IGF2	V29I	C	470	T	KCNC1	V356M	G	1121	A	KLHL3	R240Q	C	1163	T	LRP1B	S3238G	T	10684	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	11462	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	13639	G
IGF2BP3	E477*	C	1786	A	KCND1	E492*	C	2772	A	KLHL33	R263W	G	787	A	LRP1B	E3741*	C	12193	A
IGF2BP3	E235*	C	1060	A	KCND2	R247H	G	1705	A	KLHL34	R190W	G	1110	A	LRP1B	R3547I	C	11612	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	12926	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	11463	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	11462	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	13221	C
IGHE	S119L	G	356	A	KCNG2	W108C	G	324	T	KLHL5	-	A	0	G	LRP2	F4014I	A	12326	T
IGHE	R289Q	C	866	T	KCNG3	V77A	A	826	G	KLHL5	S171R	T	588	G	LRP2	R3765*	G	11579	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	11789	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

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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
IGHV3OR1 6-8	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

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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

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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

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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

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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

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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

DEMANDE OU BREVET VOLUMINEUX

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CECI EST LE TOME 1 DE 2
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JUMBO APPLICATIONS/PATENTS

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NOM DU FICHIER / FILE NAME :

NOTE POUR LE TOME / VOLUME NOTE:

CLAIMS

WHAT IS CLAIMED IS:

1) A method 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.

2) A method 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.

3) A method of treating cancer in an individual provided that the individual has been found to have cancer comprising an R-spondin translocation, the method comprising administering to the individual an effective amount of a wnt pathway antagonist.

4) A method 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.

5) A method 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.

6) A method 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.

7) A method 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.

8) A method 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.

9) The method of any one of claims 6-8, wherein the method further comprises administering to the individual an effective amount of a wnt pathway antagonist.

10) A method of inhibiting proliferation of a cancer cell comprising contacting the cancer cell with an effective amount of an R-spondin-translocation antagonist.

11) A method of treating cancer in an individual comprising administering to the individual an effective amount of an R-spondin-translocation antagonist.

12) The method of any one of claims 10-11, wherein the cancer or cancer cell comprises an R-spondin translocation.

13) The method of any one of claims 1-9 and 12, wherein the R-spondin translocation is a RSPO1 translocation, RSPO2 translocation, RSPO3 translocation and/or RSPO4 translocation.

14) The method of claim 13, wherein the R-spondin translocation is a RSPO2 translocation.

15) The method of claim 14, wherein the RSPO2 translocation comprises *EIF3E* and *RSPO2*.

16) The method of claim 14, wherein the RSPO2 translocation comprises *EIF3E* exon 1 and *RSPO2* exon 2.

17) The method of claim 14, wherein the RSPO2 translocation comprises *EIF3E* exon 1 and *RSPO2* exon 3.

18) The method of claim 14, wherein the RSPO2 translocation comprises SEQ ID NO:71.

19) The method of claim 13, wherein the R-spondin translocation is a RSPO3 translocation.

20) The method of claim 19, wherein the RSPO3 translocation comprises *PTPRK* and *RSPO3*.

21) The method of claim 19, wherein the RSPO3 translocation comprises *PTPRK* exon 1 and *RSPO3* exon 2.

22) The method of claim 19, wherein the RSPO3 translocation comprises *PTPRK* exon 7 and *RSPO3* exon 2.

23) The method of claim 19, wherein the RSPO3 translocation comprises SEQ ID NO:72 and/or SEQ ID NO:73.

24) The method of any one of claims 1-9 and 12-23, wherein 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).

25) The method of any one of claims 1-24, wherein the cancer or cancer cell is colorectal cancer.

26) The method of claim 25, wherein the cancer or cancer cell is a colon cancer or rectal cancer.

27) The method of any one of claims 1-9 and 13-26, wherein the wnt pathway antagonist is an antibody, binding polypeptide, small molecule, or polynucleotide.

28) The method of any one of claims 1-9 and 13-27, wherein the wnt pathway antagonist is an R-spondin antagonist.

29) The method of claim 28, wherein the wnt pathway antagonist is an isolated monoclonal antibody which binds R-spondin.

30) The method of claim 29, wherein the R-spondin is RSPO2 and/or RSPO3.

31) The method of any one of claims 28-30, wherein the R-spondin antagonist is an R-spondin-translocation antagonist.

32) An isolated R-spondin-translocation antagonist, wherein the R-spondin-translocation antagonist is an antibody, binding polypeptide, small molecule, or polynucleotide.

33) The method of claim 31 or antagonist of claim 32, wherein 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.

34) The method or antagonist of claim 33, wherein the R-spondin-translocation antagonist binds a RSPO2-translocation fusion polypeptide and/or polynucleotide.

35) The method or antagonist of claim 34, wherein the RSPO2-translocation fusion polypeptide and/or polynucleotide comprises *EIF3E* and *RSPO2*.

36) The method or antagonist of claim 34, wherein the RSPO2-translocation fusion polypeptide and/or polynucleotide comprises *EIF3E* exon 1 and *RSPO2* exon 2.

37) The method or antagonist of claim 34, wherein the RSPO2-translocation fusion polypeptide and/or polynucleotide comprises *EIF3E* exon 1 and *RSPO2* exon 3.

38) The method or antagonist of claim 34, wherein the RSPO2-translocation fusion polypeptide and/or polynucleotide comprises SEQ ID NO:71.

39) The method or antagonist of claim 33, wherein the R-spondin-translocation fusion polypeptide and/or polynucleotide is a RSPO3-translocation fusion polypeptide and/or polynucleotide.

40) The method or antagonist of claim 39, wherein the RSPO3-translocation fusion polypeptide and/or polynucleotide comprises *PTPRK* and *RSPO3*.

41) The method or antagonist of claim 39, wherein the RSPO3-translocation fusion polypeptide and/or polynucleotide comprises *PTPRK* exon 1 and *RSPO3* exon 2.

42) The method or antagonist of claim 39, wherein the RSPO3-translocation fusion polypeptide and/or polynucleotide comprises *PTPRK* exon 7 and *RSPO3* exon 2.

43) The method or antagonist of claim 39, wherein the RSPO3-translocation fusion polypeptide and/or polynucleotide comprises SEQ ID NO:72 and/or SEQ ID NO:73.

44) The method of any one of claims 1-41, wherein the method further comprises administering an additional therapeutic agent.

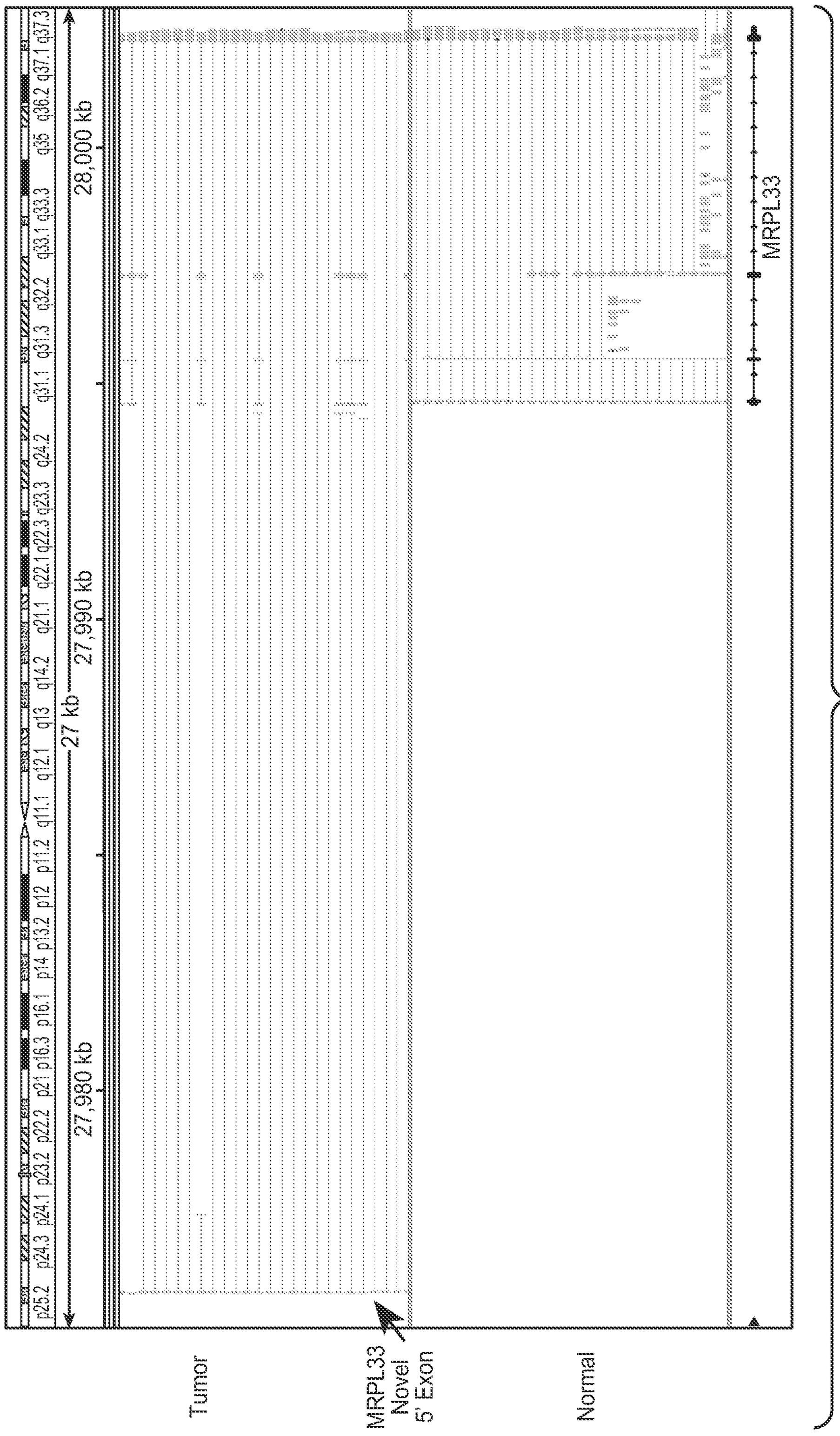

FIG. 1A

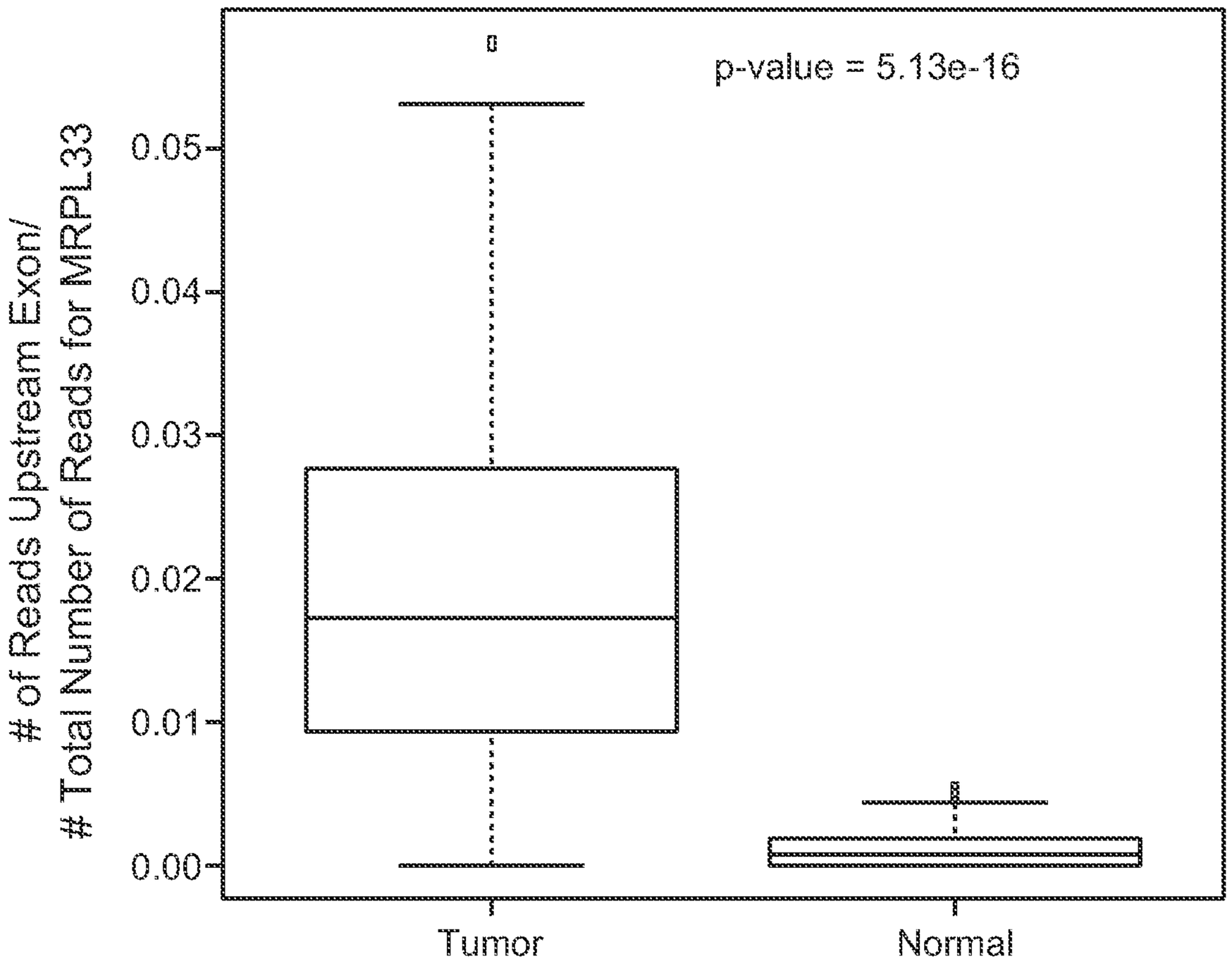

FIG. 1B

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

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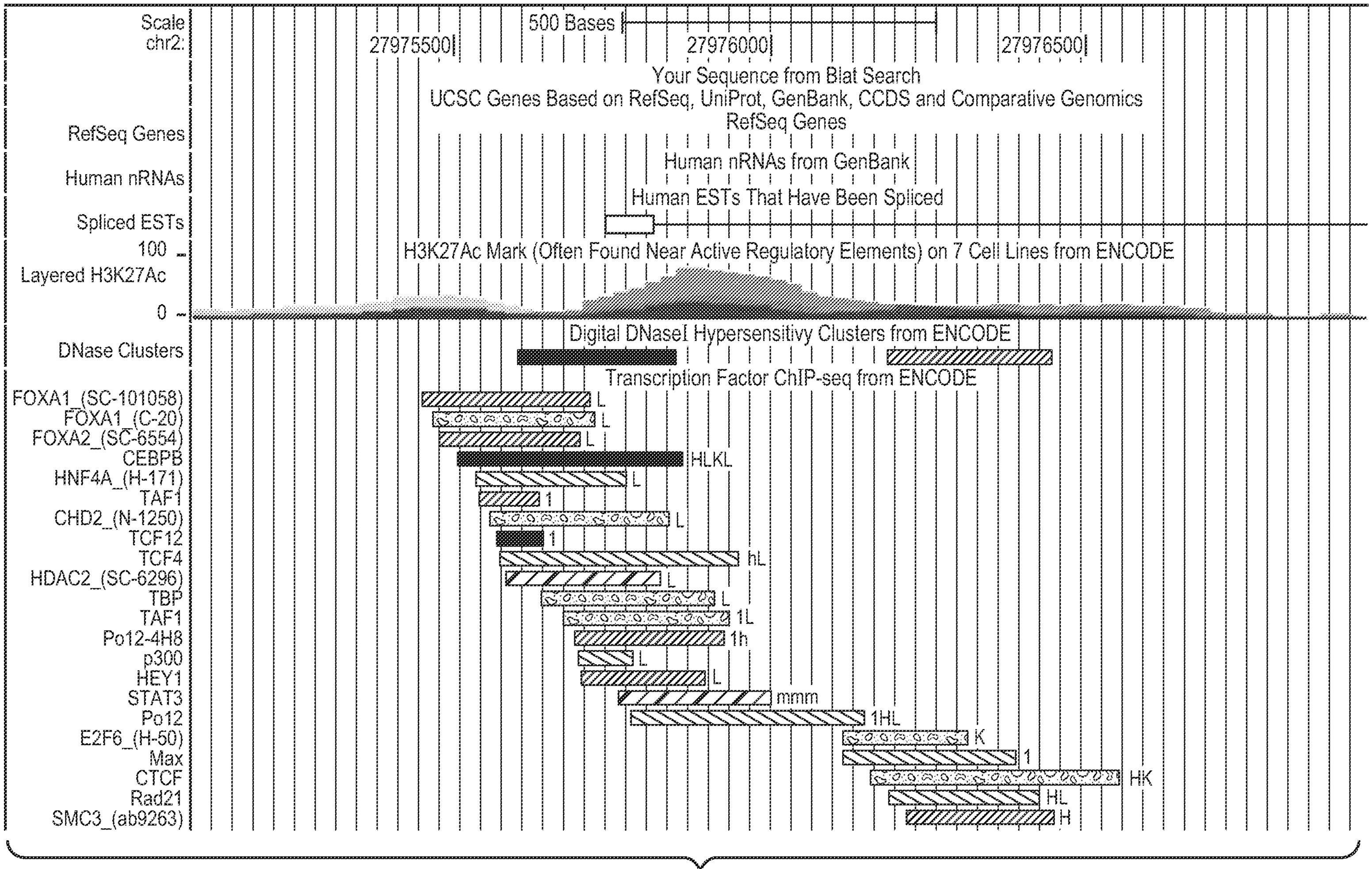
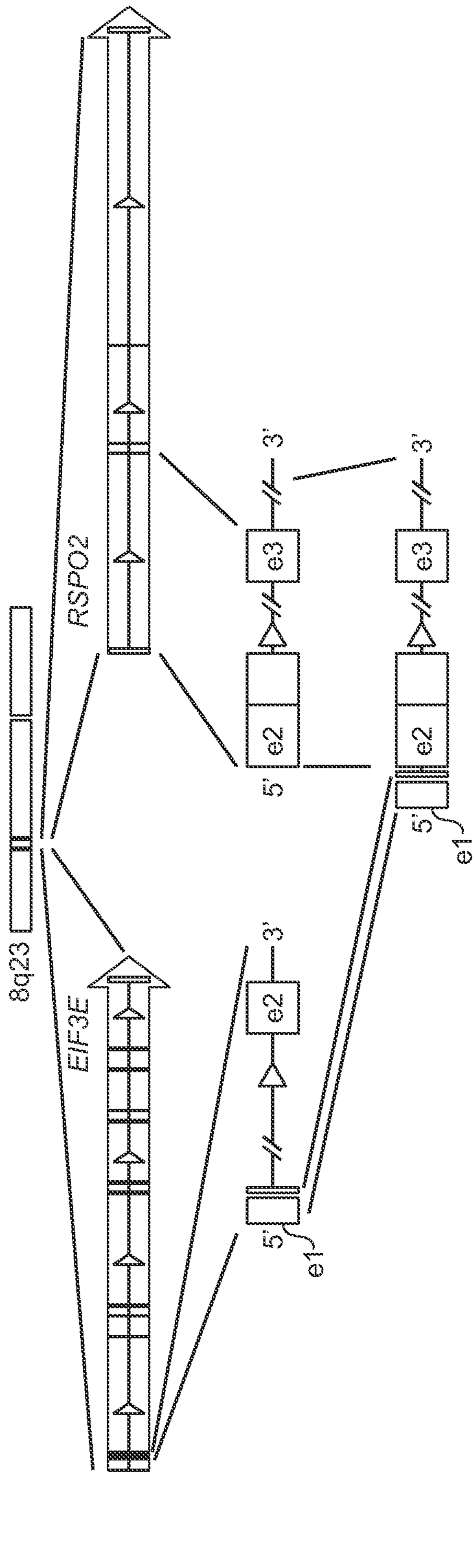


FIG. 1C



GTTCGTGGCGGAGAGATGCTGATCGCGCTGAACTGAACCTGACCGGTGCGGCCCGGGGGTGA
GTTCGTGGCGGAGAGATGCTGATCGGCTGAACTGAACCTGACCGGTGC
GTTCGTGGCGGAGAGATGCTGATCGGCTGAACTGAACCTGACCGGTGCGG
GTTCGTGGCGGAGAGATGCTGATCGCGCTGAACTGAACCTGACCGGT
GTTCGTGGCGGAGAGATGCTGATCGCGCTGAACTGAACCTGACCGGTGCGGCCCGGGGGG
GTTCGTGGCGGAGAGATGCTGATCGCGCTGAACTGAACCTGACCGGT
GTTCGTGGCGGAGAGATGCTGATCGCGCTGAACTGAACCTGACCGGTGCGGCCCGGGGGG
GTTCGTGGCGGAGAGA
GTTCGTGGCGGAGAGATGCTGATCGCGCTGAACTGAACCTGACCGGTGCGGCCCGGGGGG

SEQ ID NO:71

G T T C G T G G C G

ATTTCTCTCTGTAAAGGAG
TTCCGCTTCTTGAATTTCTCTCTGTAAAGGAG
CCGCTTCTTGAATTTCTCTCTGTAAAGGAG
CTAGTCTTTCCGCTTCTTGAATTTCTCTCTGTAAAGGAG
CTTTCCGCTTCTTGAATTTCTCTCTGTAAAGGAG
AATTTCTCTCTTGTAAAGGAG
CTAGTCTTTTCCGCTTCTTGAATTTCTCTCTGTAAAGGAG
CTTTCCGCTTCTTGAATTTCTCTCTGTAAAGGAG

T G T A A A G G A G

TCGGCATCTATTTTTGGATCGGCATCTAGTCTTTTCCGCTTCTTGAATTTCTCTCTGTAAAGGAG

FIG. 2B

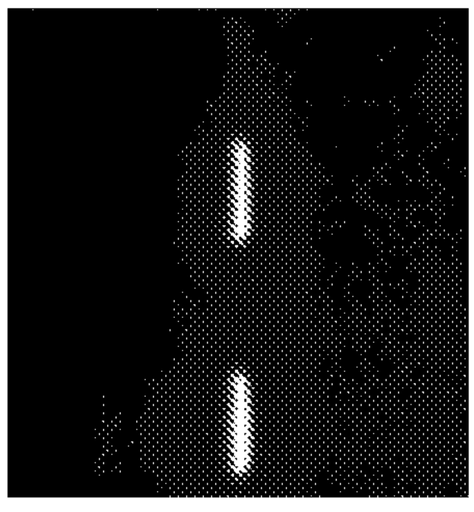


FIG. 2C

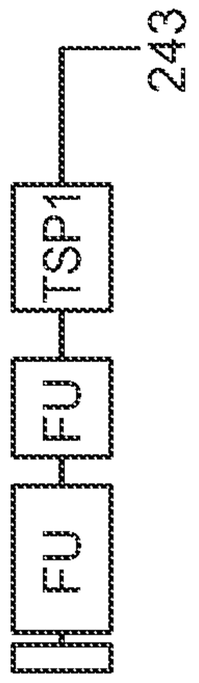


FIG. 2D

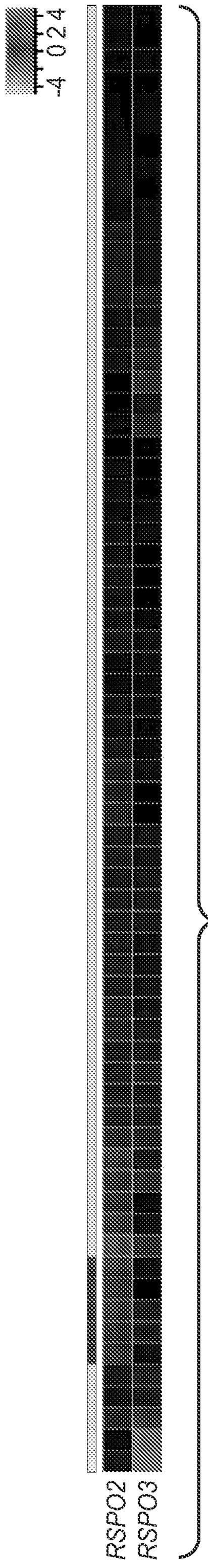


FIG. 2E

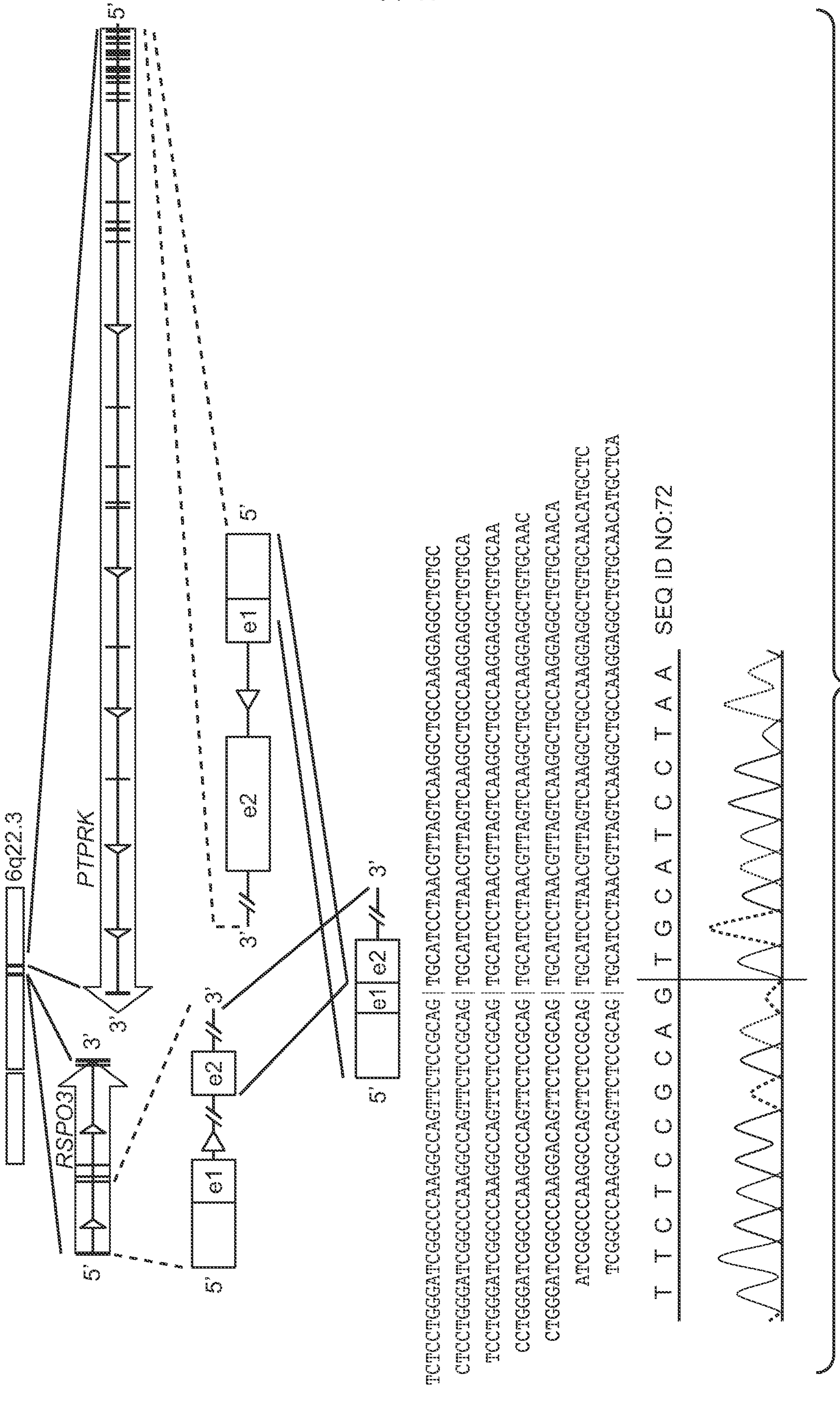

6q22.3
PTPRK
RSPO3
5'
3'
e1
e2
TCTCCTGGGATCGGCCCAAGGCCAGTTCTCCGCAG TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGC
CTCCTGGGATCGGCCCAAGGCCAGTTCTCCGCAG TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGCA
TCCTGGGATCGGCCCAAGGCCAGTTCTCCGCAG TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGCAA
CCTGGGATCGGCCCAAGGCCAGTTCTCCGCAG TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGCAAC
CTGGGATCGGCCCAAGGACAGTTCTCCGCAG TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGCAACA
ATCGGCCCAAGGCCAGTTCTCCGCAG TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGCAACATGCTC
TCGGCCCAAGGCCAGTTCTCCGCAG TGCATCCTAACGTTAGTCAAGGCTGCCAAGGAGGCTGTGCAACATGCTCA
T T C T C C 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

FIG. 3B

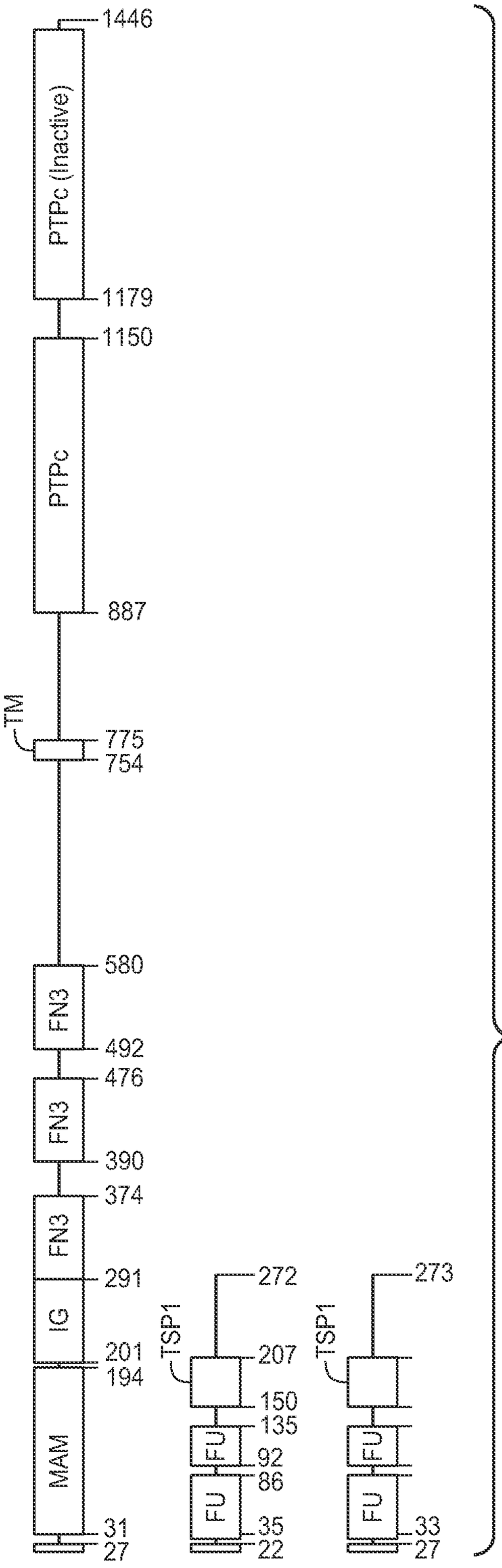

1446
PTPc (Inactive)
1179
1150
PTPc
887
TM
775
754
580
FN3
492
476
FN3
390
374
FN3
291
IG
201
194
MAM
31
27
272
TSP1
207
150
135
FU
92
86
FU
35
22
273
TSP1
FU
FU
33
27

FIG. 3C

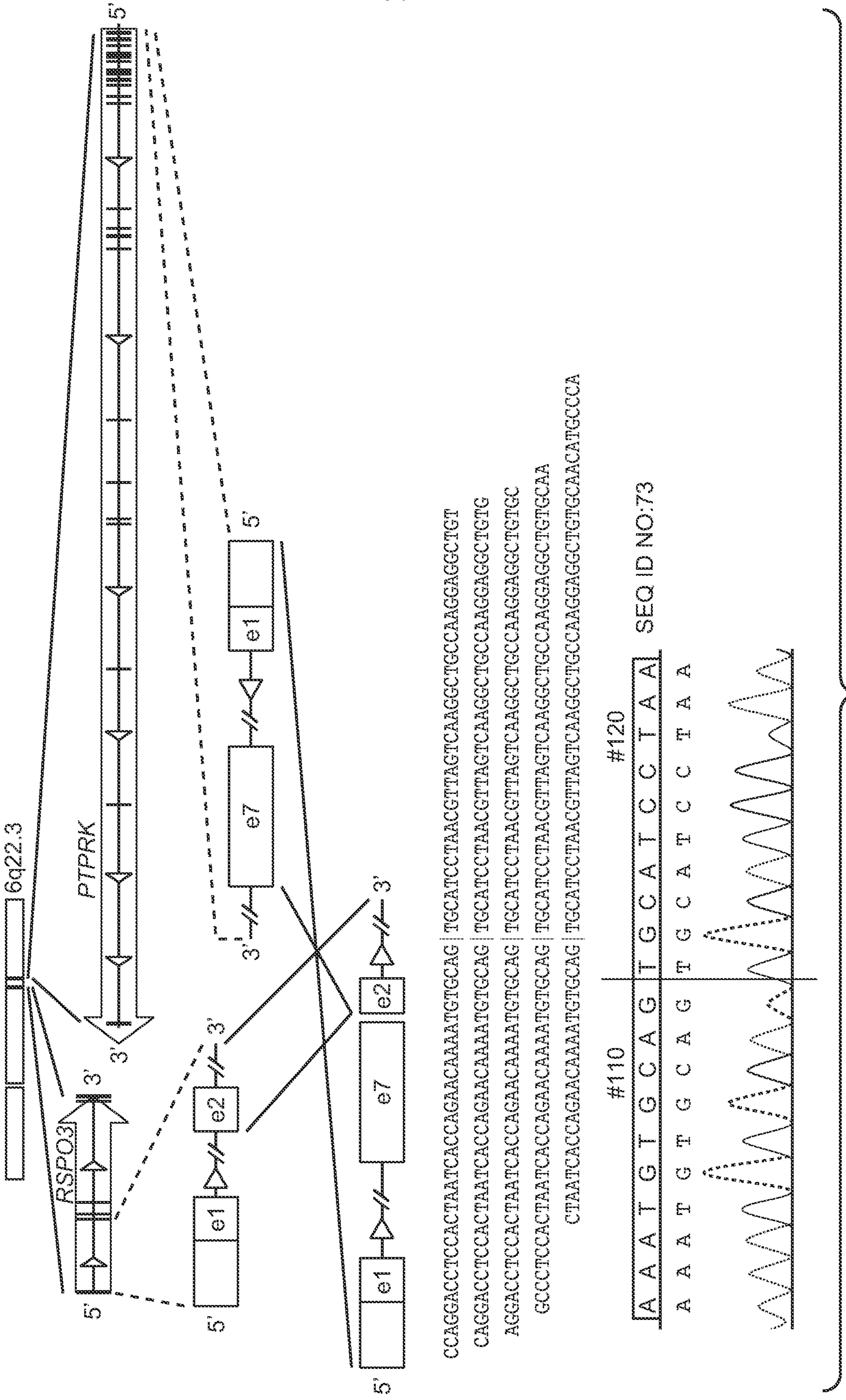

5'
6q22.3
PTPRK
3'
3'
RSPO3
3'
5'
e2
e1
e7
3'
3'
e7
e2
e1
5'
5'
TGCATCCTAACGTTAGTCAAGGCTGCCAAGGA
TGCATCCTAACGTTAGTCAAGGCTGTG
TGCATCCTAACGTTAGTCAAGGCTGTGC
TGCATCCTAACGTTAGTCAAGGCTGTGCAA
TGCATCCTAACGTTAGTCAAGGCTGTGCCCA
CCAGGACCTCCACTAATCACCAGAACAAAATGTGCAG
CAGGACCTCCACTAATCACCAGAACAAAATGTGCAG
AGGACCTCCACTAATCACCAGAACAAAATGTGCAG
GCCCTCCACTAATCACCAGAACAAAATGTGCAG
CTAATCACCAGAACAAAATGTGCAG
#110
#120
SEQ ID NO:73
T G C A G
T G C A T C C T A A
A A T G T G C A G
A A T G T G C A G
T G C A T C C T A A
A A T G T G C A G

FIG. 4A


T
N

FIG. 4B

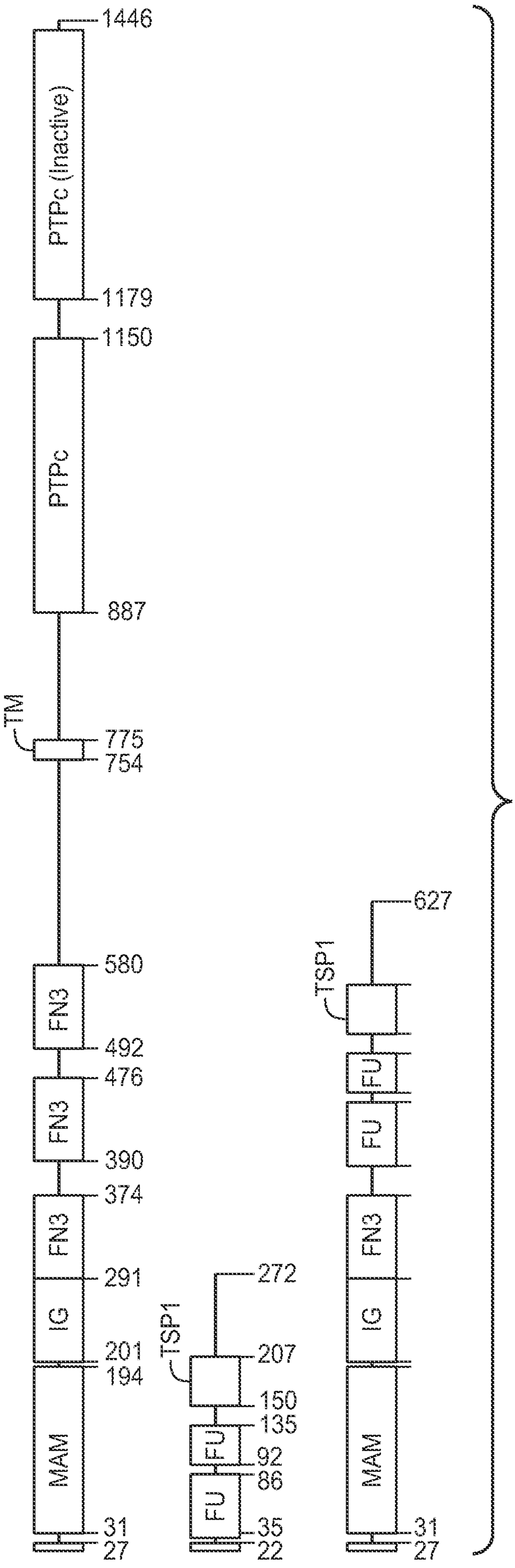

1446
PTPc (Inactive)
1179
1150
PTPc
887
TM
775
754
580
FN3
492
476
FN3
390
374
FN3
291
IG
201
194
MAM
31
27
627
TSP1
FU
FU
FN3
IG
MAM
31
27
272
TSP1
207
150
135
FU
92
86
FU
35
22

FIG. 4C

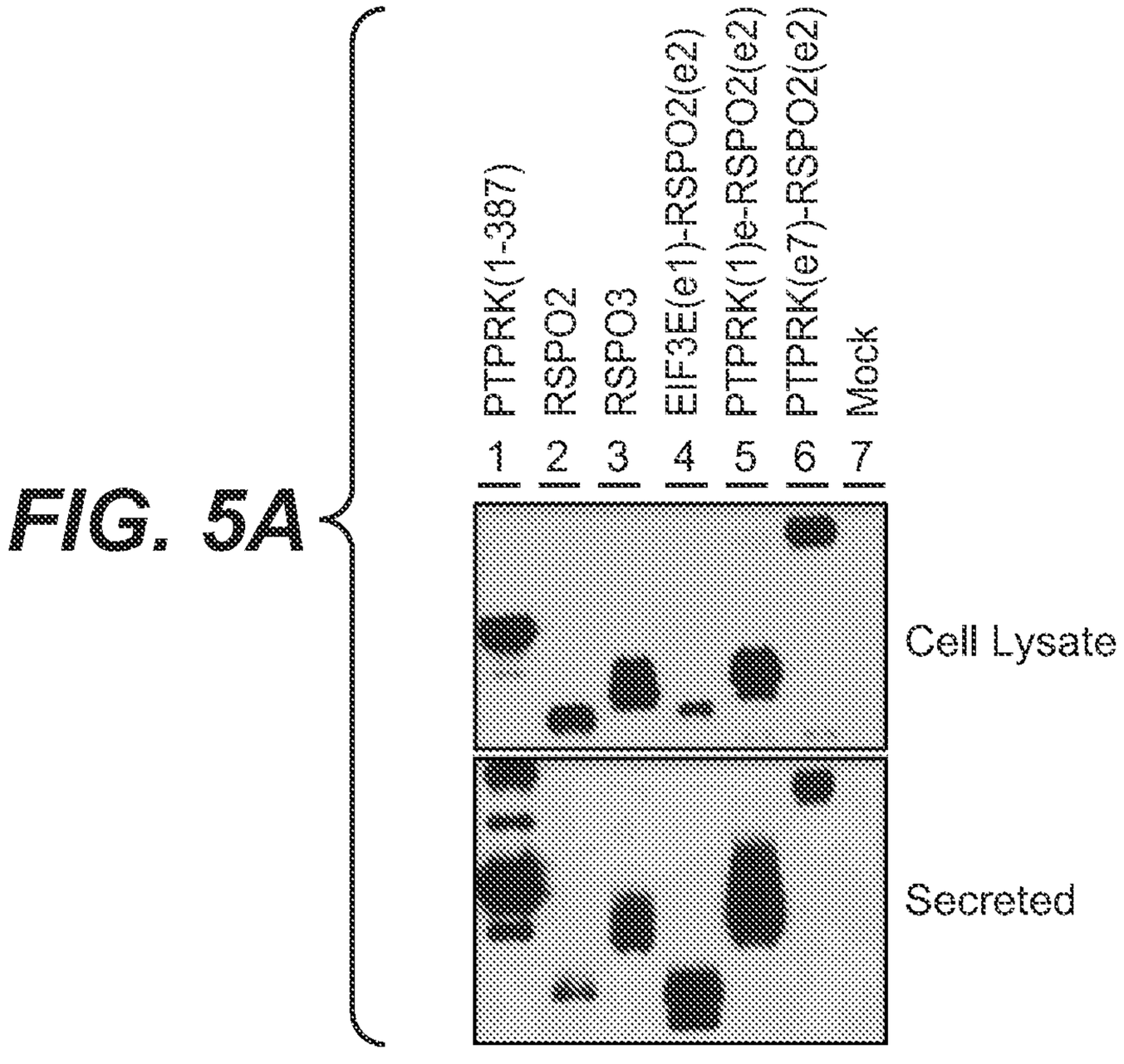

PTPRK(1-387)
RSPO2
RSPO3
EIF3E(e1)-RSPO2(e2)
PTPRK(1)e-RSPO2(e2)
PTPRK(e7)-RSPO2(e2)
Mock
1 2 3 4 5 6 7
Cell Lysate
Secreted

FIG. 5A

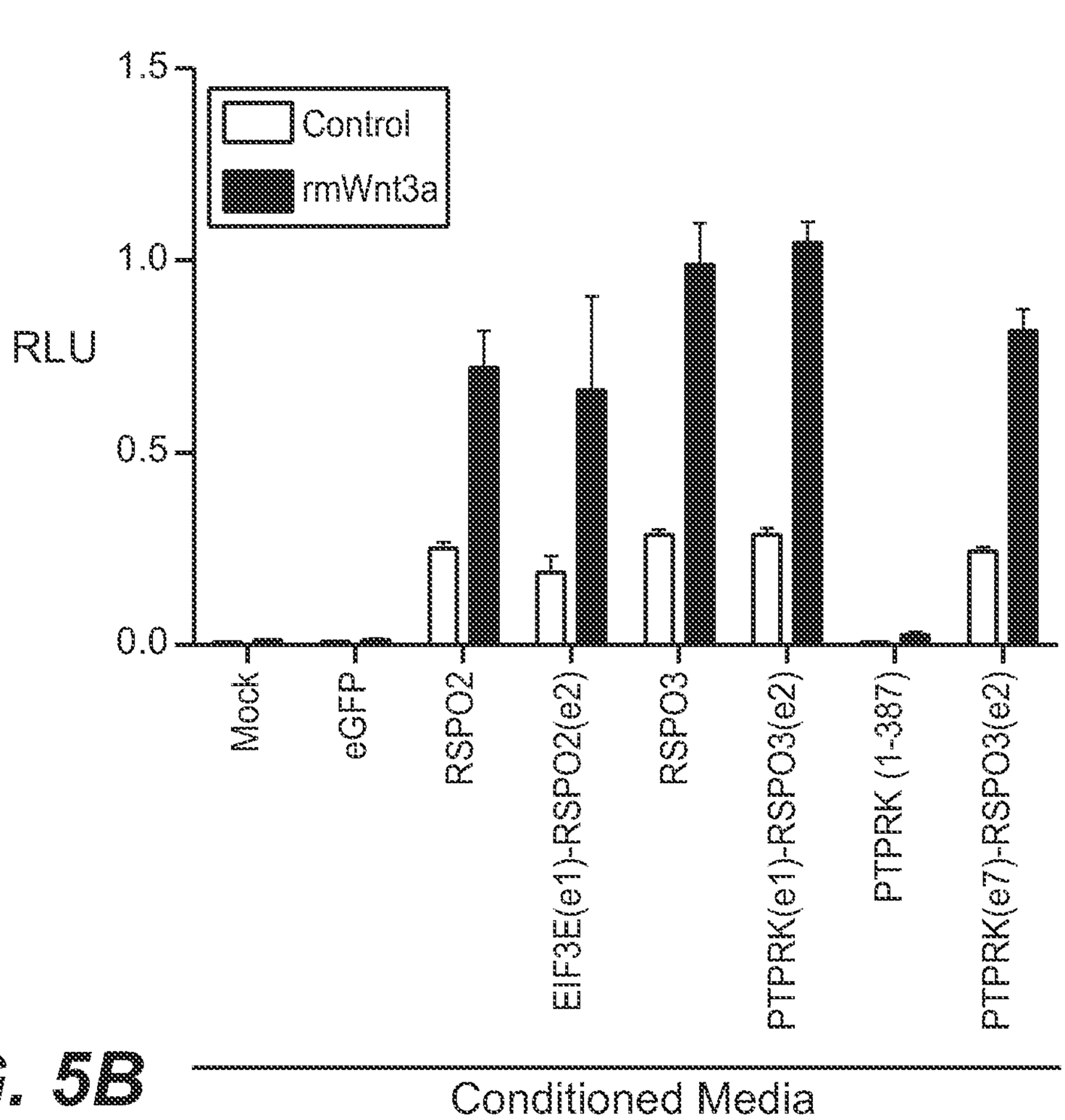

1.5
1.0
0.5
0.0
RLU
Control
rmWnt3a
Mock
eGFP
RSPO2
EIF3E(e1)-RSPO2(e2)
RSPO3
PTPRK(e1)-RSPO3(e2)
PTPRK (1-387)
PTPRK(e7)-RSPO3(e2)
Conditioned Media

FIG. 5B

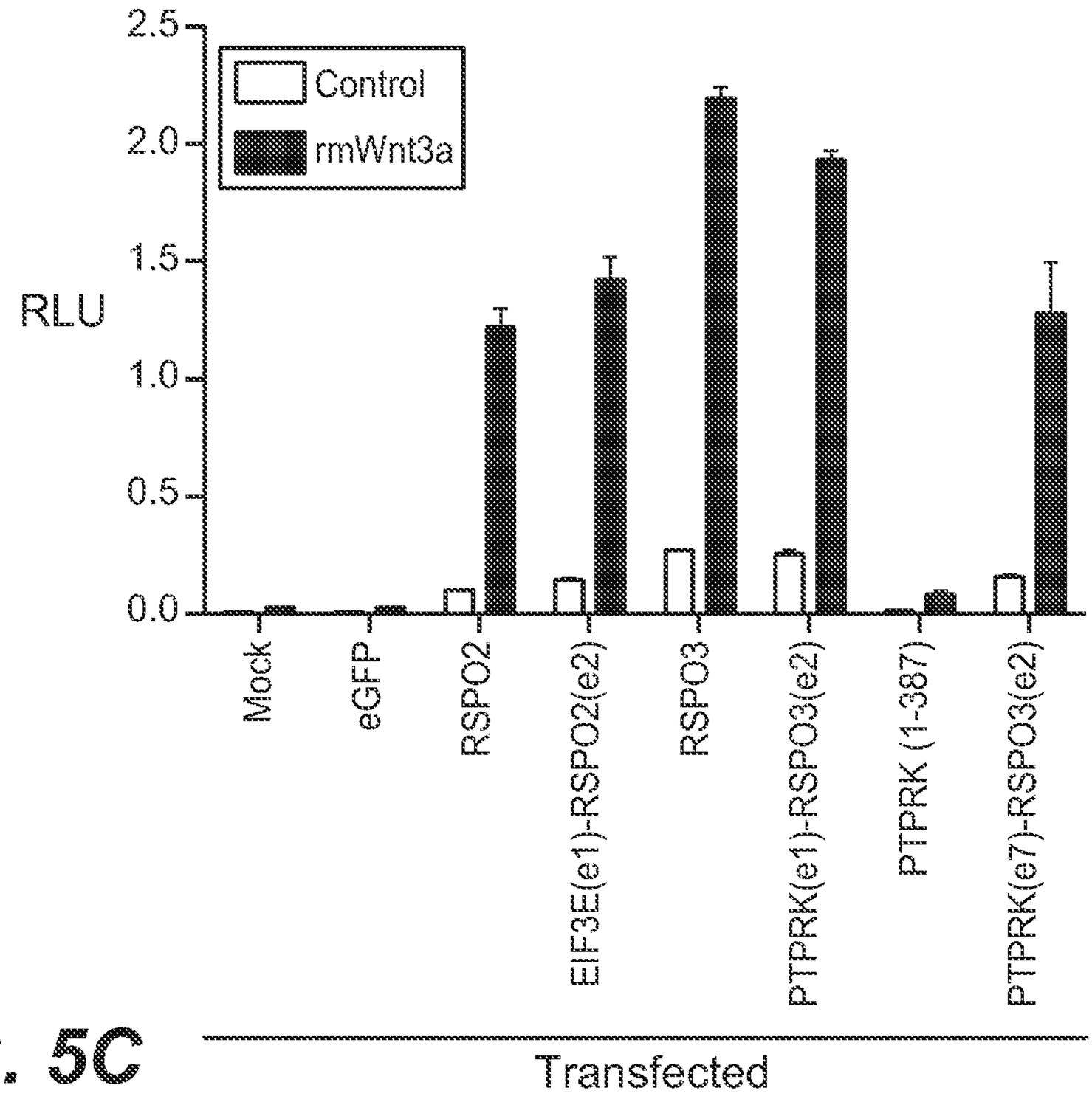
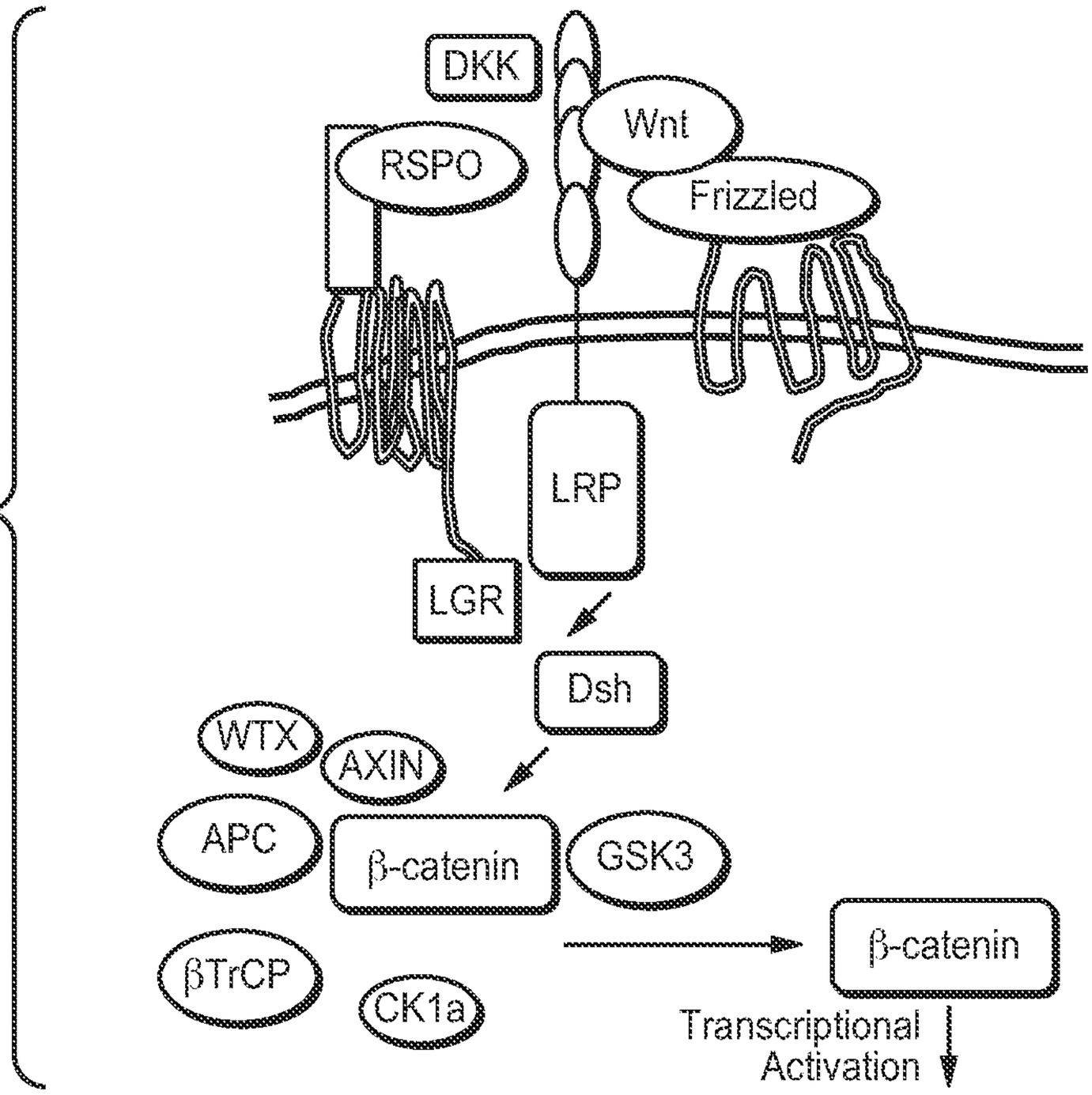

2.5
2.0
1.5
1.0
0.5
0.0
RLU
Control
rmWnt3a
Mock
eGFP
RSPO2
EIF3E(e1)-RSPO2(e2)
RSPO3
PTPRK(e1)-RSPO3(e2)
PTPRK (1-387)
PTPRK(e7)-RSPO3(e2)
Transfected

FIG. 5C

FIG. 5D


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

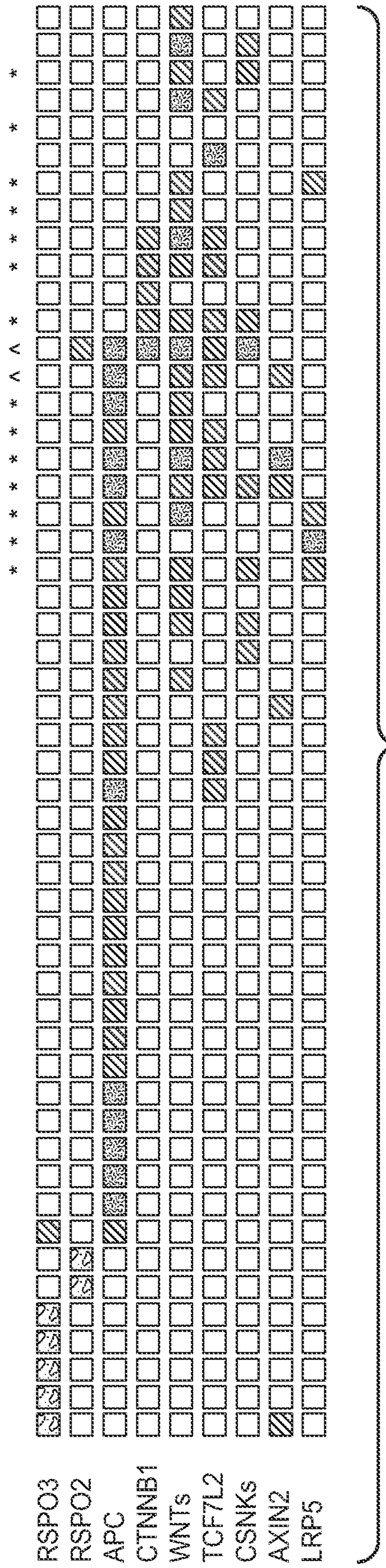


FIG. 5E

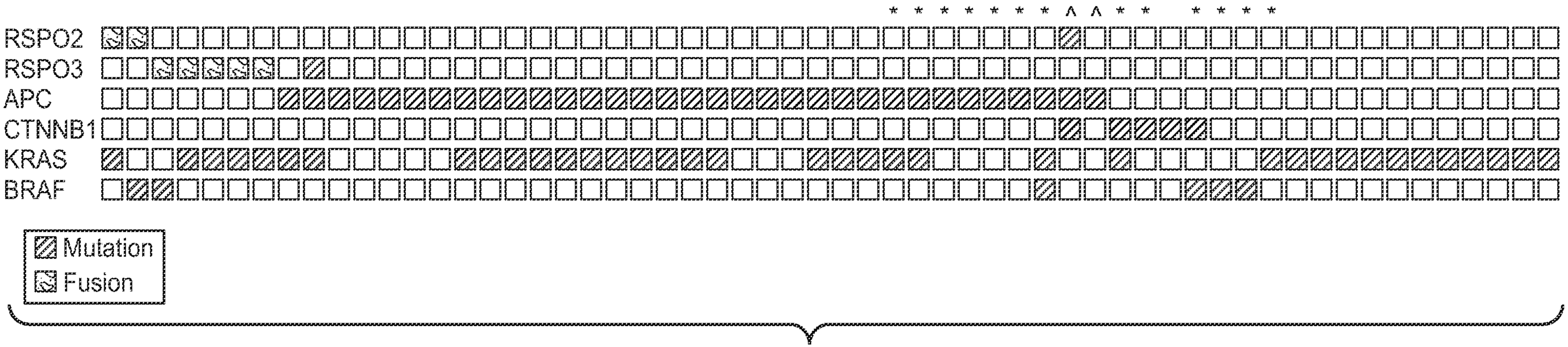

RSPO2
RSPO3
APC
CTNNB1
KRAS
BRAF
Mutation
Fusion

FIG. 6A

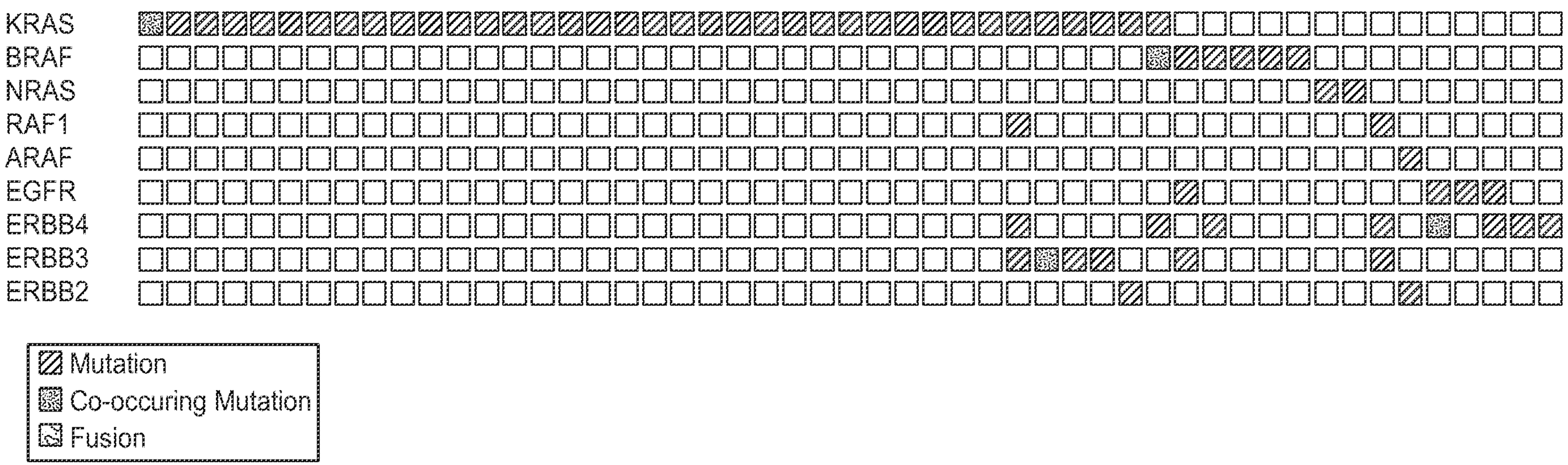

KRAS
BRAF
NRAS
RAF1
ARAF
EGFR
ERBB4
ERBB3
ERBB2
Mutation
Co-occuring Mutation
Fusion

FIG. 6B

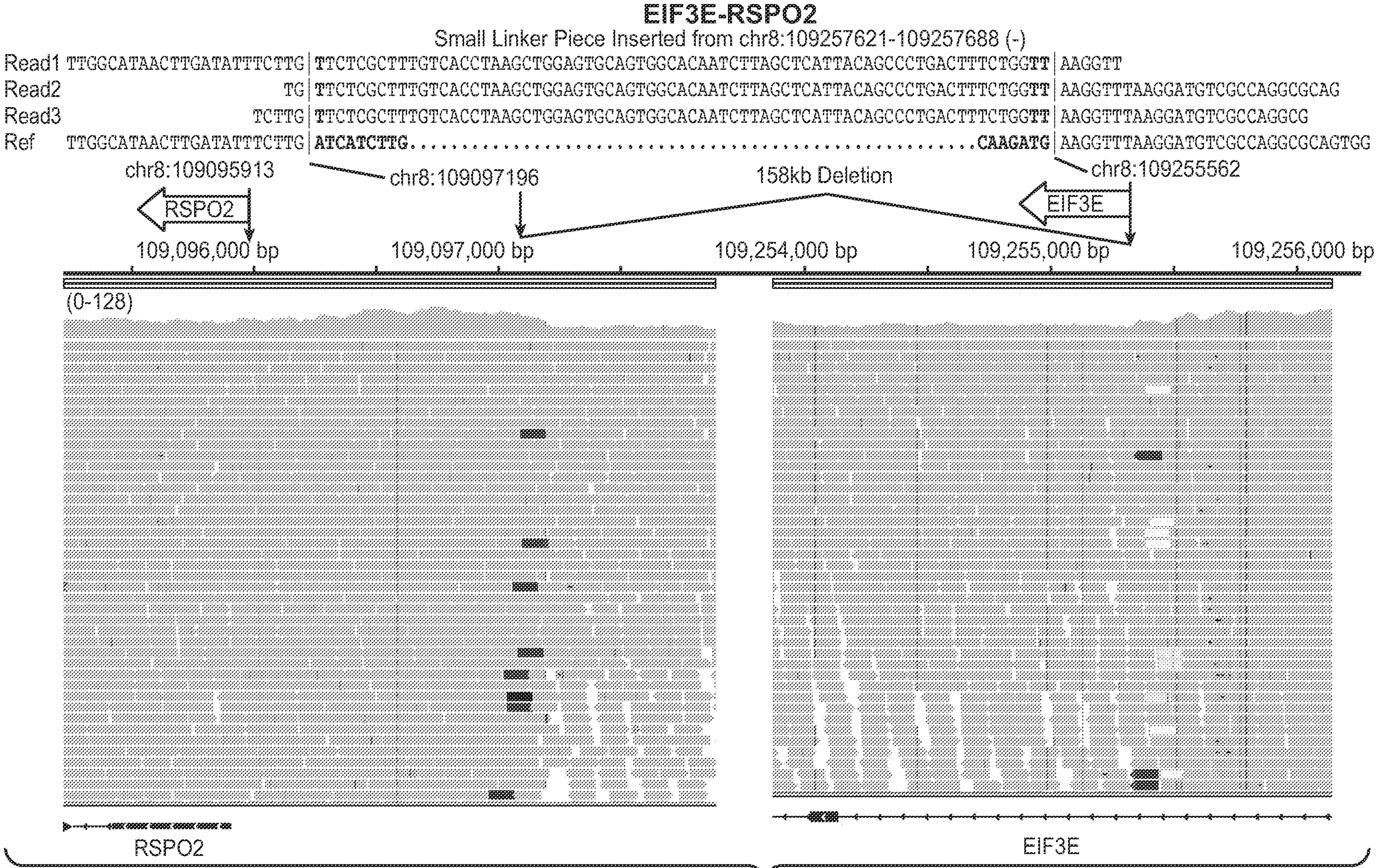

EIF3E-RSPO2
Small Linker Piece Inserted from chr8:109257621-109257688 (-)
Read1 TTGGCATAACTTGATATTTCTTG TTCTCGCTTTGTCACCTAAGCTGGAGTGCAGTGGCACAATCTTAGCTCATTACAGCCCTGACTTTCTGGTT AAGGTT
Read2 TG TTCTCGCTTTGTCACCTAAGCTGGAGTGCAGTGGCACAATCTTAGCTCATTACAGCCCTGACTTTCTGGTT AAGGTTTAAGGATGTCGCCAGGCGCAG
Read3 TCTTG 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

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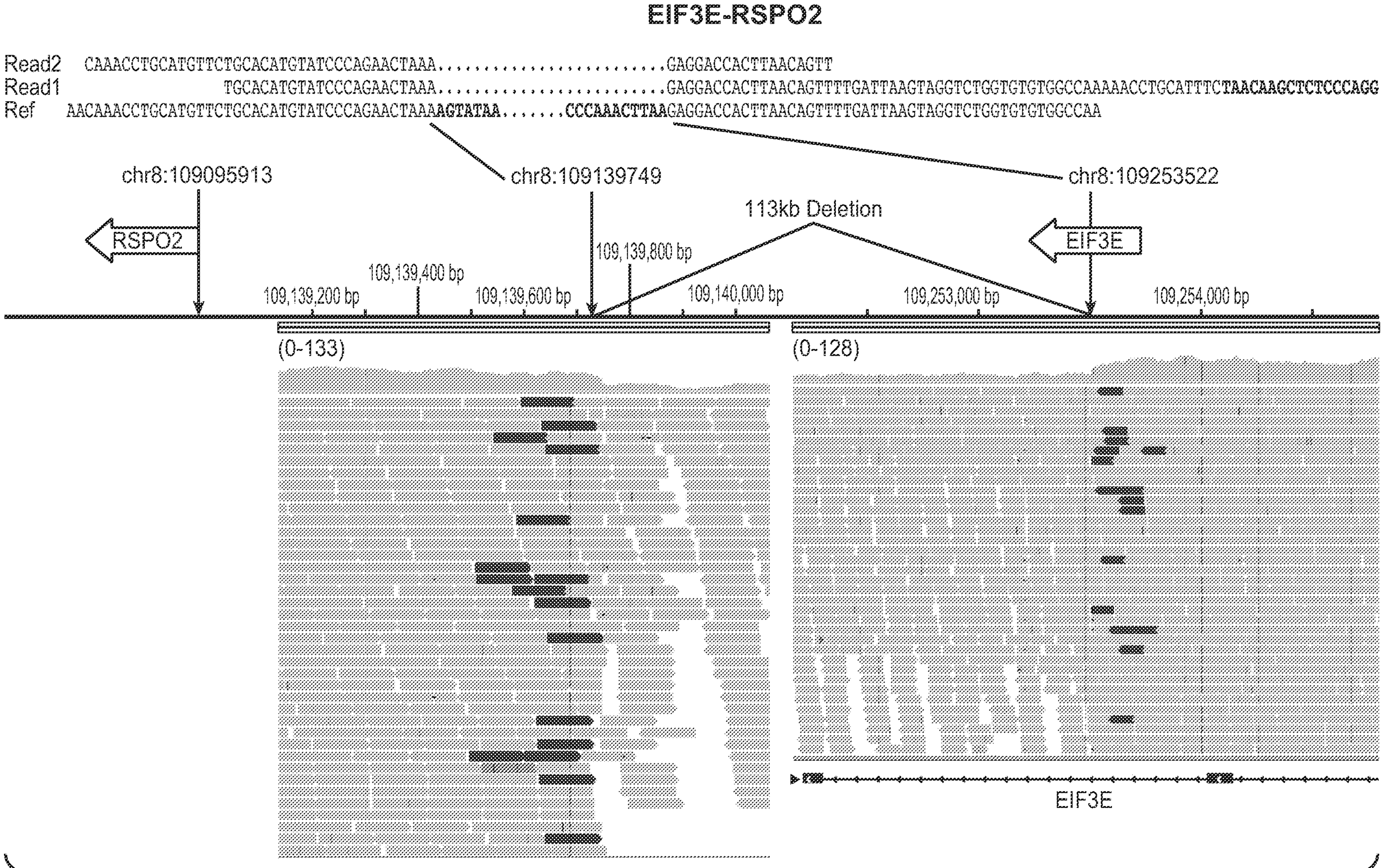

FIG. 8

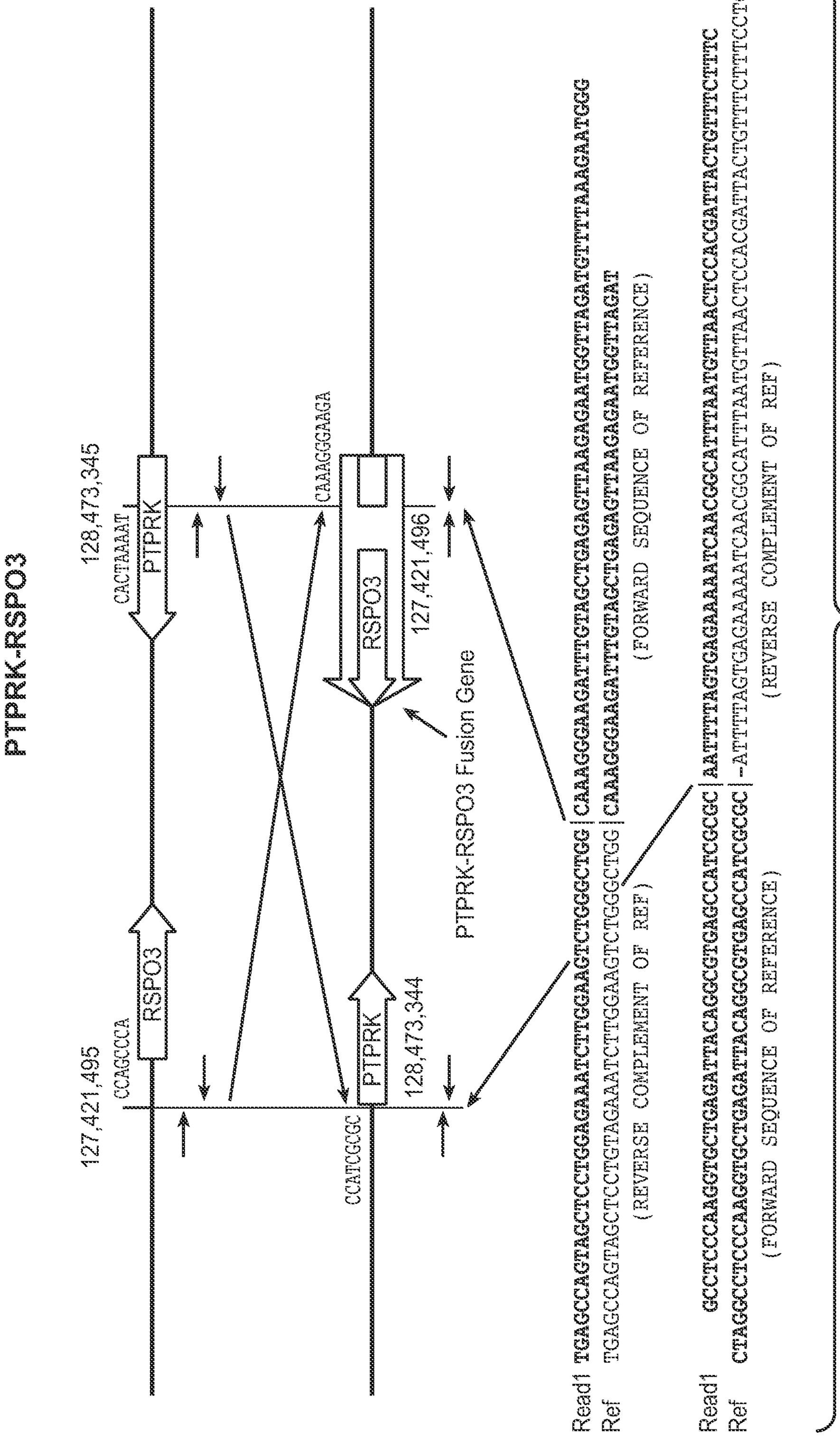
PTPRK-RSPO3
128,473,345
CACTAAAT
PTPRK
CAAAGGAAGA
RSPO3
127,421,496
PTPRK-RSPO3 Fusion Gene
127,421,495
CCAGCCCA
RSPO3
PTPRK
128,473,344
Read1 TGAGCCAGTAGCTCCTGGAAGTCTGGGCTGG | CAAAGGCAAGATTTGTAGATGTTTAAAGAAATCTTGGAAGTCTGGGCTGG | CAAAGGAAGATTTGTAGATGGTTAAGAGAATCTTGGAAGTCTGGGCTGG | CAAAGGAAGATTTGTAGATGGTTAAGAGAATCTTGGAAGTCTGGGCTGG
Ref TGAGCCAGTAGCTCCTGTAGAAATCTTGGAAGTCTGGGCTGG
(REVERSE COMPLEMENT OF REF)
(FORWARD SEQUENCE OF REFERENCE)
Read1 GCCTCCCAAGGTGCTGAGATTACAGGCGTGAGCCATCGCGC | AATTTTAGTGAGAAATCAACGGCATTTAATGTTAACTCCACGC | AATTTTAGTGAGAAATCAACGGCATTTAATGTTAACTCCACGC
Ref CTAGGCCTCCCAAGGTGCTGAGATTACAGGCGTGAGCCATCGCGC | -ATTTTAGTGAGAAATCAACGGCATTTAATGTTAACTCCACGC
(FORWARD SEQUENCE OF REFERENCE)
(REVERSE COMPLEMENT OF REF)

FIG. 9

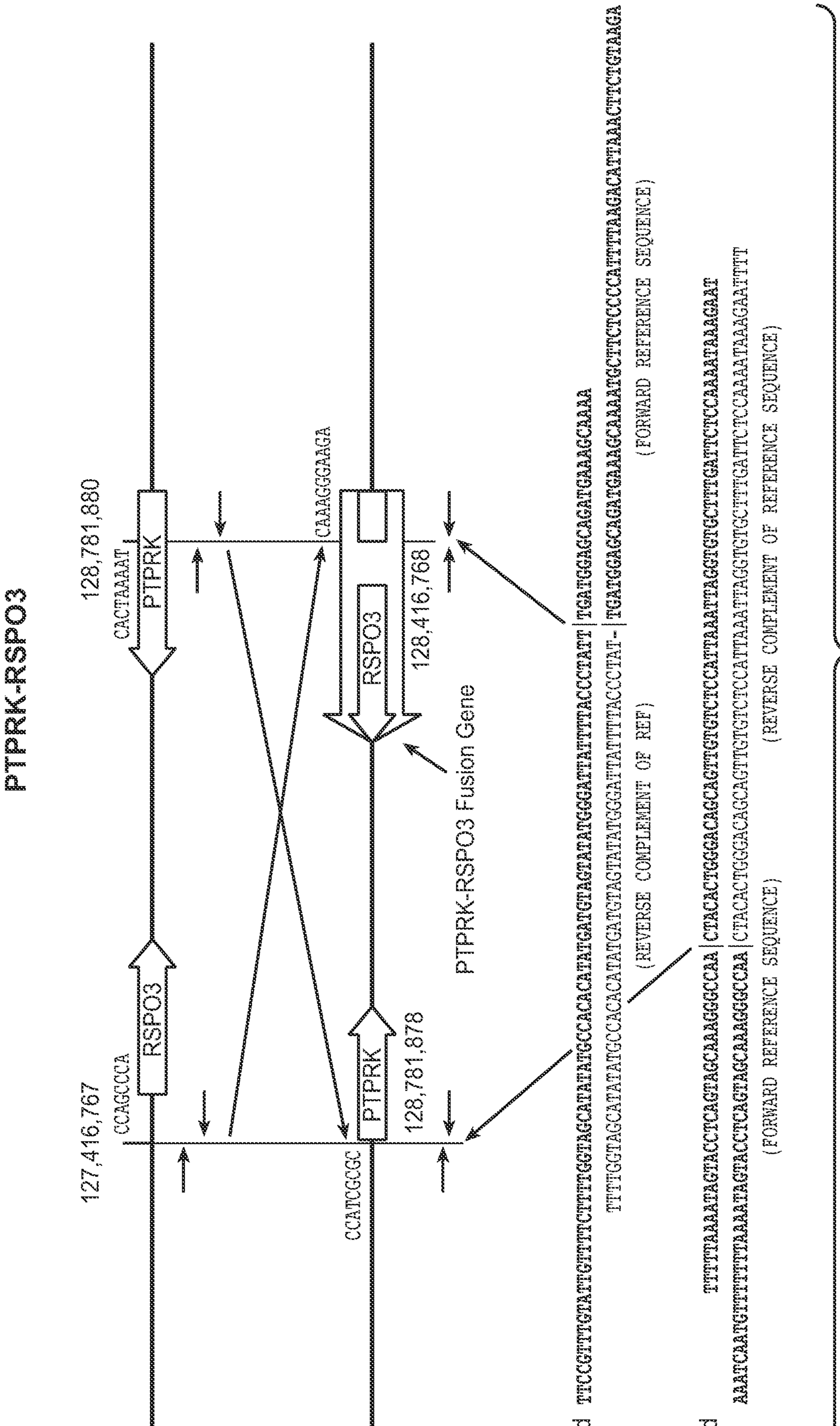
PTPRK-RSPO3
128,781,880
CACTAAAAT
PTPRK
CAAAGGGAAGA
RSPO3
128,416,768
TGATGGAGGCAGATGAAAGCAAAA
(FORWARD REFERENCE SEQUENCE)
TAAATTAGGTGTGCTTTGATTCTCCAAAATAAAGAAT
TAAATTAGGTGTGCTTTGATTCTCCAAAATAAAGAATTTT
(COMPLEMENT OF REFERENCE SEQUENCE)
PTPRK-RSPO3 Fusion Gene
127,416,767
CCAGCCCA
RSPO3
CCATCGCGC
PTPRK
128,781,878
TGATGGAGGCAGATGAAAGCAAAA
(REVERSE COMPLEMENT OF REF)
CTACACTGGGACAGCAGTTGTGTCTCCATTTAAAGAATTTT
(FORWARD REFERENCE SEQUENCE)
CTACACTGGGACAGCAGTTGTGTCTCCATTAAAGAATTTT
(REVERSE COMPLEMENT OF REFERENCE SEQUENCE)
Read TTCCGTTTGTATTGTTTCTTTGGA
Ref TTTTGGTAGGCATATATGCCACACATATGATGGGATTATTTACCCTAT
Read TTTTTAAAATAGTAC
Ref AAATCAATGTTTTTTTAAAATAGTAC

FIG. 10