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(54) Title: BLOOD MARKERS PREDICTIVE OF BRAIN PATHOLOGY AND CLINICAL OUTCOME IN PARKINSON'S DISEASE

(57) Abstract: The present invention provides biological markers which are molecular markers and predictive of brain pathology and clinical status and/or outcome in Parkinson's disease (PD). The invention provides genes, RNA and protein markers that are associated with, relevant to, or predictive of Parkinson's disease (PD), Parkinson's disease with dementia (PDD), Parkinson's disease with dyskinesia or Parkinson's disease duration. The present invention further provides methods, kits and markers for the identification and monitoring of disease and disease aspects in Parkinson's patients and their application as markers and targets in and for evaluating, monitoring and treatment of Parkinson's disease and relevant pathologies and conditions associated with or developing in Parkinson's disease.



BLOOD MARKERS PREDICTIVE OF BRAIN PATHOLOGY AND CLINICAL OUTCOME IN PARKINSON'S DISEASE

CROSS REFERENCE TO RELATED APPLICATION

[001] The present application claims priority to U.S. Application Serial No. 63/464,735, filed May 8, 2023, the entire contents of which is incorporated by reference herein.

STATEMENT OF GOVERNMENT RIGHTS

[0002] This invention was made with government support under numbers NS081706 and R35NS097404 awarded by the National Institutes of Health. The government has certain rights in the invention.

FIELD OF THE INVENTION

[0003] The present invention relates generally to the identification and characterization of biological markers which are molecular markers and predictive of brain pathology and clinical status and/or outcome in Parkinson's disease (PD). The invention further relates to genes, RNA and protein markers that are associated with, relevant to, or predictive of Parkinson's disease (PD), Parkinson's disease with dementia (PDD), Parkinson's disease with dyskinesia or Parkinson's disease duration. The present invention relates to methods, kits and markers for the identification and monitoring of disease and disease aspects in Parkinson's patients and their application as markers and targets in and for evaluating, monitoring and treatment of Parkinson's disease and relevant pathologies and conditions associated with or developing in Parkinson's disease.

BACKGROUND OF THE INVENTION

[0004] Parkinson's disease (PD) is the second most common neurodegenerative disorder after Alzheimer's disease, affecting 2-3% of the population over 65 years of age¹⁻³. Clinically, PD is a highly heterogeneous disease with motor symptoms such as tremor, slowness of movements, stiffness, and postural instability, and more than half of PD patients develop PD dementia (PDD) within 10 years of diagnosis⁴⁻⁷. Patients with late onset of PD experience faster progression and are at increased risk of dementia while patients with early onset have slower progression, less frequent cognitive impairment, but more treatment related motor complications⁸. The disabling motor and non-motor manifestations of PD are primarily due to loss of dopaminergic input from the *substantia nigra* into the dorsal striatum¹.

[0005] The main therapy for Parkinson's disease is levodopa. Other medicines may also be prescribed and utilized to treat Parkinson's symptoms, including Dopamine agonists to stimulate the production of dopamine in the brain, enzyme inhibitors (e.g., MAO-B inhibitors, COMT inhibitors) to increase the amount of dopamine by slowing down the enzymes that break down dopamine in the brain, amantadine to help reduce involuntary movements, or anticholinergic drugs to reduce tremors and muscle rigidity.

[0006] While the symptomatic therapeutic mainstay for PD remains levodopa, which restores brain dopamine levels, its chronic use is fraught with several problems, including loss of drug efficacy, erratic (on-off) responses, and abnormal hyperkinetic movements such as levodopa-induced dyskinesia, a common motor complication related to dopamine transporter loss and abnormal connectivity in the putamen^{17,18}.

[0007] The molecular basis underlying the various clinical-pathologic features of PD remains incompletely understood and any assessment of molecular changes following dopamine denervation in the striatum has been surprisingly limited. Moreover, RNA changes have not been studied with respect to the heterogeneous clinical features of PD.

[0008] There remains a need for improved disease understanding, and disease and symptom and clinical features management in Parkinson's disease patients, including those with Parkinson's disease dementia (PDD) and those with dyskinesia. The present invention addresses such unmet needs with regard to Parkinson's disease, including Parkinson's disease with dementia (PDD) and PD with dyskinesia. Molecular changes in PD brain, including caudate and putamen, and in blood that underlie clinical heterogeneity in PD, have been evaluated and identified, providing RNA markers of potential pathophysiologic, diagnostic and prognostic importance.

[0009] The citation of references herein shall not be construed as an admission that such is prior art to the present invention.

SUMMARY OF THE INVENTION

[00010] In a general aspect, the present invention provides markers, genes, RNAs associated with Parkinson's disease (PD) or clinical aspects and conditions associated with Parkinson's disease. RNA markers and protein markers have been identified which are differentially expressed or preferentially expressed in PD patient(s), and also in PD patients with certain associated conditions or pathologies, including Parkinson's disease with dementia (PDD) and Parkinson's disease with dyskinesia. These RNAs and their genes and associated proteins provide markers which can predict or monitor or evaluate Parkinson's disease (PD) or aspects of Parkinson's disease such as associated dementia or dyskinesia.

[00011] Various gene and RNA markers are provided herein that are associated with Parkinson's disease (PD), including with particular aspects of the disease, such as PD with dementia (PDD) or PD

with dyskinesia. These markers provide genes that are altered, up regulated or down regulated, and whose relevant RNA(s) are increased or decreased in Parkinson's disease (PD), including in certain aspects of Parkinson's disease (PD) such as and including in Parkinson's disease with dementia (PDD) or PD with dyskinesia.

[00012] In some embodiments, markers, genes and their RNAs are provided in listings and tables herein. Markers and genes or RNAs associated with Parkinson's disease (PD), including wherein the relevant or corresponding RNA is increased/upregulated or is decreased/downregulated in patients or individuals, particularly humans, with PD versus control individuals and patients or individuals without PD. These genes, RNAs or markers are associated with Parkinson's disease (PD). Markers, genes, RNAs include those expressed in the brain and associated with PD and also those expressed in blood, particularly those expressed in blood and correlated with expression in brain, particularly in caudate and/or in putamen. In some embodiments, the association with PD is irrespective or and independent of the patients treatment, drugs being taken, or drug interventions.

[00013] Markers, genes, RNAs expressed in the the brain, particularly caudate and putamen, and associated with PD are provided in Table 4. The markers, genes, corresponding RNAs set out in Table 4 are increased or decreased in brain, including putamen and/or caudate, of patients with PD. Markers, genes, RNAs that are decreased or down regulated in the blood of patients with PD are set out in Table 13. Markers, genes, RNAs that are increased or upregulated in the blood of patients with PD are set out in Table 14. Methods and assays for evaluating PD in patients or individuals wherein one or more markers set out in Table 13 or set out in Table 14, or set out in Tables 13 and/or 14 are evaluated or assessed, including determining the relative expression or amount thereof, are provided herein and in embodiments hereof. Markers, genes, RNAs that are decreased or down regulated in the blood of patients with PD are set out in Table 6C. Markers, genes, RNAs that are increased or upregulated in the blood of patients with PD are set out in Table 6D. Methods and assays for evaluating PD in patients or individuals wherein one or more markers set out in Table 6C or set out in Table 6D, or set out in Tables 6C and/or 6D are evaluated or assessed, including determining the relative expression or amount thereof, are provided herein and in embodiments hereof. Classifier genes in caudate associated with PD are provided in Table 5A. Methods and assays for evaluating PD in patients or individuals wherein one or more markers associated with one or more the classifier genes set out in Table 5A are evaluated or assessed, including determining the relative expression or amount thereof, are provided herein and in embodiments hereof. Altered expression can be determined by comparison to one or more control or against a standard of expression, such as of or from unaffected individuals. In partiular embodiments, these methods include evaluating the expression or amount of one or more gene or RNA as set out in Table 13, in Table 14, or in Table 13 and 14. Markers, genes, RNAs increased in expression or amount in the blood and also the brain, caudate, of patients or individuals with PD are set out in Table 23. Markers, genes, RNAs decreased in expression or amount in the blood and also the brain, caudate, of patients or individuals with PD

are set out in Table 24. Markers, genes, RNAs increased in expression or amount in the blood and also the brain, putamen, of patients or individuals with PD are set out in Table 25. Markers, genes, RNAs decreased in expression or amount in the blood and also the brain, caudate, of patients or individuals with PD are set out in Table 26. The markers provided in Tables 23-26 are increased or decreased in PD in patient blood, correlating with patient brain expression. The markers provided in Tables 23 and 25 are increased in PD in patient blood, correlating with patient brain expression. The markers provided in Tables 24 and 26 are decreased in PD in patient blood, correlating with patient brain expression. Methods and assays for evaluating PD disease in patients or individuals wherein one or more markers set out in Table 23, Table 24, Table 25 and/or Table 26 or set out in Tables 23-26 are provided herein and in embodiments hereof.

[00014] In some embodiments, the methods or assays hereof evaluate the genes, markers, RNA in blood, such as a blood sample, including blood samples collected and assessed over time or in regular intervals of time to assess expression or change in expression.

[00015] In an embodiment, genes and their RNAs are provided as down regulated in PD blood, even in drug naïve patients, versus control patients and are selected from one or more of GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4. In a particular embodiment, genes and their RNAs are provided as being down regulated in the blood of PD drug naïve patients, in particular one or more of DNAJC6, SNCA, DLG2 and GPR52. In a further embodiment, genes TOMM70 and CAMK4 are down regulated in caudate and putamen of PD patients. TIAM1 is decreased or down regulated in blood, caudate and putamen in PD versus controls.

[00016] In another embodiment, genes and their RNAs are provided as being up regulated in PD blood, even in drug naïve patients, versus control patients and are selected from one or more of FCAR, PROK2, IL1R2, HSPA6 and CHRNA10. In a particular embodiment, one or more of genes FCAR, PROK2 and IL1R2 are up regulated in the blood of PD drug naïve patients. In a particular embodiment, genes FCAR, PROK2 and IL1R2 are up regulated in the blood of PD drug naïve patients.

[00017] In one embodiment, genes or their RNAs, selected from the following are up or down regulated and their expression or activity is altered in PD patients, even in drug naïve patients: GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL, CAMK4, FCAR, PROK2, IL1R2, HSPA6 and CHRNA10. Thus, in some embodiments, a kit or collection of markers corresponding to one or more of the following genes or their RNAs is provided in a kit or system for assessing and determining whether a patient has or is likely to have or become afflicted with Parkinson's disease, even prior to any drug intervention: GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL, CAMK4, FCAR, PROK2, IL1R2, HSPA6 and CHRNA10. In a particular aspect, the kit or collection of markers is designed to evaluate the expression or activity of a gene, its RNA, or encoded protein in the blood of a patient or individual.

[00018] In an embodiment, a kit or collection of markers corresponding to one or more of the following genes or their RNAs is provided in a kit or system for assessing and determining whether a patient has or is likely to have or become afflicted with Parkinson's disease, even prior to any drug intervention, whereby a decrease in expression or amount of one or more gene or corresponding RNA, or protein, in a sample from a patient or individual selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL, and CAMK4. In a particular aspect, the kit or collection of markers is designed to evaluate the expression or activity of a gene, its RNA, or encoded protein in the blood of a patient or individual.

[00019] In an embodiment, a kit or collection of markers corresponding to one or more of the following genes or their RNAs is provided in a kit or system for assessing and determining whether a patient has or is likely to have or become afflicted with Parkinson's disease, even prior to any drug intervention, whereby an increase in expression or amount of one or more gene or corresponding RNA, or protein, in a sample from a patient or individual selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10. In a particular aspect, the kit or collection of markers is designed to evaluate the expression or activity of a gene, its RNA, or encoded protein in the blood of a patient or individual.

[00020] The invention provides a method for assessing or evaluating Parkinson's disease (PD) in a patient or individual comprising:

- (a) isolating a sample from said patient;
- (b) evaluating the sample for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (i) markers as provided in Table 4;
 - (ii) markers as provided in Table 13 or 14;
 - (iii) markers as provided in Table 23, 24, 25 or 26;
 - (iv) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4;
 - (v) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
 - (vi) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL, CAMK4, FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
 - (vii) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4; and
 - (viii) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

[00021] The invention provides a method for assessing or evaluating Parkinson's disease (PD) in a patient or individual comprising:

- (a) isolating a sample from said patient;
- (b) evaluating the sample for expression or quantitatively increased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (i) markers as provided in Table 14;
 - (ii) markers as provided in Table 23 or 25; and
 - (iii) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (c) wherein the expression or quantitatively increased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

[00022] The invention provides a method for assessing or evaluating Parkinson's disease (PD) in a patient or individual comprising:

- (a) isolating a sample from said patient;
- (b) evaluating the sample for expression or quantitatively decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (i) markers as provided in Table 13;
 - (ii) markers as provided in Table 24 or 26;
 - (iii) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4; and
 - (iv) markers selected from GPR52, SNCA, DNAJC6 and DLG2;
 - (v) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (c) wherein the expression or quantitatively decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

[00023] The invention provides a method for assessing or evaluating Parkinson's disease (PD) in a patient or individual comprising:

- (a) isolating a blood sample from said patient;
- (b) evaluating the blood sample for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (ii) markers as provided in Table 13 or 14;
 - (iii) markers as provided in Table 23, 24, 25 or 26;
 - (iv) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4;
 - (v) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10; and
 - (vi) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL, CAMK4, FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;

(c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

[00024] The invention provides a method for assessing or evaluating Parkinson's disease (PD) in a patient or individual comprising:

(a) isolating a blood sample from said patient;
 (b) evaluating the blood sample for expression or quantitatively increased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (i) markers as provided in Table 14;
- (ii) markers as provided in Table 23 or 25; and
- (iii) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;

(c) wherein the expression or quantitatively increased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

[00025] The invention provides a method for assessing or evaluating Parkinson's disease (PD) in a patient or individual comprising:

(a) isolating a blood sample from said patient;
 (b) evaluating the blood sample for expression or quantitatively decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (i) markers as provided in Table 13;
- (ii) markers as provided in Table 24 or 26;
- (iii) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4; and
- (iv) markers selected from GPR52, SNCA, DNAJC6 and DLG2;

(c) wherein the expression or quantitatively decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

[00026] Parkinson's Disease with Dementia (PDD)

[00027] Markers and genes or RNAs associated with Parkinson's disease with dementia (PDD), including wherein the relevant or corresponding RNA is increased/upregulated or is decreased/downregulated in patients or individuals, particularly humans, with Parkinson's disease with dementia (PDD) versus patients or individuals with PD without dementia. These genes, RNAs or markers are associated with PD with dementia (PDD). Markers, genes, RNAs include those expressed in the brain and associated with PDD and also those expressed in blood, particularly those expressed in blood and correlated with expression in brain, particularly in caudate and/or in putamen. In some embodiments, the association with PDD is irrespective or independent of the patients treatment, drugs being taken, or drug interventions.

[00028] Markers, genes, RNAs expressed in the brain, particularly caudate and/or putamen, and associated with PD with dementia (PDD) are provided in Tables 15, 16, 17, 18, 19, 27 and 28. GO terms associated with PDD and identified in patient blood are provided in Table 9C. Markers, genes, RNAs expressed in the blood and associated with PDD are provided in Table 9B. Tables 8A and 8B provide a subset of particular markers, genes RNAs associated with PDD in the caudate and putamen respectively. The markers, genes, corresponding RNAs set out in Tables 8A and 8B are increased or decreased in brain, including putamen and/or caudate, of patients with PD with dementia (PDD). The markers, genes, corresponding RNAs set out in Tables 15, 16, 17, 18, 19, 27 and 28 are increased or decreased in brain, including putamen and/or caudate, of patients with PD with dementia (PDD). Markers, genes, RNAs that are decreased or down regulated in the caudate of patients with PDD are set out in Table 15. Markers, genes, RNAs that are increased or upregulated in the caudate of patients with PDD are set out in Table 16. Markers, genes, RNAs that are decreased or down regulated in the putamen of patients with PDD are set out in Table 17. Markers, genes, RNAs that are increased or upregulated in the putamen of patients with PDD are set out in Table 18. Markers, genes, RNAs that are increased/upregulated or are decreased/downregulated in the caudate of patients with PDD are set out in Table 19. Markers, genes, RNAs that are increased/upregulated or are decreased/downregulated in the caudate and also in the blood of patients with PDD are set out in Table 27 and Table 28. Methods and assays for evaluating PDD in patients or individuals wherein one or more markers set out in Tables 15, 16, 17, 18, 19, 27 and/or 28 are evaluated or assessed, including determining the relative expression or amount thereof, are provided herein and in embodiments hereof. Altered expression can be determined by comparison to one or more control or against a standard of expression, such as of or from unaffected individuals. In particular embodiments, these methods include evaluating the expression or amount of one or more gene or RNA as set out in Tables 15, 16, 17, 18, 19, 27 and/or 28. Markers, genes, RNAs increased or decreased in expression or amount in the blood and also the brain, caudate, of patients or individuals with PDD are set out in Table 27 and Table 28. The markers provided in Tables 27 and/or 28 are increased or decreased in PDD in patient blood, correlating with patient brain expression. Methods and assays for evaluating PDD disease in patients or individuals wherein one or more markers set out in Tables 15, 16, 17, 18, 19, 27 and/or 28 are provided herein and in embodiments hereof. Methods and assays for evaluating PDD disease in patients or individuals wherein one or more markers set out in Tables 27 and/or 28 are evaluated in the blood or in a blood sample are provided herein and in embodiments hereof. In some embodiments, the methods or assays hereof evaluate the genes, markers, RNA in blood, such as a blood sample, including blood samples collected and assessed over time or in regular intervals of time to assess expression or change in expression.

[00029] In one embodiment, genes or their RNAs as provided in TABLE 8A or TABLE 8B are associated with PDD in the brain. In an embodiment, one or more genes or RNAs selected from TABLE 8A are altered in caudate with PDD. In an embodiment, one or more genes or RNAs

selected from TABLE 8B are altered in putamen with PDD. In an embodiment, one or more genes or RNAs selected from RGP5, TMEM150C, GPAT2, BTN2A2, PDE1A, SYTL2, BMP6 AND PELO are altered in brain, particularly putamen, with PDD.

[00030] The disclosure provides genes, or their associated RNA(s) which have been identified as being down regulated or up regulated in Parkinson's disease with dementia (PDD) versus in PD without dementia. In one embodiment, genes or their RNAs selected from one or more of TRAPPC6A, NUCKS1, STAG3 and ARFRP1 are down regulated, or their RNA expression or amount are decreased, in caudate in Parkinson's disease with dementia (PDD) versus in PD without dementia. In a particular embodiment, the genes TRAPPC6A and ARFRP1, or their respective RNA(s) are down regulated, decreased, or reduced in amount in blood in PDD patients versus PD without dementia. Thus, in one embodiment, TRAPPC6A and ARFRP1 provide blood markers indicative or predictive for PD with dementia in Parkinson's patients, even in drug naïve blood. These genes provide a blood marker gene set for PDD.

[00031] In another embodiment, genes or their RNAs selected from one or more of MARS1, NFAT5, LONRF3, PPP1R15B and TARS1 are up regulated, or their RNA expression or amount are increased, in caudate in Parkinson's disease with dementia (PDD) versus in PD without dementia.

[00032] In another embodiment, genes or their RNA(s) selected from one or more of NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115 are down regulated, or their RNA expression or amount is decreased, in putamen in Parkinson's disease with dementia (PDD) versus in PD without dementia.

[00033] In another embodiment, genes or their RNA(s) selected from one or more of STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR are up regulated, or their RNA expression or amount is increased, in putamen in Parkinson's disease with dementia (PDD) versus in PD without dementia.

[00034] In one embodiment, genes or their RNAs, selected from the following are up or down regulated and their expression or activity is altered in PD patients with dementia (PDD) versus PD patients without dementia: TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2, TMEM115, MARS1, NFAT5, LONRF3, PPP1R15B, TARS1, STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR.

[00035] Thus, in some embodiments, a kit or collection of markers corresponding to one or more of the following genes or their RNAs or their encoded proteins is provided in a kit or system for assessing and determining whether a patient has or is likely to have or become afflicted with Parkinson's disease with dementia, in some embodiments even prior to any evident or consistent dementia symptoms or characteristics: TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2, TMEM115, MARS1, NFAT5, LONRF3, PPP1R15B, TARS1, STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR. The kit, collection or set of markers, such as or including but not limited to, gene or RNA probes or primers, or antibodies directed against the encoded protein(s) of the genes or markers or

RNAs, may be directed against or include means to evaluate a subset of the genes, such as at least two or more genes, at least 2 genes, at least 3 genes, 3 or more genes, at least four genes, at least 5 genes, at least 5 or more genes, at least 6 genes, at least 7 genes, at least 8 genes, 10 genes, at least 10 genes, 10 or more genes, at least 12 genes, 12 or more genes, at least 15 genes, 15 or more genes, at least 18 genes, 18 or more genes, at least 20 genes, 20 or more genes, at least half of the genes, at least 75% of the genes, at least 80% of the genes, or all of the genes. In embodiments the kit, collection or set of markers is directed against 2 or more genes or RNAs or proteins, 3 or more genes or RNAs or proteins, 5 or more genes or RNAs or proteins, 7 or more genes or RNAs or proteins, 9 or more genes or RNAs or proteins, 10 or more genes or RNAs or proteins. In embodiments the kit, collection or set of markers is directed against at least 2, 3, 4, or 5 genes or RNAs or proteins.

[00036] In an embodiment, a kit or collection of markers corresponding to the genes TRAPPC6A and ARFRP1 or their RNAs is provided in a kit or system for assessing and determining whether a patient has or is likely to have or become afflicted with Parkinson's disease with dementia (PDD), in some embodiments even prior to any drug intervention or dementia relevant indicators or symptoms, whereby an decrease in expression or amount of TRAPPC6A and ARFRP1 or their RNAs or encoded proteins in a sample from a patient or individual indicates that the patient or individual has or may likely or will develop dementia with Parkinson's disease. In a particular aspect, the kit or collection of markers is designed to evaluate the expression or activity of a gene TRAPPC6A and/or ARFRP1, its RNA, or encoded protein in the blood of a patient or individual.

[00037] In another embodiment, genes or their RNAs, selected from the following are down regulated and their expression or activity is decreased in PD patients with dementia (PDD) versus PD patients without dementia: TRAPPC6A, NUCKS1, STAG3, ARFRP1 NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115. Thus, in an embodiment, a kit or collection of markers corresponding to one or more of the following genes or their RNAs is provided in a kit or system for assessing and determining whether one or more genes, or their relevant RNA(s) are decreased in a PD patient or patient suspected of PD, so as to determine whether a patient has or is likely to have or become afflicted with Parkinson's disease with dementia: TRAPPC6A, NUCKS1, STAG3, ARFRP1 NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115.

[00038] In another embodiment, genes or their RNAs, selected from the following are up regulated and their expression or activity is increased in PD patients with dementia (PDD) versus PD patients without dementia: MARS1, NFAT5, LONRF3, PPP1R15B, TARS1 STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR. Thus, in an embodiment, a kit or collection of markers corresponding to one or more of the following genes or their RNAs is provided in a kit or system for assessing and determining whether one or more genes, or their relevant RNA(s) are increased in a PD patient or patient suspected of PD, so as to determine whether a patient has or is likely to have or become

afflicted with Parkinson's disease with dementia: MARS1, NFAT5, LONRF3, PPP1R15B, TARS1, STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR.

[00039] The invention provides a method for assessing or evaluating Parkinson's disease with dementia (PDD) in a patient or individual comprising:

- (a) isolating a sample from said patient;
- (b) evaluating the sample for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (i) markers as provided in Table 15, 16, 17, 18, 19, 27 or 28;
 - (ii) markers as provided in Table 27 or 28;
 - (iv) markers selected from TRAPPC6A, NUCKS1, STAG3 and ARFRP1;
 - (v) markers selected from MARS1, NFAT5, LONRF3, PPP1R15B and TARS1;
 - (vi) markers selected from NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;
 - (vii) markers selected from STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;
 - (vii) markers selected from TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2, TMEM115, MARS1, NFAT5, LONRF3, PPP1R15B, TARS1, STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;
 - (viii) markers selected from TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;
 - (vii) markers selected from MARS1, NFAT5, LONRF3, PPP1R15B, TARS1, STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR; and
- (c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease with dementia (PDD) in a patient or individual.

[00040] The invention provides a method for assessing or evaluating Parkinson's disease with dementia (PDD) in a patient or individual comprising:

- (a) isolating a sample from said patient;
- (b) evaluating the sample for expression or quantitatively increased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (i) markers as provided in Table 16 or 18;
 - (ii) markers selected from MARS1, NFAT5, LONRF3, PPP1R15B and TARS1;
 - (iii) markers selected from STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;

(iv) markers selected from MARS1, NFAT5, LONRF3, PPP1R15B, TARSI
STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR; and

(c) wherein the expression or quantitatively increased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease with dementia (PDD) in a patient or individual.

[00041] The invention provides a method for assessing or evaluating Parkinson's disease with dementia (PDD) in a patient or individual comprising:

(a) isolating a sample from said patient;

(b) evaluating the sample for expression or quantitatively decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

(i) markers as provided in Table 15 or 17;

(ii) markers selected from TRAPPC6A, NUCKS1, STAG3 and ARFRP1;

(ii) markers selected from NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115; and

(iv) markers selected from TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;

(c) wherein the expression or quantitatively decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease with dementia (PDD) in a patient or individual.

[00042] The invention provides a method for assessing or evaluating Parkinson's disease with dementia (PDD) in a patient or individual comprising:

(a) isolating a blood sample from said patient;

(b) evaluating the blood sample for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

(i) markers as provided in Table 27 or 28;

(c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease with dementia (PDD) in a patient or individual.

[00043] Parkinson's disease with Dyskinesia

[00044] In an additional embodiment, genes or markers are provided which are altered in Parkinson's patients with dyskinesia. In an embodiment, genes or their RNA(s) are up regulated or their RNA expression or amount is increased, or are downregulated or their RNA expression or amount is decreased or reduced in Parkinson's disease with dyskinesia.

[00045] Markers and genes or RNAs associated with Parkinson's disease (PD), including wherein the relevant or corresponding RNA is increased/upregulated or is decreased/downregulated in patients or individuals, particularly humans, with PD with dyskinesia versus control individuals and/or patients

or individuals with PD without dyskinesia. These genes, RNAs or markers are associated with PD with dyskinesia. Markers, genes, RNAs include those expressed in the brain and associated with PD with dyskinesia and also those expressed in blood, particularly those expressed in blood and correlated with expression in brain, particularly in caudate and/or in putamen. In some embodiments, the association with PD with dyskinesia is irrespective or and independent of the patients treatment, drugs being taken, or drug interventions.

[00046] GO terms associated with dyskinesia and altered in putamen in PD patients with dyskinesia are provided in Table 10D. Genes or RNAs associated with one or more of the GO terms set out in Table 10D are suitable in methods hereof for evaluating or assessing or monitoring dyskinesia in PD patients. Particular markers, genes, RNAs expressed in the the brain, particularly caudate, and associated with PD with dyskinesia are provided in Table 10C. In a particular embodiment, particular markers, genes, RNAs expressed in the the brain, particularly putamen, and associated with PD with dyskinesia are provided in Table 10B. Methods and assays for evaluating PD with dyskinesia in patients or individuals wherein one or more markers set out in Table 10B or described in TABLE 10C are evaluated or assessed, including determining the relative expression or amount thereof, are provided herein and in embodiments hereof. In an embodiment, one or more marker is selected from NGF, EXOC3L1, CCDC172, ITGB3, STX17-AS1, VWA2, DACT1, CPTP, LINC01574, C1QTNF3-AM, MIER2, C9orf129, SLCO4A1-AS1, EFCC1, TMEM115, C1orf1116, DNAH8 and CAGE1.

[00047] Markers, genes, RNAs expressed in the the brain, particularly putamen, and associated with PD with dyskinesia are provided in Table 20. The markers, genes, corresponding RNAs set out in Table 20 are increased or decreased in brain, including putamen, of patients with PD with dyskinesia. Markers, genes, RNAs that are are increased or decreased in brain, including putamen, and in the blood of patients with PD with dyskinesia are set out in Table 29 and 30. Markers, genes, RNAs that are increased/upregulated or are decreased/downregulated in the blood of patients with PD with dyskinesia are set out in Table 29 and 20. In an embodiment, one or more marker is selected from FTCDNL1, MAF1, THEM4, TSTA3, XKRX, KANSL1-AS1, NUDT15, LINC00269, TMEM80, TMPO-AS1, ALAS2, TUBB4B, AHSP, EIF3C, WDR45, KIFC3 and CDC34. Methods and assays for evaluating PD with dyskinesia in patients or individuals wherein one or more markers set out in Table 29 or described in TABLE 30 are evaluated or assessed, including determining the relative expression or amount thereof, are provided herein and in embodiments hereof. Altered expression can be determined by comparison to one or more control or against a standard of expression, such as of or from unaffected individuals. In particular embodiments, these methods include evaluating the expression or amount of one or more gene or RNA as set out in Tables 20 and/or 29 or in Table 30. In particular embodiments, these methods include evaluating the expression or amount of one or more gene or RNA selected from FTCDNL1, MAF1, THEM4, TSTA3, XKRX, KANSL1-AS1, NUDT15, LINC00269, TMEM80, TMPO-AS1, ALAS2, TUBB4B, AHSP, EIF3C, WDR45, KIFC3 and CDC34. Methods and assays for evaluating PDD disease in patients or individuals wherein one or

more markers set out in Tables 29 or 30 are evaluated in the blood or in a blood sample are provided herein and in embodiments hereof. Methods and assays for evaluating PDD disease in patients or individuals wherein one or more markers selected from FTCDNL1, MAF1, THEM4, TSTA3, XKRX, KANSL1-AS1, NUDT15, LINC00269, TMEM80, TMPO-AS1, ALAS2, TUBB4B, AHSP, EIF3C, WDR45, KIFC3 and CDC34 are evaluated in the blood or in a blood sample are provided herein and in embodiments hereof. In some embodiments, the methods or assays hereof evaluate the genes, markers, RNA in blood, such as a blood sample, including blood samples collected and assessed over time or in regular intervals of time to assess expression or change in expression.

[00048] In an embodiment, genes or RNAs, or encoded proteins, selected from the genes provided in Table 20, 29 and/or 30 are altered in dyskinesia with Parkinson's disease. In an embodiment, genes or RNAs, or encoded proteins, selected from the genes provided in Table 29 and/or 30 are altered in dyskinesia with parkinson's disease.

[00049] In an embodiment, genes or their RNA(s) selected from one or more of selected from FTCDNL1, MAF1, THEM4, TSTA3, XKRX, KANSL1-AS1, NUDT15, LINC00269, TMEM80, TMPO-AS1, ALAS2, TUBB4B, AHSP, EIF3C, WDR45, KIFC3 and CDC34 are differentially expressed such that they are up regulated or down regulated, or their RNA expression or amount is increased or decreased, in Parkinson's disease with dyskinesia versus in PD without associated dyskinesia. In an embodiment, these genes or RNAs are altered in brain, including putamen, and in blood. In an embodiment, these genes or RNAs are altered in blood. In an embodiment, changes in one or nmore of these genes or their RNAs expression can be identified by analysis of a patient's blood, particularly a Parkinson's disease patient or patient suspected of having Parkinson's disease, particularly a patients peripheral blood.

[00050] The invention provides a method for assessing or evaluating Parkinson's disease (PD) with dyskinesia in a patient or individual comprising:

- (a) isolating a sample from said patient;
- (b) evaluating the sample for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (i) markers as provided in Table 20;
 - (ii) markers as provided in Table 29 and/or 30; and
 - (iv) markers selected from FTCDNL1, MAF1, THEM4, TSTA3, XKRX, KANSL1-AS1, NUDT15, LINC00269, TMEM80, TMPO-AS1, ALAS2, TUBB4B, AHSP, EIF3C, WDR45, KIFC3 and CDC34;
- (c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) with dyskinesia in a patient or individual.

[00051] The invention provides a method for assessing or evaluating Parkinson's disease (PD) with dyskinesia in a patient or individual comprising:

- (a) isolating a blood sample from said patient;
- (b) evaluating the blood sample for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (i) markers as provided in Table 29 and/or 30; and
 - (ii) markers selected from FTCDNL1, MAF1, THEM4, TSTA3, XKRX, KANSL1-AS1, NUDT15, LINC00269, TMEM80, TMPO-AS1, ALAS2, TUBB4B, AHSP, EIF3C, WDR45, KIFC3 and CDC34;
- (c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) with dyskinesia in a patient or individual.

[00052] The invention provides a method for assessing or evaluating Parkinson's disease (PD) with dyskinesia in a patient or individual comprising:

- (a) isolating a blood sample from said patient;
- (b) evaluating the blood sample for expression or quantitatively increased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from FTCDNL1, THEM4, KANSL1-AS1, LINC00269, TMPO-AS1 and EIF3C;
- (c) wherein the expression or quantitatively increased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) with dyskinesia in a patient or individual.

[00053] The invention provides a method for assessing or evaluating Parkinson's disease (PD) with dyskinesia in a patient or individual comprising:

- (a) isolating a blood sample from said patient;
- (b) evaluating the blood sample for expression or quantitatively decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from MAF1, TSTA3, TUBB4B, WDR45, KIFC3 and CDC34;
- (c) wherein the expression or quantitatively decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) with dyskinesia in a patient or individual.

[00054] Markers and genes or RNAs associated with Parkinson's disease (PD), including wherein the relevant or corresponding RNA is increased/upregulated or is decreased/downregulated in patients or individuals, particularly humans, with PD with disease duration versus control individuals and/or patients or individuals with PD without disease duration or earlier in the disease. These genes, RNAs or markers are associated with PD with disease duration. Markers, genes, RNAs include those expressed in the brain, particularly in putamen or caudate, and associated with PD with disease duration. Correlative markers expressed in the blood of patients or individuals are contemplated in one embodiment. In some embodiments, the association with PD with disease duration is irrespective or and independent of the patients treatment, drugs being taken, or drug interventions.

[00055] Markers, genes, RNAs expressed in the caudate and associated with PD with disease duration are provided in Table 12B. Markers, genes, RNAs expressed in the putamen and associated with PD with disease duration are provided in Table 12C. The markers provided in Table 12B and 12C are increased or decreased in PD with disease duration. Methods and assays for evaluating PD disease duration in patients or individuals wherein one or more markers set out in Table 12B or set out in Table 12C, or set out in Tables 12B and/or 12C are provided herein and in embodiments hereof.

[00056] Markers, genes, RNAs expressed in the caudate and associated with PD with disease duration are provided in Table 21. Markers, genes, RNAs expressed in the putamen and associated with PD with disease duration are provided in Table 22. The markers provided in Table 21 and 22 are increased or decreased in PD with disease duration. Methods and assays for evaluating PD disease duration in patients or individuals wherein one or more markers set out in Table 21 or set out in Table 22, or set out in Tables 21 and/or 22 are provided herein and in embodiments hereof.

[00057] The invention provides a method for assessing or evaluating Parkinson's disease (PD) with disease duration in a patient or individual comprising:

- (a) isolating a sample from said patient;
- (b) evaluating the sample for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (i) markers as provided in Table 21 and/or 22;
- (c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) with disease duration in a patient or individual.

[00058] In an embodiment of the methods, a subset of at least 20 of the markers are evaluated. In an embodiment, all of the markers in a Table are evaluated, such as all of the markers in Table 13, 14, 15, 16, 17, 18, 29 or 30. In an embodiment, a subset of at least 10 of the markers are evaluated. At least 4, at least 5, at least 6, at least 7, at least 8, at least 9, at least 10, at least 11, at least 12, at least 13, at least 14, at least 15, at least 16, at least 17, at least 18, at least 19, at least 20, at least 25, at least 30, at least 35, at least 40, at least 45, at least 50 of the markers in a Table or a listing of markers are or may be evaluated.

[00059] Evaluation of RNA or protein expression assessed using any method known in the art. Evaluation of RNA expression can be conducted by quantitative RNA analysis. Thus, in accordance with the methods of the invention, RNA expression or amount may be assessed by RT PCR. In accordance with the method, protein expression may be assessed using specific antibodies.

[00060] Marker expression, particularly protein expression as encoded by the genes or RNAs provided herein, including marker expression or presence on the surface of cells in the blood or in the cells in the blood in accordance with the methods of the invention may be determined using standard and known methods. Cell markers may be evaluated using antibodies. Cell markers may be evaluated

using Fluorescent Activated Cell Sorting (FACs) analysis. Cells or cell markers may be evaluated using cell sorting or single cell assessments.

[00061] In embodiments of the methods, methods are provided for assessment or evaluation of one or more markers to determine PD disease or PD associated clinical aspects in a patient, wherein the patient is then treated with or administered one or more agent or therapy based on the assessment and evaluation. In one embodiment, a patient wherein PD is determined or predicted based on markers and RNA or gene expression or associated protein markers, the patient is then administered an agent or drug for treatment or alleviation of PD. In one embodiment, a patient wherein PDD is determined or predicted based on markers and RNA or gene expression or associated protein markers, the patient is then administered an agent or drug for treatment or alleviation of dementia. In one embodiment, a patient wherein PD associated dyskinesia is determined or predicted based on markers and RNA or gene expression or associated protein markers, the patient is then administered an agent or drug for treatment or alleviation of dyskinesia. In embodiments of the method of the invention, the agent or therapy for treating PD may be selected from standard or clinically recognized agents or therapies for PD. In embodiments of the method of the invention, the agent for treating PD may be one or more agent selected from levodopa, dopamine agonists, and MAO-B inhibitors. In an embodiment of the method of the invention, the agent for treating PD may be one or more agent selected from the PD agents and therapies described and provided herein. In embodiments of the method of the invention, the agent or therapy for treating PDD may be selected from standard or clinically recognized agents or therapies for dementia, PDD, or Alzheimer's. In embodiments of the method of the invention, the agent for treating PDD may be one or more agent selected from cholinesterase inhibitors and dementia medications used to treat Alzheimer's disease. Anticholinergics include Trihexyphenidate, Trihexyphenidyl. Drugs or agents to treat or alleviate dementia symptoms include Donepezil, Memantine, Rivastigmine and Ginkgo Biloba. In embodiments of the method of the invention, the agent or therapy for treating PD dyskinesia may be selected from standard or clinically recognized agents or therapies for dyskinesia. In embodiments of the method of the invention, the agent for treating PD may be one or more agent selected from dopamine agonists or dopamine promoters include bromocriptine, pergolide, pramipexole (or Mirapex), amantadine, ropinirole, priribedil, cabergoline, apomorphine, Requip XL, and lisuride as well as the Rotigotine transdermal system. In an embodiment of the method of the invention, the agent for treating PD dyskinesia may be one or more agent selected from the dyskinesia agents and therapies or the agents which control, alter or manage dopamine levels described and provided herein.

[00062] Other objects and advantages will become apparent to those skilled in the art from a review of the ensuing detailed description, which proceeds with reference to the following illustrative drawings, and the attendant claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[00063] The patent or patent application contains at least one drawing executed in color. Copies of this patent or patent application publication with color drawing(s) will be provided by the U.S. Patent and Trademark Office upon request and payment of the necessary fee.

[00064] **Figure 1A-1G Transcriptome differences in PD caudate and putamen.** (A) Overview of the study. RNA-sequencing and mass spectrometry was performed in postmortem caudate and putamen from controls and PD patients. Antemortem blood transcriptome data was obtained from an independent cohort of subjects enrolled in the PPMI study. Clinical information was extracted from accompanying charts (postmortem donors) and open-access database (PPMI subjects) to determine molecular profiles associated with PD clinical variables. (B) Principal component analysis (PCA) shows separation of caudate and putamen regions of striatum along PC1 (p value: 2.6×10^{-20} , Kruskal-Wallis test). Healthy controls and PD are separated along PC2 (p value: 2.08×10^{-8}). Ellipses indicate confidence interval = 0.8 of indicated groups. (C) Volcano plot shows significantly changed RNAs in PD caudate and putamen compared to their respective controls. RNAs with changes in expression (determined by limma) with false discovery rate (FDR) < 0.05 and absolute value of $\log_2$ fold change (FC, PD/Control) > 0.1, 0.5 and 1 are colored according to direction. (D) Bubble plot shows representative top significantly (FDR < 0.05) up- ($\log_2\text{FC} > 0$) and down ($\log_2\text{FC} < 0$)-regulated GO terms in both caudate and putamen, as determined by GSVA. (E) Sample-wise gene set enrichment scores (determined by GSVA) for individual donors show select GO terms that are changed in both regions. (F) Gene set enrichment scores for individual donors show select GO terms that are preferentially changed in either caudate or putamen. (G) Heatmap shows expression ($\log_2(\text{counts per million})$, scaled by genes) of classifier genes (identified in caudate) in control and PD striatum. Significance for box-plots were determined by the Wilcoxon test. ** p value < 0.01, **** p value < 0.0001, ns: not significant.

[00065] **Figure 2A-2F Transcriptome changes in PD striatum** (A) Tyrosine hydroxylase (TH) protein levels in PD caudate (n=5) and putamen (n=5) are significantly lower compared to controls (n=5). TH levels were estimated by ELISA in 120 micrograms of total protein from respective regions. p values were obtained from unpaired two-tailed Student's t-test ** p < 0.01 (B) Principal component 2 scores of RNA-seq (from Figure 1b) correlate with TH levels in PD caudate (n=35). Linear regression lines are shown in blue, with 95% confidence intervals shaded in gray. (C) Scatter plot of changes in enrichment scores ($\log_2\text{FC}$) for GO terms that are preferentially enriched (determined by GSVA) in PD caudate and putamen compared to respective controls are highlighted. GO terms were highlighted as preferentially enriched in caudate if FDR < 0.05 in caudate and FDR > 0.1 in putamen. Likewise, preferentially enriched GO terms in putamen had FDR < 0.05 in putamen and FDR > 0.1 in caudate. Gray dots indicate all GO terms in analysis. (D) Gene ontology analysis of highly changed RNAs (FDR < 0.05, absolute value of $\log_2\text{FC} > 1$) in PD caudate and putamen compared to respective controls. (E) Venn diagrams show overlap of differentially expressed RNAs in PD and RNAs changed independent of dopaminergic medication dose in PD. Only RNAs with

absolute $\log_2FC > 0.1$ and $FDR < 0.05$ are shown (F) Correlation plot of differentially changed pathways ($\log_2FC$, calculated by GSEA) in PD compared to controls and pathways changed in PD independent of medication dose. Correlation coefficient (r) and p values were determined by Pearson's correlation test.

[00066] Figure 3A-3D Mass spectrometry in PD striatum (A) Correlation plot for mean RNA expression (RNA-seq) and protein expression (mass spectrometry) in control (RNA-seq, n=40; Mass spectrometry, n=5) and PD caudate (RNA-seq, n=35; Mass spectrometry, n=10). (B) Gene set enrichment analysis shows top differentially changed pathways on mass spectrometry in PD caudate (C) Correlation plot for mean RNA and protein expression in control (RNA-seq, n=40; Mass spectrometry, n=6) and PD (RNA-seq, n=35; Mass spectrometry, n=12) putamen. (D) GSEA for top differentially changed pathways on mass spectrometry in putamen. For correlation plots, values were obtained from Pearson's correlation test.

[00067] Figure 4A-4E. Concordant RNA changes are seen in PD brain and blood (A) Volcano plot showing differential gene expression analysis of blood transcriptome from PPMI subjects. Select RNAs that are also significantly up- or downregulated in the PD striatum (caudate or putamen) are labeled. Controls (n=195), PD (n=479). Only significantly ($FDR < 0.05$) changed ($\log_2FC > 0.1$ or < -0.1) RNAs in PD blood are colored according to direction. (B) Cumulative distribution function plots show that top ($FDR < 0.05$, $\log_2FC > 0.5$ or $\log_2FC < -0.5$) changed RNAs in the PD caudate and putamen (n=35 each) are collectively differentially expressed in the same direction in blood from controls (n=195) and PD (n=479) subjects in the PPMI cohort. p-values were calculated using Kolmogorov-Smirnov tests. (C) RNA expression box plot showing $\log_2(cpm)$ for select RNAs significantly changed in the striatum (controls (n=40), PD (n=35)) and blood (PPMI) in controls (n=195) and PD (n=479) subjects. p values were determined by the Wilcoxon tests. C: Control (D) Volcano Plot shows significantly ($FDR < 0.05$) changed GO terms in PD blood compared to controls. Select top GO terms are labeled. (E) Gene set enrichment scores of the top downregulated GO term (extrinsic component of postsynaptic density membrane) in PD blood correlate with disease progression, based on Hoehn and Yahr scale and MDS-UPDRS III motor scores. p values were obtained from the Wilcoxon test. Only significant comparisons as determined by Wilcoxon tests are shown. * $p < 0.05$, ** $p < 0.01$, **** $p < 0.0001$

[00068] Figure 5A-5E Concordance between blood and brain RNA changes in PD. (A) Venn diagram showing overlap of RNAs that are significantly ($FDR < 0.05$) up- ($\log_2FC > 0.1$) and down- ($\log_2FC < -0.1$) -regulated in the caudate and putamen and blood from controls (n=195) and PD (n=479) subjects in the PPMI cohort. (B) CDF plot of changes in GO term enrichment scores ($\log_2FC/SE$) shows that GO terms that are significantly ($FDR < 0.05$) up- ($\log_2FC > 0$) and down- ($\log_2FC < 0$) -regulated in the PD brain as identified by GSEA are collectively up and downregulated in the blood, respectively. p values were calculated using Kolmogorov-Smirnov tests. (C) Volcano plots show that direction of change in top differentially changed GO terms in PD blood are driven by

changes in most RNAs in the GO term. All RNAs are plotted in black, and RNAs within the indicated GO term are shown in blue. (D) Boxplots show that RNA expression levels ($\log_2(\text{cpm})$) of *TIAM-1*, one of the RNAs in the GO term extrinsic component of postsynaptic density membrane, is downregulated in the blood of PPMI PD subjects and correlates with motor progression as shown by MDS-UPDRSIII scores. *TIAM-1* is also downregulated in postmortem PD caudate and putamen. Significance was determined by Wilcoxon tests. ** p value < 0.01, *** p value < 0.001 (E) CDF plots show that differentially changed RNAs in PD striatum (caudate) show concordant changes in the blood of prodromal subjects (n=60)²⁷ but not in genetic carriers (n=247) who are otherwise healthy. p values were obtained from Kolmogorov-Smirnov tests.

[00069] Figure 6A-6I PD RNA changes seen in blood is independent of medication effect. (A) Venn diagrams show overlap of differentially expressed RNAs in PD and RNAs changed independent of medication dose, among PPMI subjects on dopaminergic medications when compared to controls. (B) Cumulative distribution plot of gene expression changes in the blood ($\log_2\text{FC}/\text{SE}$) shows that differentially (FDR < 0.05, absolute value of $\log_2\text{FC}$ > 0.1 or $\log_2\text{FC}$ < -0.1) expressed RNAs in PD blood after accounting for medication dose (LEDD) show concordant changes with RNAs in the PD striatum. p values were obtained from Kolmogorov-Smirnov tests. (C) Changes in pathway enrichment ($\log_2\text{FC}$) are plotted both before and after accounting for medication dose. Blue line indicates y=x. (D) MDS-UPDRS total and motor (MDS-UPDRS III) scores are plotted in drug-naive and medicated PD patients in the PPMI cohort. Significance was obtained from Wilcoxon tests. (E) Overlap of drug-naive PD (n = 463) blood transcriptome with postmortem striatum RNA changes in the PD caudate and putamen. (F) Volcano plot shows significantly (FDR < 0.05) changed (absolute value of $\log_2\text{FC}$ > 0.1) RNAs in drug-naive PD blood compared to controls. Select brain RNAs changed in the same direction are highlighted. (G) Expression plots for RNAs changed in PD striatum such as *SNCA*, the PD gene *DNAJC6*, *GPR52* and *FCAR* show changes in blood in drug-naive PD subjects. Significance was obtained from Wilcoxon tests. (H) Correlation plot comparing changes between enrichment scores ($\log_2\text{FC}$) in the blood of PD subjects on dopaminergic medications and drug-naive subjects when compared to controls. (I) Classifier RNAs identified in drug-naive early PD⁴⁵ show similar changes in postmortem PD striatum. Significance was obtained from Kolmogorov-Smirnov tests. ** p < 0.01, **** p < 0.0001

[00070] Figure 7A-7D Caudate is affected in PDD with concordant changes seen in blood (A) Volcano plot shows differentially expressed RNAs in PDD caudate (n=16) compared to PD without dementia (PD) (n=11). Only significantly (FDR < 0.05) changed (absolute value of $\log_2\text{FC}$ > 0.1) RNAs are colored according to direction. (B) Bubble plot shows representative top significant (FDR < 0.05) GO terms from GSEA analysis in PDD caudate compared to PD. (C) GSEA enrichment scores of select GO terms in controls, PD and PDD. Controls (n=40), PD (n=11), PDD (n=16) p values were determined by Wilcoxon tests. (D) Differentially changed RNAs in the PDD caudate show similar changes in expression levels in PD blood with worsening cognition as seen by Montreal Cognitive

Assessment (MoCA) scores. Only significant comparisons as determined by Wilcoxon tests are shown. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, **** $p < 0.0001$, ns: not significant.

[00071] Figure 8A-8H Transcriptome patterns in PDD caudate are reflected in the blood of PD subjects with cognitive impairment, including those who were drug-naïve. (A) Volcano plot shows few differentially expressed RNAs in PDD putamen ($n=16$) compared to PD without dementia (PD) ($n=11$). Significantly ($FDR < .05$) changed (absolute value of $\log_2FC > 0.1$) RNAs are colored according to direction. (B) GSVA identified significantly changed pathways in PDD caudate but not putamen. Pathways with $FDR < 0.05$ are colored according to direction. (C) Volcano plot shows differentially expressed RNAs in PD blood of subjects with abnormal cognition ($MoCA < 26$, $n=144$) compared to those with normal MoCA scores ($n=332$). Only significantly ($FDR < 0.05$) changed (absolute value of $\log_2FC > 0.1$) RNAs are colored according to direction. (D) Differential enrichment of GO terms based on GSVA in the blood of PPMI PD subjects with abnormal MoCA ($n=144$) compared to subjects with normal MoCA scores ($n=332$). Only differentially changed GO terms with $FDR < 0.05$ and $\log_2FC > 0$ and $\log_2FC < 0$ are colored according to direction. Select top GO terms are labeled. (E) Enrichment scores of top GO terms significantly changed in PDD caudate change with cognitive impairment (as determined by MoCA scores) in the blood of PPMI subjects. Only significant comparisons as determined by Wilcoxon tests are shown. (F) Among PPMI subjects with abnormal MoCA scores ($n=144$), those who were drug-naïve ($n=112$) had significantly better cognitive performance than those on medications for dementia ($n=32$). (data not shown). Significance was determined by the Wilcoxon test. (G) Drug-naïve PPMI patients were grouped according to MoCA scores (26-30, 22-25 and 0-21) and expression levels of RNAs significantly changed in the PDD caudate are plotted in the blood for these groups. (H) Enrichment scores of top pathways changed in PDD caudate were also changed in the drug-naïve blood. Only significant comparisons as determined by Wilcoxon tests are shown. * $p < 0.05$, ** $p < 0.01$.

[00072] Figure 9A-9D Putamen is preferentially affected in PD dyskinesia. (A) Volcano plot shows differentially expressed RNAs in PD dyskinesia ($n=5$) putamen compared to PD without dyskinesia ($n=11$). Only RNAs with $FDR < 0.1$ and absolute value of $\log_2FC > 0.1$ are colored according to direction. Similar analysis in the caudate show few differentially expressed RNAs between those with and without dyskinesia (B) Volcano plot shows differentially enriched GO terms in PD dyskinesia compared to PD without dyskinesia in the putamen than in the caudate. Only GO terms that are differentially ($FDR < 0.25$) changed are colored according to direction. (C) Bubble plot shows top differentially regulated GO terms from GSVA in the putamen in patients with and without dyskinesia. (D) Gene set enrichment scores of top differentially affected GO term plotted in controls and PD patients without and with dyskinesia shows downregulation of the gene set in PD dyskinesia putamen. p-values are the result of Wilcoxon test * p value < 0.05

[00073] Figure 10A-10D PD caudate and putamen from patients with later onset PD (LOPD) show significant changes in RNA levels compared to controls. (A) PC2 values (from Figure 1b)

distinguish LOPD (n=25), but not EOPD (n=6) samples from controls (n=40) in both the caudate and putamen. For each region, controls are plotted individually with EOPD (left) and LOPD (right) samples and colored accordingly. p values for separation of the groups along PC2 were obtained from Kruskal-Wallis test. $p = 0.05$ (Caudate, EOPD and Control), $p = 0.0006$ (Caudate, LOPD and Control), $p = 0.07$ (Putamen, EOPD and Control) $p = 0.0007$ (Putamen, LOPD and Control). Ellipses indicate confidence interval = 0.8 of indicated groups. (B) Volcano plots show differential gene expression for LOPD and EOPD compared to controls in caudate (left) and putamen (right). Only significantly changed RNAs (FDR < 0.05, absolute value of $\log_2FC > 0.1$) are colored according to direction. (C) Gene set enrichment scores for GO terms are plotted for LOPD, EOPD and controls (C) in the caudate and putamen. Changes detected in PD donors with LOPD when compared to controls are not significant in those with EOPD compared to controls. p-values are the result of the Wilcoxon test (D) Volcano plots show differential gene expression analysis in LOPD and EOPD compared to controls in the blood. Only RNAs with FDR < 0.05 and absolute value of $\log_2FC > 0.1$ are colored according to direction. Control (n=195); LOPD, PD onset >55 (n=330); EOPD, PD onset <= 55 (n=149). * $p < 0.05$, ** $p < 0.01$, **** $p < 0.0001$ ns: not significant

[00074] Figure 11A-11D LOPD and EOPD striatum are molecularly distinct with comparable loss of dopamine input (A) Differential gene expression analysis was performed on 50 randomly chosen groups (n=6) of LOPD compared to all controls (n=40). Median numbers of significantly (FDR < 0.05 and absolute $\log_2FC > 0.1$) changed RNAs in these analyses are shown, grouped according to the direction of change. CAU: Caudate, PUT: Putamen (B) Differential gene expression analysis was performed on 50 different groups of equal number (n=6) of randomly chosen controls and LOPD, and all 6 EOPD donors. Median numbers of significantly changed RNAs from analyses are shown. (C) Enzyme-linked immunosorbent assay shows comparable levels of Tyrosine hydroxylase (TH), a marker for dopamine innervation into the striatum in EOPD (n=6) and LOPD (n=25) donors in the caudate. Significance was determined by unpaired two-tailed t-tests. (D) Western blot for TH in putamen shows decreased dopamine innervation in both LOPD and EOPD compared to controls (C) Quantification of relative intensity of TH is normalized to GAPDH in LOPD and EOPD compared to controls. n=3 per group. Significance was determined by unpaired two-tailed Student's t-test ** $p < 0.01$, ns: not significant

[00075] Figure 12A-12D Disease duration correlates with distinct molecular changes in caudate and putamen. (A,B) Heatmaps show significant (FDR < 0.05) GO terms associated with disease duration in PD caudate (A) and putamen (B), identified by spline regression analysis. Scaled expression ($\log_2(\text{cpm})$) values are plotted. (C, D) Scatter plots show GSVA enrichment scores for top significant GO terms plotted against disease duration in caudate (C) and putamen (D). Blue lines indicate loess regression lines, with 95% confidence intervals shaded in gray.

DETAILED DESCRIPTION

[00076] In accordance with the present invention there may be employed conventional molecular biology, microbiology, and recombinant DNA techniques within the skill of the art. Such techniques are explained fully in the literature. See, e.g., Sambrook et al, "Molecular Cloning: A Laboratory Manual" (1989); "Current Protocols in Molecular Biology" Volumes I-III [Ausubel, R. M., ed. (1994)]; "Cell Biology: A Laboratory Handbook" Volumes I-III [J. E. Celis, ed. (1994)]; "Current Protocols in Immunology" Volumes I-III [Coligan, J. E., ed. (1994)]; "Oligonucleotide Synthesis" (M.J. Gait ed. 1984); "Nucleic Acid Hybridization" [B.D. Hames & S.J. Higgins eds. (1985)]; "Transcription And Translation" [B.D. Hames & S.J. Higgins, eds. (1984)]; "Animal Cell Culture" [R.I. Freshney, ed. (1986)]; "Immobilized Cells And Enzymes" [IRL Press, (1986)]; B. Perbal, "A Practical Guide To Molecular Cloning" (1984).

[00077] Therefore, if appearing herein, the following terms shall have the definitions set out below.

A. TERMINOLOGY

[00078] The term "antibody" describes an immunoglobulin whether natural or partly or wholly synthetically produced. The term also covers any polypeptide or protein having a binding domain which is, or is homologous to, an antibody binding domain. CDR grafted antibodies are also contemplated by this term. An "antibody" is any immunoglobulin, including antibodies and fragments thereof, that binds a specific epitope. The term encompasses polyclonal, monoclonal, and chimeric antibodies. The term "antibody(ies)" includes a wild type immunoglobulin (Ig) molecule, generally comprising four full length polypeptide chains, two heavy (H) chains and two light (L) chains, or an equivalent Ig homologue thereof (e.g., a camelid nanobody, which comprises only a heavy chain); including full length functional mutants, variants, or derivatives thereof, which retain the essential epitope binding features of an Ig molecule, and including dual specific, bispecific, multispecific, and dual variable domain antibodies; Immunoglobulin molecules can be of any class (e.g., IgG, IgE, IgM, IgD, IgA, and IgY), or subclass (e.g., IgG1, IgG2, IgG3, IgG4, IgA1, and IgA2). Also included within the meaning of the term "antibody" are any "antibody fragment".

[00079] An "antibody fragment" means a molecule comprising at least one polypeptide chain that is not full length, including (i) a Fab fragment, which is a monovalent fragment consisting of the variable light (VL), variable heavy (VH), constant light (CL) and constant heavy 1 (CH1) domains; (ii) a F(ab')₂ fragment, which is a bivalent fragment comprising two Fab fragments linked by a disulfide bridge at the hinge region; (iii) a heavy chain portion of an Fab (Fd) fragment, which consists of the VH and CH1 domains; (iv) a variable fragment (Fv), which consists of the VL and VH domains of a single arm of an antibody, (v) a domain antibody (dAb) fragment, which comprises a single variable domain (Ward, E.S. et al., Nature 341, 544-546 (1989)); (vi) a camelid antibody; (vii) an isolated complementarity determining region (CDR); (viii) a Single Chain Fv Fragment wherein a VH domain and a VL domain are linked by a peptide linker which allows the two domains to associate to form an antigen binding site (Bird et al, Science, 242, 423-426, 1988; Huston et al, PNAS USA, 85, 5879-5883, 1988); (ix) a diabody, which is a bivalent, bispecific antibody in which VH and

VL domains are expressed on a single polypeptide chain, but using a linker that is too short to allow for pairing between the two domains on the same chain, thereby forcing the domains to pair with the complementarity domains of another chain and creating two antigen binding sites (WO94/13804; P. Holliger et al Proc. Natl. Acad. Sci. USA 90 6444-6448, (1993)); and (x) a linear antibody, which comprises a pair of tandem Fv segments (VH-CH1-VH-CH1) which, together with complementarity light chain polypeptides, form a pair of antigen binding regions; (xi) multivalent antibody fragments (scFv dimers, trimers and/or tetramers (Power and Hudson, J Immunol. Methods 242: 193-204 9 (2000)); (xii) a minibody, which is a bivalent molecule comprised of scFv fused to constant immunoglobulin domains, CH3 or CH4, wherein the constant CH3 or CH4 domains serve as dimerization domains (Olafsen T et al (2004) Prot Eng Des Sel 17(4):315-323; Hollinger P and Hudson PJ (2005) Nature Biotech 23(9):1126-1136); and (xiii) other non-full length portions of heavy and/or light chains, or mutants, variants, or derivatives thereof, alone or in any combination.

[00080] As antibodies can be modified in a number of ways, the term "antibody" should be construed as covering any specific binding member or substance having a binding domain with the required specificity. Thus, this term covers antibody fragments, derivatives, functional equivalents and homologues of antibodies, including any polypeptide comprising an immunoglobulin binding domain, whether natural or wholly or partially synthetic. Chimeric molecules comprising an immunoglobulin binding domain, or equivalent, fused to another polypeptide are therefore included.

[00081] The term "adjuvant(s)" describes a substance, compound, agent or material useful for improving an immune response or immune cell or component stimulation, and may in some instances be combined with any particular antigen in an immunological, pharmaceutical or vaccine composition. Adjuvants can be used to increase the amount of antibody and effector T cells produced and to reduce the quantity of antigen or immune stimulant or modulator and the frequency of injection. An adjuvant can serve as a tissue depot that slowly releases the antigen and also as a lymphoid system activator that non-specifically enhances the immune response. In a preferred aspect an adjuvant is physiologically and/or pharmaceutically acceptable in a mammal, particularly a human.

[00082] The term "specific" may be used to refer to the situation in which one member of a specific binding pair will not show any significant binding to molecules other than its specific binding partner(s). The term is also applicable where *e.g.* an antigen binding domain is specific for a particular epitope which is carried by a number of antigens, in which case the specific binding member carrying the antigen binding domain will be able to bind to the various antigens carrying the epitope.

[00083] The term "comprise" generally used in the sense of include, that is to say permitting the presence of one or more features or components. The term "consisting essentially of" refers to a product, such as a peptide sequence, of a defined number of residues which is not covalently attached to a larger product.

[00084] The term "oligonucleotide," as used herein in referring to a probe of use the present invention, is defined as a molecule comprised of two or more ribonucleotides, preferably more than three. Its exact size will depend upon many factors which, in turn, depend upon the ultimate function and use of the oligonucleotide. The term "primer" as used herein refers to an oligonucleotide, which is capable of acting as a point of initiation of synthesis when placed under conditions in which synthesis of a primer extension product, which is complementary to a nucleic acid strand, is induced, i.e., in the presence of nucleotides and an inducing agent such as a DNA polymerase and at a suitable temperature and pH. The primer may be either single-stranded or double-stranded and must be sufficiently long to prime the synthesis of the desired extension product in the presence of the inducing agent. The exact length of the primer will depend upon many factors, including temperature, source of primer and use of the method. For example, for diagnostic applications, depending on the complexity of the target sequence, the oligonucleotide primer typically contains 15-25 or more nucleotides, although it may contain fewer nucleotides.

[00085] The term "agent" means any molecule, including polypeptides, antibodies, polynucleotides, chemical compounds and small molecules. In particular the term agent includes compounds such as test compounds or drug candidate compounds.

[00086] The term "assay" means any process used to measure a specific property of a compound. A "screening assay" means a process used to characterize or select compounds based upon their activity from a collection of compounds.

[00087] The term "protein" is used herein to mean protein, polypeptide, oligopeptide or peptide. The terms "protein marker", "biomarker" are used herein to refer to proteins associated with or predictive or which precede specific diseases or conditions or symptoms, including proteins from or associated with aspects, cells or tissues affected by a disease or condition or symptom.

[00088] As used herein, the terms "increase" in marker, gene, RNA expression or "differential expression" of a marker refer to a statistically significant increase or presence. The term statistically significant is used in the art to refer to the likelihood that a result or relationship is caused by something other than mere random chance. Statistical hypothesis testing is traditionally employed to determine if a result is statistically significant or not. Such testing provides a "p-value" representing the probability that random chance could explain the result. In general, a 5% or lower p-value is considered to be statistically significant.

[00089] As used herein, the terms "decrease" in marker, gene, RNA expression or "differential expression" of a marker refer to a statistically significant decrease, reduced presence or absence. The term statistically significant is used in the art to refer to the likelihood that a result or relationship is caused by something other than mere random chance. Statistical hypothesis testing is traditionally employed to determine if a result is statistically significant or not. Such testing provides a "p-value" representing the probability that random chance could explain the result. In general, a 5% or lower p-value is considered to be statistically significant.

[00090] A skilled practitioner would, moreover, appreciate that a relative increase or decrease in a particular protein (a protein marker) or a particular RNA (an RNA marker) or gene expression in a sample alone may be weakly indicative or predictive of disease, but may not be diagnostic per se, if noted as a single determinant. If, however, a plurality of such single determinants are noted in a biological sample, the combined detection of several, even weakly indicative, determinants may serve to identify a strong combinatorial diagnostic indicator of impending disease or symptomatic disease aspects, such as PD or a clinical aspect of PD including dementia, dyskinesia. Furthermore, the single protein/determinant need not approach the threshold of weak diagnostic by itself but in combination with the detection of an increase of another protein or proteins or RNA or RNAs (other markers) or gene expression may serve as a strong combinatorial diagnostic indication of a disease state or disease aspect or an impending disease state or disease aspect. Accordingly, also encompassed herein are combinatorial diagnostic indicators or combinatorial markers that are associated with a particular disease or disease aspect/characteristic or an impending disease or disease aspect/characteristic and not observed in healthy subjects or patients with other diseases.

[00091] Accordingly, selected sets of one, two, three, several, at least 10, about 10, a dozen, 10-15, about 20, at least 20, 25, 30, about 30 and more, etc of the markers of this invention (up to the number equivalent to all of the markers, or all in a set of markers, including any intervening number, in whole number increments, e.g., 1, 2, 3, 4, 5, 6 ...) can be used as diagnostic indicators and predictors of a particular disease or disease aspect/characteristic for methods and/or in kits described herein. In one embodiment, larger numbers of the markers identified herein are used in methods or kits of the invention, since the accuracy of the method or kit may improve as the number of markers screened increases. With respect to aspects of the invention pertaining to evaluating therapeutic efficacy, the methods and kits of the present invention include evaluating whether administration of a therapeutic composition causes a change, either a transient change or a long term change, in expression of one or more of the markers; in expression of two or more of the markers; in expression of three or more of the biomarkers; in expression of four or more of the biomarkers; in expression of five or more of the biomarkers, in expression of six or more of the biomarkers, etc.

[00092] As an example, a straightforward identification of a protein marker or an RNA marker or gene is the presence or increased amount of a protein or RNA associated with a disease or condition and not with other conditions or a decreased amount or the absence of a protein or RNA associated with a disease or condition and not with other conditions that might be clinically confused with the disease under consideration. Variations to this scenario include the situation wherein a marker is present in an increased quantity compared to other conditions or controls. Variations to this scenario include the situation wherein a marker is present in a decreased quantity compared to other conditions or controls. Although not a protein marker, an example is the presence of glucose in the blood in high quantities in diabetics compared to normal individuals who have glucose present but not in elevated quantities. A variation is where the functional marker is not just one protein, RNA or gene

but two or more in combination that can be quantitatively different, wherein the ensemble defines its marker potential.

[00093] In some embodiments, a marker of the invention is a member of a biological pathway. As used herein, the term "precursor" or "successor" refers to molecules that precede or follow the marker in the biological pathway. Thus, once a marker is identified as a member of one or more biological pathways, the present invention can include additional members of the biological pathway that come before (are upstream of or a precursor of) or follow (are downstream of) the marker. Such identification of biological pathways and their members is within the skill of one in the art.

[00094] Also encompassed herein is the analysis of markers identified and listed in the tables presented herein to identify metabolic pathways implicated in the pathogenesis, maintenance, and/or progression of a disease or an impending disease or disease aspect or characteristic, such as dyskinesia or dementia. Such analyses may utilize a variety of software programs or approaches known and available to the skilled artisan. Multiple hits in a particular metabolic pathway underscore the potential importance of the pathway for the disease and direct therapeutic intervention toward appropriate modulation of same. Accordingly, the present methods encompass such analyses and the identification of metabolic pathways of potential significance in a particular disease or impending disease aspect or symptom. Knowing that, for example, activation of a metabolic pathway appears to be linked or associated with a particular disease or impending symptom presents the opportunity to test pharmaceutical modulators of the pathway (i.e., inhibitors) to determine if such modulators could be used as therapeutics for treatment of patients with the disease or impending disease or symptoms. This and these aspects are illustrated and described herein including in the examples.

[00095] Polypeptide or protein markers and RNA(s) or RNA markers may be isolated or evaluated by any suitable method known in the art. Proteins or RNAs can be purified or assayed by standard methods known in the art such as via immunoassay, ELISA, nucleic acid probes, primers, oligonucleotides, antibody affinity methods, RNA sequencing etc. In one embodiment, polypeptide and metabolite markers may be isolated from a biological sample using standard techniques known in the art, for example, affinity purification using substrate-bound antibodies that specifically bind to the marker. As described herein, immunoaffinity depletion of abundant RNA(s) or proteins (with masking potential) enhances coverage and detection of low abundance proteins or RNA(s).

[00096] Antibodies immunospecific for any one of the markers provided herein may be known and available to the public and may be accessed via the scientific community or purchased from a commercial vendor. Readily searchable databases or web browsers may be utilized for example for identifying potential suppliers for such antibodies.

[00097] In accordance with the present disclosure, the tables present information with which an ordinarily skilled practitioner can access the amino acid or nucleic acid sequences of the proteins, genes and RNAs identified herein as markers, as well as nucleic acid sequences encoding same. A stepwise protocol or means for identification of the sequences listed in the tables presented herein

may include the artisan accessing one of the publicly available databases and entering the ensemble number or gene name or symbol to identify the sequence and relevant marker information. Such information may be used to design probes for detection of any of the proteins, genes, RNAs listed therein or to identify commercially available probes or antibodies therefore or thereof. Primers for detection of nucleic acid sequences encoding any of the proteins listed in the tables presented herein are also envisioned as are primers for PCR including RT PCR. Such primers may be used to detect RNA expression levels (including relative increases or decreases as compared to controls) of a marker relevant to the invention. The design of primers for detecting expression levels of RNA (e.g., mRNA) of a marker or markers listed herein is a matter of routine practice with the nucleic acid sequence in hand as provided by publicly available websites such as those mentioned above. Such probes and primers are useful for the kits described herein.

[00098] The term "preventing" or "prevention" refers to a reduction in risk of acquiring or developing a disease or disorder (i.e., causing at least one of the clinical symptoms of the disease not to develop) in a subject that may be exposed to a disease-causing agent, or predisposed to the disease in advance of disease onset. The term "prophylaxis" is related to and encompassed in the term 'prevention', and refers to a measure or procedure the purpose of which is to prevent, rather than to treat or cure a disease. Non-limiting examples of prophylactic measures may include the administration of vaccines; the administration of low molecular weight heparin to hospital patients at risk for thrombosis due, for example, to immobilization; and the administration of an anti-malarial agent such as chloroquine, in advance of a visit to a geographical region where malaria is endemic or the risk of contracting malaria is high.

[00099] "Therapeutically effective amount" means that amount of a drug, compound, antibody, or pharmaceutical agent that will elicit the biological or medical response of a subject that is being sought by a medical doctor or other clinician. In particular, with regard to gram-positive bacterial infections and growth of gram-positive bacteria, the term "effective amount" is intended to include an effective amount of a compound or agent that will bring about a biologically meaningful decrease in the amount of or extent of disease or symptom free or reduced time period and or increase in length of a subject's survival or period disease-free or in remission or free of dyskinesia, dementia, or other PD associated symptoms. The phrase "therapeutically effective amount" is used herein to mean an amount sufficient to prevent, and preferably reduce by at least about 20 percent, preferably reduce by at least about 30 percent, more preferably by at least 50 percent, more preferably by at least 70 percent, most preferably by at least 90 percent, a clinically significant change, or enhanced survival or disease-free or clinical symptom or disease aspect free period by at least about 30 percent, more preferably by at least 50 percent, most preferably by at least 90 percent.

[000100] The term "treating" or "treatment" of any disease, condition, or infection refers, in one embodiment, to ameliorating the disease or infection (i.e., arresting the disease or growth of the infectious agent or bacteria or reducing the manifestation, extent or severity of at least one of the

clinical symptoms thereof). In another embodiment "treating" or "treatment" refers to ameliorating at least one physical parameter, which may not be discernible by the subject. In another embodiment, "treating" or "treatment" refers to modulating the disease or infection, either physically, (e.g., stabilization of a discernible symptom), physiologically, (e.g., stabilization of a physical parameter), or both. In a further embodiment, "treating" or "treatment" relates to slowing the progression of a disease or reducing an infection.

[000101]The phrase "pharmaceutically acceptable" refers to molecular entities and compositions that are physiologically tolerable and do not typically produce an allergic or similar untoward reaction, such as gastric upset, dizziness and the like, when administered to a human.

[000102]As used herein, "pg" means picogram, "ng" means nanogram, "ug" or "μg" mean microgram, "mg" means milligram, "ul" or "μl" mean microliter, "ml" means milliliter, "l" means liter.

B. DETAILED DISCLOSURE.

[000103]The invention relates to and provides previously unidentified and unrecognized markers and marker sets, particularly gene, RNA markers and corresponding protein markers, which are indicators of and associated with Parkinson's disease, or clinical aspects of Parkinson's disease, particularly Parkinson's disease with dementia (PDD) or dyskinesia Parkinson's disease. The markers are differentially expressed or preferentially expressed in conjunction with Parkinson's disease, or clinical aspects of Parkinson's disease, particularly Parkinson's disease with dementia (PDD) or dyskinesia Parkinson's disease in a patient or individual and provide markers which can indicate Parkinson's disease, or clinical aspects of Parkinson's disease, particularly Parkinson's disease with dementia (PDD) or dyskinesia Parkinson's disease, and can be utilized to implement and prescribe treatment and therapy to a patient.

[000104]The concordant transcriptome changes seen in brain and blood can be leveraged to molecularly characterize clinical subtypes of PD and develop novel tools for antemortem clinical diagnosis, prognostication and monitoring therapeutic responses by a minimally invasive approach.

[000105]Parkinson's disease is a central nervous system disorder that affects movement, causing unintended or uncontrollable movements, such as shaking, stiffness, and difficulty with balance and coordination. Parkinson's is a neurodegenerative disorder that affects predominately the dopamine-producing ("dopaminergic") neurons in the substantia nigra area of the brain. Nerve cell damage in the brain causes dopamine levels to drop, leading to the symptoms of Parkinson's.

[000106]People with Parkinson's disease also lose the nerve endings that produce norepinephrine, the main chemical messenger of the sympathetic nervous system, which controls many functions of the body, such as heart rate and blood pressure. The loss of norepinephrine may help explain some of the non-movement features of Parkinson's, such as fatigue, irregular blood pressure, decreased movement of food through the digestive tract, and sudden drop in blood pressure when a person stands up from a sitting or lying position. Many brain cells of people with Parkinson's disease contain Lewy bodies, unusual clumps of the protein alpha-synuclein.

[000107]Symptoms and clinical aspects of Parkinson's disease generally develop slowly over years. The progression of symptoms can be different from one person to another due to the diversity of the disease. People with PD may experience: tremor, mainly at rest and described as pill rolling tremor in hands, other forms of tremor are possible; slowness and paucity of movement (called bradykinesia and hypokinesia); limb stiffness (rigidity); gait and balance problems (postural instability). In addition to movement-related ("motor") symptoms, Parkinson's symptoms may be unrelated to movement ("non-motor"). People with PD can be more impacted by their non-motor symptoms than motor symptoms. Examples of non-motor symptoms include: depression, anxiety, apathy, hallucinations, constipation, orthostatic hypotension, sleep disorders, loss of sense of smell, and a variety of cognitive impairments. Cognitive impairments can progress to dementia.

[000108]Dyskinesia

[000109]Dyskinesia is and includes involuntary, erratic, writhing movements of the face, arms, legs or trunk. They are often fluid and dance-like, but they may also cause rapid jerking or slow and extended muscle spasms. They are not a symptom of Parkinson's disease (PD) alone but are associated with PD in some patients. Dyskinesia may occur with long-term levodopa use and longer time with Parkinson's. Dyskinesia can involve one body part, such as an arm or leg, or the entire body. It can look like fidgeting, writhing, wriggling, head bobbing or body swaying.

[000110]Researchers believe a number of brain chemicals, including serotonin, glutamate and dopamine, play a role in dyskinesia. Dopamine is particularly important. In Parkinson's, the brain cells that make dopamine are lost, so dopamine levels decrease. Levodopa temporarily restores dopamine, but because some of the levodopa medication has to be taken several times per day, dopamine levels can rise and fall. These fluctuating levels, and the continued loss of dopamine-producing brain cells, make it impossible to keep a steady level of dopamine, which contributes to dyskinesia.

[000111]Treatment options for dyskinesia include: changing the dose and/or timing of levodopa; switching to a different formulation of levodopa, such as extended-release (Rytary) or the gel infusion (Duopa), which aims to keep dopamine levels steady to control symptoms and limit dyskinesia; adding amantadine or Gocovri (amantadine extended release) works on the glutamate brain chemical system to lessen dyskinesia. Also, under-the-skin levodopa pumps are designed to keep dopamine levels consistent to control symptoms and prevent dyskinesia. Other treatment approaches include deep brain stimulation (DBS) or focused ultrasound. The Michael J. Fox Foundation has created and validated a tool, the Unified Dyskinesia Rating Scale, to measure and assess dyskinesia, including measuring the impact of dyskinesia therapies in trials.

[000112]Dementia and PDD

[000113]Cognitive impairment is common in Parkinson's disease (PD) and involves attentional, executive, visuospatial, and memory dysfunctions. Dementia describes a set of symptoms that gradually get worse over time and affect daily life. Dementia symptoms occur when nerve cells in the brain become damaged and eventually die. The condition usually involves problems with memory,

thinking, communication and mood. Symptoms and associated features include forgetfulness, slowed thinking and difficulty concentrating, increasing difficulty to make decisions, plan activities and solve problems, sleep disturbances, changes in appetite, and mental health problems such as anxiety, depression or agitation, hallucinations or delusions. Parkinson's dementia and dementia with Lewy bodies are the two types of dementia most likely to affect people with Parkinson's. If there have been motor symptoms (such as tremor or rigidity) for at least one year before dementia symptoms occur, specialists will often give a diagnosis of Parkinson's dementia.

[000114]Disease Treatments

[000115]The main families of drugs useful for treating motor symptoms of PD are levodopa, dopamine agonists, and MAO-B inhibitors. The treatment approach varies depending on the disease stage. Two phases are usually distinguished: an initial phase in which the individual with PD has already developed some disability which requires pharmacological treatment, and a second stage in which the patient develops motor complications related to levodopa usage. Treatment in the initial state aims to attain an optimal tradeoff between good management of symptoms and side effects resulting from enhancement of dopaminergic function. The start of L-DOPA treatment may be delayed by using other medications such as MAO-B inhibitors and dopamine agonists, in the hope of delaying the onset of dyskinesias. In the second stage, the aim is to reduce symptoms while controlling fluctuations of the response to medication. Sudden withdrawals from medication, and overuse by some patients, also must be controlled. When medications are not enough to control symptoms, surgical techniques such as deep brain stimulation (DBS) can relieve the associated movement disorders.

[000116]The main therapy for Parkinson's disease is levodopa. Other medicines may also be prescribed and utilized to treat Parkinson's symptoms, including Dopamine agonists to stimulate the production of dopamine in the brain, enzyme inhibitors (e.g., MAO-B inhibitors, COMT inhibitors) to increase the amount of dopamine by slowing down the enzymes that break down dopamine in the brain, amantadine to help reduce involuntary movements, or anticholinergic drugs to reduce tremors and muscle rigidity.

[000117]Levodopa is often taken along with another medication carbidopa, which prevents or reduces some of the side effects of levodopa therapy (nausea, vomiting, low blood pressure, and restlessness) and reduces the amount of levodopa needed to improve symptoms. Carbidopa and benserazide are peripheral dopa decarboxylase inhibitors. They inhibit the metabolism of L-DOPA in the periphery, thereby increasing levodopa delivery to the central nervous system and are generally given as combination preparations with levodopa. Available and utilized preparations include carbidopa/levodopa (co-careldopa, trade names Sinemet, Pharmacopa, Atamet) and benserazide/levodopa (co-beneldopa, trade name Madopar). Controlled, slow-release versions of Sinemet and Madopar spread out the effect of the levodopa. Duodopa is a combination of levodopa and carbidopa.

[000118] Tolcapone inhibits the catechol-O-methyltransferase (COMT) enzyme, which degrades dopamine and levodopa, thereby prolonging the therapeutic effects of levodopa, and has been used alongside inhibitors of peripheral dopa decarboxylase to complement levodopa. A similar drug is entacapone, which is available for treatment alone (COMTan) or combined with carbidopa and levodopa (Stalevo). Stalevo is a commercial preparation of entacapone, levodopa, and carbidopa.

[000119] Levodopa preparations lead to the development of motor complications characterized by involuntary movements called dyskinesias and fluctuations in the response to medication. When this occurs, PD patients change rapidly from stages with good response to medication and few symptoms ("on" state) to phases with no response to medication and important motor symptoms ("off" state). For this reason, levodopa doses are kept as low as possible while maintaining functionality. The on-off phenomenon is an almost invariable consequence of sustained levodopa treatment in patients with Parkinson's disease. Redistribution of levodopa dosage which may mean smaller, more frequent doses, or larger less frequent increments, may be helpful in controlling oscillations in some patients. Dietary protein restriction and the use of selegiline (Eldepryl) and bromocriptine may also temporarily improve motor fluctuations. New approaches to management include the use of subcutaneous apomorphine, controlled-release preparations of levodopa with a peripheral dopa decarboxylase inhibitor and the continuous intraduodenal administration of levodopa.

[000120] Dopamine agonists in the brain have a similar effect to levodopa since they bind to dopaminergic postsynaptic receptors. Dopamine agonists were initially used for patients experiencing on-off fluctuations and dyskinesias as a complementary therapy to levodopa, but they are now mainly used on their own as an initial therapy for motor symptoms with the aim of delaying motor complications. When used in late PD, they are useful at reducing the off periods. Dopamine agonists or dopamine promoters include bromocriptine, pergolide, pramipexole (or Mirapex), amantadine, ropinirole, piribedil, cabergoline, apomorphine, Requip XL, and lisuride as well as the Rotigotine transdermal system.

[000121] Apomorphine, which is a dopamine agonist not orally administered, may be used to reduce off periods and dyskinesia in late PD. Apomorphine can be administered by subcutaneous injection using a small pump which is carried by the patient. Nausea and vomiting are common, and may require domperidone (an antiemetic).

[000122] Monoamine oxidase inhibitors (selegiline or Eldepryl and rasagiline) increase the level of dopamine in the basal ganglia by blocking its metabolism. Similarly to dopamine agonists, MAO-B inhibitors improve motor symptoms and delay the need of taking levodopa when used as monotherapy in the first stages of the disease, but produce more adverse effects and are less effective than levodopa.

[000123] Some evidence indicates other drugs such as amantadine and anticholinergics may be useful as treatment of motor symptoms in early and late PD, but since the quality of evidence on efficacy is reduced, they are not first-choice treatments. Donepezil (Aricept), which boosts the level of the

neurotransmitter acetylcholine, may help prevent falls in people with Parkinson's. Clozapine (Clozaril) is useful in the treatment of psychotic symptoms of PD. Cholinesterase inhibitors and dementia medications used to treat Alzheimer's disease may be utilized in treatment or amelioration of Parkinson's disease dementia (PDD). Anticholinergics include Trihexyphenidate, Trihexyphenidyl. Drugs or agents to treat or alleviate dementia symptoms include Donepezil, Memantine, Rivastigmine and Ginkgo Biloba.

[000124] Provided herein are methods for evaluating and assessing Parkinson's disease (PD), Parkinson's disease with dementia (PDD), Parkinson's associate dyskinesia, and/or Parkinson's with disease duration.

[000125] Thus, a method is provided for assessing or evaluating Parkinson's disease (PD) in a patient or individual comprising:

- (a) isolating a sample from said patient;
- (b) evaluating the sample for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (i) markers as provided in Table 4;
 - (ii) markers as provided in Table 13 or 14;
 - (iii) markers as provided in Table 23, 24, 25 or 26;
 - (iv) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4;
 - (v) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL, CAMK4, FCAR, PROK2, IL1R2, HSPA6 and CHRNA10; and
 - (vi) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

[000126] A method is provided for assessing or evaluating Parkinson's disease (PD) in a patient or individual comprising:

- (a) isolating a sample from said patient;
- (b) evaluating the sample for expression or quantitatively increased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (i) markers as provided in Table 14;
 - (ii) markers as provided in Table 23 or 25; and
 - (iii) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (c) wherein the expression or quantitatively increased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

[000127] A method is provided for assessing or evaluating Parkinson's disease (PD) in a patient or individual comprising:

- (a) isolating a sample from said patient;
- (b) evaluating the sample for expression or quantitatively decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (i) markers as provided in Table 13;
 - (ii) markers as provided in Table 24 or 26;
 - (iii) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4; and
 - (iv) markers selected from GPR52, SNCA, DNAJC6 and DLG2;
 - (v) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (c) wherein the expression or quantitatively decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

[000128] Methods are provided wherein a blood sample is isolated and evaluated for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (ii) markers as provided in Table 13 or 14;
- (iii) markers as provided in Table 23, 24, 25 or 26;
- (iv) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4;
- (v) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10; and
- (vi) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL, CAMK4, FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

[000129] Methods are provided wherein a blood sample is isolated and evaluated for expression or quantitatively increased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (i) markers as provided in Table 14;
- (ii) markers as provided in Table 23 or 25; and
- (iii) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (c) wherein the expression or quantitatively increased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

[000130] Methods are provided wherein a blood sample is isolated and evaluated for expression or quantitatively decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (i) markers as provided in Table 13;
 - (ii) markers as provided in Table 24 or 26;
 - (iii) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4; and
 - (iv) markers selected from GPR52, SNCA, DNAJC6 and DLG2;
- (c) wherein the expression or quantitatively decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

[000131] Methods are provided for assessing or evaluating Parkinson's disease with dementia (PDD) in a patient or individual comprising:

- (a) isolating a sample from said patient;
- (b) evaluating the sample for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (i) markers as provided in Table 15, 16, 17, 18, 19, 27 or 28;
- (ii) markers as provided in Table 27 or 28;
- (iv) markers selected from TRAPPC6A, NUCKS1, STAG3 and ARFRP1;
- (v) markers selected from MARS1, NFAT5, LONRF3, PPP1R15B and TARS1;
- (vi) markers selected from NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;
- (vii) markers selected from STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;
- (viii) markers selected from TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2, TMEM115, MARS1, NFAT5, LONRF3, PPP1R15B, TARS1, STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;
- (ix) markers selected from TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;
- (x) markers selected from MARS1, NFAT5, LONRF3, PPP1R15B, TARS1, STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR; and

(c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease with dementia (PDD) in a patient or individual.

[000132] A method is provided for assessing or evaluating Parkinson's disease with dementia (PDD) in a patient or individual comprising:

- (a) isolating a sample from said patient;

(b) evaluating the sample for expression or quantitatively increased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (i) markers as provided in Table 16 or 18;
- (ii) markers selected from MARS1, NFAT5, LONRF3, PPP1R15B and TARS1;
- (iii) markers selected from STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;
- (iv) markers selected from MARS1, NFAT5, LONRF3, PPP1R15B, TARS1 STX17AS1,

DACT1, DNAH8 and C1QTNF3-AMACR; and

(c) wherein the expression or quantitatively increased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease with dementia (PDD) in a patient or individual.

[000133] Methods are provided for assessing or evaluating Parkinson's disease with dementia (PDD) in a patient or individual comprising:

(a) isolating a sample from said patient;

(b) evaluating the sample for expression or quantitatively decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (i) markers as provided in Table 15 or 17;
- (ii) markers selected from TRAPPC6A, NUCKS1, STAG3 and ARFRP1;
- (iii) markers selected from NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116,

CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115; and

- (iv) markers selected from TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;

(c) wherein the expression or quantitatively decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease with dementia (PDD) in a patient or individual.

[000134] Methods are provided wherein a blood sample is isolated and evaluated for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (i) markers as provided in Table 27 or 28;

(c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease with dementia (PDD) in a patient or individual.

[000135] A method is provided for assessing or evaluating Parkinson's disease (PD) with dyskinesia in a patient or individual comprising:

(a) isolating a sample from said patient;

(b) evaluating the sample for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (i) markers as provided in Table 20;

- (ii) markers as provided in Table 29 and/or 30; and
 - (iii) markers selected from FTCDNL1, MAF1, THEM4, TSTA3, XKRX, KANSL1-AS1, NUDT15, LINC00269, TMEM80, TMPO-AS1, ALAS2, TUBB4B, AHSP, EIF3C, WDR45, KIFC3 and CDC34;
- (c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) with dyskinesia in a patient or individual.

[000136] Methods are provided, wherein a blood sample is isolated and evaluated for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (i) markers as provided in Table 29 and/or 30; and
 - (ii) markers selected from FTCDNL1, MAF1, THEM4, TSTA3, XKRX, KANSL1-AS1, NUDT15, LINC00269, TMEM80, TMPO-AS1, ALAS2, TUBB4B, AHSP, EIF3C, WDR45, KIFC3 and CDC34;
- (c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) with dyskinesia in a patient or individual.

[000137] A method is provided for assessing or evaluating Parkinson's disease (PD) with disease duration in a patient or individual comprising:

- (a) isolating a sample from said patient;
- (b) evaluating the sample for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (i) markers as provided in Table 21 and/or 22;
- (c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) with dyskinesia in a patient or individual.

[000138] In an embodiment of the methods, a subset of at least 20 of the markers are evaluated. In an embodiment of the methods, a subset of at least 10 of the markers are evaluated. In an embodiment of the methods, all of at least one set of the markers are evaluated.

[000139] In an embodiment of the methods, RNA expression is assessed by RT PCR. In an embodiment of the methods, protein expression is assessed using specific antibodies.

[000140] The methods provided herein include further comprising treating the patient thereby diagnosed with Parkinson's disease (PD), Parkinson's disease with dementia (PDD), PD with dyskinesia, or PD with disease duration by administering a therapeutically effective amount of one or more agent or therapy for treating PD, dementia, or dyskinesia.

[000141] Provided herein are one or more sets or a set of RNA or protein markers for assessing or evaluating Parkinson's disease (PD), Parkinson's disease with dementia (PDD), Parkinson's disease dyskinesia or Parkinson's with disease duration in a patient comprising the markers selected from:

- (i) markers as provided in Table 4;
- (ii) markers as provided in Table 13 or 14;
- (iii) markers as provided in Table 23, 24, 25 or 26;
- (iv) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4;
- (v) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (vi) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL, CAMK4, FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (vii) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4; and
- (viii) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (ix) markers as provided in Table 15, 16, 17, 18, 19, 27 or 28;
- (x) markers as provided in Table 27 or 28;
- (xi) markers selected from TRAPPC6A, NUCKS1, STAG3 and ARFRP1;
- (xii) markers selected from MARS1, NFAT5, LONRF3, PPP1R15B and TARS1;
- (xiii) markers selected from NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;
- (xiv) markers selected from STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;
- (xv) markers selected from TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2, TMEM115, MARS1, NFAT5, LONRF3, PPP1R15B, TARS1, STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;
- (xvi) markers selected from TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;
- (xvii) markers selected from MARS1, NFAT5, LONRF3, PPP1R15B, TARS1 STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR; and
- (xviii) markers as provided in Table 20;
- (xix) markers as provided in Table 29 and/or 30; and
- (xx) markers selected from FTCDNL1, MAF1, THEM4, TSTA3, XKRX, KANSL1-AS1, NUDT15, LINC00269, TMEM80, TMPO-AS1, ALAS2, TUBB4B, AHSP, EIF3C, WDR45, KIFC3 and CDC34; and
- (xxi) markers as provided in Table 21 an/or 22.

[000142]In aspects or methods of the invention, the markers, RNAs, genes or their encoded proteins may be evaluated to identify or select at-risk PD patients. Thus, patients may be identified or selected,

for example, for clinical trials. Provided herein are a variety of companion diagnostics and markers both for evaluating treatments, agents, compounds and for developing treatments, agents, compounds, including for different patient subsets of clinical disease, such as for PD with dementia (PDD) or PD with dyskinesia. Early and late onset PD patients may be differentially identified and assessed and can be selected for certain evaluations and clinical trials. Those at risk of different time courses (e.g. faster) for disease progression can be identified, selected and evaluated or assessed.

[000143] The correlation provided herein between blood markers and changes in specific regions of the basal ganglia in the brain (caudate nucleus and putamen) may be utilized to point to or suggest specific clinical actions. This includes prescription of particular drugs or agents. This further includes the use or application of drugs or agents directed to or against one or more marker. For example, blood/brain markers may point to targeted therapies that affect the brain and therefore are potentially not just markers, but offer the potential for development or monitoring of therapeutic targets.

[000144] Provided herein is a system or kit for assessing or evaluating Parkinson's disease (PD), Parkinson's disease with dementia (PDD), Parkinson's disease dyskinesia or Parkinson's with disease duration in a patient comprising a set of markers hereof or a set of probes and/or antibodies for evaluating a set of markers of hereof.

[000145] Any applicable and sufficient number of markers may be evaluated in a patient to determine or evaluate, PD or aspects of PD including PDD and PD dyskinesia. Thus, the markers should be sufficient to reliably predict, assess or evaluate PD or aspects of PD including PDD and PD dyskinesia. One skilled in the art will be able to utilize the data herein and available to provide a set of markers necessary or sufficient to assess or evaluate PD or aspects of PD including PDD and PD dyskinesia. In particular and for example, markers which are associated with certain pathways or responses may be selected.

[000146] A subset of at least 50 of the markers may be evaluated. A subset of at least 40 of the markers may be evaluated. A subset of at least 30 of the markers may be evaluated. A subset of at least 20 of the markers may be evaluated. A subset of at least 10 of the markers may be evaluated. A subset of at least 5 of the markers may be evaluated. A subset of at least 4 of the markers may be evaluated. A subset of at least 3 of the markers may be evaluated. At least 3, at least 4, at least 5, at least 6, at least 7, at least 8, at least 9, at least 10, at least 11, at least 12, at least 13, at least 14, at least 15, at least 16, at least 17, at least 18, at least 19, at least 20, at least 25, at least 30, at least 35, at least 40, at least 45, at least 50 of the markers may be evaluated.

[000147] Evaluation of RNA or protein expression may be conducted using any method known in the art. Thus, in accordance with the methods of the invention, RNA expression may be assessed by RT PCR or may be determined by RNA sequencing. In accordance with the method, protein expression may be assessed using specific antibodies, assessing for protein activity, utilizing protein ligands. Protein expression may be evaluated utilizing one or more protein markers, such as one or more antibody specific for the protein or by a suitable readout of the amount of protein, such as a label, dye,

ligand etc. Where an RNA or gene is indicated by name, its corresponding information can be derived by one skilled in the art, such as via determination of the gene ID, a database listing, corresponding database nucleic acid or protein sequence. The sequence enables development and utilization of a nucleic acid probe, directed or specific antibody, protein assay, etc to determine expression, amount, level, activity of the corresponding nucleic acid such as RNA or of the corresponding protein. This and these approaches for evaluation of RNA or protein expression, of RNA or protein levels/amounts, or of RNA or protein activity are within the knowledge and ability of one skilled in the art.

[000148] The present invention also relates to a variety of diagnostic applications, including methods for detecting and evaluating the expression of or altered presence (increased or decreased amount) of any of the markers provided herein, particularly the gene, RNA markers or their associated proteins as markers described and provided herein. Thus, the expression of a gene, presence or amount of RNA, or presence or amount of associated or encoded protein is evaluated. RNA may be evaluated by assessing transcriptome changes. RNA may be evaluated by RNA sequencing. RNA may be evaluated and determined by RT-PCR. Nucleic acid probes for evaluation and PCR can be designed, selected and utilized by one skilled in the art, including based on the gene and nucleic acid sequence(s) known and available corresponding to the markers listed and in the marker sets provided herein.

Protein may be evaluated by reference to their ability to be recognized by a specific antibody directed thereto. Antibodies directed against the markers listed and marker sets provided herein can readily be generated using standard methods or purchased from commercial or publicly available sources. This is well within the knowledge, capability and access of the skilled artisan. For example, for the marker set GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4: anti-GPR52 antibodies are commercially available from Thermo Fisher Scientific, R&D Systems, Abcam, LS Bio, Atlas Antibodies, Sigma Aldrich and/or Santa Cruz Biotechnology; antibodies MAB10357-100 and PA5-3281, Syn211 or ab138501, PA5-26981 or ab262877, LS-C153136 or ab231634, AF5038, HPA048020 or KIAA0719, sc-393321, and ab3557 or IHC-0042 respectively. Similarly, for the marker set FCAR, PROK2, IL1R2, HSPA6 and CHRNA10: antibodies are commercially available from Thermo Fisher Scientific, R&D Systems and/or Abcam; antibodies BS-6586R or AF3939, Ab76747 or PA5-70630, PA5-21974 or 34141, PA5-21726 or ab212044 and ab234767, respectively.

[000149] Proteins, peptides or peptide complexes can be identified, targeted, labeled, and/or quantitated on cells or in cells, including cell(s) in peripheral blood. Diagnostic applications include *in vitro* and *in vivo* applications well known and standard to the skilled artisan and based on the present description. Diagnostic assays and kits for *in vitro* assessment and evaluation of marker status or marker amounts may be utilized to diagnose, evaluate and monitor patient samples including those known to have or suspected of having Parkinson's disease (PD), Parkinson's disease with dementia (PDD), Parkinson's with dyskinesia. The assessment and evaluation of PD and PD disease and associated pathologies or conditions and status is useful in determining the suitability of a patient for a clinical trial of a drug or for the administration of a particular therapy, drug, or disease agent,

including as described herein, including combinations thereof, versus a different agent, drug or therapy. This type of diagnostic monitoring and assessment is already in practice utilizing antibodies against the HER2 protein in breast cancer (Hercep Test, Dako Corporation), where the assay is also used to evaluate patients for antibody therapy using Herceptin. *In vivo* applications may include imaging of the brain, CNS.

[000150] In a further embodiment, commercial test kits suitable for use by a medical specialist may be prepared to determine the presence or absence of aberrant, differential or increased expression of one or more or of a subset of markers, genes, RNAs, relevant proteins described herein. One class of kits will contain at least the labeled marker or its binding partner, for instance a nucleic acid probe, primer, or an antibody specific thereto, and directions, of course, depending upon the method selected. The kits may also contain peripheral reagents such as buffers, stabilizers, etc.

[000151] In accordance with the above, an assay system for screening potential drugs effective to modulate PD, PDD, PD dyskinesia or an aspect of PD and/or the activity of a marker or protein marker of the present invention may be prepared. The marker peptide or antibody thereto may be introduced into a test system, and the prospective drug may also be introduced into the resulting system cell culture, and the culture thereafter examined to observe any changes in the activity of the cells, binding of the antibody, or amount and extent of the marker due either to the addition of the prospective drug alone, or due to the effect of added quantities of a known agent(s).

[000152] The invention provides a system or kit for evaluating PD, PDD, PD dyskinesia or an aspect of PD comprising a set of markers as described and provided herein or a set of probes and/or antibodies for evaluating a set of markers as described and provided herein. The system or kit may comprise a set of probes and/or antibodies for evaluating a set of markers selected from:

- (i) markers GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4;
- (ii) markers FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (iii) markers GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL, CAMK4, FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (iv) markers GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4;
- (v) markers FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (vi) markers TRAPPC6A, NUCKS1, STAG3 and ARFRP1;
- (vii) markers MARS1, NFAT5, LONRF3, PPP1R15B and TARS1;
- (viii) markers NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;
- (ix) markers STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;
- (x) markers TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2, TMEM115, MARS1, NFAT5, LONRF3, PPP1R15B, TARS1, STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;

(xi) markers TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;

(xii) markers MARS1, NFAT5, LONRF3, PPP1R15B, TARS1 STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR; and

(xiii) markers FTCDNL1, MAF1, THEM4, TSTA3, XKRX, KANSL1-AS1, NUDT15, LINC00269, TMEM80, TMPO-AS1, ALAS2, TUBB4B, AHSP, EIF3C, WDR45, KIFC3 and CDC34.

[000153] The invention may be better understood by reference to the following non-limiting Examples, which are provided as exemplary of the invention. The following examples are presented in order to more fully illustrate the preferred embodiments of the invention and should in no way be construed, however, as limiting the broad scope of the invention.

EXAMPLE 1

[000154] The ability to use blood markers to predict outcomes of Parkinson's disease (PD), including disease progression and development of cognitive and motor complications, would be of enormous clinical value. We undertook deep bulk RNA sequencing from the caudate and putamen of postmortem PD (n=35) and control (n=40) striatum, and compared molecular profiles with clinical features and bulk RNA sequencing data obtained from antemortem peripheral blood. Cognitive and motor complications of PD were associated with molecular changes in the caudate (stress response) and putamen (endothelial pathways) respectively. Later and earlier-onset PD were molecularly distinct, and disease duration was associated with distinct changes in caudate (oligodendrocyte development) and putamen (cellular senescence), respectively. Remarkably, molecular signatures and transcriptome patterns in the postmortem PD brain were also evident in antemortem peripheral blood and correlated with clinical features of disease and disease severity. Together, these findings identify molecular markers and signatures in PD patients' brain and blood of pathophysiologic and prognostic importance.

[000155] Parkinson's disease (PD) is the second most common neurodegenerative disorder after Alzheimer's disease, affecting 2-3% of the population over 65 years of age¹⁻³. Clinically, PD is a highly heterogeneous disease with motor symptoms such as tremors, slowness of movements, stiffness, and postural instability, and more than half of PD patients develop PD dementia (PDD) within 10 years of diagnosis⁴⁻⁷. Patients with late onset of PD experience faster progression and are at increased risk of dementia while patients with early onset have slower progression, less frequent cognitive impairment, but more treatment related motor complications⁸. The disabling motor and non-motor manifestations of PD are primarily due to loss of dopaminergic input from the substantia nigra into the dorsal striatum¹.

[000156] The dorsal striatum is divided into the caudate and putamen, which have discrete corticostriatal circuitry and differing roles in PD symptom manifestations⁹⁻¹². Functional imaging

studies in PD patients have demonstrated that loss of dopaminergic input into the caudate and putamen correlate with cognitive impairment and motor worsening respectively^{13–16}. While the symptomatic therapeutic mainstay for PD remains levodopa, which restores brain dopamine levels, its chronic use is fraught with several problems, including loss of drug efficacy, erratic (on-off) responses, and abnormal hyperkinetic movements such as levodopa-induced dyskinesia, a common motor complication related to dopamine transporter loss and abnormal connectivity in the putamen^{17,18}.

[000157] While the molecular basis underlying the various clinical-pathologic features of PD remain incompletely understood, a careful assessment of molecular changes following dopamine denervation in the striatum has been surprisingly limited. Two RNA sequencing (RNA-seq) studies from a small number of PD patients found downregulation of synaptic pathway RNAs in the putamen, but it is not known whether these changes are shared with the caudate or if the caudate is molecularly distinct in PD^{19–22}. Moreover, changes in RNA in the caudate and putamen have not been studied with respect to the heterogeneous clinical features of PD.

[000158] Peripheral blood transcriptome studies in Alzheimer's disease have demonstrated correlations with clinical status, including correlates of immune and neural changes with molecular brain pathology^{23,24} raising the question of whether the blood might be informative in PD. It has not been explored whether such correlations, particularly those associated with blood transcriptome, brain pathology and clinical status, are present in other neurologic disorders. The Parkinson's Progression Marker Initiative (PPMI), a multi-center study aggregating whole-blood transcriptome data from PD cases and matched controls in a publicly available dataset, recently identified altered expression of immunologic signatures, with an increase in neutrophil gene expression in the whole blood of patients with PD^{25–27}. Specifically, it is not yet known whether transcriptional changes detectable in PD blood correlate with clinical status or specific molecular changes in the brain.

[000159] Here we performed RNA-seq from paired caudate and putamen regions of 35 PD and 40 control brains to develop a comparative analysis of clinical and molecular changes in PD. We identified gene expression changes that were common to both caudate and putamen, including increased levels of RNAs encoding proteins involved in regulation of miRNA activity and immune response, and decreased levels of RNAs encoding proteins involved in the postsynaptic membrane, synaptic signaling, mitochondrial dynamics and lipid metabolism. Transcriptome changes were confirmed by mass spectrometry analysis of striatal proteins. We also identified regionally distinct changes that were specific to caudate and putamen that were associated with dementia and levodopa-induced dyskinesia (motor symptoms), respectively. Later and earlier onset PD were also molecularly distinct, even at the end of their disease course. Findings in the PD brain were corroborated by analysis of bulk RNA profiles in peripheral blood obtained from the PPMI, correlating with disease severity and clinical features of the disease, and these findings were independent of medication effect. In summary, we identify molecular changes in PD caudate, putamen and blood associated with the

clinical heterogeneity in PD, providing RNA markers and RNA signatures of potential pathophysiologic, diagnostic and prognostic importance.

METHODS

[000160] Human Samples

[000161] Brain samples from individuals who had pathological confirmation of Parkinson's disease were obtained from NIHNeuroBioBank. Control donors did not carry a clinical history of neurological disease. Chart review of available clinical material for information on age of onset/diagnosis, disease duration, medications, dementia, dyskinesia were done retrospectively from visit notes with movement disorders specialists, neurologists, general and other specialty practitioners as available. Details for categorization of individual clinical features are described in the bioinformatics section of methods. LEDD was calculated from all listed dopaminergic medications³⁶. Relevant clinical information for blood transcriptome analysis was obtained from Parkinson's Progression Markers Initiative (PPMI).

[000162] RNA-seq

[000163] RNA was extracted using standard TRIzol (Invitrogen) extraction method. RNA samples were treated with RQ1 RNase-free DNase (Promega), purified by TRIzol LS (Ambion) and checked on Agilent Bioanalyzer. The sequencing libraries were prepared for polyadenylated RNA by using Dynabeads RNA Purification Kit (ThermoFisher Scientific) and TruSeq Stranded Total RNA Gold Library Kit (Illumina) following manufacturer's instructions. IDT for Illumina TruSeq DNA UD Indexes were used and high-throughput sequencing was performed on Illumina NovaSeq 500 to obtain 150 nucleotide paired-end reads.

[000164] Mass Spectrometry

[000165] Approximately 35 mg brain tissue was homogenized in 8 M urea lysis buffer (8 M urea, 100 mM Na₂HPO₄, pH 8.5) with HALT protease and phosphatase inhibitor cocktail (ThermoFisher). After sonication and centrifugation, protein concentration and integrity of the supernatant was tested by bicinchoninic acid (BCA) assay (Pierce) and gel electrophoresis, respectively. Disulfide bonds were reduced with dithiothreitol and cysteines alkylated with Indole acetic acid. Proteins were extracted using Chloroform/Water/Methanol precipitation and digested using LysC (ThermoFisher) and trypsin. Peptides were labeled with tandem mass tag (TMT) pro labeling reagent and stoichiometry and labeling efficiency evaluated. TMT-peptides were mixed according to label check and purified using RP solid phase extraction. Purified TMT-peptides were fractionated first using strong cation exchange, and then by high-pH RP-fractionation. The resulting fractions were analyzed by liquid chromatography with tandem mass spectrometry. Spectra were queried against the *homo sapiens* proteome concatenated with common contaminants at 1% FDR. Quantitation was performed using reporter ions from fragment spectra, requiring a spectral purity of 75%. Quantitative values for proteins were log₂ transformed. A protein was required to be observed in at least 5 replicates in at least one group. Protein isoform with the highest expression was used. After this filtering, 6994

(caudate) and 5183 (putamen) proteins remained. Missing values were imputed with random low-abundant values from a normal distribution. Values were normalized to the median for each channel by subtraction and significance tested using permutation-based FDR-corrected t-tests (FDR 0.05).

[000166]ELISA

[000167] Tissue was homogenized in Radio-immunoprecipitation (RIPA) Buffer (Sigma-Aldrich R0278) with complete Mini EDTA-free Protease Inhibitor (Roche). Protein concentration of lysate was quantified by BCA protein assay kit (Pierce). 120-200 micrograms of total protein from striatum were used for quantification of Tyrosine hydroxylase using a sandwich ELISA kit (Antibodies online-ABIN6960326) according to manufacturer's instructions.

[000168]Western Blotting

[000169] Protein lysates were run on NuPAGE gels (Invitrogen) and transferred to a PVDF membrane. The protein of interest was detected using ECL Prime Western Blotting Detection Reagent (Amersham - RPN2232) with an appropriate conjugated secondary HRP (1:15000) antibody. Antibodies used were: Tyrosine hydroxylase (Abcam AB112: 1:1000), GAPDH (AM4300 Invitrogen).

[000170]Bioinformatics

[000171]General

[000172] Transcript expression was quantified from RNA-seq reads using salmon (version 0.8.1) and hg38 UCSC knownGene gene models (TxDb.Hsapiens.UCSC.hg38.knownGene, version 3.4.0). To account for differences in RNA integrity number (RIN), differential gene expression analysis was done with limma⁸¹ using the voomWithQualityWeights function in order to downweight low quality samples⁸². GSEA analysis was performed using the fgsea R package (<https://www.biorxiv.org/content/10.1101/060012v3>) using C5 gene ontology sets (<https://www.gsea-msigdb.org>), and Gene set variation analysis was performed using GSVA²⁸.

[000173]Principal component analysis (PCA)

[000174]For PCA analysis, expression values from voomWithQualityWeights were corrected with the removeBatchEffect function in limma to remove effects, gender and quality (using RIN values). The top 500 variable RNAs were used for pca analysis. Kruskal-Wallis tests were performed using the correlatePCs function from the pcaExplorer package in order to test for significant correlations between PCs and experimental variables.

[000175]Differential Gene and pathway expression – PD vs Control (Brain)

[000176]Genes were filtered using the filterByExpr function from the edgeR package using default settings⁸³. Samples were grouped according to brain region and disease state (PD or Control). In order to account for differences in death age in PD samples, death age was included as a covariate in the limma model. “0 + group + death age” was used as the design. voomWithQualityWeights from limma was used for normalization in order to account for sample quality. A linear model was fitted with the lmFit function, followed by computation of log₂FC and moderated t-statistics with the eBayes

function. As contrasts, PD - Control was evaluated for each brain region. Multiple hypothesis testing was performed with the decideTests function, using the “BH” method. Significant RNAs were defined as those with an FDR < 0.05 and $\log_2\text{FC} > [0.1]$ or $< [-0.1]$. To test for LEDD-independent transcriptional changes in the brain, Control LEDD values were set to 0, and LEDD was added to the model as a continuous variable (“0 + group + death age + LEDD”).

[000177] *Gene set enrichment analysis - MS*

[000178] Gene set enrichment analysis (GSEA) was performed in order to determine GO pathways enriched in mass spectrometry data for comparing PD and control (**Figure 13a**). To do this, mean expression values were determined for PD and Control, and the $\log_2$ fold change values (PD/Control) were calculated from these values. For GSEA, genes were ranked according to $\log_2$ fold changes.

[000179] *Gene set variation analysis*

[000180] For all GSVA analyses, count data was processed as described for limma and $\log_2$ -cpm values were obtained using the cpm function from edgeR and a prior count of 3. GSVA scores were calculated for all GO pathways with 10 or more genes in the brain or 5 or more genes in the blood with the gsva function from the GSVA package, followed by addition of sample weights with the arrayWeights function from the the limma package. The resulting scores were used for standard differential expression testing with limma as described above using the same model and contrasts as described for limma. The GSVA scores (which were calculated for all samples) were also used for plotting and t-tests among clinical subtypes using the compare_means function in the ggpubr package.

[000181] *Gene Ontology*

[000182] Enrichment of GO terms was performed by the goseq package in R⁸⁴. All expressed transcripts were used as background, and gene sets were determined using $\log_2\text{FC}$ and/or FDR cutoffs as described in individual figure legends. Multiple correction was performed using the p.adjust function using the Benjamini & Hochberg (“BH”) method.

[000183] *Classifier Genes*

[000184] To identify classifier genes for Parkinson’s and control patients, we used the MLSeq Bioconductor package⁸⁵ to implement a nearest shrunken centroid classifier on the voom variance stabilized caudate RNAseq data. We used 70% of all samples as our training set and 30% as our test dataset. The accuracy of models on test data was recorded. Following this, the accuracy of the caudate classifier was also assessed in the putamen.

[000185] *PPMI*

[000186] All transcriptome and clinical data were collected according to the PPMI study protocol (www.ppmi-info.org/access-dataspecimens/download-data). For up-to-date information on the study, visit ppmi-info.org. Transcript abundance files generated by salmon were obtained from the PPMI database. The tximport package was used to generate a count matrix⁸⁶. The counts matrix filtered for the desired samples (see demographics tables) was used as input for limma and voomWithQuality weights, as described for brain samples above.

[000187]*Differential Gene expression – PD vs Control (Blood)*

[000188] 195 healthy controls with no neurological disease and 479 subjects with primary diagnosis of PD (including 61 Scans Without Evidence of Dopaminergic Deficit, at time of inclusion) were included in our PD versus Control analysis. For each patient included in the study, sequencing and clinical information associated with only the latest study visit was used for analysis. RNA quality (defined by percent of reads mapping to the genome), gender, and age were included in the limma model to control for these variables. Age was calculated by adding age at enrollment and visit year at sample collection. GSVA analysis was performed as described above. Sequencing plate was used to determine batch. To test for LEDD-independent transcriptome changes, LEDD was also included in the limma model.

[000189]*Differential Gene expression – Genetic Carriers vs Control (Blood)*

[000190] RNA-seq data of patients with PD-relevant genetic mutations but no disease were obtained from the PPMI cohort (“Genetic unaffected”, 247 patients). Only those samples where age, quality, gender and batch information were available were included in the analysis. Most recent samples were used for analysis and compared to healthy controls (183).

[000191]*Differential Gene expression – PD vs Control (Blood, Drug-Naïve Cohort)*

[000192] To determine PD-dependent changes in dopaminergic drug-naïve PD patients, most recent RNA-seq samples when patients were drug-naïve were taken into analysis. 16 subjects in the cohort whose chart did not indicate that they were drug-naïve in the PPMI study were removed from analysis. For limma, gender, age, quality and batch were included in the model. For the dementia-drug naïve cohort, patients who were on drugs for dementia were removed from analysis and the most recent sample when patients were drug-naïve were taken for comparison (data not shown).

[000193]*Differential Gene expression – Dementia (Brain)*

[000194] PD caudate (n=35) samples were further categorized as PD dementia (PDD), PD without dementia (PD), according to clinical records. For selection of PDD and PD without dementia, a chart history of dementia (“+”) was supported by medication history for cholinesterase inhibitors or NMDA receptor antagonists for dementia or scores from a cognitive test. In those considered not to have dementia (“-”) chart reviews did not mention dementia or a medication history for dementia. One donor did not have a chart history of dementia although medication history included cholinesterase inhibitors. As Montreal cognitive assessment (MoCA) done 6 and 2 years prior to death were normal, this patient was considered to be PD without dementia. When clinical information was deemed to be inadequate for the above clinical features, the sample was removed from analysis. For DGE analysis, limma was performed as described above, using PDD, PD and Control as groups and using “0 + group + age” as the design for limma. The contrast between PDD - PD was evaluated for each brain region. Significant genes were defined as those with an FDR < [0.05] and log₂FC > [0.1] or < [-0.1]. GSVA was performed as described above.

[000195]*Differential Gene expression – Dementia (Blood)*

[000196] For comparisons of cognitive impairment among the PPMI subjects, subjects with MoCa ≥ 26 were considered to be of normal cognition, while subjects with MoCa ≤ 26 were considered to have cognitive impairment. Only subjects with MoCa ≥ 26 were included among healthy controls. Limma was performed to compare PD patients with and without dementia, with age, gender, quality and batch also included in the limma model.

[000197]*Differential Gene expression – Dyskinesia (Brain)*

[000198] Patients were categorized as having levodopa-induced dyskinesia based on mention of the term upon chart review. Samples were grouped as PD-dyskinesia or PD-no dyskinesia and control. Limma was performed as described above, using PD-Dyskinesia, PD-No dyskinesia and control as groups and using “0 + group + age” as the design for limma. For comparisons, PD-Dyskinesia - PD-no dyskinesia was evaluated for each brain region. Significant genes were defined as those with an $FDR < [0.1]$ and $\log_2FC > [0.1]$ or $< [-0.1]$. GSVA was performed as described above.

[000199]*Differential Gene expression – Age of Onset (Brain)*

[000200] Age of onset was defined as the age of symptom onset (when available) or the age of diagnosis for each patient, whichever was the earliest information available. Samples were grouped into Control, LOPD (age of onset > than 55), or EOPD (age of onset $\leq$ to 55). Limma was performed as described above, accounting for death age in the model and testing EOPD - Control and LOPD - Control for each brain region. GSVA was performed as described above.

[000201]*Differential Gene expression – Age of Onset (Blood)*

[000202] EOPD and LOPD was defined among the PPMI patients as described for brain. Limma was performed to compare PD and control, using gender, quality and batch in the limma model.

[000203]*Pathway Analysis – Disease duration (spline interpolation, Brain)*

[000204] Disease duration was defined as the difference between age of symptom onset or diagnosis (as defined above) and the age of death. Spline curves were generated from the disease duration using the ns function from the splines R package (CRAN), using 4 degrees of freedom. To allow for determination of genes and GO terms with non-linear trends in the two brain regions, “X + region + region:X” was used as the design matrix, with X being the disease duration splines. For determination of genes with significant trends, voomWithQuality weights was used, followed by lmFit and eBayes, as described above. To determine significance, all coefficients corresponding to the region of interest were included in the topTable function, which generates an F-statistic and p-value. For pathway analysis, the GSVA package was used to create GSVA scores. Array weights were included in the lmFit using the arrayWeights function from limma, and the resulting object was subject to eBayes and decideTests as described above.

[000205]*Data Availability*

[000206] All demographic information and metadata are available in the Supplemental Tables. The resulting data from all relevant limma, GSEA and GSVA analyses are also included. Pathway enrichment scores, determined by GSVA, are also included. Raw data and gene expression values for

brain RNA-seq data were uploaded to GEO (GSE205450). Data used for blood transcriptome analysis in this study are available for downloading from PPMI (<https://www.ppmi-info.org/access-data-specimens/download-data>) through Laboratory of Neuro Imaging (LONI) Image Data Archive (IDA). To access the data, users need to complete a data use agreement and submit an online application.

RESULTS

[000207] Transcriptome Differences in PD Caudate and Putamen

[000208] We undertook bulk RNA-seq from both the caudate and putamen from 40 control donors and 35 PD donors (Fig 1a, TABLE 1). TABLE 2 shows demographic characteristics and RNA quality metrics of each group. Principal component analysis (PCA) of the top 500 variable genes revealed four significant clusters, corresponding to the striatal region and clinical diagnosis (Fig 1b). The first principal component (PC1) was driven by the striatal region, separating caudate from putamen, while the second, PC2, was driven by disease status, separating control from PD striatum. PC2 scores correlated with tyrosine hydroxylase (TH) protein levels, thus confirming that these RNA changes reflected the extent of dopamine denervation in PD (Fig 2 a,b, TABLE 3).

TABLE 1

Lewy Body Location	NA	NA	Midbrain, Neocortex	NA
PD_Braak_Staging	NA	NA	Stage 4	NA
AD_CFRAD_Staging	A2/B2/C2	NA	A2/B2/C2	NA
AD_Braak_Staging	Stage 3	NA	Stage 4	NA
Neuropathology_diagnosis_other	Mild cerebral amyloid	NA	NA	NA
Neuropathology_diagnosis	Unremarkable adult brain	NA	Parkinson's disease	NA
All dementia medications	NA	NA	Rivastigmine	NA
All dopaminergic medications	NA	NA	Carbidopa/Levodopa	NA
Dementia medications	CTRL	CTRL	Yes	Yes
Dyskinesia	CTRL	CTRL	No	No
Dementia	CTRL	CTRL	Yes	Yes
Patient	CTRL_23	CTRL_2	PD_22	PD_22
Gender	M	M	M	M
Disease_duration	CTRL	CTRL	23	23
Age_completed	CTRL	CTRL	64	64
Region	CAU	PUT	CAU	PUT
Diagnosis	CTRL	CTRL	PD	PD

NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Criteria	NA	Criteria	NA	Criteria	NA	Criteria	NA	Criteria	NA	Criteria	NA	A1/B1/C1	NA
Neurofibril	NA	Neurofibr	NA	Neurofibril	NA	Neurofibril	NA	Neurofibril	NA	Neurofibril	NA	Stage 1	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Normal brain	NA	Normal brain	NA	Normal brain	NA	Normal brain	NA	Normal brain	NA	Microscop ic infarct	NA	Perivascu lar	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
CTRL_24	CTRL_24	CTRL_25	CTRL_2	CTRL_26	CTRL_26	CTRL_27	CTRL_27	CTRL_28	CTRL_28	CTRL_29	CTRL_29	CTRL_29	CTRL_29
M	M	M	M	M	M	M	M	M	M	M	M	M	M
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL

Substantia nigra,	NA	Amygdala, Hippocam	NA	Brainstem, Amygdala,	NA	Frontal Cortex,	NA	Amygdala, Substantia	NA	Not specified	NA	NA
Not	NA	Not	NA	Not	NA	Not	NA	Not	NA	Stage 3	NA	NA
Criteria	NA	Criteria	NA	Criteria	NA	Criteria	NA	Criteria	NA	Criteria	NA	Possible
NF	NA	NF	NA	NF	NA	NF	NA	NF	NA	NF	NA	Stage 5-6
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Lacunar infarct
Lewy Body	NA	Lewy Body	NA	Lewy Body	NA	Lewy Body	NA	Lewy Body	NA	Lewy Body	NA	Hypertensive
None	NA	None	NA	None	NA	Rivastigim	NA	None	NA	None	NA	NA
Carbidopa/ Levodopa	NA	Carbidopa/ Levodopa	NA	Carbidopa/ Levodopa	NA	Carbidopa Levodopa	NA	Carbidopa/ Levodopa	NA	Carbidopa/ Levodopa	NA	NA
No	No	No	No	No	No	Yes	Yes	No	No	No	No	CTRL
UK	UK	UK	UK	Yes	Yes	UK	UK	UK	UK	UK	UK	CTRL
No	No	No	No	No	No	Yes	Yes	No	No	No	No	CTRL
PD_23	PD_23	PD_24	PD_24	PD_25	PD_25	PD_26	PD_26	PD_27	PD_27	PD_28	PD_28	CTRL_30
M	M	F	F	M	M	M	M	M	M	M	M	F
24	24	16	16	5	5	7	7	22	22	5	5	CTRL
50	50	65	65	68	68	85	85	69	69	84	84	CTRL
CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU
PD	PD	PD	PD	PD	PD	PD	PD	PD	PD	PD	PD	CTRL

NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	1a	NA	0	NA	0	NA	NA	NA	0
NA	Criteria	NA	A3/B3/C3	NA	0	NA	1b	NA	1a	NA	NA	NA	1a
NA	Neurofibril	NA	Stage 5-6	NA	Stage 0	NA	Stage 1	NA	Stage 2	NA	NA	NA	Stage 0
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	Normal brain	NA	Arteriolar sclerosis	NA	No significant	NA	No significant	NA	No significant	NA	NA	NA	No significant
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
CTRL_30	CTRL_31	CTRL_31	CTRL_32	CTRL_32	CTRL_38	CTRL_38	CTRL_39	CTRL_39	CTRL_40	CTRL_40	CTRL_40	CTRL_40	CTRL_41
F	M	M	F	F	M	M	M	M	F	F	F	F	F
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL

NA	NA	NA	NA	NA	Nucleus Basalis of	NA	Nucleus Basalis of	NA	Nucleus Basalis of	NA	Nucleus Basalis of	NA
NA	0	NA	0	NA	Stage 5	NA	Stage 3	NA	Stage 4	NA	Stage 4	NA
NA	1a	NA	1c	NA	Not	NA	Not	NA	Not	NA	Not	NA
NA	Stage 0	NA	Stage 2	NA	Stage 3	NA	Stage 1	NA	Stage 1	NA	Stage 2	NA
NA	NA	NA	NA	NA	Amyloid plaques,	NA	Abundant axonal	NA	NA	NA	NA	NA
NA	No significant	NA	No significant	NA	Parkinson's disease	NA	Parkinson's disease	NA	Parkinson's disease	NA	Parkinson's disease	NA
NA	NA	NA	NA	NA	No records	NA	None	NA	Donepezil	NA	None	NA
NA	NA	NA	NA	NA	No records	NA	None	NA	Carbidopa/ Levodopa	NA	Carbidopa/ Levodopa	NA
CTRL	CTRL	CTRL	CTRL	CTRL	UK	UK	No	No	Yes	Yes	No	No
CTRL	CTRL	CTRL	CTRL	CTRL	UK	UK	UK	No	No	No	Yes	Yes
CTRL	CTRL	CTRL	CTRL	CTRL	UK	UK	UK	Yes	Yes	Yes	Yes	Yes
CTRL_41	CTRL_42	CTRL_42	CTRL_43	CTRL_43	PD_37	PD_37	PD_38	PD_38	PD_39	PD_39	PD_40	PD_40
F	F	F	M	M	F	F	F	M	M	M	M	M
CTRL	CTRL	CTRL	CTRL	CTRL	7	7	UK	UK	7	7	20	20
CTRL	CTRL	CTRL	CTRL	CTRL	65	65	UK	UK	68	68	52	52
PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT
CTRL	CTRL	CTRL	CTRL	CTRL	PD	PD	PD	PD	PD	PD	PD	PD

Nucleus Basalis of	N/A	Nucleus Basalis of	N/A	Substantia nigra,	N/A	Nucleus Basalis of	N/A	Substantia nigra,	N/A	Substantia nigra,	N/A	Substantia nigra,	N/A	N/A	Neocortex
Stage 4	N/A	Stage 5	N/A	Stage 4	N/A	Stage 4	N/A	Stage 4	N/A	Stage 4	N/A	Stage 5	N/A	N/A	Stage 6
Not	N/A	Not	N/A	Not	N/A	Not	N/A	Not	N/A	Not	N/A	Not	N/A	N/A	Not
Stage 1	N/A	Stage 3	N/A	Stage 2	N/A	Stage 1	N/A	Stage 1	N/A	Stage 2	N/A	Stage 2	N/A	N/A	Not
Amyloid plaques	N/A	Amyloid plaques,	N/A	Acute subdural	N/A	N/A	N/A	Lesions suggestive	N/A	Amyloid plaques	N/A	N/A	N/A	N/A	N/A
Parkinson's disease	N/A	Parkinson's disease	N/A	Parkinson's disease	N/A	Parkinson's disease	N/A	Parkinson's disease	N/A	Parkinson's disease	N/A	N/A	N/A	N/A	Parkinson's disease
Donepezil	N/A	Memantin	N/A	Weaned	N/A	Rivastigmi	N/A	No records	N/A	None	N/A	N/A	N/A	None	None
Carbidopa/Levodopa	N/A	Carbidopa/Levodopa	N/A	Carbidopa/Levodopa	N/A	Carbidopa/Levodopa	N/A	No records	N/A	Carbidopa/Levodopa	N/A	N/A	N/A	N/A	Carbidopa/Levodopa
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	UK	UK	No	No	No	No	No	No
No	No	No	No	No	No	No	No	UK	UK	No	No	No	No	Yes	Yes
Yes	Yes	Yes	Yes	Yes	No	No	UK	UK	UK	No	No	No	No	No	No
PD_41	PD_41	PD_42	PD_42	PD_43	PD_43	PD_44	PD_44	PD_45	PD_45	PD_46	PD_46	PD_48	PD_48	PD_48	PD_48
M	M	M	M	M	M	M	F	F	F	M	M	M	M	M	M
4	4	7	7	13	13	13	20	20	8	8	11	11	11	11	11
74	74	62	62	60	60	57	52	52	63	63	UK	UK	UK	UK	UK
CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	PUT	PUT	CAU	CAU
PD	PD	PD	PD	PD	PD	PD	PD	PD	PD	PD	PD	PD	PD	PD	PD

NA	NA	Neocortex	NA	Brainstem, Neocortex	NA	Substantia nigra,	NA	Brainstem	NA	NA	NA	NA
NA	NA	Stage 2	NA	Stage 4	NA	Stage 1	NA	Stage 4	NA	NA	NA	NA
NA	Criteria	A2/B1/C2	NA	A2/B2/C3	NA	Not	NA	A2/B2/C3	NA	Not	NA	A0/B1/C0
NA	Stage 1	Not	NA	Stage 4	NA	Not	NA	Not	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Rare neurofibril
NA	Mild small vessel	Parkinson's disease	NA	Parkinson's disease	NA	Parkinson's disease	NA	Parkinson's disease	NA	Age- related Tau	NA	Unremarkable adult
NA	NA	Memantine	NA	Donepezil	NA	Rivastigmine	NA	None	NA	NA	NA	NA
NA	NA	Carbidopa/ Levodopa/	NA	Carbidopa/ Levodopa	NA	Carbidopa/ Levodopa/	NA	Carbidopa/ Levodopa	NA	NA	NA	NA
CTRL	CTRL	Yes	Yes	Yes	Yes	Yes	Yes	No	No	CTRL	CTRL	CTRL
CTRL	CTRL	No	No	Yes	Yes	Yes	Yes	UK	UK	CTRL	CTRL	CTRL
CTRL	CTRL	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	CTRL	CTRL	CTRL
CTRL_44	CTRL_44	PD_1	PD_1	PD_2	PD_2	PD_3	PD_3	PD_4	PD_4	CTRL_1	CTRL_1	CTRL_2
M	M	M	M	M	M	M	M	F	F	F	F	M
CTRL	CTRL	7	7	20	20	14	14	15	15	CTRL	CTRL	CTRL
CTRL	CTRL	66	66	59	59	57	57	72	72	CTRL	CTRL	CTRL
PUT	CAU	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU
CTRL	CTRL	PD	PD	PD	PD	PD	PD	PD	PD	CTRL	CTRL	CTRL

NA	Not specified	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	Stage 5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	Not	NA	A0/B2/C0	NA	NA	A1/B1/C1	NA	A0/B1/C0	NA	A2/B1/C1	NA	Not
NA	Not	NA	NA	NA	NA	NA	NA	Stage 3	NA	NA	NA	Not
NA	Left MCA clippings	NA	Patchy acute	NA	NA	NA	NA	Small congenital	NA	NA	NA	NA
NA	'Parkinson's disease'	NA	Unremarkable adult	NA	Unremarkable adult	NA	Unremarkable adult	NA	Unremarkable adult	NA	Unremarkable adult	NA
NA	Donepezil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	Carbidopa/Levodopa	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CTRL	Yes	Yes	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
CTRL	UK	UK	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
CTRL	Yes	Yes	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
CTRL_2	PD_5	PD_5	CTRL_3	CTRL_3	CTRL_4	CTRL_4	CTRL_5	CTRL_5	CTRL_6	CTRL_6	CTRL_7	CTRL_7
M	M	M	F	F	M	M	M	M	F	F	F	F
CTRL	3	3	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
CTRL	70	70	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	CAU
CTRL	PD	PD	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL

NA	NA	NA	NA	NA	NA	NA	NA	No report	NA	Substantia nigra, no
NA	NA	NA	NA	NA	NA	NA	NA	No report	NA	Not
NA	Not	NA	A1/B1/C1	NA	A0/B1/C0	NA	Not	No report	NA	Criteria
NA	Stage 3	NA	Stage 1	NA	Stage 1	NA	Not	No report	NA	NF
NA	Cerebral amyloid	NA	Cerebral amyloid	NA	NA	NA	NA	Dementia, Cerebrova	NA	NA
NA	Moderate cerebrovas	NA	Moderate atheroscler	NA	Unremarka ble adult	NA	Unremarka ble adult	Parkinson' s disease	NA	Parkinson' s disease
NA	NA	NA	NA	NA	NA	NA	NA	None	NA	Rivastigmi
NA	NA	NA	NA	NA	NA	NA	NA	Carbidopa Levodopa	NA	Carbidopa/ Levodopa
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	No	No	Yes
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	UK	UK	No
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	No	No	Yes
CTRL_7	CTRL_8	CTRL_8	CTRL_9	CTRL_9	CTRL_10	CTRL_10	CTRL_11	PD_6	PD_6	PD_7
F	F	F	M	M	M	M	M	F	F	M
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	21	21	23
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	61	61	43
PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	CAU	PUT	CAU
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	PD	PD	PD

NA	Not specified	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	Stage 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	Not	NA	No report	NA	Not	NA	No report	NA	NA	Not	Not	Not
NA	Not	NA	No report	NA	Not	NA	No report	NA	NA	No report	NA	No report
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	Parkinson's disease	NA	No report	NA	Unremarkable adult	NA	No report	NA	No report	NA	NA	Right parietal
NA	Donepezil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	Carbidopa/Levodopa	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Yes	Yes	Yes	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
No	UK	UK	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
Yes	Yes	Yes	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
PD_7	PD_10	PD_10	CTRL_12	CTRL_12	CTRL_13	CTRL_13	CTRL_14	CTRL_14	CTRL_15	CTRL_15	CTRL_16	CTRL_16
M	M	M	M	M	M	M	M	M	M	M	M	M
23	11	11	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
43	68	68	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL
PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	CAU
PD	PD	PD	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	CTRL

NA	Not specified	NA	Substantia nigra,	NA	Brainstem, Substantia	NA	Substantia nigra,	NA	SN, medulla	NA	Not specified	NA
NA	Not	NA	Stage 3/4	NA	Stage 5	NA	Not	NA	NA	Stage 3	NA	NA
NA	Not	NA	A2/B2/C2	NA	Not	NA	Criteria	NA	Criteria	NA	5a	NA
NA	Not	NA	Not	NA	Not	NA	NF	NA	Stage 2	NA	Stage 1	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	Lewy body disease,	NA	NA	NA
NA	Parkinson's disease	NA	Parkinson's disease	NA	Parkinson's disease	NA	Lewy Body	NA	Low level of	NA	Parkinson's disease	NA
NA	Donepezil	NA	No records	NA	None	NA	None	NA	NA	NA	No records	NA
NA	Carbidopa/Levodopa	NA	No records	NA	Carbidopa/Levodopa	NA	Carbidopa/Levodopa	NA	NA	NA	No records	NA
CTRL	Yes	Yes	UK	UK	No	No	No	No	CTRL	CTRL	UK	UK
CTRL	UK	UK	UK	UK	No	No	UK	UK	CTRL	CTRL	UK	UK
CTRL	Yes	Yes	UK	UK	No	No	Yes	Yes	CTRL	CTRL	UK	UK
CTRL_16	PD_11	PD_11	PD_12	PD_12	PD_13	PD_13	PD_20	PD_20	CTRL_45	CTRL_4	PD_15	PD_15
M	M	M	M	M	F	F	M	M	F	F	M	M
CTRL	25	25	UK	UK	8	8	15	15	CTRL	CTRL	UK	UK
CTRL	52	52	UK	UK	58	58	58	58	CTRL	CTRL	UK	UK
PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT
CTRL	PD	PD	PD	PD	PD	PD	PD	PD	CTRL	CTRL	PD	PD

NA	NA	NA	NA	NA	NA	Pons, Medulla	NA	Brainstem, Limbic/fro	NA
0	NA	0	NA	0	NA	Not Criteria	NA	Not Criteria	NA
1a	NA	1a	NA	1a	NA	Criteria	NA	Criteria	NA
Stage 2	NA	Stage 1	NA	Stage 2	NA	NF	NA	NF	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
No significant	NA	No significant	NA	No significant	NA	Lewy Body	NA	Lewy body Disease	NA
NA	NA	NA	NA	NA	NA	None	NA	None	NA
NA	NA	NA	NA	NA	NA	Carbidopa/ Levodopa	NA	Carbidopa/ Levodopa	NA
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	No	No	No	No
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	No	No	UK	UK
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	No	No	UK	UK
CTRL_17	CTRL_17	CTRL_18	CTRL_18	CTRL_19	CTRL_19	PD_16	PD_16	PD_17	PD_17
M	M	M	M	M	M	M	M	M	M
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	9	9	6	6
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	68	68	67	67
CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT
CTRL	CTRL	CTRL	CTRL	CTRL	CTRL	PD	PD	PD	PD

NA	NA	NA	NA	Substantia nigra, Locus coeruleus	NA	Substantia nigra, Locus coeruleus	NA
NA	NA	NA	NA	NA	NA	NA	NA
Not specified	NA	Not specified	NA	Criteria not met	NA	Criteria not met	NA
Not specified	NA	Not specified	NA	NF degeneration	NA	NF degeneration not	NA
NA	NA	Mild age related changes -	NA	NA	NA	NA	NA
No significant	NA	Cerebrovascular atherosclerosis	NA	Parkinson's disease	NA	Parkinson's disease	NA
NA	NA	NA	NA	No records	NA	None	NA
NA	NA	NA	NA	No records	NA	Carbidopa/Levodopa 25/100 1 tab 4	NA
CTRL	CTRL	CTRL	CTRL	UK	UK	UK	UK
CTRL	CTRL	CTRL	CTRL	UK	UK	UK	UK
CTRL	CTRL	CTRL	CTRL	UK	UK	UK	UK
CTRL_21	CTRL_21	CTRL_22	CTRL_22	PD_18	PD_18	PD_19	PD_19
M	M	F	F	M	M	F	F
CTRL	CTRL	CTRL	CTRL	11	11	15	15
CTRL	CTRL	CTRL	CTRL	54	54	62	62
CAU	PUT	CAU	PUT	CAU	PUT	CAU	PUT
CTRL	CTRL	CTRL	CTRL	PD	PD	PD	PD

TABLE 2

	Controls (n=40)	PD (n=35)	p value	Test
Age at death (years)	72.4 (11.8)	76.9 (7.3)	0.0318	Wilcoxon
Male/Female	28/12	27/8	0.603 (gender)	Fisher test
Race (White/Black/Hispanic/Other)	34/2/2/2	31/2/1/1	1	Fisher test
Age of onset/diagnosis (years)	NA	63 (9.2)	NA	
Disease duration (years)	NA	13.0 (6.7)	NA	
PMI (hours)	16.9 (7.6)	18.9 (9.1)	0.45	Wilcoxon
RIN (Caudate)	6.6 (1.8)	5.6 (2.0)	0.0203	Wilcoxon

RIN (Putamen)	6.6 (1.9)	5.5 (2.0)	0.0403	Wilcoxon
Mean (standard deviation); p values were determined using listed tests				

TABLE 3

Sample_ID	TH
2653_PD_CAU	0.66
2679_PD_CAU	0.18
2685_PD_CAU	0.72
2687_PD_CAU	0.86
2689_PD_CAU	1.51
2725_PD_CAU	0.80
2727_PD_CAU	0.47
2774_PD_CAU	0.15
2776_PD_CAU	0.01
2778_PD_CAU	0.19
2780_PD_CAU	0.42
2782_PD_CAU	0.36
2784_PD_CAU	0.28
2786_PD_CAU	0.23
2788_PD_CAU	0.31
2790_PD_CAU	0.96
2792_PD_CAU	0.30
2803_PD_CAU	0.51
2579_PD_CAU	1.82
2581_PD_CAU	0.37
2583_PD_CAU	0.52
2585_PD_CAU	3.62
2593_PD_CAU	1.33
2625_PD_CAU	0.96
2627_PD_CAU	1.58
2633_PD_CAU	0.55
2645_PD_CAU	0.29
2647_PD_CAU	1.23
2649_PD_CAU	0.85
2681_PD_CAU	0.22
2703_PD_CAU	0.20
2713_PD_CAU	0.08
2715_PD_CAU	0.29
2721_PD_CAU	0.31
2723_PD_CAU	0.13
2683_CTRL_CAU	0.16
2595_CTRL_CAU	4.11
2733_CTRL_CAU	0.84
2643_CTRL_CAU	4.42

[000209] Differential gene expression analysis revealed 5383 and 5110 up and downregulated RNAs, respectively, in the PD caudate versus controls, and 5971 and 5676 up and downregulated RNAs, respectively, in PD putamen versus controls (**Fig 1c**, data not shown). To identify gene sets with similar biological activity that were changed in PD, we employed gene set variation analysis (GSVA) on Gene Ontology (GO) terms²⁸ (**Fig 1d**, data not shown). GSVA provides an enrichment analysis that takes into account all genes in a GO term/pathway using a non-parametric, unsupervised method (i.e., without relying on phenotypic/disease group information) for estimating variation of that gene set within each sample²⁸. Both caudate and putamen showed decreases in transcripts encoding proteins involved at the synapse such as postsynaptic membrane, SNARE complex assembly, vesicular ion transport and calcium mediated signaling (**Fig 1d,e**), consistent with loss of dopaminergic input from the *substantia nigra*^{22,29}. Other transcripts highly downregulated in the PD caudate and putamen encoded proteins involved in lipid metabolism and mitochondrial fission (**Fig 1d,e**), both of which are implicated in nigral dopamine neuronal dysfunction and death^{30,31}. Conversely, regulation of miRNA activity was highly enriched indicating their role in modulation of RNA levels and translation in the PD striatum (**Fig 1d,e**). Pathways related to NF kappa B, a transcription factor abundantly expressed in the brain and linked to neuro-inflammation, neurogenesis and dendrite morphogenesis, were also upregulated in PD striatum (**Fig 1d**)³². Other immune response RNAs, including those involved in T cell activity and NOD containing-2 (NOD2) signaling pathways, were highly enriched in both regions of the striatum, indicating global immune hyperactivation in the PD brain (**Fig 1d,e**, data not shown).

[000210] Although the majority of differentially changed GO terms were common to both caudate and putamen, we identified a number of unanticipated region-specific RNA changes (**Fig 2c**, **Fig 1f**). The caudate was characterized by increased enrichment of stress response pathways, including epigenetic pathways such as histone acetylation and methylation, protein kinase C signaling, chaperone-mediated protein folding and mitochondrial DNA metabolic process (**Fig 2c**, **Fig 1f**). Conversely, the serotonin metabolism pathway was preferentially downregulated in the caudate (**Fig 2c**), consistent with previous studies showing preferential loss of serotonin markers in the caudate more than putamen in PD³³. Terms upregulated only in the putamen included Hedgehog signaling and connexin complex (**Fig 2c**)³⁴. GO terms regulating biosynthesis of ceramides, which are substrates of the PD susceptibility gene glucocerebrosidase (*GBA*), were preferentially downregulated in the putamen (**Fig 2c**, **Fig 1f**)³⁵. These results suggest that while the caudate and the putamen share common dysregulated pathways in PD, there are region-specific molecular changes, consistent with the unique roles different striatal regions have in clinical manifestations in PD.

[000211] Gene ontology analysis of highly changed RNAs (**TABLE 4**) defined by using more stringent filters identified involvement of pathways congruent to those seen on GSVA. Downregulated terms in caudate and putamen included synaptic pathways such as trans-synaptic

signaling, G protein coupled receptor signaling and postsynaptic membrane (**Fig 2d**). Top upregulated terms in caudate included stress response terms (cellular response to heat, chaperone-mediated protein folding), inflammatory response, and purine metabolism. In the putamen, top upregulated terms identified ion stress response as well as inflammatory response (**Fig 2d**).

TABLE 4

ID	logFC	P.Value	adj.P.Val	Region
BFSP1	-1.461384	1.22E-17	1.02E-13	PUT
GPCPD1	-1.3814413	2.07E-17	1.02E-13	PUT
DHRS11	-1.1680176	2.16E-17	1.02E-13	PUT
RBM3	-1.3144924	1.25E-16	3.68E-13	PUT
PCYOX1L	-1.4230596	1.22E-16	3.68E-13	PUT
SLC10A4	-2.645612	1.91E-16	4.52E-13	PUT
CERNA1	-1.8438493	1.36E-16	3.68E-13	PUT
ANGPT2	1.676049	2.42E-15	3.29E-12	PUT
ACLY	-1.1845711	3.67E-15	3.87E-12	PUT
NTRK1	-2.5098071	3.14E-15	3.51E-12	PUT
FUCA1	-1.0994348	3.91E-15	3.91E-12	PUT
CDKL1	1.23860587	4.95E-15	4.54E-12	PUT
DLGAP1-AS1	1.00940568	5.97E-15	5.15E-12	PUT
COL27A1	1.43027876	1.04E-14	8.21E-12	PUT
H4C15	1.20079233	1.45E-14	1.00E-11	PUT
CIRBP	-1.1600094	2.33E-14	1.43E-11	PUT
NUP210L	1.93100437	1.98E-14	1.25E-11	PUT
SLC5A7	-3.5270615	2.47E-14	1.47E-11	PUT
KCNE4	1.04336679	3.72E-14	1.91E-11	PUT
NAA80	-1.4360332	8.96E-14	3.70E-11	PUT
LPIN3	1.23731975	1.16E-13	4.40E-11	PUT
DLEU7	-1.309622	1.00E-13	4.04E-11	PUT
TRIP10	1.27974618	1.22E-13	4.40E-11	PUT
CHODL	-1.308981	1.23E-13	4.40E-11	PUT
H3C15	1.77020511	1.58E-13	5.27E-11	PUT
LINC00513	1.3062089	1.70E-13	5.46E-11	PUT
SLCO4A1	2.70496755	2.33E-13	6.76E-11	PUT
B9D1	-1.0327288	2.35E-13	6.76E-11	PUT
TRPC3	-2.137579	2.29E-13	6.76E-11	PUT
HHLA1	1.10094909	2.84E-13	7.83E-11	PUT
TNIP2	1.02288096	3.06E-13	8.22E-11	PUT
BCL6	1.16104051	3.20E-13	8.43E-11	PUT
MAFF	2.02150249	3.86E-13	9.62E-11	PUT
ECEL1	-2.8079175	4.46E-13	1.02E-10	PUT
PNOC	-2.2423085	2.13E-13	6.41E-11	PUT

ABCA11P	-1.1956397	4.06E-13	9.76E-11	PUT
LINC01561	1.37172773	4.28E-13	1.00E-10	PUT
NELL1	-1.9070266	4.22E-13	1.00E-10	PUT
SLC16A14	-1.0445184	5.35E-13	1.16E-10	PUT
RAB11FIP1	1.03006898	5.39E-13	1.16E-10	PUT
TCAP	1.34068923	5.39E-13	1.16E-10	PUT
SCUBE3	1.27631731	5.54E-13	1.16E-10	PUT
JMJD6	1.16170768	6.68E-13	1.36E-10	PUT
PHF21B	1.06051059	6.81E-13	1.36E-10	PUT
NAPIL5	-1.1163505	6.77E-13	1.36E-10	PUT
MDH1	-1.3925714	7.00E-13	1.37E-10	PUT
CYGB	-1.5801195	8.30E-13	1.53E-10	PUT
CCDC96	-1.0688772	8.43E-13	1.53E-10	PUT
FLRT1	-1.0086341	9.63E-13	1.66E-10	PUT
CHAT	-3.4000665	7.83E-13	1.46E-10	PUT
PXDC1	1.08518172	1.16E-12	1.87E-10	PUT
SERTAD1	1.06484285	1.22E-12	1.93E-10	PUT
CCDC184	-1.2144836	1.41E-12	2.09E-10	PUT
ATP6V1G2	-1.0290694	1.38E-12	2.07E-10	PUT
HOOK2	1.08072253	1.44E-12	2.11E-10	PUT
ESRG	1.04959547	1.46E-12	2.13E-10	PUT
LINC01338	1.81670168	1.38E-12	2.07E-10	PUT
RD3	1.42543116	1.18E-12	1.89E-10	PUT
SLC5A3	1.3390325	1.78E-12	2.40E-10	PUT
CHRM2	-1.7300502	1.59E-12	2.29E-10	PUT
PRR26	1.44021203	1.96E-12	2.58E-10	PUT
PLK4	-1.5513295	9.74E-13	1.67E-10	PUT
SND1-IT1	1.11314675	1.82E-12	2.43E-10	PUT
KCNJ15	1.18433668	2.28E-12	2.81E-10	PUT
TUBB4A	-1.2569655	2.67E-12	3.11E-10	PUT
LOC100506274	-2.1753694	7.87E-13	1.46E-10	PUT
NXPH1	-1.5198405	3.06E-12	3.46E-10	PUT
HCN4	-1.7071992	3.15E-12	3.48E-10	PUT
ATOH8	1.3815879	3.50E-12	3.73E-10	PUT
FAM167B	2.32989013	2.17E-12	2.75E-10	PUT
ZBTB20	1.02811301	3.78E-12	3.93E-10	PUT
FAM49B	-1.0310387	3.96E-12	4.02E-10	PUT
TNFRSF10D	1.94162385	3.82E-12	3.93E-10	PUT
TAS2R4	1.05096049	4.30E-12	4.27E-10	PUT
DCTN1-AS1	-1.1193487	5.23E-12	4.84E-10	PUT
SLC35G5	1.65332883	4.31E-12	4.27E-10	PUT
TECTA	-1.3487723	5.36E-12	4.94E-10	PUT

TACR1	-2.2581685	5.60E-12	5.11E-10	PUT
MIR639	1.30399868	5.74E-12	5.19E-10	PUT
ITFG1	-1.1665295	6.09E-12	5.43E-10	PUT
ERN2	1.3392588	5.40E-12	4.96E-10	PUT
NUPR1	1.39403294	6.96E-12	6.00E-10	PUT
HPRT1	-1.3100857	7.03E-12	6.01E-10	PUT
RELL2	-1.2249688	8.15E-12	6.73E-10	PUT
NHLRC1	-1.4413045	5.64E-12	5.13E-10	PUT
MIA	2.22765368	3.80E-12	3.93E-10	PUT
GLTPD2	-1.4846667	6.20E-12	5.47E-10	PUT
CEP152	1.11790764	9.76E-12	7.69E-10	PUT
IKBKE	-1.3611058	9.84E-12	7.72E-10	PUT
RIPOR3	1.24296468	1.00E-11	7.81E-10	PUT
IL21R	1.14979411	1.13E-11	8.62E-10	PUT
LNP1	-1.0838769	1.14E-11	8.63E-10	PUT
PRPS2	-1.1339262	1.21E-11	9.00E-10	PUT
DYNC1I1	-1.0411968	1.32E-11	9.57E-10	PUT
CFLAR-AS1	1.14168205	1.26E-11	9.30E-10	PUT
AMBN	-3.3143947	9.72E-12	7.69E-10	PUT
GOLGA8J	-1.3468397	1.45E-11	1.02E-09	PUT
C5orf17	1.25047538	1.58E-11	1.09E-09	PUT
FLJ31356	1.53111274	8.94E-12	7.23E-10	PUT
GPR4	1.88549942	1.62E-11	1.11E-09	PUT
KCNK6	1.1013542	1.63E-11	1.11E-09	PUT
TUBB3	-1.3096493	1.67E-11	1.13E-09	PUT
LINC01722	1.13851432	1.72E-11	1.16E-09	PUT
LINC00838	1.40061336	1.23E-11	9.10E-10	PUT
MS4A2	1.00581487	1.43E-11	1.02E-09	PUT
MT1E	1.24979199	1.96E-11	1.27E-09	PUT
NMBR	-2.2643367	6.16E-12	5.46E-10	PUT
KAZALD1	-1.2010685	1.38E-11	9.88E-10	PUT
SPR	1.35717748	2.14E-11	1.36E-09	PUT
FFAR2	1.16639428	1.96E-11	1.27E-09	PUT
GABARAPL1	-1.0490172	2.18E-11	1.37E-09	PUT
LINC01087	1.13575144	2.23E-11	1.38E-09	PUT
EXOC3L1	-1.2073872	1.82E-11	1.21E-09	PUT
MT1M	1.63283081	2.24E-11	1.38E-09	PUT
DEPP1	2.14238474	2.26E-11	1.38E-09	PUT
STC1	1.97756115	2.18E-11	1.37E-09	PUT
GPRC5A	1.63167495	2.38E-11	1.43E-09	PUT
PPP1R18	1.04958871	2.33E-11	1.41E-09	PUT
PDP1	-1.5129021	2.31E-11	1.41E-09	PUT

MALAT1	1.3970147	2.44E-11	1.45E-09	PUT
LINC02547	1.06034161	2.48E-11	1.46E-09	PUT
C9orf153	1.83213874	1.27E-11	9.31E-10	PUT
NUDT18	-1.0814856	2.97E-11	1.68E-09	PUT
FOSL1	1.27963304	2.80E-11	1.62E-09	PUT
EGR2	-2.0241983	2.93E-11	1.66E-09	PUT
C7orf61	1.94921341	3.27E-11	1.79E-09	PUT
MT2A	1.29672763	3.35E-11	1.83E-09	PUT
PAK1	-1.1433171	3.28E-11	1.80E-09	PUT
WDR78	1.2060133	3.42E-11	1.85E-09	PUT
LOC101928118	1.00637001	3.73E-11	1.96E-09	PUT
LINC02078	1.17607579	3.76E-11	1.97E-09	PUT
MRPS6	1.03330042	3.81E-11	1.98E-09	PUT
ELFN1	-1.1618662	4.02E-11	2.03E-09	PUT
GPRASP2	-1.0782237	3.93E-11	2.01E-09	PUT
XK	-1.4797702	4.30E-11	2.13E-09	PUT
LINC02288	1.46324371	4.27E-11	2.12E-09	PUT
HAPLN1	-1.8085186	3.64E-11	1.94E-09	PUT
LINC02245	1.34874335	4.82E-11	2.31E-09	PUT
NXPH2	-2.4472725	1.21E-11	9.00E-10	PUT
DPPA4	1.31494582	4.71E-11	2.28E-09	PUT
MPO	-1.4722618	3.70E-11	1.96E-09	PUT
PTPRN2	-1.3952949	5.41E-11	2.53E-09	PUT
PPM1E	-1.1446398	5.65E-11	2.60E-09	PUT
CTRC	1.39279437	4.36E-11	2.14E-09	PUT
SHANK2-AS3	1.21426542	5.30E-11	2.49E-09	PUT
ARL4D	-1.5223752	5.73E-11	2.62E-09	PUT
PCLAF	1.43063748	5.77E-11	2.63E-09	PUT
ADAMTS9-AS2	1.09213241	5.77E-11	2.63E-09	PUT
BZW2	-1.0679605	5.83E-11	2.63E-09	PUT
LHX8	-2.6725967	4.87E-11	2.32E-09	PUT
SKOR1	-1.4095403	3.93E-11	2.01E-09	PUT
DCAF12L2	-2.0670772	2.76E-11	1.60E-09	PUT
ATP5MGL	1.32786997	4.87E-11	2.32E-09	PUT
NFKB2	1.01056892	6.28E-11	2.76E-09	PUT
LINC02071	1.27237441	4.62E-11	2.25E-09	PUT
CX3CL1	-1.2944677	6.20E-11	2.73E-09	PUT
ASAH2	-1.0615768	6.55E-11	2.85E-09	PUT
LOC101928123	1.3943623	5.56E-11	2.57E-09	PUT
SPINK9	1.38611978	7.26E-11	3.06E-09	PUT
PLAC8	1.15656192	7.14E-11	3.03E-09	PUT
LOC101928855	1.42555253	5.85E-11	2.64E-09	PUT

NOS1	-1.2687551	7.57E-11	3.15E-09	PUT
ME3	-1.1559327	7.82E-11	3.23E-09	PUT
NUGGC	1.23876544	8.32E-11	3.33E-09	PUT
MAB21L3	1.41999487	8.01E-11	3.25E-09	PUT
TJP3	1.36158671	7.99E-11	3.25E-09	PUT
CLEC2B	1.4702124	8.80E-11	3.47E-09	PUT
H1-2	1.26241633	9.41E-11	3.66E-09	PUT
C5orf63	1.0020125	9.44E-11	3.66E-09	PUT
FOXJ1	2.25933673	9.49E-11	3.67E-09	PUT
PCAT19	1.44652512	9.75E-11	3.75E-09	PUT
TGFB2-OT1	1.27579742	9.97E-11	3.81E-09	PUT
CMRK2	-1.0926632	1.00E-10	3.84E-09	PUT
PRICKLE2-AS3	1.12350395	9.16E-11	3.58E-09	PUT
GCNT3	1.18975614	9.61E-11	3.70E-09	PUT
LHX6	-1.2413143	1.08E-10	4.05E-09	PUT
HTR3B	1.00635622	1.06E-10	4.02E-09	PUT
CCDC102A	1.40605259	1.07E-10	4.03E-09	PUT
CALM3	-1.2351077	1.19E-10	4.39E-09	PUT
MT1F	1.54326253	1.14E-10	4.24E-09	PUT
MRPL23-AS1	-1.467408	1.08E-10	4.05E-09	PUT
CCBE1	1.31937795	1.28E-10	4.60E-09	PUT
MIR497	1.1126452	1.13E-10	4.22E-09	PUT
GOT1	-1.1145771	1.27E-10	4.58E-09	PUT
LOC283038	1.6871967	1.33E-10	4.73E-09	PUT
PRKX	1.24969876	1.45E-10	5.08E-09	PUT
CYP2C8	-1.5801331	1.25E-10	4.54E-09	PUT
PAM	-1.0780218	1.57E-10	5.37E-09	PUT
LIPH	1.06327349	1.52E-10	5.27E-09	PUT
BTBD19	1.10428264	1.67E-10	5.64E-09	PUT
MCM8-AS1	1.07786616	1.47E-10	5.16E-09	PUT
GPD1	-1.553571	1.69E-10	5.70E-09	PUT
LOC101927476	1.18993218	1.59E-10	5.44E-09	PUT
PPEF2	1.0723835	1.55E-10	5.35E-09	PUT
TMEM179	-1.5884019	1.77E-10	5.86E-09	PUT
GKAP1	1.15520779	1.73E-10	5.77E-09	PUT
LRG1	1.2582499	1.52E-10	5.28E-09	PUT
SLC7A4	-1.8586128	1.71E-10	5.73E-09	PUT
CCDC36	1.38052337	1.56E-10	5.35E-09	PUT
IGSF3	-1.11416	1.90E-10	6.17E-09	PUT
LINC02261	1.20679395	1.66E-10	5.62E-09	PUT
MKNK2	1.1939388	1.99E-10	6.41E-09	PUT
C2orf80	-1.364353	2.20E-10	6.98E-09	PUT

FAR2	-1.0816488	2.24E-10	7.02E-09	PUT
FOXP1-AS1	1.16686807	1.70E-10	5.73E-09	PUT
ZFP42	1.09091722	2.18E-10	6.93E-09	PUT
YBX3	1.06221034	2.24E-10	7.02E-09	PUT
SPON2	-1.2022943	2.47E-10	7.51E-09	PUT
RCAN2	-1.3486843	2.35E-10	7.27E-09	PUT
ENO2	-1.097156	2.52E-10	7.61E-09	PUT
FAM163B	-1.7057977	2.70E-10	8.02E-09	PUT
CSRP3	1.88205349	7.17E-11	3.03E-09	PUT
MOGAT3	1.09164826	2.60E-10	7.82E-09	PUT
CLLU1	1.48333227	1.78E-10	5.86E-09	PUT
CHORDC1	1.36613233	2.63E-10	7.88E-09	PUT
SMIM31	1.13531302	2.63E-10	7.86E-09	PUT
SPACA6	1.0131215	3.01E-10	8.75E-09	PUT
ZNF341-AS1	2.05924963	6.11E-11	2.70E-09	PUT
REP15	1.61897645	1.94E-10	6.27E-09	PUT
RFPL1	-1.5475055	3.18E-10	9.15E-09	PUT
CLDN15	1.01010595	3.25E-10	9.29E-09	PUT
HS6ST2	-1.8274841	3.45E-10	9.70E-09	PUT
HIF3A	1.10162389	3.23E-10	9.26E-09	PUT
RHOH	1.11402306	3.15E-10	9.09E-09	PUT
TOMM70	-1.1851745	3.41E-10	9.63E-09	PUT
SPHKAP	-1.6385925	3.65E-10	1.02E-08	PUT
FAM92B	1.65485616	3.70E-10	1.03E-08	PUT
NEAT1	1.5862602	3.82E-10	1.06E-08	PUT
LHFPL3	-1.3455677	4.02E-10	1.10E-08	PUT
VSIR	1.12138096	3.93E-10	1.08E-08	PUT
LOC441086	-1.21014	3.87E-10	1.07E-08	PUT
LRRC17	-1.3245079	3.26E-10	9.29E-09	PUT
DSCAM-AS1	1.56806475	3.74E-10	1.04E-08	PUT
C10orf126	1.21852894	4.02E-10	1.10E-08	PUT
SCG5	-1.3817658	4.20E-10	1.13E-08	PUT
CYP26A1	-2.4473054	2.22E-10	7.01E-09	PUT
PPIAL4G	1.13551276	4.53E-10	1.20E-08	PUT
RASGRF1	-1.2838112	4.32E-10	1.16E-08	PUT
HRG	1.55784244	4.33E-10	1.16E-08	PUT
POU2AF1	1.26509304	4.46E-10	1.19E-08	PUT
LOC284009	1.01833599	4.74E-10	1.24E-08	PUT
SLC18A3	-2.4351107	4.67E-10	1.22E-08	PUT
KCNA7	1.06203918	4.64E-10	1.22E-08	PUT
OTX2-AS1	1.45281201	5.10E-10	1.32E-08	PUT
NPFF	1.01069428	5.14E-10	1.32E-08	PUT

PPP4R4	-1.2411869	5.18E-10	1.33E-08	PUT
ADAMTS8	-1.0095538	5.48E-10	1.39E-08	PUT
SHOC1	1.15671798	5.61E-10	1.42E-08	PUT
CNR2	1.16571974	5.44E-10	1.39E-08	PUT
ADAMTSL3	1.11425008	5.47E-10	1.39E-08	PUT
C21orf62	1.35106513	6.23E-10	1.53E-08	PUT
SLC17A8	-1.7992438	5.98E-10	1.48E-08	PUT
MAGEE1	-1.4469652	5.86E-10	1.46E-08	PUT
GCNA	1.14280858	6.30E-10	1.54E-08	PUT
MARCHF3	1.0177924	6.40E-10	1.56E-08	PUT
CYP4X1	-1.2036852	6.71E-10	1.62E-08	PUT
NLRP8	1.77613898	3.25E-10	9.29E-09	PUT
SNORD17	1.57515011	6.60E-10	1.60E-08	PUT
ZBTB16	1.39680665	6.81E-10	1.64E-08	PUT
BAZ1A	1.03690112	7.00E-10	1.67E-08	PUT
TNFSF14	1.1583152	7.05E-10	1.68E-08	PUT
DCLK1	-1.0738205	7.29E-10	1.73E-08	PUT
LOC105369507	2.17999984	2.67E-10	7.94E-09	PUT
SLC15A1	1.31324722	7.68E-10	1.79E-08	PUT
SH3RF2	-1.8115404	7.78E-10	1.81E-08	PUT
CCDC188	-1.2102776	7.58E-10	1.77E-08	PUT
SLC7A11-AS1	1.73051841	7.89E-10	1.83E-08	PUT
SKA1	1.13951841	8.50E-10	1.92E-08	PUT
LINC00691	1.07438891	7.95E-10	1.83E-08	PUT
SOX1-OT	-1.4299883	9.17E-10	2.04E-08	PUT
GPR61	-1.2427144	9.26E-10	2.05E-08	PUT
NBPF10	1.2359096	8.48E-10	1.92E-08	PUT
SST	-2.178769	8.74E-10	1.96E-08	PUT
MIR193BHG	-1.2856926	9.13E-10	2.04E-08	PUT
FIBCD1	-1.7640982	7.62E-10	1.78E-08	PUT
NUDT10	-1.1664177	1.00E-09	2.18E-08	PUT
LINC01609	1.0737827	9.47E-10	2.09E-08	PUT
TARM1	1.73975012	8.68E-10	1.95E-08	PUT
LRPAP1	-1.0194464	1.00E-09	2.18E-08	PUT
ERC2-IT1	1.2596926	9.18E-10	2.04E-08	PUT
PIM1	1.13828268	1.04E-09	2.25E-08	PUT
WNT16	-2.2524393	7.40E-10	1.74E-08	PUT
C22orf34	1.04605554	1.09E-09	2.31E-08	PUT
DDIT4	1.50008489	1.01E-09	2.19E-08	PUT
LINC02584	1.07784948	9.18E-10	2.04E-08	PUT
CLEC1A	1.06400227	1.11E-09	2.36E-08	PUT
TUSC3	-1.2786443	1.05E-09	2.26E-08	PUT

SUSD1	-1.0533724	1.15E-09	2.41E-08	PUT
DUSP2	-1.4180197	1.18E-09	2.46E-08	PUT
SMIM10L2B	-1.2258424	1.11E-09	2.36E-08	PUT
EDN3	-1.4291797	1.19E-09	2.48E-08	PUT
ROBO2	-1.2629512	1.11E-09	2.36E-08	PUT
PCDHAC2	-1.2050651	1.17E-09	2.46E-08	PUT
RNF112	-1.1398479	1.12E-09	2.37E-08	PUT
RRM2	1.02945222	1.11E-09	2.36E-08	PUT
PCSK1	-1.8234452	1.27E-09	2.63E-08	PUT
LINC01873	1.24484105	1.15E-09	2.43E-08	PUT
MYBPC1	1.22766739	1.17E-09	2.45E-08	PUT
LOC101928909	1.31831679	1.04E-09	2.23E-08	PUT
LRRC73	-1.1005055	1.33E-09	2.70E-08	PUT
P2RY12	-1.5010355	1.37E-09	2.76E-08	PUT
SLC7A3	-2.145565	6.65E-10	1.61E-08	PUT
NCR3LG1	-1.1011122	1.41E-09	2.82E-08	PUT
CEBPD	1.73741752	1.34E-09	2.72E-08	PUT
NEK2	1.06989002	1.30E-09	2.67E-08	PUT
CRABP2	-1.4521025	1.44E-09	2.86E-08	PUT
RNF128	-1.4121977	1.41E-09	2.82E-08	PUT
RBM47	1.10392503	1.45E-09	2.87E-08	PUT
IFITM2	1.32071844	1.33E-09	2.70E-08	PUT
CRYM-AS1	1.05535858	1.31E-09	2.69E-08	PUT
TRPV6	-1.2110989	1.50E-09	2.94E-08	PUT
GCM1	1.24471861	1.32E-09	2.69E-08	PUT
NPY5R	-1.7726254	1.52E-09	2.97E-08	PUT
GPR52	-2.3727388	1.47E-09	2.91E-08	PUT
LINC01588	1.07457867	1.58E-09	3.04E-08	PUT
HAS2-AS1	1.39110524	1.28E-09	2.64E-08	PUT
GOLGA6L6	1.11183207	1.57E-09	3.04E-08	PUT
ADAMTS9	1.73577601	1.61E-09	3.08E-08	PUT
BCYRN1	1.20338249	1.66E-09	3.14E-08	PUT
CASP4	1.0474613	1.71E-09	3.18E-08	PUT
ATAD3C	1.30547416	1.69E-09	3.16E-08	PUT
TBC1D30	-1.0222724	1.71E-09	3.19E-08	PUT
PCA3	1.00254876	1.82E-09	3.35E-08	PUT
ZCCHC12	-1.6749605	1.73E-09	3.22E-08	PUT
ACOT7	-1.1284309	1.67E-09	3.14E-08	PUT
RASGRP2	-1.2754515	1.68E-09	3.15E-08	PUT
ABCG4	-1.1364723	1.84E-09	3.37E-08	PUT
VGF	-1.991578	1.76E-09	3.26E-08	PUT
PNMA3	-1.1899783	1.77E-09	3.27E-08	PUT

BMP4	1.35212965	1.70E-09	3.18E-08	PUT
HOXB13	1.45286188	1.92E-09	3.49E-08	PUT
HRH4	1.04524915	1.88E-09	3.42E-08	PUT
SMOC2	-1.1042406	1.92E-09	3.48E-08	PUT
KCNAB1	-1.7561407	1.83E-09	3.36E-08	PUT
LOC102724163	1.31986253	1.89E-09	3.44E-08	PUT
RTN1	-1.2737114	1.91E-09	3.47E-08	PUT
C17orf107	-1.2388075	2.04E-09	3.64E-08	PUT
DRD5	-1.5600764	1.96E-09	3.54E-08	PUT
RGS7	-1.3307134	1.93E-09	3.49E-08	PUT
OLFM3	-1.6030065	2.10E-09	3.71E-08	PUT
CLSTN3	-1.5912473	2.01E-09	3.59E-08	PUT
LINC01134	1.35309526	1.44E-09	2.85E-08	PUT
HTR6	-2.2367004	2.30E-09	3.99E-08	PUT
ARHGEF9	-1.1310253	2.15E-09	3.77E-08	PUT
MIR202HG	1.36685567	1.64E-09	3.10E-08	PUT
HSPB1	1.97311668	2.27E-09	3.94E-08	PUT
RAB13	1.00771737	2.21E-09	3.85E-08	PUT
CLEC2L	-1.3228159	2.46E-09	4.20E-08	PUT
INSYN1-AS1	-1.6053156	1.62E-09	3.09E-08	PUT
RIT2	-1.3711945	2.50E-09	4.24E-08	PUT
CD3G	1.16292173	2.37E-09	4.09E-08	PUT
MLKL	1.42927583	2.50E-09	4.24E-08	PUT
ZBED6	1.12898048	2.43E-09	4.16E-08	PUT
SMIM25	1.03924588	2.41E-09	4.12E-08	PUT
GLP1R	-2.055884	1.95E-09	3.51E-08	PUT
BATF	-1.6940028	2.18E-09	3.81E-08	PUT
KIRREL3-AS2	1.48213626	2.60E-09	4.37E-08	PUT
DOCK9-DT	-1.4156807	2.06E-09	3.67E-08	PUT
STXBP1	-1.1557743	2.56E-09	4.31E-08	PUT
LINC01133	1.52124479	2.74E-09	4.53E-08	PUT
BNIP1	1.0486563	2.53E-09	4.26E-08	PUT
GPRACR	1.23398351	2.18E-09	3.81E-08	PUT
LINC01119	-1.5612283	2.09E-09	3.71E-08	PUT
PADI1	-1.8639254	1.37E-09	2.76E-08	PUT
LDB2	-1.24169	2.64E-09	4.41E-08	PUT
HROB	1.2867426	2.61E-09	4.39E-08	PUT
BAG3	1.67186151	2.71E-09	4.49E-08	PUT
NSG1	-1.6539715	2.74E-09	4.53E-08	PUT
CCR4	1.00619411	2.93E-09	4.78E-08	PUT
SIGLEC1	-1.2307649	2.98E-09	4.83E-08	PUT
EVC2	1.35632222	2.89E-09	4.74E-08	PUT

PSMD6-AS2	1.04932025	2.86E-09	4.70E-08	PUT
RNF222	1.08239692	2.50E-09	4.24E-08	PUT
H3C4	1.36561892	2.51E-09	4.25E-08	PUT
SLC36A2	1.08348486	3.25E-09	5.16E-08	PUT
KLHL13	-1.4696362	3.16E-09	5.04E-08	PUT
NSF	-1.4278281	3.24E-09	5.16E-08	PUT
UPK2	-1.6610615	1.85E-09	3.37E-08	PUT
LINC00638	1.0744679	3.74E-09	5.73E-08	PUT
AICDA	1.12815546	3.65E-09	5.63E-08	PUT
RAB3A	-1.6103503	3.62E-09	5.60E-08	PUT
LOC158434	1.31845193	3.71E-09	5.69E-08	PUT
ATP1A1	-1.0851442	3.95E-09	6.02E-08	PUT
CYP4F8	1.00771517	4.12E-09	6.20E-08	PUT
POU2F3	1.42474264	3.96E-09	6.02E-08	PUT
CORT	-1.769427	4.07E-09	6.14E-08	PUT
ANKRD22	1.1103244	4.12E-09	6.20E-08	PUT
RNU6-1	1.95271919	4.15E-09	6.24E-08	PUT
FAM151A	1.1166503	4.74E-09	6.91E-08	PUT
SLAH3	-1.0764757	4.99E-09	7.22E-08	PUT
TPBGL	-1.6137523	5.02E-09	7.25E-08	PUT
LINC00470	1.69902228	3.10E-09	4.96E-08	PUT
UBE2T	-1.1920455	5.56E-09	7.91E-08	PUT
LINC01310	-1.4091488	5.64E-09	7.99E-08	PUT
TAC3	-1.737523	5.90E-09	8.30E-08	PUT
CCL5	1.14448994	6.02E-09	8.43E-08	PUT
NPAS4	-2.8037212	4.77E-09	6.94E-08	PUT
CEL	1.04812573	5.96E-09	8.36E-08	PUT
TNFRSF1A	1.05284885	5.65E-09	8.00E-08	PUT
BACE2	1.1334717	6.34E-09	8.80E-08	PUT
OSBPL10-AS1	1.27666032	4.03E-09	6.10E-08	PUT
GLT1D1	-1.4142394	6.10E-09	8.52E-08	PUT
PLPPR4	-1.5443745	5.84E-09	8.24E-08	PUT
SYTL1	1.0674305	6.32E-09	8.78E-08	PUT
LRRTM1	-1.2708002	6.21E-09	8.64E-08	PUT
LOC101927560	1.37323589	6.43E-09	8.88E-08	PUT
GPR82	1.11765365	7.32E-09	9.83E-08	PUT
LOC101927661	1.34531346	5.61E-09	7.96E-08	PUT
ST7-AS1	-1.4075215	5.14E-09	7.42E-08	PUT
NLRP12	1.05819107	6.89E-09	9.39E-08	PUT
SERPINH1	2.20172948	6.96E-09	9.44E-08	PUT
CLVS1	-1.4321457	7.34E-09	9.84E-08	PUT
LOC101929698	1.02097983	7.42E-09	9.92E-08	PUT

OPCML	-1.322099	6.92E-09	9.41E-08	PUT
MCHR1	-1.7906075	6.36E-09	8.82E-08	PUT
ADIPOQ	1.29443098	7.11E-09	9.61E-08	PUT
MC4R	-2.2807596	7.49E-09	9.99E-08	PUT
MSX1	1.39591321	8.06E-09	1.06E-07	PUT
LOC389641	1.15726575	6.42E-09	8.87E-08	PUT
CACNA2D2	-1.1708394	7.25E-09	9.77E-08	PUT
LINC01006	-1.2755761	7.34E-09	9.85E-08	PUT
PRR27	1.18780232	5.98E-09	8.37E-08	PUT
BLACE	1.27704805	4.97E-09	7.21E-08	PUT
PGM5P2	1.06532465	8.16E-09	1.07E-07	PUT
RTN4RL1	-1.2119088	8.41E-09	1.10E-07	PUT
ART4	1.14047339	6.78E-09	9.28E-08	PUT
CDH22	-1.1480743	8.25E-09	1.08E-07	PUT
DNASE1L3	1.22215402	8.66E-09	1.13E-07	PUT
KCNJ6	1.34496991	7.96E-09	1.05E-07	PUT
NBPF14	1.38318394	7.95E-09	1.05E-07	PUT
RDH12	-1.0204916	8.07E-09	1.06E-07	PUT
OLAH	1.08258718	7.87E-09	1.04E-07	PUT
SPEF1	-1.1242232	8.88E-09	1.15E-07	PUT
PREPL	-1.0658077	9.24E-09	1.19E-07	PUT
FBN3	-1.1422551	9.06E-09	1.17E-07	PUT
ZC3H12A	1.27916974	9.36E-09	1.20E-07	PUT
LILRA5	1.53602083	9.04E-09	1.17E-07	PUT
PATE2	1.01254605	1.01E-08	1.27E-07	PUT
NBPF20	1.29750814	9.54E-09	1.21E-07	PUT
CLSTN2	-1.2697106	9.99E-09	1.26E-07	PUT
ADAM11	-1.0827509	1.06E-08	1.33E-07	PUT
WASF1	-1.3436625	1.00E-08	1.26E-07	PUT
SERPINB11	1.69882826	6.73E-09	9.22E-08	PUT
NEXN-AS1	1.31252798	1.14E-08	1.41E-07	PUT
PNISR	1.01253307	1.03E-08	1.30E-07	PUT
TMEM30B	-1.1237471	1.09E-08	1.36E-07	PUT
WNT9B	1.02830551	1.06E-08	1.33E-07	PUT
MAL2	-1.6869198	1.06E-08	1.33E-07	PUT
TUBA8	-1.4064924	1.09E-08	1.36E-07	PUT
RAX2	1.25756762	9.48E-09	1.21E-07	PUT
CD96	1.32969485	1.15E-08	1.42E-07	PUT
CRAT37	1.09397846	1.18E-08	1.44E-07	PUT
SOC3	2.35835839	1.18E-08	1.45E-07	PUT
ADRA1D	-1.2344336	1.17E-08	1.44E-07	PUT
KLK11	1.18132795	1.22E-08	1.48E-07	PUT

TRPC7	-1.8488106	6.71E-09	9.20E-08	PUT
CALN1	-1.0385779	1.13E-08	1.40E-07	PUT
MPEG1	-1.1737888	1.29E-08	1.55E-07	PUT
CGAS	1.0029712	1.30E-08	1.56E-07	PUT
GATA2-AS1	1.32396917	1.22E-08	1.48E-07	PUT
SLC10A1	1.61429557	9.47E-09	1.21E-07	PUT
DIRAS2	-1.4841632	1.20E-08	1.46E-07	PUT
PLAC4	1.30177558	1.36E-08	1.62E-07	PUT
PIGR	1.11490321	1.35E-08	1.60E-07	PUT
RNU11	1.76700413	1.34E-08	1.59E-07	PUT
LINC00410	1.03176646	1.30E-08	1.56E-07	PUT
KDM4D	-1.1582233	1.23E-08	1.49E-07	PUT
GLRB	-1.007699	1.29E-08	1.54E-07	PUT
EGR1	-1.190558	1.28E-08	1.54E-07	PUT
SLC13A4	1.00638288	1.51E-08	1.76E-07	PUT
STAM-AS1	1.03735678	1.33E-08	1.58E-07	PUT
GGT6	1.2093982	1.47E-08	1.72E-07	PUT
NDC80	1.18253354	1.59E-08	1.83E-07	PUT
APELA	1.0560249	1.39E-08	1.64E-07	PUT
NPTN	-1.2708788	1.53E-08	1.77E-07	PUT
FAM9A	1.53984006	1.48E-08	1.73E-07	PUT
AP1S1	-1.0409059	1.57E-08	1.81E-07	PUT
LINC00562	1.00240214	1.69E-08	1.93E-07	PUT
NEBL-AS1	-1.4077932	1.30E-08	1.55E-07	PUT
L1TD1	1.29731528	1.87E-08	2.09E-07	PUT
NOTO	1.11345434	1.25E-08	1.51E-07	PUT
TAGLN3	-1.5753237	1.66E-08	1.90E-07	PUT
NPC1L1	1.91135584	1.40E-08	1.66E-07	PUT
TNFSF8	-1.3725362	1.16E-08	1.43E-07	PUT
ZSCAN4	1.11907827	1.96E-08	2.18E-07	PUT
SORCS3	-1.1365702	1.96E-08	2.17E-07	PUT
SDR16C5	-1.3559307	1.89E-08	2.11E-07	PUT
LCN10	2.15756233	1.47E-08	1.71E-07	PUT
LINC00311	1.52119112	2.05E-08	2.25E-07	PUT
FAM156B	-2.930958	2.16E-08	2.35E-07	PUT
EXTL1	-1.0088263	2.05E-08	2.25E-07	PUT
ARHGAP20	-1.2773384	2.08E-08	2.28E-07	PUT
NETO1	-1.467127	2.10E-08	2.29E-07	PUT
LOC101929586	1.036774	2.27E-08	2.42E-07	PUT
B3GNT2	-1.0579026	2.04E-08	2.24E-07	PUT
KCNK2	-1.4114459	2.20E-08	2.38E-07	PUT
SYS1-DBNDD2	-1.2787943	2.43E-08	2.55E-07	PUT

CABCOC01	-1.2879967	2.45E-08	2.58E-07	PUT
PRKCD	-1.0517357	2.17E-08	2.35E-07	PUT
GNG3	-1.0566106	2.16E-08	2.35E-07	PUT
C9orf129	-1.5243565	2.01E-08	2.22E-07	PUT
C10orf82	1.07461753	2.60E-08	2.70E-07	PUT
VWA7	-1.4044822	2.57E-08	2.66E-07	PUT
HSPB9	1.08745228	2.29E-08	2.44E-07	PUT
C5orf60	1.00068211	2.43E-08	2.56E-07	PUT
SERTM1	-2.0651358	2.19E-08	2.37E-07	PUT
GS1-279B7.1	1.04100436	2.25E-08	2.41E-07	PUT
PCDHGC5	-1.9229533	2.50E-08	2.61E-07	PUT
LOC101928622	1.8646001	1.17E-08	1.43E-07	PUT
KIAA1210	1.08271752	2.46E-08	2.58E-07	PUT
C11orf97	-1.491093	2.59E-08	2.69E-07	PUT
PCDHGC4	-1.0180183	2.84E-08	2.90E-07	PUT
NNAT	-1.7074759	2.63E-08	2.72E-07	PUT
PRSS56	-1.484683	2.33E-08	2.48E-07	PUT
ALB	-1.4805083	2.30E-08	2.45E-07	PUT
CEACAM8	1.00112639	2.77E-08	2.84E-07	PUT
NPY	-1.9455449	2.71E-08	2.80E-07	PUT
B4GALT6	-1.0540617	2.72E-08	2.80E-07	PUT
ZNF20	1.09650754	3.18E-08	3.16E-07	PUT
CAPN12	1.37592919	2.94E-08	2.97E-07	PUT
LPL	-1.6157839	3.01E-08	3.03E-07	PUT
SLC12A3	1.69416741	2.56E-08	2.66E-07	PUT
CELSR1	1.56930707	3.58E-08	3.51E-07	PUT
SMIM17	-1.2484268	3.43E-08	3.38E-07	PUT
ATP2B3	-1.2790627	3.10E-08	3.10E-07	PUT
MYOG	1.42840376	3.11E-08	3.11E-07	PUT
PNMA2	-1.045662	3.35E-08	3.31E-07	PUT
MAP3K5-AS1	1.09752301	3.27E-08	3.23E-07	PUT
PHF24	-1.3349167	3.46E-08	3.40E-07	PUT
RBM5-AS1	1.12159011	3.67E-08	3.58E-07	PUT
PRAG1	-1.0229277	3.52E-08	3.45E-07	PUT
HAS1	-1.2333508	3.80E-08	3.68E-07	PUT
LINC00261	1.83243418	4.04E-08	3.88E-07	PUT
SAP25	1.78258016	4.13E-08	3.95E-07	PUT
LOC101927770	1.14051611	4.32E-08	4.10E-07	PUT
LINC00540	1.28837241	4.24E-08	4.03E-07	PUT
SGO1	1.18545315	3.84E-08	3.71E-07	PUT
PLK2	-1.3933385	4.18E-08	3.99E-07	PUT
KIF14	1.02659847	4.21E-08	4.02E-07	PUT

CCNA1	-1.393222	4.89E-08	4.55E-07	PUT
CGREF1	-1.0856493	4.23E-08	4.03E-07	PUT
DSG1	-1.6393647	2.51E-08	2.62E-07	PUT
SV2A	-1.0923057	4.55E-08	4.29E-07	PUT
MT1G	1.63670634	4.43E-08	4.18E-07	PUT
LINC02664	1.08844554	5.16E-08	4.75E-07	PUT
TMEM200B	-1.3516026	5.13E-08	4.73E-07	PUT
CDKN1A	1.32964027	4.59E-08	4.32E-07	PUT
DCAF4L1	1.00667831	5.18E-08	4.76E-07	PUT
KRT26	1.61086142	5.30E-08	4.86E-07	PUT
C1orf94	-1.8662182	3.07E-08	3.08E-07	PUT
CACNB1	-1.0621298	4.64E-08	4.36E-07	PUT
CCNA2	1.00812084	5.40E-08	4.93E-07	PUT
FAM83A	1.00700617	4.51E-08	4.26E-07	PUT
CNPY1	-1.5404804	2.97E-08	3.00E-07	PUT
AMPH	-1.0097812	4.89E-08	4.55E-07	PUT
CDA	1.50824202	5.13E-08	4.73E-07	PUT
IGFN1	-1.6605761	5.66E-08	5.13E-07	PUT
CAMKK2	-1.0641765	5.07E-08	4.69E-07	PUT
KRT5	-1.5229386	4.82E-08	4.50E-07	PUT
PPP3R1	-1.1278758	5.23E-08	4.79E-07	PUT
SYTL5	-1.482509	5.35E-08	4.89E-07	PUT
ACTN2	-1.3792333	5.06E-08	4.68E-07	PUT
LSMEM1	1.0091031	5.73E-08	5.17E-07	PUT
LMO1	-1.1500503	5.08E-08	4.69E-07	PUT
KIRREL2	-1.1598225	5.96E-08	5.36E-07	PUT
RHOV	-1.7064296	4.16E-08	3.97E-07	PUT
STARD5	-1.3842727	5.90E-08	5.31E-07	PUT
PABPC1L2B	-1.3837998	6.36E-08	5.65E-07	PUT
PKP1	-1.4306366	5.69E-08	5.14E-07	PUT
ADAMTS9-AS1	1.90722318	5.36E-08	4.90E-07	PUT
SNAP91	-1.1103733	5.50E-08	5.01E-07	PUT
LOC100505795	1.64645727	4.86E-08	4.53E-07	PUT
UCHL1	-1.1641126	5.96E-08	5.36E-07	PUT
LOC100128006	1.02835576	5.43E-08	4.96E-07	PUT
RNY4	1.22101548	6.95E-08	6.07E-07	PUT
CKMT1A	-1.5584639	6.12E-08	5.48E-07	PUT
DACH2	-1.318522	6.84E-08	6.01E-07	PUT
NAPB	-1.0247375	6.37E-08	5.65E-07	PUT
SLC52A3	1.39670619	7.54E-08	6.49E-07	PUT
BPESC1	1.53749593	4.87E-08	4.54E-07	PUT
SLC35D3	-1.8495325	7.71E-08	6.61E-07	PUT

TMEM184A	1.09647489	6.87E-08	6.02E-07	PUT
RHOXF2B	1.23883044	7.54E-08	6.49E-07	PUT
BCL3	1.17807792	7.82E-08	6.69E-07	PUT
SRGAP3-AS3	1.4218934	5.28E-08	4.84E-07	PUT
ULK4P1	-1.2198866	7.09E-08	6.18E-07	PUT
MIR3945HG	1.46922059	7.02E-08	6.12E-07	PUT
CX3CR1	-1.5362414	7.45E-08	6.43E-07	PUT
LINC01127	1.33966491	6.84E-08	6.01E-07	PUT
MIR8066	2.00596318	5.49E-08	5.01E-07	PUT
COL6A5	-1.8303477	4.96E-08	4.60E-07	PUT
PDE2A	-1.1822766	7.44E-08	6.42E-07	PUT
MARCHF4	-1.3740146	7.92E-08	6.75E-07	PUT
HPDL	-1.0625279	8.51E-08	7.17E-07	PUT
SCN4B	-1.9122394	7.87E-08	6.71E-07	PUT
DKK2	-1.429045	6.81E-08	5.99E-07	PUT
GFRAL	1.68239067	4.57E-08	4.30E-07	PUT
LINC00477	1.32683584	7.07E-08	6.16E-07	PUT
TMEM132D	-1.1318835	9.02E-08	7.53E-07	PUT
SVOP	-1.5397907	8.44E-08	7.12E-07	PUT
HS3ST5	-1.0256443	8.90E-08	7.45E-07	PUT
LUCAT1	1.24293068	9.27E-08	7.70E-07	PUT
FLJ42393	1.2050197	9.72E-08	7.99E-07	PUT
HTR5A	-1.682471	1.04E-07	8.44E-07	PUT
SYT2	-1.7820049	8.90E-08	7.45E-07	PUT
RNY3	1.19561705	9.24E-08	7.67E-07	PUT
GOLGA8G	-1.8807547	1.05E-07	8.51E-07	PUT
CXADRP3	1.39229066	8.63E-08	7.25E-07	PUT
LOC100506551	-1.0553218	1.09E-07	8.79E-07	PUT
RSP04	-1.1507516	1.06E-07	8.55E-07	PUT
FGF8	1.10973987	1.07E-07	8.60E-07	PUT
PLEK	-1.0139532	1.07E-07	8.60E-07	PUT
LCA10	1.12482139	1.02E-07	8.33E-07	PUT
OBSCN-AS1	-1.4062608	1.02E-07	8.35E-07	PUT
CALY	-1.4177396	9.76E-08	8.02E-07	PUT
TMOD1	-1.1098804	9.73E-08	7.99E-07	PUT
COL26A1	-1.1617099	1.14E-07	9.10E-07	PUT
HYAL4	1.13921949	1.03E-07	8.37E-07	PUT
RNF175	-1.0709781	1.09E-07	8.79E-07	PUT
LOC284933	1.85823067	1.03E-07	8.36E-07	PUT
CRABP1	-1.276163	1.06E-07	8.55E-07	PUT
VIT	-1.4697655	8.99E-08	7.51E-07	PUT
SYT13	-1.4248445	1.12E-07	8.95E-07	PUT

CFAP61	-1.0722053	1.27E-07	9.95E-07	PUT
BIRC5	1.03179023	1.21E-07	9.58E-07	PUT
LOC105369509	1.40344805	1.03E-07	8.38E-07	PUT
CPNE4	-1.3843988	1.24E-07	9.76E-07	PUT
PPP1R1B	-1.0367658	1.28E-07	1.00E-06	PUT
TNIP3	1.10249414	1.25E-07	9.87E-07	PUT
NXF2B	-1.4875533	9.80E-08	8.04E-07	PUT
VAT1L	-1.8378472	1.16E-07	9.24E-07	PUT
DNAJB1	1.760481	1.19E-07	9.43E-07	PUT
GPR158	-1.3983627	1.21E-07	9.55E-07	PUT
SLC14A1	1.30302893	1.21E-07	9.58E-07	PUT
NELL2	-1.3721005	1.26E-07	9.89E-07	PUT
HAS2	1.01027524	1.54E-07	1.17E-06	PUT
RHOD	1.17639283	1.48E-07	1.14E-06	PUT
C8orf49	1.1233924	1.58E-07	1.20E-06	PUT
GOLGA8H	-1.6506575	1.47E-07	1.13E-06	PUT
MT1A	1.31480034	1.59E-07	1.21E-06	PUT
TNFRSF8	-1.946709	1.69E-07	1.28E-06	PUT
PABPC1L2A	-1.141793	1.69E-07	1.28E-06	PUT
ANKRD20A2	1.25060367	1.43E-07	1.10E-06	PUT
CHRNA7	-1.0051777	1.74E-07	1.30E-06	PUT
GRIK1-AS1	1.11307523	1.41E-07	1.09E-06	PUT
SFTPA2	-1.6333248	1.06E-07	8.55E-07	PUT
GUCY1B1	-1.0833445	1.50E-07	1.15E-06	PUT
CBLN1	-1.1971469	1.85E-07	1.37E-06	PUT
MT1X	1.20273898	1.52E-07	1.16E-06	PUT
NNMT	1.20549864	1.70E-07	1.28E-06	PUT
ACR	-1.1805545	1.70E-07	1.28E-06	PUT
CRNDE	-1.0440569	1.92E-07	1.42E-06	PUT
ANKRD34A	-1.1133871	1.66E-07	1.26E-06	PUT
EFNA3	-1.0757959	1.70E-07	1.28E-06	PUT
PLPPR5	-1.0846839	1.91E-07	1.41E-06	PUT
KIF18A	1.06880248	1.88E-07	1.39E-06	PUT
PEG10	-1.1808126	1.77E-07	1.32E-06	PUT
CHGB	-1.3127976	1.72E-07	1.29E-06	PUT
LRRC14B	-1.7603163	1.27E-07	9.97E-07	PUT
VSIG8	1.45473481	1.94E-07	1.43E-06	PUT
CALB1	-1.68498	1.80E-07	1.34E-06	PUT
MIR519A2	1.29743831	2.20E-07	1.59E-06	PUT
STAT4	-1.2567366	2.18E-07	1.58E-06	PUT
RET	-1.007608	2.22E-07	1.60E-06	PUT
MYLK2	-1.5219898	2.04E-07	1.50E-06	PUT

INPP5A	-1.0637349	1.88E-07	1.40E-06	PUT
MTHFD2	1.06553365	2.06E-07	1.51E-06	PUT
CAMKK1	-1.320555	1.91E-07	1.42E-06	PUT
LOC100287042	-1.0335012	2.37E-07	1.69E-06	PUT
USP46-AS1	-1.1906349	2.18E-07	1.58E-06	PUT
GPRIN2	-1.6922969	1.77E-07	1.33E-06	PUT
LINC02214	1.58440477	1.49E-07	1.14E-06	PUT
LINC01730	1.19991335	2.18E-07	1.58E-06	PUT
RBP3	-1.1557071	2.05E-07	1.51E-06	PUT
KIF12	-1.5372591	2.49E-07	1.77E-06	PUT
HIGD1C	1.61764415	1.22E-07	9.65E-07	PUT
TESC	-1.1451678	2.09E-07	1.53E-06	PUT
GABRD	-1.5299161	2.10E-07	1.54E-06	PUT
FKBP5	1.21116872	2.11E-07	1.54E-06	PUT
EPHA5	-1.2205727	2.69E-07	1.89E-06	PUT
AMY2A	-1.5776793	2.32E-07	1.66E-06	PUT
TMEFF1	-1.2142061	2.63E-07	1.85E-06	PUT
CCNB3	-1.2366473	2.37E-07	1.69E-06	PUT
GAD1	-1.6282203	2.30E-07	1.65E-06	PUT
STUM	-1.0834187	2.34E-07	1.68E-06	PUT
KCNE5	-1.1189204	2.86E-07	1.98E-06	PUT
CACNA2D3	-1.157419	2.37E-07	1.69E-06	PUT
ARHGAP44	-1.0430254	2.33E-07	1.67E-06	PUT
REM2	-1.3942961	3.02E-07	2.08E-06	PUT
SLC12A5	-1.5552299	2.53E-07	1.79E-06	PUT
SALRNA2	1.43564084	2.13E-07	1.55E-06	PUT
LOC100287944	-1.5066596	1.97E-07	1.45E-06	PUT
DACT2	-1.3861537	2.64E-07	1.86E-06	PUT
TGFB3	1.24167352	2.62E-07	1.84E-06	PUT
GACAT2	-1.7071527	2.02E-07	1.49E-06	PUT
EFNB3	-1.23052	2.70E-07	1.89E-06	PUT
NGEF	-1.7388698	2.83E-07	1.97E-06	PUT
STRIP2	-1.4900604	2.73E-07	1.91E-06	PUT
CPNE7	-1.0383409	3.22E-07	2.20E-06	PUT
SMIM18	-1.1038061	3.20E-07	2.20E-06	PUT
FRAS1	-1.025748	3.03E-07	2.09E-06	PUT
SYT6	-1.087415	3.19E-07	2.19E-06	PUT
OR1F1	-1.7863854	2.52E-07	1.79E-06	PUT
PMEL	1.47385327	1.97E-07	1.45E-06	PUT
CRYBA1	1.62062713	1.89E-07	1.40E-06	PUT
S100A4	1.1562586	3.69E-07	2.48E-06	PUT
MISP	1.17400173	3.08E-07	2.12E-06	PUT

PKN3	1.00523287	3.73E-07	2.50E-06	PUT
TNNI1	1.16996984	2.73E-07	1.91E-06	PUT
STX1B	-1.2134245	3.30E-07	2.25E-06	PUT
NRIP3	-1.0647593	3.20E-07	2.19E-06	PUT
NMNAT2	-1.3566521	3.21E-07	2.20E-06	PUT
GPR158-AS1	-1.3185764	3.83E-07	2.56E-06	PUT
PRMT8	-1.3870916	3.32E-07	2.26E-06	PUT
SH2D5	-1.4598958	3.34E-07	2.27E-06	PUT
PRLHR	-1.0943583	4.19E-07	2.75E-06	PUT
LINC00460	-1.5539487	4.22E-07	2.77E-06	PUT
BLID	1.50817796	2.42E-07	1.72E-06	PUT
PNLIPRP1	1.07761948	3.99E-07	2.65E-06	PUT
SEC14L3	1.0761592	4.16E-07	2.74E-06	PUT
MIR5690	2.03227899	2.14E-07	1.56E-06	PUT
GBX2	-1.1901213	4.32E-07	2.82E-06	PUT
ATP11A-AS1	1.0892159	4.28E-07	2.80E-06	PUT
ARC	-1.0521681	3.94E-07	2.62E-06	PUT
LEF1-AS1	1.06244682	3.89E-07	2.59E-06	PUT
ATP2B2	-1.1041615	3.74E-07	2.51E-06	PUT
GOLT1A	-1.3627773	4.41E-07	2.87E-06	PUT
TMEM150B	1.20867768	4.05E-07	2.68E-06	PUT
LL22NC01-81G9.3	1.39801834	4.22E-07	2.77E-06	PUT
SULT4A1	-1.5265304	3.79E-07	2.53E-06	PUT
MAGEE2	-1.0896338	4.67E-07	3.00E-06	PUT
PARM1	-1.2422251	3.88E-07	2.58E-06	PUT
ABCC5-AS1	1.54368258	3.73E-07	2.51E-06	PUT
CDK5R2	-1.4991405	3.94E-07	2.62E-06	PUT
WDR88	-1.0711064	4.75E-07	3.05E-06	PUT
TMEM92	1.00599179	4.36E-07	2.84E-06	PUT
ADAM23	-1.1326346	4.06E-07	2.69E-06	PUT
CAP2	-1.2506984	4.07E-07	2.69E-06	PUT
CA4	-1.1646262	5.12E-07	3.24E-06	PUT
RASGRP1	-1.180809	4.24E-07	2.78E-06	PUT
KCNQ3	-1.2326531	4.16E-07	2.74E-06	PUT
MIOX	1.18141011	4.06E-07	2.69E-06	PUT
SEZ6	-1.4411881	4.22E-07	2.77E-06	PUT
LHFPL4	-1.000377	4.20E-07	2.76E-06	PUT
PTPRR	-1.185022	5.05E-07	3.21E-06	PUT
DGKB	-1.3851686	4.26E-07	2.79E-06	PUT
NAV2-AS4	1.27704105	3.62E-07	2.44E-06	PUT
SYTL4	1.04463783	4.37E-07	2.85E-06	PUT
SULT2A1	1.06007894	4.88E-07	3.12E-06	PUT

PLA1A	1.56897738	5.42E-07	3.42E-06	PUT
SNAP25	-1.6119234	4.82E-07	3.09E-06	PUT
UNC5A	-1.2809336	4.49E-07	2.91E-06	PUT
LINC01013	1.06897708	4.47E-07	2.90E-06	PUT
PDK4	1.00297313	4.42E-07	2.87E-06	PUT
LOC101929420	1.27082572	4.65E-07	3.00E-06	PUT
HMOX1	1.04367902	4.86E-07	3.11E-06	PUT
DMRT1	1.29654341	4.09E-07	2.70E-06	PUT
SERPINF2	1.07900254	5.83E-07	3.63E-06	PUT
SLC22A14	1.20641791	5.09E-07	3.23E-06	PUT
LOC286177	1.15221373	4.63E-07	2.99E-06	PUT
CNR1	-1.6772826	4.83E-07	3.09E-06	PUT
RIMBP2	-1.189653	5.10E-07	3.24E-06	PUT
DDC	-1.4114007	5.86E-07	3.64E-06	PUT
SUSD4	-1.1494059	4.89E-07	3.12E-06	PUT
SIX4	1.14104905	6.20E-07	3.82E-06	PUT
KRTAP5-7	-1.2535271	4.37E-07	2.85E-06	PUT
CYP4B1	1.44426011	5.61E-07	3.52E-06	PUT
ENC1	-1.6847418	5.18E-07	3.28E-06	PUT
LRIT2	-1.3627633	6.50E-07	3.98E-06	PUT
RBP4	-1.2221548	5.56E-07	3.49E-06	PUT
CIDEA	-1.6177149	6.74E-07	4.11E-06	PUT
C11orf87	-1.3648627	5.88E-07	3.65E-06	PUT
TUSC7	1.18862431	7.23E-07	4.35E-06	PUT
LINC00824	1.10182235	7.12E-07	4.30E-06	PUT
INSM2	-1.1729191	7.26E-07	4.37E-06	PUT
TMEM196	-1.1634554	7.18E-07	4.33E-06	PUT
SNORA77	2.23097513	2.97E-07	2.05E-06	PUT
SFN	-1.1033715	7.54E-07	4.52E-06	PUT
LOC100128770	1.04020445	6.61E-07	4.05E-06	PUT
CACNA1C-AS4	1.5441055	5.68E-07	3.56E-06	PUT
KIF1C	1.00613959	6.97E-07	4.23E-06	PUT
NOXO1	-1.5018554	5.84E-07	3.63E-06	PUT
RAB3C	-1.5401983	6.41E-07	3.94E-06	PUT
FBXL16	-1.4713607	7.35E-07	4.42E-06	PUT
SLC22A9	1.0482648	8.00E-07	4.75E-06	PUT
CLEC12A	1.14642873	6.85E-07	4.17E-06	PUT
APOBEC3A	1.27968162	6.12E-07	3.79E-06	PUT
TMEM171	-1.5090847	8.00E-07	4.75E-06	PUT
CKMT1B	-1.2831605	6.96E-07	4.23E-06	PUT
PDE10A	-1.5404232	7.09E-07	4.29E-06	PUT
SPRY4-IT1	1.2654339	7.21E-07	4.35E-06	PUT

TEAD4	1.12951724	9.10E-07	5.29E-06	PUT
LINC02210-CRHR1	-2.2973796	7.22E-07	4.35E-06	PUT
KNCN	-1.6107336	7.06E-07	4.28E-06	PUT
PTGES3L-AARSD1	-2.2061537	8.73E-07	5.11E-06	PUT
C1orf210	1.17952609	7.99E-07	4.74E-06	PUT
MMP13	1.2507926	6.70E-07	4.09E-06	PUT
FBXO43	1.18426688	8.88E-07	5.19E-06	PUT
ABLM2	-1.0006437	7.96E-07	4.73E-06	PUT
NUDT11	-1.1797215	8.83E-07	5.16E-06	PUT
SPTBN2	-1.1873386	8.49E-07	5.00E-06	PUT
NCEH1	-1.1233221	8.18E-07	4.84E-06	PUT
IGFBPL1	-1.4714706	1.00E-06	5.74E-06	PUT
ACRV1	-1.193427	1.01E-06	5.80E-06	PUT
CALB2	-1.2429852	8.80E-07	5.14E-06	PUT
ACHE	-1.2514422	8.25E-07	4.87E-06	PUT
NUCB1-AS1	2.02852489	6.07E-07	3.76E-06	PUT
HNF1B	1.14141795	9.96E-07	5.72E-06	PUT
CNTNAP2-AS1	1.08269692	1.01E-06	5.77E-06	PUT
SV2B	-1.193733	8.78E-07	5.14E-06	PUT
PCAT29	1.24949443	8.72E-07	5.11E-06	PUT
NECAB2	-1.0938444	8.96E-07	5.22E-06	PUT
TRH	-1.6178458	1.12E-06	6.32E-06	PUT
OR51B5	1.0634216	1.03E-06	5.88E-06	PUT
PDZD4	-1.0001238	1.01E-06	5.80E-06	PUT
PDLIM1	1.33894553	1.18E-06	6.62E-06	PUT
GPR55	-1.5428465	1.22E-06	6.79E-06	PUT
RGS14	-1.749755	1.01E-06	5.78E-06	PUT
PTHLH	-1.1494167	1.25E-06	6.94E-06	PUT
TSPAN13	-1.0586284	9.77E-07	5.63E-06	PUT
CDHR1	-1.2780439	9.80E-07	5.64E-06	PUT
TDRD5	-1.3300458	1.28E-06	7.09E-06	PUT
LINC01840	1.09378046	1.19E-06	6.64E-06	PUT
SEMA3G	-1.1544196	1.09E-06	6.16E-06	PUT
LINC02192	-1.3711592	1.26E-06	7.01E-06	PUT
SGK2	-1.0339953	1.17E-06	6.56E-06	PUT
ZIM3	1.18481878	1.15E-06	6.48E-06	PUT
UPK1A-AS1	1.07509879	1.30E-06	7.17E-06	PUT
ADGRF2	1.10774366	1.27E-06	7.06E-06	PUT
MUC5B	-1.6583255	1.26E-06	7.01E-06	PUT
GFI1B	1.18348581	1.18E-06	6.63E-06	PUT
NTRK3-AS1	1.75110709	8.17E-07	4.84E-06	PUT

LINC01441	1.45002093	9.24E-07	5.36E-06	PUT
PDE1B	-1.6279845	1.24E-06	6.91E-06	PUT
GABRE	1.17623408	1.50E-06	8.10E-06	PUT
LBX2	1.52851341	1.03E-06	5.88E-06	PUT
PCP4	-1.2949357	1.30E-06	7.16E-06	PUT
GALNT17	-1.1143199	1.20E-06	6.71E-06	PUT
ZNF664-RFLNA	-1.185857	1.69E-06	8.98E-06	PUT
EIF4EBP1	1.0165311	1.66E-06	8.87E-06	PUT
IL4R	1.16261593	1.41E-06	7.69E-06	PUT
LINC02525	-1.0108384	1.70E-06	9.03E-06	PUT
DOCK9-AS1	1.43888595	1.14E-06	6.42E-06	PUT
PITX1	1.06273398	1.77E-06	9.36E-06	PUT
ST8SIA6-AS1	1.07982742	1.76E-06	9.29E-06	PUT
SYT8	1.90229818	1.13E-06	6.35E-06	PUT
ZNF385B	-1.1480235	1.50E-06	8.13E-06	PUT
UNC13A	-1.2064728	1.48E-06	8.05E-06	PUT
LRTM2	-1.5853977	1.49E-06	8.06E-06	PUT
EPHA8	-1.165319	1.88E-06	9.82E-06	PUT
KCNS2	-1.4867685	1.90E-06	9.94E-06	PUT
HAR1A	-1.0808726	1.83E-06	9.61E-06	PUT
SLC2A13	-1.0707394	1.49E-06	8.09E-06	PUT
PCSK2	-1.2328776	1.50E-06	8.12E-06	PUT
RPH3A	-1.2332968	1.52E-06	8.20E-06	PUT
LNK1	-1.1470864	1.62E-06	8.66E-06	PUT
FRMD6-AS1	1.00649501	2.02E-06	1.05E-05	PUT
FMOD	-1.060159	2.07E-06	1.07E-05	PUT
ELAVL2	-1.0193865	1.82E-06	9.59E-06	PUT
LINC01363	1.0446751	1.86E-06	9.73E-06	PUT
IQGAP3	1.08631224	2.03E-06	1.05E-05	PUT
TMEM121B	-1.178293	1.79E-06	9.43E-06	PUT
CHRNA2	-1.4079897	1.75E-06	9.26E-06	PUT
GREM2	-1.0344411	2.04E-06	1.05E-05	PUT
VSTM2L	-1.1127778	1.78E-06	9.40E-06	PUT
THOC7-AS1	1.13816198	1.72E-06	9.13E-06	PUT
NRGN	-1.4478441	2.01E-06	1.04E-05	PUT
SLC32A1	-1.686548	1.82E-06	9.57E-06	PUT
PDGFD	-1.135302	2.42E-06	1.22E-05	PUT
ACTL6B	-1.2285468	1.90E-06	9.91E-06	PUT
HGFAC	1.4246927	2.38E-06	1.20E-05	PUT
GPR139	-2.0646948	2.10E-06	1.08E-05	PUT
IL6	2.07786752	1.79E-06	9.43E-06	PUT
WT1	-1.5930765	2.35E-06	1.19E-05	PUT

NCDN	-1.406054	2.27E-06	1.15E-05	PUT
ARPP21	-1.4227219	2.21E-06	1.13E-05	PUT
LINC01676	1.22041231	1.94E-06	1.01E-05	PUT
KCNK9	-1.4350438	2.60E-06	1.30E-05	PUT
NKX1-2	-1.0712519	2.25E-06	1.15E-05	PUT
SLITRK3	-1.0372548	2.21E-06	1.13E-05	PUT
LYPD4	1.21892694	2.00E-06	1.04E-05	PUT
ICAM5	-1.5978484	2.14E-06	1.10E-05	PUT
LOC101929353	-1.760099	2.41E-06	1.22E-05	PUT
SH3GL2	-1.2390576	2.12E-06	1.09E-05	PUT
CXCL1	1.69707714	2.62E-06	1.31E-05	PUT
LOC102723831	1.50235689	2.01E-06	1.04E-05	PUT
KLHL10	-1.3038876	2.11E-06	1.09E-05	PUT
NSG2	-1.4900751	2.34E-06	1.19E-05	PUT
PCP4L1	-1.6733706	2.20E-06	1.12E-05	PUT
FSTL4	-1.2766079	2.40E-06	1.21E-05	PUT
P4HA2	1.02529117	2.48E-06	1.25E-05	PUT
CACNG1	-1.433164	2.77E-06	1.37E-05	PUT
RGS4	-1.2747046	2.23E-06	1.14E-05	PUT
EEF1A2	-1.2903812	2.38E-06	1.20E-05	PUT
SMPD3	-1.1371236	2.24E-06	1.14E-05	PUT
C6orf141	-1.7061529	2.84E-06	1.40E-05	PUT
HSPA1A	1.77743312	2.54E-06	1.27E-05	PUT
TPBG	-1.2995629	2.37E-06	1.20E-05	PUT
ADH1B	1.16307573	3.12E-06	1.51E-05	PUT
SLC16A12	1.00431619	3.16E-06	1.53E-05	PUT
GUCA1A	-1.1069352	3.09E-06	1.50E-05	PUT
GLS2	-1.1977189	2.66E-06	1.32E-05	PUT
FGF18	1.03647076	3.07E-06	1.49E-05	PUT
CD81-AS1	-1.1219967	2.78E-06	1.37E-05	PUT
HIPK4	-1.5383989	2.72E-06	1.35E-05	PUT
LINC00242	-1.1686847	3.38E-06	1.61E-05	PUT
PHKA1-AS1	1.03871318	3.00E-06	1.47E-05	PUT
VSTM5	-1.3039573	3.36E-06	1.61E-05	PUT
SMIM32	-1.6025348	3.44E-06	1.64E-05	PUT
HSPA1B	1.6418131	2.84E-06	1.40E-05	PUT
SYT5	-1.1525809	2.68E-06	1.33E-05	PUT
PHEX-AS1	-1.0489778	3.34E-06	1.60E-05	PUT
LOC285847	1.16129689	3.18E-06	1.53E-05	PUT
COMP	1.05146371	3.44E-06	1.64E-05	PUT
SLC6A17	-1.2195525	2.70E-06	1.34E-05	PUT
ACY3	-1.4766892	3.62E-06	1.71E-05	PUT

ADAMTS3	-1.1463547	3.37E-06	1.61E-05	PUT
HSP90AA1	1.02935115	3.41E-06	1.63E-05	PUT
SYT4	-1.3817057	2.90E-06	1.42E-05	PUT
NMUR2	1.58411697	3.87E-06	1.81E-05	PUT
MRAP2	-1.0005396	3.43E-06	1.64E-05	PUT
KIAA1549L	-1.0734968	2.93E-06	1.44E-05	PUT
FLJ46284	1.513421	2.98E-06	1.46E-05	PUT
PSPN	1.23085099	3.36E-06	1.61E-05	PUT
ATP6V1B1- AS1	1.11701857	3.78E-06	1.78E-05	PUT
MACROD2- IT1	1.50747478	3.41E-06	1.63E-05	PUT
SH2D7	1.07721137	4.12E-06	1.92E-05	PUT
LINC02393	1.30325084	3.69E-06	1.74E-05	PUT
PAPPA-AS1	2.48468546	3.06E-06	1.49E-05	PUT
HTR1E	-1.3350533	4.48E-06	2.07E-05	PUT
CPLX2	-1.3596852	3.84E-06	1.80E-05	PUT
SCRT1	-1.0595278	3.40E-06	1.63E-05	PUT
ENTPD3	-1.4959058	3.52E-06	1.67E-05	PUT
GLDN	-1.0280581	3.42E-06	1.63E-05	PUT
LOC100129620	-1.2123487	3.70E-06	1.74E-05	PUT
UPK1A	1.66213892	3.33E-06	1.60E-05	PUT
SNX31	1.50267784	4.64E-06	2.13E-05	PUT
ATP1A3	-1.5043845	4.15E-06	1.93E-05	PUT
ADCY10	1.07871569	5.05E-06	2.29E-05	PUT
PNCK	-1.0588067	3.97E-06	1.85E-05	PUT
INHA	-1.0601271	5.36E-06	2.40E-05	PUT
CHRNA3	-1.1947739	5.35E-06	2.40E-05	PUT
CARNS1	-1.2355738	4.22E-06	1.96E-05	PUT
HTR2C	-1.6075889	4.19E-06	1.95E-05	PUT
KDF1	2.03206011	4.13E-06	1.92E-05	PUT
KCNH1	-1.044341	4.62E-06	2.12E-05	PUT
PTPRN	-1.2925251	4.44E-06	2.05E-05	PUT
EGR4	-1.4855845	5.19E-06	2.34E-05	PUT
CACNA2D4	-1.0555415	6.09E-06	2.69E-05	PUT
LOC100130264	1.12879636	5.16E-06	2.33E-05	PUT
AOC1	1.29404445	4.59E-06	2.11E-05	PUT
BBOX1-AS1	1.01500179	5.11E-06	2.31E-05	PUT
MAGI2-AS2	1.80250844	4.12E-06	1.92E-05	PUT
SPINK8	1.00995212	4.98E-06	2.26E-05	PUT
NFE2	1.21156418	5.62E-06	2.51E-05	PUT
LINC01616	-1.2706783	5.84E-06	2.59E-05	PUT
SPDEF	-1.1078598	5.87E-06	2.60E-05	PUT
CHRM4	-1.8111623	5.62E-06	2.51E-05	PUT

TXK	1.12829705	6.14E-06	2.71E-05	PUT
PAX7	-1.4475222	6.18E-06	2.73E-05	PUT
LOC100129603	1.74773788	5.05E-06	2.29E-05	PUT
FLJ37201	1.3264409	4.78E-06	2.18E-05	PUT
HES2	1.01792578	6.43E-06	2.82E-05	PUT
HILPDA	1.06508729	5.55E-06	2.48E-05	PUT
SNCB	-1.0573595	5.35E-06	2.40E-05	PUT
CPLX1	-1.0505547	5.63E-06	2.51E-05	PUT
LINC00484	1.34784934	5.42E-06	2.43E-05	PUT
ACPP	1.1390641	7.48E-06	3.21E-05	PUT
L1CAM	-1.4023708	5.53E-06	2.47E-05	PUT
STAB2	1.12646009	6.66E-06	2.91E-05	PUT
MYADML2	-1.0132325	7.05E-06	3.05E-05	PUT
RGS9	-1.2190905	5.56E-06	2.48E-05	PUT
WNT1	-1.6168081	7.48E-06	3.21E-05	PUT
RTL9	-1.251982	7.75E-06	3.31E-05	PUT
GPRIN3	-1.0478494	5.71E-06	2.54E-05	PUT
LOC286178	1.20826262	7.07E-06	3.06E-05	PUT
SLC11A1	1.00308964	6.48E-06	2.84E-05	PUT
TMEM239	1.1365672	8.04E-06	3.42E-05	PUT
LINC01993	1.04716661	8.77E-06	3.69E-05	PUT
HPGD	-1.0850227	8.67E-06	3.65E-05	PUT
MT1H	1.59975823	8.14E-06	3.46E-05	PUT
EGFL6	-1.4932537	6.88E-06	2.98E-05	PUT
RGS8	-1.5007728	6.69E-06	2.92E-05	PUT
WSCD2	-1.2626694	6.83E-06	2.96E-05	PUT
LOC101928663	1.42824995	7.18E-06	3.10E-05	PUT
PAK6	-1.1288077	7.04E-06	3.05E-05	PUT
DLGAP2	-1.1469199	7.36E-06	3.17E-05	PUT
PHACTR2-AS1	1.16710717	8.07E-06	3.43E-05	PUT
C10orf105	1.27120089	7.46E-06	3.21E-05	PUT
STK26	-1.1077273	9.59E-06	4.00E-05	PUT
MTRNR2L1	1.2096468	9.84E-06	4.09E-05	PUT
LOC101929613	1.22077491	9.10E-06	3.81E-05	PUT
RAB27B	-1.2214639	1.00E-05	4.15E-05	PUT
RNU4ATAC	1.24920672	8.76E-06	3.69E-05	PUT
CAMKV	-1.3798937	7.95E-06	3.39E-05	PUT
KRT86	-1.1110112	9.78E-06	4.06E-05	PUT
KCNG3	-1.2614872	1.07E-05	4.40E-05	PUT
LOC100506071	-1.5898046	1.08E-05	4.42E-05	PUT
TNFRSF6B	3.66915316	1.08E-05	4.42E-05	PUT
LINC00159	1.19170045	8.60E-06	3.63E-05	PUT

DNAH3	1.10027495	1.02E-05	4.22E-05	PUT
CNTN5	-1.0896051	1.13E-05	4.62E-05	PUT
TMIE	1.27169718	1.08E-05	4.44E-05	PUT
CXCR2	1.05472089	1.18E-05	4.78E-05	PUT
MTRNR2L7	1.05070004	1.16E-05	4.70E-05	PUT
LINC00692	1.11067705	9.98E-06	4.14E-05	PUT
DNAH12	1.0924052	1.16E-05	4.71E-05	PUT
OCA2	-1.2918459	1.24E-05	4.99E-05	PUT
CHRM1	-1.4323316	9.06E-06	3.80E-05	PUT
CARNMT1- AS1	1.11667069	1.26E-05	5.06E-05	PUT
LAMP5	-1.4950028	9.24E-06	3.86E-05	PUT
PIANP	-1.2145974	9.43E-06	3.94E-05	PUT
ST8SIA2	-1.3581735	1.32E-05	5.29E-05	PUT
LOC105373021	-1.1256735	1.29E-05	5.15E-05	PUT
LEXM	-1.2584583	1.26E-05	5.05E-05	PUT
KCNB2	-1.0630625	1.37E-05	5.45E-05	PUT
LINC00901	1.19168994	1.23E-05	4.96E-05	PUT
TUBB1	1.0316452	1.20E-05	4.85E-05	PUT
EGR3	-1.216502	1.00E-05	4.14E-05	PUT
GRM5	-1.0312025	9.88E-06	4.10E-05	PUT
TM4SF1	1.0199642	1.02E-05	4.23E-05	PUT
CACNG3	-1.3772317	1.01E-05	4.19E-05	PUT
HPCA	-1.5134073	1.14E-05	4.65E-05	PUT
LINC01596	1.02684285	1.37E-05	5.44E-05	PUT
POU4F1	1.22408319	1.28E-05	5.14E-05	PUT
C16orf90	1.6027441	1.05E-05	4.34E-05	PUT
KCNAB2	-1.0172874	1.08E-05	4.44E-05	PUT
RASD2	-1.4488649	1.11E-05	4.56E-05	PUT
CPLX3	-1.0307866	1.36E-05	5.40E-05	PUT
TRDN	1.15256398	1.42E-05	5.63E-05	PUT
MTRNR2L10	1.10842942	1.15E-05	4.68E-05	PUT
CACNA1H	-1.1430396	1.08E-05	4.42E-05	PUT
RAP1GAP	-1.1625991	1.18E-05	4.78E-05	PUT
ST8SIA3	-1.4793347	1.14E-05	4.65E-05	PUT
RNY1	1.14190146	1.14E-05	4.66E-05	PUT
SNORD63	1.40593394	1.34E-05	5.34E-05	PUT
OR2W3	-1.3438038	1.47E-05	5.77E-05	PUT
C6orf118	1.17640689	1.59E-05	6.21E-05	PUT
GABRG2	-1.2431989	1.16E-05	4.70E-05	PUT
STAC	-1.0121913	1.62E-05	6.33E-05	PUT
MYBPH	1.14790268	1.62E-05	6.32E-05	PUT
NMRK2	1.79259455	1.25E-05	5.02E-05	PUT

GJA3	-1.4915006	1.56E-05	6.10E-05	PUT
ALOX12B	-1.0214899	1.63E-05	6.35E-05	PUT
CCDC87	-1.0324393	1.58E-05	6.17E-05	PUT
MIR144	1.06981994	1.64E-05	6.37E-05	PUT
ANKRD63	-1.6937802	1.70E-05	6.55E-05	PUT
GOLGA8T	-2.1687607	1.63E-05	6.35E-05	PUT
TMEM130	-1.0812543	1.26E-05	5.07E-05	PUT
CCKBR	-1.2538922	1.64E-05	6.37E-05	PUT
MPZL2	1.14475368	1.72E-05	6.64E-05	PUT
LTB4R2	-1.0181966	1.72E-05	6.64E-05	PUT
PACSIN1	-1.2131664	1.41E-05	5.57E-05	PUT
S100A8	2.05479026	1.86E-05	7.13E-05	PUT
GABRB3	-1.0854958	1.34E-05	5.35E-05	PUT
HEATR9	1.12195219	1.90E-05	7.23E-05	PUT
SGCG	-1.0724816	1.77E-05	6.80E-05	PUT
GABRA3	-1.0344506	1.69E-05	6.55E-05	PUT
RPE65	-1.8295333	1.82E-05	7.00E-05	PUT
POTEH	2.01164612	1.91E-05	7.27E-05	PUT
DSG3	1.29811705	1.67E-05	6.48E-05	PUT
CBLN4	-1.5769518	2.01E-05	7.59E-05	PUT
SLC8A2	-1.1294139	1.46E-05	5.74E-05	PUT
LTA	1.45330151	1.66E-05	6.44E-05	PUT
SYNGR3	-1.0836107	1.48E-05	5.81E-05	PUT
PWAR1	1.03390089	2.08E-05	7.82E-05	PUT
LINC00485	1.07778439	2.17E-05	8.12E-05	PUT
TAC1	-1.6833435	1.56E-05	6.10E-05	PUT
XKR7	-1.0553018	2.19E-05	8.17E-05	PUT
SLC1A7	1.66816662	2.35E-05	8.70E-05	PUT
MTRNR2L6	1.19199475	1.85E-05	7.09E-05	PUT
GADD45G	1.06982815	2.01E-05	7.60E-05	PUT
PRH1-TAS2R14	-1.3937843	2.35E-05	8.70E-05	PUT
INA	-1.2196038	1.65E-05	6.42E-05	PUT
MAGEL2	-1.2591656	2.13E-05	7.96E-05	PUT
MS4A14	1.21082854	2.39E-05	8.84E-05	PUT
GABRA1	-1.0952678	1.77E-05	6.80E-05	PUT
LOC101927139	1.13929354	2.46E-05	9.06E-05	PUT
LOC100131635	1.53301263	2.05E-05	7.73E-05	PUT
FAM189A1	-1.0117156	1.88E-05	7.17E-05	PUT
ODF3L2	1.07677278	2.59E-05	9.48E-05	PUT
KCNC2	-1.4952735	2.46E-05	9.07E-05	PUT
LOC101928140	1.20044999	2.55E-05	9.35E-05	PUT
COL25A1	-1.1983397	2.33E-05	8.64E-05	PUT

GY82	1.21701603	2.62E-05	9.56E-05	PUT
LINC01679	1.29036035	2.59E-05	9.47E-05	PUT
SHISAL1	-1.1042253	2.19E-05	8.18E-05	PUT
PTPRT	-1.0663613	2.16E-05	8.06E-05	PUT
RNU12	1.15765628	3.12E-05	0.00011196	PUT
FRG2C	1.19427058	3.16E-05	0.00011331	PUT
RIMBP3C	-1.6117864	3.18E-05	0.00011384	PUT
FNDC1	-1.4299842	3.22E-05	0.00011512	PUT
SP9	-1.2561397	3.07E-05	0.0001104	PUT
ANO3	-1.6702531	2.40E-05	8.88E-05	PUT
NCR1	1.11553667	3.07E-05	0.0001103	PUT
KCNK4	-1.0210344	3.06E-05	0.0001102	PUT
FAM155A-IT1	1.18748805	3.48E-05	0.00012286	PUT
FOXF1	1.02071297	3.22E-05	0.00011517	PUT
TRIML2	-1.2858143	3.18E-05	0.00011384	PUT
DNAJB5-DT	1.45606216	2.88E-05	0.00010465	PUT
ZSWIM8-AS1	1.11616063	3.60E-05	0.00012654	PUT
CEACAM5	1.17834987	3.37E-05	0.00011973	PUT
MIR320D1	1.2502655	3.23E-05	0.00011525	PUT
GLRA4	-1.1729469	3.45E-05	0.00012186	PUT
CRH	-1.2148764	3.75E-05	0.0001313	PUT
SNORA12	1.29270555	3.60E-05	0.0001266	PUT
KCNIP2	-1.0555365	2.75E-05	0.00010018	PUT
UNC5D	-1.0295656	3.34E-05	0.00011883	PUT
AGAP2	-1.1329867	2.91E-05	0.00010541	PUT
AADACL3	1.01301541	3.43E-05	0.00012154	PUT
NIBAN3	1.28834096	3.79E-05	0.00013237	PUT
TEX101	1.13726251	3.99E-05	0.00013876	PUT
CENPVL1	-1.143522	4.01E-05	0.00013925	PUT
PCDH8	-1.3708923	3.06E-05	0.0001102	PUT
ANKRD34C-AS1	-1.0004328	4.45E-05	0.00015209	PUT
MCHR2	-1.2937925	4.25E-05	0.00014609	PUT
EVPL	-1.1938082	4.40E-05	0.00015093	PUT
CACNA1S	-1.0896298	4.55E-05	0.00015527	PUT
DLGAP3	-1.0755239	3.11E-05	0.00011185	PUT
C20orf173	1.25114995	4.00E-05	0.00013891	PUT
S100A12	2.34229451	4.06E-05	0.00014072	PUT
SCX	1.03343927	4.73E-05	0.00016062	PUT
PLCXD2	-1.2163744	4.61E-05	0.00015708	PUT
VSTM2A	-1.1174816	3.43E-05	0.00012154	PUT
TESPA1	-1.2925976	3.40E-05	0.0001205	PUT
LOC101927950	1.19594313	5.17E-05	0.0001737	PUT

C19orf33	1.02977083	5.22E-05	0.00017533	PUT
DRD3	-1.6535917	5.33E-05	0.00017827	PUT
ANGPTL4	1.01127961	3.56E-05	0.0001255	PUT
ST6GALNAC5	-1.1596476	4.49E-05	0.00015345	PUT
LIN28B-AS1	-1.0642536	5.32E-05	0.00017791	PUT
SNORD115-45	-1.22782	5.43E-05	0.00018104	PUT
CLTRN	-1.0056411	5.75E-05	0.00019059	PUT
LINC01570	1.03076521	5.33E-05	0.00017823	PUT
GLI1	1.3764595	6.09E-05	0.00020068	PUT
MIR3663HG	1.21511698	6.02E-05	0.00019877	PUT
RN7SK	1.2464534	4.41E-05	0.00015104	PUT
KCNQ5	-1.3116568	4.25E-05	0.00014624	PUT
MTRNR2L4	1.15601781	4.59E-05	0.00015645	PUT
FOXN4	1.39075895	5.27E-05	0.0001765	PUT
FAM163A	-1.1724926	6.60E-05	0.00021466	PUT
SMAD1-AS2	1.48953209	5.99E-05	0.00019778	PUT
PENK	-1.9039455	4.93E-05	0.00016651	PUT
CDHR5	-1.067164	6.53E-05	0.00021275	PUT
AMN	1.06392266	6.85E-05	0.00022159	PUT
LOC401442	-1.1611742	7.26E-05	0.00023334	PUT
SCG2	-1.1863882	5.26E-05	0.0001763	PUT
ATOH7	-1.0468378	7.65E-05	0.0002446	PUT
TMEM238L	1.35154528	7.12E-05	0.0002292	PUT
TUNAR	-1.1601803	5.24E-05	0.00017588	PUT
DSCAM-IT1	1.26542616	7.26E-05	0.00023334	PUT
MMRN1	1.4384137	8.13E-05	0.00025811	PUT
GOLGA8K	-1.6761443	8.11E-05	0.00025761	PUT
CHGA	-1.0148629	5.53E-05	0.00018404	PUT
LINC01123	-1.0929145	7.13E-05	0.00022945	PUT
DNMT3L	1.45862905	7.69E-05	0.0002456	PUT
TMPRSS11A	1.02768958	8.45E-05	0.0002669	PUT
CKM	1.1615722	9.51E-05	0.00029615	PUT
SPRNP1	-1.1215528	9.61E-05	0.00029877	PUT
SPTB	-1.0940311	6.61E-05	0.00021488	PUT
ADAMTSL1	-1.0227746	0.00010255	0.00031673	PUT
PAQR9	-1.1656308	0.00010245	0.00031652	PUT
CUZD1	1.20613123	0.0001017	0.00031441	PUT
CP	1.33938763	7.16E-05	0.00023032	PUT
FAM237A	-1.1862898	0.00010599	0.00032626	PUT
C3orf86	1.07414365	9.89E-05	0.00030702	PUT
MME	-1.2710676	7.38E-05	0.00023691	PUT
SYN2	-1.2429235	7.20E-05	0.00023149	PUT

HTR3A	-1.3557853	0.00010953	0.00033595	PUT
RNA5S9	1.8981806	0.00011449	0.00034909	PUT
CAMK4	-1.0901732	7.52E-05	0.00024108	PUT
LOC101927447	1.00123619	0.00011216	0.00034283	PUT
MTRNR2L8	1.03086112	0.00011458	0.00034924	PUT
ETV2	1.03768592	0.00010945	0.00033588	PUT
RNF216-IT1	1.20240247	0.0001152	0.00035058	PUT
CRYGD	-1.1718373	0.00011869	0.0003597	PUT
CRYM	-1.3446854	8.15E-05	0.00025877	PUT
OLFM4	-1.1211321	0.00012809	0.00038519	PUT
PDYN	-1.7184185	8.77E-05	0.00027611	PUT
PTPN5	-1.322763	9.23E-05	0.00028844	PUT
FAM81B	1.38188421	0.00013468	0.00040248	PUT
ZBTB20-AS5	1.26566877	0.00013102	0.00039272	PUT
TNFRSF11B	1.33416251	0.00014288	0.0004242	PUT
GAD2	-1.3163714	9.21E-05	0.00028791	PUT
KCNJ1	-1.1838585	0.00013975	0.00041599	PUT
LOC642366	-1.1612138	0.00014543	0.00043082	PUT
SOST	1.48331124	0.00012511	0.00037699	PUT
FER1L6-AS2	-1.0384716	0.0001471	0.00043529	PUT
RPRML	-1.1186537	0.00012015	0.00036355	PUT
PHYHIP	-1.0286228	0.00011004	0.00033709	PUT
LYPD6B	-1.0990401	0.00016027	0.00046949	PUT
RDH8	1.12874869	0.00016599	0.00048401	PUT
NR1I2	-1.0697346	0.00015726	0.00046168	PUT
LOC153910	1.07696594	0.00015806	0.00046375	PUT
CCDC168	1.70913535	0.00015195	0.00044796	PUT
IL1R2	1.83792935	0.00015711	0.00046138	PUT
KCNJ4	-1.2928253	0.00010964	0.00033624	PUT
DLEC1	1.00009735	0.00013821	0.00041186	PUT
SLC17A4	1.19940637	0.00018093	0.00052349	PUT
RIMBP3	-1.3815093	0.00018653	0.00053789	PUT
CHRNA	1.00947266	0.00019112	0.00054989	PUT
RNA5-8SN5	1.46260988	0.00014085	0.00041881	PUT
FLT4	-1.0744288	0.00013003	0.00039007	PUT
C7orf57	-1.1645044	0.00019532	0.00056036	PUT
LINC01589	1.17660339	0.00019379	0.00055696	PUT
ISLR2	-1.0461271	0.00013471	0.00040252	PUT
LINC02185	1.11789174	0.00021678	0.00061357	PUT
PGM5P4-AS1	-1.3779851	0.00020186	0.00057685	PUT
PDILT	1.30210698	0.00019745	0.00056517	PUT
GRIN1	-1.1038922	0.00015246	0.00044933	PUT

ZFP91-CNTF	2.53955073	0.00020435	0.00058289	PUT
C12orf71	1.15584973	0.00023867	0.00066776	PUT
SNORA73B	1.59104278	0.00023286	0.00065346	PUT
DRD2	-1.2167843	0.00015268	0.00044985	PUT
HSPA6	2.12062662	0.0001952	0.00056023	PUT
PRTN3	-1.0558254	0.00025978	0.00071929	PUT
HLA-DOB	-1.1385758	0.00025261	0.00070097	PUT
MIR8082	1.06636401	0.00025935	0.00071821	PUT
SYNPR	-1.2898295	0.00016864	0.00049085	PUT
HES5	-1.1077826	0.00024903	0.00069246	PUT
SAPCD1	-1.1900224	0.00027005	0.00074545	PUT
TH	-1.3625821	0.00024211	0.00067637	PUT
CAMK1G	-1.0699441	0.00016678	0.00048588	PUT
FAT2	-1.180598	0.00021985	0.00062143	PUT
LY6K	1.04001549	0.00028795	0.00079048	PUT
IGFBP3	1.2925394	0.00023358	0.00065514	PUT
CATSPERD	1.31282579	0.0002911	0.00079799	PUT
SLCO4A1-AS1	1.37113593	0.00030421	0.00082985	PUT
DLX5	-1.0104342	0.00024434	0.00068191	PUT
LINC00930	1.13583716	0.00030795	0.00083836	PUT
GDF15	1.24847384	0.00031771	0.0008611	PUT
SCARA5	-1.18882	0.00032041	0.00086731	PUT
NFIA-AS1	1.09855472	0.00032004	0.00086656	PUT
ISL1	-1.0149921	0.00030513	0.00083191	PUT
HNF1A	1.07852956	0.00032241	0.00087235	PUT
H4C4	1.61031136	0.00031702	0.00085997	PUT
SNORA73A	1.8396233	0.00036895	0.00098288	PUT
ARHGAP40	-1.082966	0.00037356	0.00099319	PUT
GNA14-AS1	1.06779898	0.00037101	0.00098751	PUT
RNU2-1	1.06399749	0.00023669	0.00066318	PUT
SNORA81	2.03910814	0.00037119	0.00098777	PUT
RNA5S1	1.82649168	0.00024659	0.00068717	PUT
F13A1	-1.0235348	0.00031573	0.00085671	PUT
NBPF4	-1.7602419	0.00038215	0.00101489	PUT
TMX2-CTNND1	-1.4326243	0.0003921	0.00103841	PUT
GPR6	-1.2901172	0.00026549	0.00073391	PUT
SV2C	-1.1279167	0.00026354	0.00072895	PUT
SLPI	1.23834154	0.00044429	0.00116139	PUT
SERPINC1	1.06251309	0.00046147	0.00120332	PUT
LUM	-1.2018547	0.000487	0.00126039	PUT
GOS2	1.22729268	0.00043151	0.00113086	PUT
TERT	-1.1039116	0.00049772	0.00128427	PUT

PPIAL4E	1.27717319	0.00052469	0.00134455	PUT
MIR5689HG	1.03651364	0.00053938	0.00137809	PUT
LOC101929341	1.00938173	0.00054035	0.00137998	PUT
CT45A1	-1.823206	0.0005073	0.00130615	PUT
PEX5L-AS2	1.0912417	0.00055006	0.00140237	PUT
SERPINA3	1.26655694	0.00034097	0.0009167	PUT
TCL1B	1.06078324	0.00060595	0.00152701	PUT
GZMM	1.06833996	0.00062936	0.00158014	PUT
SNORA54	1.22588342	0.00062857	0.00157837	PUT
IL18R1	1.12756224	0.00065841	0.00164331	PUT
ALOX15B	1.19141808	0.00075419	0.00185407	PUT
IL1RL1	1.65469559	0.00059435	0.00149997	PUT
DCLK3	-1.0394887	0.00051027	0.00131256	PUT
IL13RA2	-1.022344	0.00070927	0.0017557	PUT
OTOF	-1.1299066	0.00045169	0.00117962	PUT
S100A9	1.53128835	0.00067018	0.00166944	PUT
CELF3	-1.0004157	0.00049729	0.00128333	PUT
GJA9	1.87589505	0.00078916	0.00193079	PUT
SERPINA5	1.25341737	0.00077351	0.0018969	PUT
DNAAF3	1.11861027	0.000962	0.00229857	PUT
COCH	-1.2441894	0.00061483	0.00154714	PUT
RNU4-2	1.13083821	0.00076125	0.00186926	PUT
SYNDIG1L	-1.013332	0.00077098	0.0018912	PUT
BCL2A1	1.23340304	0.00127434	0.00294876	PUT
SNORA53	1.05492832	0.00134955	0.00310389	PUT
PCK1	1.0616716	0.0011894	0.00276978	PUT
MIR4451	1.17174492	0.00135978	0.00312287	PUT
KCNQ1DN	-1.0656709	0.00143057	0.00326767	PUT
HGD	1.02589809	0.00144643	0.00330111	PUT
RNA28SN5	1.04733261	0.00126115	0.00292144	PUT
PRKCG	-1.0839791	0.00093658	0.0022449	PUT
SNORD15B	1.26521154	0.00184713	0.00410267	PUT
CLDN19	1.19974281	0.0019667	0.00433981	PUT
LGR6	-1.17907	0.00178765	0.00398315	PUT
RNU5A-1	1.04837947	0.00186403	0.00413683	PUT
RNU5B-1	1.00988912	0.0017944	0.00399677	PUT
CSF3	1.79654487	0.00212954	0.00466335	PUT
VSNL1	-1.0955815	0.00128029	0.00296181	PUT
NTS	-1.3374614	0.00233355	0.00505473	PUT
SNORA20	1.16223065	0.00261775	0.00559376	PUT
WDR38	1.18829696	0.00236866	0.00512204	PUT
ATE1-AS1	1.05615617	0.00231871	0.00502776	PUT

RNVU1-7	2.96494105	0.00207878	0.00456486	PUT
SNORA74B	1.04693763	0.00283885	0.00600101	PUT
NPB	-1.1740481	0.00299414	0.00628905	PUT
PKHD1L1	1.01950123	0.00310813	0.00649828	PUT
MMP23B	1.09553686	0.00323668	0.00673516	PUT
FAM72D	-1.172596	0.00346588	0.00715719	PUT
LOC100130238	1.48845322	0.00353232	0.0072825	PUT
LCN6	1.04306086	0.00405094	0.00821525	PUT
GPR88	-1.1729627	0.0019645	0.00433547	PUT
TPSD1	1.13575507	0.00416228	0.00841676	PUT
SNORD14E	1.15667444	0.00423389	0.00854247	PUT
GOLGA8F	1.29169193	0.00457652	0.00915786	PUT
OR7A5	1.4625078	0.00473519	0.00943956	PUT
TAS2R39	1.05745654	0.00491128	0.00974454	PUT
CT45A6	-2.0504158	0.00477479	0.00950751	PUT
MIR3648-1	1.06360843	0.00421849	0.00851773	PUT
Clorf167	1.05427748	0.00469579	0.0093679	PUT
TVP23C- CDRT4	-1.3924563	0.00562637	0.01101147	PUT
CXCR1	1.33034009	0.00603917	0.0117323	PUT
CD177	1.25048312	0.00600147	0.01166503	PUT
HLA-DQA2	-1.7158686	0.00712644	0.01360725	PUT
NBPF6	-1.1941476	0.00728429	0.01387993	PUT
RNVU1-18	1.05245263	0.00374189	0.00766133	PUT
NLGN4Y-AS1	1.11738051	0.00796664	0.01503377	PUT
MAP3K19	1.07355153	0.00732986	0.01395416	PUT
ELOA3B	1.13184684	0.00996809	0.01835458	PUT
PSAPL1	1.10284784	0.01274318	0.02288518	PUT
RIMBP3B	-1.3336146	0.0131512	0.02354523	PUT
LRRC71	1.0108154	0.0101077	0.01858822	PUT
OR7C1	1.00526257	0.01361099	0.02424414	PUT
CCL19	-1.1180789	0.01285986	0.02306852	PUT
MEPE	-1.100718	0.01475473	0.02604681	PUT
FRG2	1.30330044	0.01829652	0.03152821	PUT
IGLL5	1.25426324	0.03002617	0.04910646	PUT
CXCL10	-1.0300091	0.02907796	0.04770775	PUT
TTR	1.62751247	0.02737066	0.04516029	PUT
HBB	-1.0010594	0.02729736	0.04505085	PUT
GPCPD1	-1.3723731	2.04E-17	3.87E-13	CAU
DHRS11	-1.08485	8.82E-16	8.37E-12	CAU
BFSP1	-1.32844	1.46E-15	9.22E-12	CAU
CIRBP	-1.1850312	5.09E-15	1.56E-11	CAU
RBM3	-1.2100339	6.67E-15	1.58E-11	CAU

JMJD6	1.24735168	1.62E-14	2.66E-11	CAU
KCNE4	1.05025416	1.83E-14	2.66E-11	CAU
NFKB2	1.20507155	1.91E-14	2.66E-11	CAU
TRIP10	1.31114985	2.36E-14	2.98E-11	CAU
COL27A1	1.38418504	3.36E-14	3.67E-11	CAU
NUP210L	1.90579871	2.72E-14	3.23E-11	CAU
TCAP	1.37506186	1.17E-13	1.11E-10	CAU
PCYOX1L	-1.2129692	2.01E-13	1.82E-10	CAU
MRPS6	1.15539141	2.49E-13	2.15E-10	CAU
RCC1	1.01822244	2.79E-13	2.30E-10	CAU
ANGPT2	1.50548965	3.34E-13	2.64E-10	CAU
SLCO4A1	2.65056086	4.10E-13	2.78E-10	CAU
H3C15	1.72434806	3.74E-13	2.68E-10	CAU
PHF21B	1.05820358	5.18E-13	3.07E-10	CAU
BCL6	1.13097151	7.15E-13	3.57E-10	CAU
H4C15	1.09378178	8.10E-13	3.84E-10	CAU
TRAM1L1	-1.0949859	8.76E-13	3.96E-10	CAU
GCNA	1.34185193	8.31E-13	3.85E-10	CAU
GPR4	2.0045704	9.34E-13	4.12E-10	CAU
PLK4	-1.5697162	4.66E-13	2.86E-10	CAU
SMTN	1.08622727	1.31E-12	4.98E-10	CAU
C7orf61	2.08538072	1.39E-12	5.19E-10	CAU
LEAP2	1.00386726	1.22E-12	4.90E-10	CAU
MKNK2	1.32446508	2.40E-12	7.34E-10	CAU
BNIP1	1.2525553	2.39E-12	7.34E-10	CAU
SLC5A3	1.30941651	3.41E-12	8.86E-10	CAU
SERPINF2	1.56005546	2.65E-12	7.69E-10	CAU
CERNA1	-1.4829476	2.48E-12	7.36E-10	CAU
SPR	1.39012838	5.38E-12	1.23E-09	CAU
SERTAD1	1.01881398	5.77E-12	1.27E-09	CAU
DYNC1H1	-1.0484776	7.27E-12	1.48E-09	CAU
MAFF	1.86467249	8.94E-12	1.71E-09	CAU
MEX3A	1.01906392	8.46E-12	1.69E-09	CAU
CHRM2	-1.6490179	1.02E-11	1.91E-09	CAU
PRSS8	1.06841689	8.82E-12	1.71E-09	CAU
SLC10A4	-2.0599396	1.27E-11	2.30E-09	CAU
CCDC62	1.02387864	1.47E-11	2.54E-09	CAU
IL17RB	1.03055278	1.91E-11	3.04E-09	CAU
NUPR1	1.34803939	1.93E-11	3.05E-09	CAU
HOOK2	1.00631488	2.02E-11	3.12E-09	CAU
NAA80	-1.2496817	2.16E-11	3.18E-09	CAU
LPIN3	1.08651412	2.19E-11	3.19E-09	CAU

CHORDC1	1.44773459	2.20E-11	3.19E-09	CAU
TNFRSF10D	1.84670106	2.12E-11	3.18E-09	CAU
C1orf94	-2.3825779	5.66E-12	1.27E-09	CAU
DDIT4	1.64986441	2.44E-11	3.43E-09	CAU
LSMEM1	1.26770852	1.90E-11	3.04E-09	CAU
ABCA11P	-1.0702344	2.47E-11	3.44E-09	CAU
CDKL1	1.01497157	2.82E-11	3.76E-09	CAU
NTRK1	-2.0147576	3.75E-11	4.78E-09	CAU
FOSL1	1.25858401	4.26E-11	5.22E-09	CAU
DCTN1-AS1	-1.0510665	5.05E-11	5.99E-09	CAU
DCAF12L2	-2.0512206	2.23E-11	3.21E-09	CAU
CCDC36	1.41698611	4.54E-11	5.53E-09	CAU
LINC00513	1.12834799	6.29E-11	7.24E-09	CAU
FAM151A	1.24865952	6.79E-11	7.67E-09	CAU
MIR639	1.21053708	8.23E-11	8.83E-09	CAU
MAP10	-1.3214528	6.93E-11	7.67E-09	CAU
HSPB1	2.15003778	8.98E-11	9.37E-09	CAU
KDM4D	-1.3453155	6.09E-11	7.05E-09	CAU
GPD1	-1.5506903	9.42E-11	9.67E-09	CAU
LRG1	1.2722891	8.01E-11	8.69E-09	CAU
MLKL	1.55381199	1.04E-10	1.04E-08	CAU
SERPINH1	2.4690271	1.15E-10	1.12E-08	CAU
SPACA6	1.02857406	1.32E-10	1.24E-08	CAU
CEL	1.16743441	1.18E-10	1.13E-08	CAU
FOXP1-AS1	1.17742523	1.04E-10	1.04E-08	CAU
SMIM10L2B	-1.2887804	1.52E-10	1.36E-08	CAU
TJP3	1.32908014	1.54E-10	1.36E-08	CAU
LOC441086	-1.2303615	1.54E-10	1.36E-08	CAU
LINC01310	-1.5536442	1.76E-10	1.45E-08	CAU
DNAJB1	2.14535584	2.13E-10	1.63E-08	CAU
ECEL1	-2.3471058	2.48E-10	1.85E-08	CAU
CLDN15	1.00911551	2.57E-10	1.90E-08	CAU
RIPOR3	1.12765737	3.18E-10	2.22E-08	CAU
BAG3	1.76721059	3.16E-10	2.21E-08	CAU
ITFG1	-1.0436116	3.23E-10	2.23E-08	CAU
AMY2A	-1.9978068	1.97E-10	1.55E-08	CAU
INSM2	-1.5283861	2.84E-10	2.03E-08	CAU
NEBL-AS1	-1.5780762	1.97E-10	1.55E-08	CAU
MIA	2.00016607	2.04E-10	1.57E-08	CAU
CYGB	-1.3313795	4.71E-10	2.83E-08	CAU
PCSK1	-1.8441074	5.11E-10	2.97E-08	CAU
CYP4X1	-1.2048881	5.59E-10	3.17E-08	CAU

SMOC2	-1.1423849	5.50E-10	3.13E-08	CAU
EVC2	1.41009999	5.10E-10	2.97E-08	CAU
NXPH1	-1.2985177	5.80E-10	3.28E-08	CAU
NXPH2	-2.2518536	1.78E-10	1.45E-08	CAU
STH	1.25524767	4.81E-10	2.86E-08	CAU
SH2D7	1.49204397	3.90E-10	2.49E-08	CAU
SLC5A7	-2.7174767	5.87E-10	3.30E-08	CAU
NPC1L1	2.12114559	3.52E-10	2.35E-08	CAU
CLEC2L	-1.3747119	6.39E-10	3.49E-08	CAU
SCUBE3	1.06135041	6.26E-10	3.46E-08	CAU
TECTA	-1.169304	8.24E-10	4.20E-08	CAU
PCAT19	1.3548122	8.22E-10	4.20E-08	CAU
ATOH8	1.18863134	7.98E-10	4.10E-08	CAU
RCAN2	-1.2914943	7.93E-10	4.08E-08	CAU
GDPD3	1.04172407	8.09E-10	4.14E-08	CAU
LOC100506274	-1.8379969	4.17E-10	2.58E-08	CAU
CMPK2	-1.0183068	9.02E-10	4.52E-08	CAU
GPR52	-2.4111866	8.79E-10	4.42E-08	CAU
KAZALD1	-1.0704608	7.61E-10	3.95E-08	CAU
KIRREL2	-1.3316264	8.76E-10	4.42E-08	CAU
LANCL1	-1.0120211	1.06E-09	5.14E-08	CAU
PLAC4	1.39818231	1.09E-09	5.25E-08	CAU
LINC01338	1.51084587	1.09E-09	5.25E-08	CAU
MALAT1	1.24541508	1.14E-09	5.40E-08	CAU
ETV4	1.05002366	1.11E-09	5.30E-08	CAU
EDN3	-1.4174065	1.32E-09	5.93E-08	CAU
SIX4	1.40302526	1.23E-09	5.62E-08	CAU
P4HA1	1.17856776	1.30E-09	5.85E-08	CAU
SYS1-DBNDD2	-1.3871575	1.45E-09	6.38E-08	CAU
SLC17A8	-1.7448531	1.39E-09	6.22E-08	CAU
H3C4	1.38727629	1.09E-09	5.25E-08	CAU
CRYM-AS1	1.04673651	1.41E-09	6.27E-08	CAU
HIF3A	1.0410077	1.66E-09	7.02E-08	CAU
CD38	-1.1845191	1.74E-09	7.25E-08	CAU
SERPINB11	1.79780862	9.06E-10	4.53E-08	CAU
ZBTB16	1.34823419	1.70E-09	7.12E-08	CAU
LOC284933	2.13470488	1.30E-09	5.86E-08	CAU
PRR26	1.1935552	1.89E-09	7.75E-08	CAU
LHFPL3	-1.2648853	2.07E-09	8.20E-08	CAU
C2orf80	-1.2630113	2.23E-09	8.62E-08	CAU
MDH1	-1.1197601	2.15E-09	8.42E-08	CAU
NHLRC1	-1.214925	1.96E-09	7.84E-08	CAU

FIBCD1	-1.6953657	1.90E-09	7.76E-08	CAU
ROBO2	-1.2267721	2.22E-09	8.62E-08	CAU
FRAS1	-1.2038609	2.67E-09	9.82E-08	CAU
RGL3	1.08268946	2.96E-09	1.06E-07	CAU
TMEFF1	-1.4213456	3.06E-09	1.09E-07	CAU
CKM	1.83227997	1.98E-09	7.87E-08	CAU
P4HA2	1.30354891	3.21E-09	1.13E-07	CAU
LOC101928123	1.23604973	2.99E-09	1.07E-07	CAU
KRT5	-1.6797165	2.30E-09	8.88E-08	CAU
HSPA1A	2.27797785	3.29E-09	1.15E-07	CAU
SHOC1	1.086694	3.47E-09	1.20E-07	CAU
NEAT1	1.47341534	3.39E-09	1.18E-07	CAU
LHX8	-2.3488129	3.23E-09	1.14E-07	CAU
CYP26A1	-2.245409	2.14E-09	8.39E-08	CAU
KCNE5	-1.2873944	3.83E-09	1.30E-07	CAU
HSPA1B	2.10823557	3.79E-09	1.29E-07	CAU
ZBED6	1.10407521	3.89E-09	1.32E-07	CAU
LINC01134	1.31854664	2.71E-09	9.93E-08	CAU
DSG1	-1.7754555	1.60E-09	6.83E-08	CAU
TUBB4A	-1.0199219	4.34E-09	1.43E-07	CAU
HPRT1	-1.0867896	4.26E-09	1.42E-07	CAU
BACE2	1.13363902	4.80E-09	1.55E-07	CAU
CCNA2	1.08017099	4.96E-09	1.59E-07	CAU
HS6ST2	-1.672455	5.47E-09	1.73E-07	CAU
TNFSF14	1.08249033	5.29E-09	1.67E-07	CAU
HSPB9	1.12419722	6.59E-09	2.01E-07	CAU
GKAP1	1.02323554	7.74E-09	2.26E-07	CAU
CLEC2B	1.27807678	8.39E-09	2.39E-07	CAU
NRIP3	-1.2146875	7.70E-09	2.25E-07	CAU
C9orf153	1.53335607	5.84E-09	1.82E-07	CAU
HSPA6	3.34050447	9.45E-09	2.63E-07	CAU
TEAD2	1.01775337	9.54E-09	2.65E-07	CAU
NDC80	1.19544054	9.26E-09	2.58E-07	CAU
TRPC3	-1.5942923	1.01E-08	2.77E-07	CAU
TUBB3	-1.0861575	9.15E-09	2.57E-07	CAU
PPP4R4	-1.1216634	1.00E-08	2.77E-07	CAU
CA4	-1.3389896	1.09E-08	2.93E-07	CAU
SLC10A1	1.61676952	7.39E-09	2.17E-07	CAU
GPR61	-1.1386335	1.16E-08	3.08E-07	CAU
TACR1	-1.7972532	1.15E-08	3.05E-07	CAU
SPHKAP	-1.463641	1.20E-08	3.17E-07	CAU
USP46-AS1	-1.3195712	1.01E-08	2.77E-07	CAU

IKBKE	-1.0962898	1.37E-08	3.50E-07	CAU
GPRC5A	1.35020661	1.31E-08	3.37E-07	CAU
GLTPD2	-1.1777472	1.35E-08	3.47E-07	CAU
NUGGC	1.05509967	1.53E-08	3.86E-07	CAU
RD3	1.09313936	1.50E-08	3.80E-07	CAU
COL25A1	-1.6545357	1.81E-08	4.43E-07	CAU
ZC3H12A	1.24035557	1.81E-08	4.43E-07	CAU
LINC01561	1.01340935	2.15E-08	5.00E-07	CAU
ATP5MGL	1.10503909	1.98E-08	4.72E-07	CAU
SGO1	1.21160519	1.72E-08	4.24E-07	CAU
MT2A	1.06330418	1.99E-08	4.72E-07	CAU
ABCG4	-1.0391599	2.30E-08	5.27E-07	CAU
SDR16C5	-1.3540863	2.07E-08	4.86E-07	CAU
OPCML	-1.2648591	2.13E-08	4.97E-07	CAU
TPBGL	-1.5242299	2.46E-08	5.59E-07	CAU
MAP3K5-AS1	1.10845672	1.99E-08	4.72E-07	CAU
DOCK9-DT	-1.3009753	2.53E-08	5.69E-07	CAU
PCLAF	1.17998705	2.87E-08	6.32E-07	CAU
FAM156B	-2.7902283	3.18E-08	6.82E-07	CAU
CLVS1	-1.3531197	3.13E-08	6.75E-07	CAU
RNF128	-1.2539519	3.36E-08	7.12E-07	CAU
CTRC	1.13957431	3.11E-08	6.73E-07	CAU
TOMM70	-1.0212671	3.00E-08	6.55E-07	CAU
NELL1	-1.3637308	3.56E-08	7.45E-07	CAU
H1-2	1.0451838	3.42E-08	7.21E-07	CAU
ARHGEF9	-1.0263905	3.18E-08	6.82E-07	CAU
VGF	-1.8009222	3.26E-08	6.94E-07	CAU
FOSL2	1.06532535	3.14E-08	6.77E-07	CAU
COL6A5	-1.8886652	1.85E-08	4.50E-07	CAU
CHAT	-2.4815272	3.55E-08	7.44E-07	CAU
LCA10	1.16620971	3.22E-08	6.87E-07	CAU
OLFM3	-1.4482847	3.77E-08	7.73E-07	CAU
PTPRR	-1.3044162	3.82E-08	7.78E-07	CAU
CX3CL1	-1.0614537	3.39E-08	7.16E-07	CAU
PLPPR4	-1.4404444	3.80E-08	7.75E-07	CAU
SLC7A11-AS1	1.506374	4.50E-08	8.78E-07	CAU
HAPLN1	-1.432953	4.25E-08	8.41E-07	CAU
SYT13	-1.4629647	4.15E-08	8.25E-07	CAU
MAGEE1	-1.2524113	4.14E-08	8.25E-07	CAU
PKP1	-1.4374166	4.33E-08	8.51E-07	CAU
MICB	1.15294934	4.98E-08	9.49E-07	CAU
LOC158434	1.2031047	4.90E-08	9.37E-07	CAU

DSCAM-AS1	1.33667644	5.10E-08	9.65E-07	CAU
LBX2	1.75022815	2.59E-08	5.80E-07	CAU
RAB20	1.06299464	5.51E-08	1.02E-06	CAU
DRD5	-1.3905389	5.45E-08	1.01E-06	CAU
SLC35G5	1.25090483	5.43E-08	1.01E-06	CAU
ARHGAP20	-1.2246323	5.18E-08	9.75E-07	CAU
LINC02210-CRHR1	-2.5782689	3.60E-08	7.51E-07	CAU
SCG5	-1.1759331	5.14E-08	9.71E-07	CAU
MT1M	1.28242049	5.37E-08	1.00E-06	CAU
SOC3	2.21089062	5.93E-08	1.08E-06	CAU
SORCS3	-1.0860581	5.91E-08	1.08E-06	CAU
CRYAB	1.09602668	6.29E-08	1.13E-06	CAU
CAPN12	1.33396232	5.91E-08	1.08E-06	CAU
TMEM132D	-1.1430819	6.47E-08	1.15E-06	CAU
GOLGA8J	-1.0304605	6.99E-08	1.22E-06	CAU
FAM167B	1.71905388	6.21E-08	1.12E-06	CAU
RASGRF1	-1.0817905	6.22E-08	1.12E-06	CAU
DEPP1	1.67066326	6.24E-08	1.12E-06	CAU
PNMA3	-1.0432638	6.52E-08	1.15E-06	CAU
KCNAB1	-1.5472418	6.42E-08	1.14E-06	CAU
COL26A1	-1.17024	7.27E-08	1.25E-06	CAU
SYT2	-1.7926528	6.60E-08	1.17E-06	CAU
LCN10	2.04592113	5.58E-08	1.03E-06	CAU
PSPN	1.45435644	4.83E-08	9.27E-07	CAU
DNMT3L	2.06665394	3.18E-08	6.82E-07	CAU
SLC17A9	1.18257489	7.83E-08	1.32E-06	CAU
RIT2	-1.1918451	8.71E-08	1.43E-06	CAU
ERN2	1.00080969	8.68E-08	1.43E-06	CAU
PHF24	-1.2893541	7.66E-08	1.30E-06	CAU
MAL2	-1.5632676	7.99E-08	1.34E-06	CAU
PRKX	1.01514662	8.09E-08	1.35E-06	CAU
PTPRN2	-1.1032969	8.29E-08	1.38E-06	CAU
SLC22A14	1.2913112	7.52E-08	1.28E-06	CAU
REP15	1.33118779	7.78E-08	1.31E-06	CAU
INSYN1-AS1	-1.384145	7.68E-08	1.30E-06	CAU
HROB	1.1311082	9.68E-08	1.56E-06	CAU
XK	-1.1437583	1.05E-07	1.66E-06	CAU
RGS7	-1.1590851	9.17E-08	1.50E-06	CAU
EIF4EBP1	1.12592473	1.09E-07	1.70E-06	CAU
RFPL1	-1.2750109	1.01E-07	1.61E-06	CAU
ARL4D	-1.1923097	1.05E-07	1.66E-06	CAU
PCDHAC2	-1.0293844	1.02E-07	1.62E-06	CAU

RAX2	1.15352047	9.60E-08	1.55E-06	CAU
NOS1	-1.0049575	9.68E-08	1.56E-06	CAU
LINC01730	1.2281773	9.93E-08	1.59E-06	CAU
NBPF10	1.04661419	9.97E-08	1.60E-06	CAU
PDP1	-1.1621004	1.01E-07	1.61E-06	CAU
HSP90AA1	1.17791619	1.18E-07	1.81E-06	CAU
SYTL5	-1.4234111	1.14E-07	1.76E-06	CAU
LNK1	-1.2766892	1.13E-07	1.74E-06	CAU
CKMT1A	-1.5143657	1.13E-07	1.75E-06	CAU
C20orf173	1.6734034	6.46E-08	1.15E-06	CAU
MTHFD2	1.07553595	1.25E-07	1.89E-06	CAU
SH3RF2	-1.5126216	1.26E-07	1.90E-06	CAU
LOC101927770	1.08570341	1.42E-07	2.09E-06	CAU
NSF	-1.2494597	1.23E-07	1.86E-06	CAU
POU2F3	1.25233017	1.41E-07	2.09E-06	CAU
SPDEF	-1.3171381	1.05E-07	1.66E-06	CAU
KRT86	-1.3457456	1.08E-07	1.69E-06	CAU
MYH6	-1.2200282	1.07E-07	1.69E-06	CAU
SLC7A4	-1.465907	1.56E-07	2.26E-06	CAU
PHKA1-AS1	1.18650032	1.10E-07	1.72E-06	CAU
DNAJB5-DT	1.89984443	7.05E-08	1.22E-06	CAU
MPEG1	-1.0541507	1.56E-07	2.27E-06	CAU
TRPV6	-1.0282895	1.53E-07	2.23E-06	CAU
GLT1D1	-1.255996	1.45E-07	2.13E-06	CAU
ALB	-1.3769823	1.33E-07	1.98E-06	CAU
LOC339666	1.07405582	1.41E-07	2.08E-06	CAU
MPO	-1.117334	1.64E-07	2.34E-06	CAU
RHOV	-1.6233567	1.24E-07	1.88E-06	CAU
CPNE4	-1.3718147	1.68E-07	2.38E-06	CAU
ZSCAN4	1.02625884	1.84E-07	2.56E-06	CAU
UBE2T	-1.043973	1.87E-07	2.59E-06	CAU
LOC283038	1.33278724	1.72E-07	2.44E-06	CAU
CEBPD	1.46405173	1.67E-07	2.38E-06	CAU
RAB40A	-1.2850839	1.77E-07	2.49E-06	CAU
LUCAT1	1.20412497	1.86E-07	2.57E-06	CAU
FBN3	-1.0107576	1.97E-07	2.69E-06	CAU
LOC285847	1.30692787	1.56E-07	2.27E-06	CAU
ACY3	-1.6271454	2.06E-07	2.78E-06	CAU
EGR2	-1.5046788	2.19E-07	2.91E-06	CAU
TMEM179	-1.2481305	2.04E-07	2.75E-06	CAU
MIR5690	2.07927043	9.76E-08	1.57E-06	CAU
HMOX1	1.07120784	1.98E-07	2.70E-06	CAU

TUBA8	-1.2557469	1.99E-07	2.71E-06	CAU
SNORA77	2.33140815	7.08E-08	1.23E-06	CAU
TDRD5	-1.4231579	2.29E-07	2.99E-06	CAU
SLC15A1	1.07617786	2.39E-07	3.10E-06	CAU
LINC01006	-1.1140438	2.31E-07	3.01E-06	CAU
VSTM5	-1.4529906	2.47E-07	3.16E-06	CAU
DACH2	-1.2426338	2.67E-07	3.33E-06	CAU
SGK2	-1.0929523	2.69E-07	3.34E-06	CAU
ATAD3C	1.09013335	2.65E-07	3.31E-06	CAU
MAB21L3	1.08697256	2.47E-07	3.16E-06	CAU
MYBPC1	1.0137194	2.47E-07	3.16E-06	CAU
HRG	1.2455654	3.05E-07	3.69E-06	CAU
C8orf49	1.08793794	3.00E-07	3.65E-06	CAU
GJA3	-1.805146	2.46E-07	3.16E-06	CAU
PKDCC	1.01082536	3.22E-07	3.85E-06	CAU
BCL3	1.1069034	3.23E-07	3.86E-06	CAU
LINC01843	1.11240224	2.41E-07	3.11E-06	CAU
ULK4P1	-1.1384294	3.08E-07	3.72E-06	CAU
BMP4	1.1156364	3.27E-07	3.90E-06	CAU
NSG1	-1.3941945	2.84E-07	3.50E-06	CAU
KIF1C	1.02953302	3.14E-07	3.78E-06	CAU
HNF1A	1.5916663	1.73E-07	2.44E-06	CAU
MIR8066	1.88833657	2.41E-07	3.11E-06	CAU
HAR1A	-1.1544865	3.53E-07	4.12E-06	CAU
DKK2	-1.3409312	2.93E-07	3.59E-06	CAU
FKBP4	1.02656259	3.15E-07	3.79E-06	CAU
EGR1	-1.0509317	3.17E-07	3.81E-06	CAU
LINC02288	1.08762983	3.88E-07	4.46E-06	CAU
CACNG1	-1.5684672	3.33E-07	3.95E-06	CAU
CSRP3	1.45010014	2.20E-07	2.92E-06	CAU
LINC00311	1.35628709	3.86E-07	4.45E-06	CAU
NETO1	-1.3105901	3.48E-07	4.08E-06	CAU
OTX2-AS1	1.15505867	3.82E-07	4.41E-06	CAU
LDB2	-1.0374237	3.39E-07	4.01E-06	CAU
GPR158	-1.3339347	3.43E-07	4.03E-06	CAU
KIRREL3-AS2	1.23334664	4.10E-07	4.66E-06	CAU
ALOX15B	1.81870217	3.73E-07	4.32E-06	CAU
TMEM196	-1.1730465	4.67E-07	5.18E-06	CAU
LINC00261	1.65819882	4.84E-07	5.33E-06	CAU
SVOP	-1.4397641	4.04E-07	4.61E-06	CAU
REM2	-1.355517	5.07E-07	5.53E-06	CAU
LINC01119	-1.2817381	4.59E-07	5.12E-06	CAU

STAT4	-1.1873089	5.06E-07	5.52E-06	CAU
CPXM1	-1.6248621	3.74E-07	4.33E-06	CAU
LOC100129620	-1.3396271	3.36E-07	3.98E-06	CAU
SOX1-OT	-1.1207678	5.23E-07	5.67E-06	CAU
GREM2	-1.0955978	5.05E-07	5.52E-06	CAU
C11orf87	-1.3709911	4.69E-07	5.19E-06	CAU
PRH1-TAS2R14	-1.674113	4.88E-07	5.37E-06	CAU
HNF1B	1.17008585	4.90E-07	5.38E-06	CAU
ANKRD37	1.08723162	4.96E-07	5.43E-06	CAU
SLC35G6	1.2624455	4.49E-07	5.03E-06	CAU
IGFBPL1	-1.495271	5.71E-07	6.05E-06	CAU
LHCGR	1.01285449	5.41E-07	5.82E-06	CAU
SMIM17	-1.1011061	6.17E-07	6.43E-06	CAU
IFITM2	1.0632689	5.09E-07	5.54E-06	CAU
LOC101927661	1.13072206	5.76E-07	6.09E-06	CAU
LINC00824	1.10352435	6.27E-07	6.52E-06	CAU
TUSC3	-1.0205604	5.24E-07	5.67E-06	CAU
C1orf210	1.19243816	5.42E-07	5.82E-06	CAU
NPY5R	-1.4087947	6.57E-07	6.78E-06	CAU
CALB1	-1.5963038	5.72E-07	6.06E-06	CAU
FAM237A	-1.5558523	6.12E-07	6.39E-06	CAU
RPE65	-2.0935123	5.35E-07	5.76E-06	CAU
EPB41L4A-DT	-1.0348712	6.31E-07	6.54E-06	CAU
UPK2	-1.3448939	5.42E-07	5.82E-06	CAU
PARM1	-1.2141891	5.85E-07	6.17E-06	CAU
SLC18A3	-1.8701164	7.28E-07	7.32E-06	CAU
AMBN	-2.2478828	7.18E-07	7.26E-06	CAU
LEXM	-1.4520061	5.84E-07	6.16E-06	CAU
KIF12	-1.4594326	7.74E-07	7.69E-06	CAU
EPHA8	-1.2025676	7.49E-07	7.50E-06	CAU
SV2B	-1.20726	6.34E-07	6.57E-06	CAU
SALRNA2	1.37055594	5.68E-07	6.03E-06	CAU
LOC102724163	1.05643056	8.09E-07	7.95E-06	CAU
CPZ	-1.3671292	6.95E-07	7.08E-06	CAU
CDA	1.34684017	8.01E-07	7.89E-06	CAU
NCR1	1.3492252	5.67E-07	6.03E-06	CAU
PRR23C	1.14144576	6.82E-07	6.98E-06	CAU
GZMM	1.57989039	5.99E-07	6.29E-06	CAU
CRH	-1.4582052	8.48E-07	8.27E-06	CAU
GBX2	-1.1481035	8.74E-07	8.48E-06	CAU
LINC01616	-1.3812661	8.43E-07	8.24E-06	CAU
GP2	1.11577881	8.21E-07	8.04E-06	CAU

ADAM23	-1.09829	7.14E-07	7.24E-06	CAU
PADI1	-1.4831119	6.66E-07	6.84E-06	CAU
KLHL13	-1.1873069	7.58E-07	7.56E-06	CAU
CLLU1	1.10516272	8.51E-07	8.28E-06	CAU
MS4A14	1.41253692	8.65E-07	8.40E-06	CAU
TLDC2	1.00544263	9.20E-07	8.86E-06	CAU
PNOC	-1.3911559	9.33E-07	8.94E-06	CAU
KCNK2	-1.2081334	8.91E-07	8.61E-06	CAU
RASGRP2	-1.0118989	8.71E-07	8.46E-06	CAU
KDF1	2.19081093	6.61E-07	6.81E-06	CAU
GATA2-AS1	1.10978909	1.11E-06	1.03E-05	CAU
PRMT8	-1.3230638	9.27E-07	8.91E-06	CAU
ATP2B3	-1.1136023	8.98E-07	8.66E-06	CAU
WASF1	-1.1246733	9.09E-07	8.76E-06	CAU
SCN4B	-1.7162532	9.37E-07	8.98E-06	CAU
KRT26	1.41729904	1.16E-06	1.07E-05	CAU
FLJ31356	1.04778198	1.08E-06	1.01E-05	CAU
P2RY12	-1.1498818	1.11E-06	1.03E-05	CAU
PAR6G-AS1	1.1416496	1.18E-06	1.08E-05	CAU
CLSTN2	-1.0551225	9.66E-07	9.18E-06	CAU
NIBAN3	1.54215821	9.78E-07	9.28E-06	CAU
CHRNA2	-1.4336223	1.03E-06	9.73E-06	CAU
SLC7A3	-1.5979709	1.05E-06	9.86E-06	CAU
PNLIPRP1	1.02168762	1.23E-06	1.11E-05	CAU
LILRA5	1.26680707	1.28E-06	1.15E-05	CAU
SLITRK3	-1.0622326	1.15E-06	1.06E-05	CAU
IGFN1	-1.4227511	1.37E-06	1.21E-05	CAU
LRRC14B	-1.6008283	9.31E-07	8.94E-06	CAU
GGT6	1.01134954	1.36E-06	1.20E-05	CAU
SYT16	-1.0064429	1.09E-06	1.01E-05	CAU
C22orf24	-1.1067551	1.28E-06	1.15E-05	CAU
DIRAS2	-1.2388713	1.13E-06	1.04E-05	CAU
INSRR	-1.2520204	1.33E-06	1.19E-05	CAU
HIGD1C	1.49013238	8.05E-07	7.92E-06	CAU
LOC101928855	1.00892415	1.44E-06	1.27E-05	CAU
DOK6	-1.0420068	1.15E-06	1.05E-05	CAU
CDKN1A	1.15989632	1.17E-06	1.07E-05	CAU
LINC02388	1.07114508	1.27E-06	1.14E-05	CAU
HTR6	-1.7391627	1.47E-06	1.29E-05	CAU
LOC101929613	1.33915192	1.16E-06	1.07E-05	CAU
PLK2	-1.2115318	1.20E-06	1.09E-05	CAU
CNTN6	-1.1624975	1.50E-06	1.31E-05	CAU

PCDHGC5	-1.6323725	1.29E-06	1.16E-05	CAU
SEMA3G	-1.1371746	1.35E-06	1.20E-05	CAU
DGKB	-1.3080637	1.36E-06	1.21E-05	CAU
CARNS1	-1.2869709	1.43E-06	1.26E-05	CAU
HGFAC	1.43243955	1.72E-06	1.46E-05	CAU
NUCB1-AS1	1.96782489	1.01E-06	9.54E-06	CAU
LPL	-1.3773246	1.42E-06	1.25E-05	CAU
MYLK2	-1.3766361	1.75E-06	1.48E-05	CAU
S100A4	1.06665774	1.88E-06	1.57E-05	CAU
LOC100287944	-1.3785816	1.37E-06	1.22E-05	CAU
SLC4A10	-1.1245252	1.58E-06	1.37E-05	CAU
KRTAP5-7	-1.1789721	1.49E-06	1.31E-05	CAU
MARCHF4	-1.2001547	1.71E-06	1.46E-05	CAU
CCDC87	-1.1469306	1.74E-06	1.48E-05	CAU
RIMBP2	-1.1213716	1.68E-06	1.44E-05	CAU
G0S2	1.65651543	2.05E-06	1.67E-05	CAU
TMEM150B	1.12478051	1.86E-06	1.56E-05	CAU
CCKBR	-1.3879399	2.04E-06	1.66E-05	CAU
KNCN	-1.5268804	1.65E-06	1.42E-05	CAU
NEXN-AS1	1.06999644	2.00E-06	1.64E-05	CAU
ATP11A-AS1	1.01149893	2.10E-06	1.70E-05	CAU
LINC01133	1.18477929	2.00E-06	1.64E-05	CAU
LTA	1.6302711	1.35E-06	1.20E-05	CAU
RAB3A	-1.2667783	1.78E-06	1.50E-05	CAU
SLC23A3	1.10742328	1.91E-06	1.59E-05	CAU
GABRD	-1.3875088	1.82E-06	1.53E-05	CAU
C9orf152	1.52161051	1.47E-06	1.29E-05	CAU
MYOG	1.19412791	2.35E-06	1.87E-05	CAU
CD96	1.07380634	2.49E-06	1.96E-05	CAU
SNORD14E	1.94422503	1.86E-06	1.56E-05	CAU
SMAD1-AS2	1.78095258	1.56E-06	1.36E-05	CAU
RASGRP1	-1.0974389	2.01E-06	1.64E-05	CAU
CALB2	-1.1770434	2.08E-06	1.69E-05	CAU
LOC101929353	-1.7845441	2.15E-06	1.73E-05	CAU
DRD3	-1.9564939	2.63E-06	2.04E-05	CAU
MC4R	-1.7721334	2.70E-06	2.09E-05	CAU
HEATR9	1.23503632	2.52E-06	1.98E-05	CAU
RNU6-1	1.51685142	2.80E-06	2.15E-05	CAU
ADH1B	1.15750913	2.87E-06	2.20E-05	CAU
FKBP5	1.08695673	2.19E-06	1.76E-05	CAU
GACAT2	-1.535136	2.15E-06	1.73E-05	CAU
CXCL1	1.67908451	2.81E-06	2.15E-05	CAU

ACTN2	-1.1707613	2.35E-06	1.87E-05	CAU
OR2W3	-1.4595459	2.60E-06	2.03E-05	CAU
LOC286177	1.05959912	2.69E-06	2.08E-05	CAU
CCDC177	-1.1079897	3.39E-06	2.51E-05	CAU
CLSTN3	-1.2082106	2.63E-06	2.04E-05	CAU
GAD1	-1.4560174	2.61E-06	2.03E-05	CAU
ANKRD63	-1.8415323	3.41E-06	2.52E-05	CAU
SAP25	1.47342307	3.54E-06	2.59E-05	CAU
UPK1A	1.67665444	2.38E-06	1.89E-05	CAU
SYT4	-1.3747141	2.77E-06	2.13E-05	CAU
GABRE	1.12241821	3.65E-06	2.64E-05	CAU
OBSCN-AS1	-1.2108375	2.99E-06	2.27E-05	CAU
SLCO4A1-AS1	1.78807504	3.02E-06	2.29E-05	CAU
SST	-1.5972735	2.94E-06	2.24E-05	CAU
TRPC7	-1.4417756	3.11E-06	2.33E-05	CAU
FLJ42393	1.02293308	3.93E-06	2.81E-05	CAU
LINC01249	1.03875591	3.75E-06	2.71E-05	CAU
RAB7B	-1.0741874	4.02E-06	2.86E-05	CAU
MIR202HG	1.01825816	3.81E-06	2.74E-05	CAU
LOC100506071	-1.6782928	4.07E-06	2.89E-05	CAU
ADAMTS9	1.29009566	3.48E-06	2.56E-05	CAU
CX3CR1	-1.2790144	3.39E-06	2.51E-05	CAU
ZCCHC12	-1.2271026	3.37E-06	2.50E-05	CAU
PDE10A	-1.4272442	3.25E-06	2.43E-05	CAU
GLDN	-1.0227893	3.26E-06	2.44E-05	CAU
SLC35D3	-1.5289374	4.20E-06	2.97E-05	CAU
BPESC1	1.28241176	3.59E-06	2.61E-05	CAU
NPTN	-1.0142754	3.49E-06	2.56E-05	CAU
NMNAT2	-1.2146105	3.38E-06	2.50E-05	CAU
WNT16	-1.5839283	4.37E-06	3.07E-05	CAU
UNC5D	-1.1463687	4.26E-06	3.00E-05	CAU
SLC2A13	-1.0220848	3.46E-06	2.55E-05	CAU
SUSD4	-1.0444309	3.59E-06	2.61E-05	CAU
CRABP2	-1.06232	4.24E-06	2.99E-05	CAU
PRSS56	-1.1788254	4.50E-06	3.13E-05	CAU
NCEH1	-1.0433169	3.58E-06	2.61E-05	CAU
TRH	-1.4776822	4.87E-06	3.34E-05	CAU
CYP2C8	-1.0610599	4.97E-06	3.39E-05	CAU
VAT1L	-1.5699736	3.95E-06	2.82E-05	CAU
GOLT1A	-1.210391	4.96E-06	3.38E-05	CAU
MSX1	1.07177744	4.73E-06	3.26E-05	CAU
CKMT1B	-1.1775456	3.98E-06	2.84E-05	CAU

KCNH1	-1.04242	4.20E-06	2.96E-05	CAU
ZIM3	1.10347607	4.72E-06	3.26E-05	CAU
TMEM200B	-1.1109186	4.82E-06	3.31E-05	CAU
TNFSF8	-1.0555776	4.65E-06	3.22E-05	CAU
SULT4A1	-1.3636649	4.11E-06	2.91E-05	CAU
LINC02185	1.39017984	4.77E-06	3.29E-05	CAU
C6orf141	-1.6559773	5.22E-06	3.52E-05	CAU
VCAM1	-1.0314435	5.45E-06	3.65E-05	CAU
TEAD4	1.03073626	5.74E-06	3.80E-05	CAU
PAQR9	-1.3733791	5.74E-06	3.80E-05	CAU
TMEM171	-1.3795643	5.53E-06	3.70E-05	CAU
RAB27B	-1.2459396	5.62E-06	3.74E-05	CAU
ST8SIA6-AS1	1.01094994	6.05E-06	3.98E-05	CAU
CEACAM5	1.29455859	5.32E-06	3.58E-05	CAU
PLA1A	1.39240876	6.34E-06	4.12E-05	CAU
GABRA1	-1.1653455	5.07E-06	3.44E-05	CAU
CIDEA	-1.4556252	6.71E-06	4.31E-05	CAU
TAGLN3	-1.2386748	5.13E-06	3.47E-05	CAU
TNFRSF8	-1.6353158	6.57E-06	4.25E-05	CAU
GABRG2	-1.2888942	5.14E-06	3.48E-05	CAU
MCHR1	-1.330574	6.79E-06	4.36E-05	CAU
CCDC196	-1.1471051	5.67E-06	3.77E-05	CAU
ACRV1	-1.0830304	6.94E-06	4.42E-05	CAU
SMIM32	-1.5548942	6.95E-06	4.43E-05	CAU
IL4R	1.07953583	5.67E-06	3.77E-05	CAU
LOC101927560	1.03290102	7.25E-06	4.58E-05	CAU
INKA2-AS1	-1.0246239	7.09E-06	4.50E-05	CAU
HOXB13	1.05044219	7.39E-06	4.65E-05	CAU
TUBB1	1.05831346	6.19E-06	4.05E-05	CAU
TMEM121B	-1.1046497	6.08E-06	3.99E-05	CAU
PMEL	1.25951384	5.70E-06	3.78E-05	CAU
ENC1	-1.4954777	5.97E-06	3.94E-05	CAU
HTR5A	-1.374148	7.79E-06	4.85E-05	CAU
SNAP25	-1.4149554	6.78E-06	4.35E-05	CAU
RDH8	1.34762581	7.62E-06	4.77E-05	CAU
CACNA1S	-1.1811311	8.72E-06	5.31E-05	CAU
NUDT11	-1.0552086	7.20E-06	4.56E-05	CAU
CCNB3	-1.0386659	8.71E-06	5.30E-05	CAU
LOC153910	1.28490615	6.93E-06	4.42E-05	CAU
SLC12A3	1.32385897	8.40E-06	5.15E-05	CAU
TTC39C-AS1	1.04075911	7.18E-06	4.55E-05	CAU
ANGPTL4	1.0974189	6.76E-06	4.34E-05	CAU

TGFB3	1.06257837	6.77E-06	4.35E-05	CAU
BATF	-1.1940587	9.34E-06	5.60E-05	CAU
STRIP2	-1.2784539	6.98E-06	4.44E-05	CAU
NMBR	-1.3637384	8.37E-06	5.14E-05	CAU
ADGRF2	1.00089261	9.52E-06	5.69E-05	CAU
PABPC1L2B	-1.1008627	9.43E-06	5.64E-05	CAU
STX1B	-1.0435214	7.54E-06	4.73E-05	CAU
LINC00470	1.23169189	9.21E-06	5.55E-05	CAU
KCNQ3	-1.0720827	7.50E-06	4.71E-05	CAU
GPR139	-1.8970014	9.46E-06	5.66E-05	CAU
LL22NC01-81G9.3	1.20171895	1.04E-05	6.12E-05	CAU
PCSK2	-1.1285842	8.10E-06	5.01E-05	CAU
NBPFI4	1.03476661	8.32E-06	5.12E-05	CAU
MAGEL2	-1.2840775	1.05E-05	6.18E-05	CAU
CHGB	-1.0950319	8.45E-06	5.17E-05	CAU
SH2D5	-1.2501274	8.65E-06	5.28E-05	CAU
VSTM2L	-1.0224267	8.98E-06	5.44E-05	CAU
SLC52A3	1.11654631	1.15E-05	6.63E-05	CAU
SERPINC1	1.34461492	9.38E-06	5.62E-05	CAU
RGS8	-1.4636455	9.73E-06	5.80E-05	CAU
SGCG	-1.0887649	1.18E-05	6.74E-05	CAU
GRM5	-1.023897	9.85E-06	5.85E-05	CAU
ZNF503-AS1	-1.0528305	1.33E-05	7.47E-05	CAU
CNR1	-1.4412532	1.07E-05	6.24E-05	CAU
MPZL2	1.14670282	1.46E-05	8.10E-05	CAU
MT1G	1.27953012	1.06E-05	6.20E-05	CAU
ANKRD34C-AS1	-1.0573421	1.52E-05	8.37E-05	CAU
RAB3C	-1.3375307	1.10E-05	6.39E-05	CAU
LOC101928674	1.33201365	1.19E-05	6.78E-05	CAU
CARNMT1-AS1	1.09813981	1.55E-05	8.53E-05	CAU
OPALIN	-1.0068282	1.19E-05	6.80E-05	CAU
TARM1	1.18145357	1.63E-05	8.87E-05	CAU
GABRA3	-1.0331931	1.45E-05	8.06E-05	CAU
LTB4R2	-1.0123552	1.58E-05	8.63E-05	CAU
CDK5R2	-1.2690277	1.24E-05	7.03E-05	CAU
GYS2	1.23531641	1.61E-05	8.80E-05	CAU
IL6	1.85963348	1.54E-05	8.46E-05	CAU
RGS7BP	-1.1765048	1.41E-05	7.86E-05	CAU
RPH3A	-1.0976736	1.40E-05	7.79E-05	CAU
C19orf33	1.08852563	1.88E-05	0.00010049	CAU
ZNF664-RFLNA	-1.03267	2.08E-05	0.00010931	CAU

HTR1E	-1.2206594	2.11E-05	0.0001104	CAU
TMEM265	1.20965444	2.14E-05	0.00011156	CAU
ACPP	1.06368212	2.20E-05	0.00011402	CAU
FSTL4	-1.1507026	1.75E-05	9.45E-05	CAU
SLC32A1	-1.5003718	1.66E-05	9.02E-05	CAU
ORM2	1.07434494	1.88E-05	0.00010058	CAU
ARHGAP40	-1.2783681	2.36E-05	0.00012142	CAU
KCNS2	-1.2999923	2.34E-05	0.00012027	CAU
PLCXD2	-1.2591831	2.21E-05	0.00011469	CAU
HTR2C	-1.4755736	1.83E-05	9.81E-05	CAU
SLC1A7	1.64774285	2.57E-05	0.00012998	CAU
IZUMO1	1.20595762	2.39E-05	0.00012238	CAU
FAM9A	1.11138543	2.63E-05	0.00013223	CAU
ACTL6B	-1.0869445	1.91E-05	0.0001019	CAU
SERPINE1	1.12266422	2.51E-05	0.00012721	CAU
RIMBP3C	-1.6148687	2.70E-05	0.0001352	CAU
STC1	1.1786568	2.70E-05	0.00013505	CAU
LINC00460	-1.2548808	2.80E-05	0.00013974	CAU
SEZ6	-1.190235	2.01E-05	0.00010647	CAU
MMP23B	1.57612455	2.50E-05	0.00012717	CAU
WASIR2	1.15994853	2.86E-05	0.00014192	CAU
GLP1R	-1.3499252	2.93E-05	0.00014502	CAU
UNC13A	-1.0465502	2.13E-05	0.00011133	CAU
MIR8082	1.22838206	2.54E-05	0.00012858	CAU
SLC12A5	-1.2529399	2.14E-05	0.00011166	CAU
ENTPD3	-1.3558848	2.15E-05	0.00011217	CAU
CRYBA1	1.2880437	2.32E-05	0.00011961	CAU
CAP2	-1.0287552	2.10E-05	0.00011008	CAU
DLGAP2	-1.0769909	2.19E-05	0.00011397	CAU
LRTM2	-1.3769531	2.19E-05	0.00011395	CAU
SH3GL2	-1.0919294	2.21E-05	0.00011466	CAU
PDE1B	-1.3898727	2.44E-05	0.00012432	CAU
GPR55	-1.296013	3.20E-05	0.0001562	CAU
SFTPA2	-1.2463851	2.99E-05	0.00014744	CAU
ZNF341-AS1	1.26298288	2.63E-05	0.00013254	CAU
GOLGA8F	1.91820875	2.71E-05	0.0001359	CAU
UNC5A	-1.0474731	2.55E-05	0.00012907	CAU
VIT	-1.1080841	3.60E-05	0.00017224	CAU
NGEF	-1.385655	2.76E-05	0.00013766	CAU
FOXN4	1.412332	2.99E-05	0.00014763	CAU
ABCC5-AS1	1.23401933	3.63E-05	0.00017375	CAU
CALY	-1.0849825	2.72E-05	0.00013628	CAU

LINC00159	1.09939894	3.41E-05	0.00016483	CAU
LOC100130548	1.05993293	3.96E-05	0.00018758	CAU
GLS2	-1.0444106	3.11E-05	0.00015223	CAU
STC2	1.08263579	4.22E-05	0.00019785	CAU
MIR3945HG	1.08515213	4.46E-05	0.00020749	CAU
SNORD63	1.31062818	4.01E-05	0.00018953	CAU
LINC01123	-1.1338141	3.79E-05	0.00018073	CAU
CENPVL1	-1.1253326	4.50E-05	0.00020917	CAU
GPR149	-1.2826967	4.65E-05	0.00021493	CAU
PAK6	-1.0301118	3.32E-05	0.00016135	CAU
RCVRN	1.06861835	4.97E-05	0.00022658	CAU
ACHE	-1.0295192	3.51E-05	0.00016875	CAU
TMEM130	-1.0067354	3.80E-05	0.0001813	CAU
MT1H	1.44459416	4.75E-05	0.00021884	CAU
LOC105369509	1.03254909	5.45E-05	0.00024498	CAU
FAM163B	-1.030451	4.94E-05	0.00022568	CAU
BCL2A1	1.55000793	5.33E-05	0.00024059	CAU
LOC101929054	1.13734517	5.07E-05	0.00023062	CAU
ARPP21	-1.2026062	4.51E-05	0.00020932	CAU
NMUR2	1.35808534	5.83E-05	0.00025933	CAU
NLRP8	1.08985962	5.66E-05	0.00025323	CAU
CRYGD	-1.2200111	5.49E-05	0.00024627	CAU
LINC02192	-1.1173473	6.00E-05	0.00026618	CAU
SNX31	1.28874448	5.91E-05	0.00026255	CAU
CDHR1	-1.0505203	4.08E-05	0.00019258	CAU
LIN28B-AS1	-1.0594999	5.81E-05	0.00025875	CAU
WT1	-1.3199617	6.50E-05	0.00028423	CAU
WSCD2	-1.1317615	4.41E-05	0.00020579	CAU
NSG2	-1.2549118	5.06E-05	0.00023048	CAU
GPR158-AS1	-1.0055112	7.10E-05	0.00030603	CAU
C9orf129	-1.0286171	7.31E-05	0.00031322	CAU
LOC101927166	1.01820213	7.26E-05	0.00031147	CAU
SERPINE3	-1.1623035	7.11E-05	0.00030624	CAU
LINC00930	1.25083829	7.12E-05	0.00030625	CAU
EGR3	-1.0963912	5.72E-05	0.00025525	CAU
MARCHF11	-1.0348747	8.97E-05	0.00037311	CAU
LOC100129603	1.48166814	8.56E-05	0.00035869	CAU
DACT2	-1.0492521	6.48E-05	0.00028359	CAU
LINC00484	1.14769934	8.41E-05	0.00035341	CAU
ST6GALNAC5	-1.105182	7.90E-05	0.00033429	CAU
BIVM-ERCC5	-3.0744178	8.67E-05	0.00036274	CAU
LOC102723831	1.21699913	8.77E-05	0.00036618	CAU

CPLX2	-1.1448065	7.38E-05	0.00031596	CAU
LOC100505795	1.14140394	9.86E-05	0.00040363	CAU
PCP4L1	-1.384255	6.60E-05	0.00028752	CAU
MIR3663HG	1.17106601	0.00010008	0.00040895	CAU
CELSR1	1.06428976	9.20E-05	0.00038127	CAU
LOC105369507	1.28562384	9.69E-05	0.00039795	CAU
ATP1A3	-1.2689489	7.68E-05	0.00032648	CAU
SLAMF8	1.06139301	0.00011481	0.00045652	CAU
PEX5L-AS2	1.2167796	0.00011439	0.00045532	CAU
SPATA46	1.27675357	0.00010715	0.00043245	CAU
ST8SIA3	-1.3094282	7.97E-05	0.00033715	CAU
SNORD115-45	-1.1550526	0.00011879	0.00046908	CAU
FBXL16	-1.1300729	9.61E-05	0.00039511	CAU
SH2D1A	1.06233616	0.00011984	0.00047213	CAU
ERI3-IT1	1.13985903	0.00012392	0.00048539	CAU
SYCE3	-1.1963796	0.00011698	0.00046338	CAU
SLC6A17	-1.0040071	8.30E-05	0.00034988	CAU
HIPK4	-1.2562773	9.07E-05	0.00037651	CAU
HGD	1.22149755	0.0001389	0.00053526	CAU
CRYM	-1.3276017	8.92E-05	0.00037174	CAU
FAT2	-1.2198764	0.00011536	0.00045802	CAU
CNGA3	-1.3921617	0.00014066	0.00054082	CAU
NPB	-1.5207221	0.00013792	0.00053189	CAU
ICAM5	-1.2804812	0.00010214	0.00041605	CAU
IL1R2	1.83961661	0.00014182	0.00054441	CAU
RPRML	-1.1092299	0.00012791	0.00049867	CAU
OR2L2	-1.256943	0.00014785	0.00056354	CAU
POU4F1	1.04037011	0.00016072	0.00060436	CAU
RGS14	-1.3462783	0.00011525	0.00045785	CAU
RASD2	-1.2429516	0.00012429	0.00048675	CAU
PALM2AKAP2	-1.0159226	0.00014152	0.00054345	CAU
ADCYAP1	-1.2151999	0.00017371	0.00064477	CAU
INA	-1.0738696	0.00011964	0.00047166	CAU
CHRM1	-1.2213843	0.0001229	0.00048211	CAU
RGS4	-1.0124025	0.00012525	0.00049011	CAU
HES5	-1.112659	0.00019143	0.00070181	CAU
TMIE	1.06554873	0.00017306	0.00064273	CAU
KCNQ5	-1.2117232	0.00013463	0.00052081	CAU
CHRM4	-1.4714405	0.00015971	0.00060128	CAU
LINC01679	1.1212239	0.0002171	0.00078154	CAU
ANO3	-1.4778034	0.00014783	0.00056354	CAU
KCNG3	-1.0360008	0.00021712	0.00078154	CAU

HTR1A	-1.4361981	0.00021944	0.00078802	CAU
NCDN	-1.0898893	0.00017679	0.00065466	CAU
EEF1A2	-1.0057187	0.0001689	0.00062965	CAU
CCL19	-1.6287956	0.00026445	0.00092227	CAU
CORT	-1.0730331	0.00017895	0.00066203	CAU
FITM1	1.09988715	0.00027645	0.00095848	CAU
CBLN4	-1.3164965	0.00026712	0.00093052	CAU
MME	-1.1884402	0.00018989	0.00069707	CAU
HBA2	-1.5561936	0.00018826	0.00069177	CAU
SCG2	-1.0788977	0.00019327	0.00070688	CAU
KCNC2	-1.2687247	0.00024844	0.00087495	CAU
NPY	-1.2510823	0.00019246	0.00070472	CAU
ELOA2	1.0509959	0.00030849	0.00105039	CAU
PCDH8	-1.19974	0.00020076	0.00073037	CAU
C16orf90	1.29974763	0.00028903	0.00099503	CAU
FNDC7	-1.0946129	0.00031623	0.0010731	CAU
TPBG	-1.0037044	0.00019904	0.00072476	CAU
LOC401442	-1.0409753	0.0003227	0.00109057	CAU
OR1F1	-1.1978149	0.00033756	0.0011327	CAU
IL13RA2	-1.0637108	0.00032057	0.00108491	CAU
RBPMS-AS1	1.00496927	0.00033074	0.00111298	CAU
ADAMTS9-AS1	1.2093474	0.00035156	0.00117224	CAU
LOC101928663	1.1218807	0.00033358	0.00112096	CAU
LOC100130238	1.82968026	0.00032497	0.00109666	CAU
CAMK4	-1.0043905	0.0002217	0.00079478	CAU
HBB	-1.6784583	0.00023139	0.00082518	CAU
TUNAR	-1.0451704	0.00022815	0.00081502	CAU
LCN6	1.29363726	0.00035832	0.00119073	CAU
SERTM1	-1.1858994	0.00038401	0.00126321	CAU
GOLGA8K	-1.4797663	0.00040479	0.00131981	CAU
CD164L2	-1.5114907	0.00036785	0.0012182	CAU
RNF216-IT1	1.08960401	0.00041679	0.00135292	CAU
ACTN3	1.01628528	0.00043463	0.00140218	CAU
H4C4	1.56102064	0.00042306	0.00137	CAU
HOXD1	-1.0755517	0.00045664	0.00146376	CAU
CACNG3	-1.1093693	0.00028709	0.00098941	CAU
GFRAL	1.04166666	0.00047481	0.00151324	CAU
NRGN	-1.0562998	0.00036837	0.00121972	CAU
SLC17A4	1.09907199	0.00055015	0.00171542	CAU
ITPKB-IT1	1.03558793	0.00054867	0.00171109	CAU
CLDN19	1.33712405	0.00053627	0.00167737	CAU
LAMP5	-1.1822439	0.00035036	0.00116988	CAU

TESPA1	-1.1027656	0.00035093	0.00117139	CAU
S100A8	1.6365421	0.00054779	0.00170907	CAU
L1CAM	-1.0791065	0.00035678	0.00118678	CAU
TAC1	-1.3622852	0.00036848	0.00121988	CAU
SYN2	-1.0985078	0.00037773	0.0012457	CAU
PAX7	-1.0541185	0.00065277	0.001989	CAU
GOLGA8G	-1.1612729	0.00060785	0.00187195	CAU
CAMKV	-1.0690172	0.00040629	0.00132405	CAU
CSF3	1.97211171	0.00070384	0.0021258	CAU
NNAT	-1.0363575	0.00045736	0.00146581	CAU
HPCA	-1.1705612	0.00052024	0.0016364	CAU
SENP3-EIF4A1	1.87813696	0.000819	0.00243037	CAU
RPEL1	-1.0205802	0.00089867	0.00263589	CAU
AMIGO3	1.90383476	0.00096041	0.00279239	CAU
PENK	-1.5891161	0.00056785	0.00176481	CAU
SYNPR	-1.1642522	0.00057922	0.00179516	CAU
KCNJ1	-1.0305743	0.00092794	0.00271045	CAU
CCL2	1.01489865	0.00082581	0.00244599	CAU
RAI1-AS1	1.07931247	0.00105459	0.00302681	CAU
AGXT	1.09039157	0.00110354	0.00314685	CAU
WNT1	-1.1449829	0.00110404	0.00314781	CAU
GAD2	-1.1327383	0.00064009	0.00195635	CAU
NMRK2	1.31203396	0.0011363	0.00322768	CAU
MACROD2-IT1	1.02933318	0.00121012	0.00340626	CAU
HBA1	-1.4192984	0.00068454	0.00207615	CAU
IL1RL1	1.57847864	0.00095114	0.00276885	CAU
ZBTB20-AS5	1.03684017	0.00139866	0.00385302	CAU
TMEM238L	1.06334137	0.00140753	0.00387238	CAU
SOST	1.218272	0.00145956	0.00399584	CAU
TACSTD2	-1.0721827	0.00157224	0.00426376	CAU
S100A12	1.76402933	0.00167242	0.00449498	CAU
MUC5B	-1.0350918	0.00165652	0.00445856	CAU
CCDC168	1.39601231	0.0016926	0.00454087	CAU
COL18A1-AS1	1.19995964	0.00171841	0.00460095	CAU
SV2C	-1.0037233	0.00100816	0.00291182	CAU
SERPINA5	1.15443696	0.00160839	0.00434689	CAU
TPSD1	1.22370102	0.0019742	0.00519483	CAU
MYO1A	-1.0308659	0.00225469	0.00582019	CAU
GOLGA8T	-1.4908941	0.002321	0.00595331	CAU
RIMBP3B	-1.6346635	0.00233361	0.00598234	CAU
PDYN	-1.3675448	0.00132831	0.0036935	CAU
TNFRSF11B	1.03150705	0.00235303	0.00602327	CAU

MIR4451	1.09386869	0.00258387	0.00652792	CAU
NBPF4	-1.4787735	0.00262025	0.0066014	CAU
COCH	-1.1418459	0.00150226	0.00409621	CAU
RIMBP3	-1.0764797	0.00289278	0.00717375	CAU
NPAS4	-1.3002429	0.00302544	0.00745115	CAU
SERPINA3	1.0946679	0.00172096	0.00460654	CAU
SI00A9	1.33880775	0.0026704	0.00670639	CAU
PTPRCAP	-1.4471546	0.00378313	0.00902344	CAU
CCL3L3	-1.0665697	0.00390353	0.00926521	CAU
HSPE1-MOB4	1.71285897	0.0037657	0.00898654	CAU
TVP23C- CDRT4	-1.4155948	0.00402418	0.00950523	CAU
DOK2	1.17803577	0.00429408	0.0100651	CAU
KCNJ4	-1.0095985	0.00212016	0.00552854	CAU
GPR6	-1.0644304	0.00234163	0.00599975	CAU
OR7C1	1.14040165	0.00494909	0.01140888	CAU
POTEH	1.2567446	0.00618423	0.01382965	CAU
OR7A5	1.37627383	0.00718455	0.01574036	CAU
MAGI2-AS2	1.00616205	0.00802944	0.01731984	CAU
CD177	1.20133495	0.00802563	0.0173153	CAU
SNORD86	1.03215997	0.00673029	0.01487732	CAU
CT45A1	-1.3543361	0.00881276	0.01876405	CAU
PAPPA-AS1	1.32097019	0.01059187	0.02202115	CAU
PVALB	-1.0319574	0.00843601	0.01806317	CAU
ELOA3B	1.1124134	0.01025374	0.02140018	CAU
C6	-1.1339739	0.01277025	0.0257932	CAU
TNFRSF6B	2.03044702	0.01224326	0.02490096	CAU
HSFY2	-1.1230483	0.01744328	0.03366547	CAU
ZFP91-CNTF	1.54159129	0.02229519	0.04155843	CAU

[000212] To assess the value of RNA-seq in the prediction of clinical diagnosis, we undertook a machine learning approach to identify binary classifier genes that can distinguish PD from controls. Using a group of 70% of control and donor PD caudates as a training dataset, we identified a set of 19 classifier genes which identified clinical diagnosis with 86% accuracy (**TABLE 5A**). The same set of classifier genes predicted clinical diagnosis in the putamen with 90% accuracy (**Fig 1g, TABLE 5B**).

TABLE 5A

Gene
ANGPT2
ANGPT4
TRIP10
DEPP1
ANKRD20A2

MYBPC1
LINC01338
MT1M
NUPR1
VGF
TUBB3
CIRBP
TARBP1
HBA2
HBA1
HBB
LBH
GPCPD1
SEMA3G

TABLE 5B

Satistics for Caudate trained classifier	
Accuracy :	0.8654
95% CI :	(0.7421, 0.9441)
No Information Rate :	0.5577
P-Value [Acc > NIR] :	2.105E-06
Kappa :	0.7259
Mcnemar's Test P-Value :	1
Sensitivity :	0.8966
Specificity :	0.8261
Pos Pred Value :	0.8667
Neg Pred Value :	0.8636
Prevalence :	0.5577
Detection Rate :	0.5
Detection Prevalence :	0.5769
Balanced Accuracy :	0.8613
Accuracy of classifier on putamen PD and Control samples.	0.9067

[000213] The majority of PD donors were on dopaminergic medications. To examine whether transcriptional changes identified were impacted by medication, we tested the effect of levodopa

equivalent drug dose (LEDD)³⁶ in our differential gene expression model, allowing the identification of RNAs associated with PD independent of their association with drug dose. This analysis showed that >95% of RNAs were significantly up and downregulated in PD independent of drug dose (**Fig 2e**), and a high correlation ($r = 0.98$, $p < 2.2e-16$) was seen for differentially changed pathways in PD before and after accounting for the effect of drug dose (**Fig 2f**). These results indicate that drug dose did not make a detectable difference on the transcriptome in postmortem brains.

[000214] Mass spectrometry on brain samples (PD caudate (n=10), PD putamen (n=12) and control (n=5)) confirmed a correlation between expression levels of RNA and protein in the striatum (**Fig 3a,c**, data not shown). GO terms altered in the RNA-seq were similarly affected at the protein level (**Fig 3b,d**, data not shown). The mitochondrial proteome was the most downregulated term in caudate (including proteins involved in mitochondrial envelope, mitochondrial protein complex, and mitochondrial gene expression), along with ion transport and lipid metabolic processes, while immune-mediated GO terms were upregulated (**Fig 5b**). In putamen, transmembrane transport, lipid metabolism, and mitochondrial envelope terms were downregulated, while inflammatory pathways were upregulated (**Fig 3d**), consistent with RNA-seq. These results provide independent support for the findings seen by RNA-seq, indicating that the RNA changes give rise to steady-state protein changes in PD striatum.

[000215] Concordant Transcriptome Changes in Brain and Peripheral Blood

Peripheral blood transcriptome studies in Alzheimer's disease have reported findings that mirror brain pathology^{23,24}. Therefore, we tested whether the transcriptional changes we identified in PD caudate and putamen were also altered in antemortem blood collected from PD patients (n=479) compared to control donors (n=195) in the PPMI cohort (**TABLE 6** and data not shown). About 1015 and 569 RNAs were significantly up or downregulated in PD blood (**Fig 4a** and data not shown), consistent with prior analysis of this data²⁷. Remarkably, we observed that mRNAs significantly up or downregulated in the PD caudate and putamen were altered in the same direction in the blood (**Fig 4b**, **Fig 5a**).

TABLE 6

	Controls (n=195)	PD (n=479)	p value	Test
Age at collection (years)	60.8 (11.3)	61.6 (9.8)	0.572	Wilcoxon
Male/Female	125/70	311/168	0.860 (gender)	Fisher test
Race (White/Black/Hispanic/Other)	180/10/1/4	444/7/9/19	1	Fisher test
Age of onset/diagnosis (years)	NA	59.6 (10.1)	NA	
Disease duration (years)	NA	6.8 (6.7)	NA	
quality (% usable bases)	41.0 (8.4)	41.1 (9.4)	0.589	Wilcoxon
Mean (standard deviation); p values were determined using listed tests				

[000216] To confirm this observation, we analyzed blood bulk RNA-seq data from an independent cohort, the Parkinson's Disease Biomarker Program (PDBP). There was a significant correlation between differentially expressed PD RNAs detected in the PPMI and PDBP cohorts. Cumulative changes in RNAs significantly up or downregulated in the PD brain were changed in the same direction in the PDBP blood (data not shown). While the evaluation of a large number (>5000) of significant striatal PD associated RNAs in the blood expectedly limit the overall effect size in blood, these findings indicate consistent concordance between postmortem brain and antemortem blood RNAs in PD.

[000217] For example, *SNCA*, which encodes alpha-synuclein and is linked to a familial form of PD^{37,38}, was significantly downregulated in both the blood and brain, consistent with smaller targeted RNA studies in the blood and with prior analysis of PPMI data (Fig 4a,c)^{27,39}. *TOMM70*, an import receptor involved in the import of *PINK-1* into the mitochondria⁴⁰, was also significantly downregulated in PD caudate, putamen, and blood (Fig 4a,c) as was the calcium-dependent kinase *CAMK4* (Fig 4a). Upregulated RNAs discovered in both the blood and the brain were immune pathway genes including (*FCAR* (Fig 4a,c), *IL1R2*), stress induced molecular chaperone *HSPA6* and genes important in brain function such as the G protein coupled receptor *PROK2* and neuronal acetyl cholinergic receptor *CHRNA10* (Fig 4a).

[000218] Significant changed (up- and downregulated) GO terms detected in the PD caudate and putamen were also collectively consistent in their direction of change in PD peripheral blood (Fig 5b, data not shown). Similar to our observations of RNA changes in PD caudate and putamen, transcripts encoding proteins in miRNA regulation and immune response (Toll-like receptor signaling, interleukin secretion and NF kappa B signaling) were upregulated in the blood (Fig 4d). Conversely, and again consistent with observations in the PD caudate and putamen, where we observed downregulation of neuronal and synaptic pathways, GO terms downregulated in PD blood included postsynaptic membrane, glutamine metabolic process and neuron maturation (Fig 4d). Direction of change in top differentially changed GO terms in PD blood were driven by changes in most genes in the GO term (Fig 5c).

[000219] The top GO terms identified as dysregulated in GSVA of PD blood were neuronal, such as “extrinsic component of postsynaptic specialization/density membrane” and interestingly, inversely correlated with motor progression, based on two different clinical scales (Movement disorders society (MDS)-unified Parkinson's disease rating score (UPDRS) and modified Hoehn and Yahr scale)^{41,42} (Fig 4e). Similarly, *TIAM-1*, a gene in the postsynaptic membrane GO term encoding a known modulator of glutamatergic synapse function,^{43,44} was significantly decreased in PD caudate, putamen, and blood, and its expression inversely correlated with motor severity in the PPMI cohort (Fig 5d). Peripheral blood from antemortem PD subjects shows concordant changes in RNA expression with PD brain, and strikingly, these antemortem blood signatures correlate with PD progression.

[000220] We also observed concordance between the blood of prodromal subjects²⁷ who were not clinically diagnosed with PD, but had clinical signs suggesting risk for PD (n=60) (such as anosmia, sleep disorder, and dopamine transporter scan showing loss of dopamine) and postmortem PD caudate (Figure 5e). In contrast, compared to controls, carriers of PD-related genetic mutations who were otherwise healthy, did not show concordance with the direction of change in PD brain RNA (Figure 5e, data not shown) suggesting that such concordance is detectable in the blood when pathology has also manifested in the brain.

[000221] We next investigated if blood transcriptome changes seen in PD blood were influenced by medication use and found that about 40% (619 and 506 (38% and 43%) of previously identified up- and down-regulated RNAs) in PD blood changed independent of medication dose (LEDD), suggesting a greater effect of medications on the blood compared to the brain transcriptome (Fig 6a). The concordance between the blood and brain transcriptome remained true with differentially expressed RNAs and pathways independent of medication dose in PD patients (Fig 6b,c).

[000222] To further investigate the concordance between blood and brain in PD, we analyzed blood transcriptome changes in PD subjects when they were drug-naïve for dopaminergic medications. As expected, drug-naïve PD subjects had lower MDS-UPDRS scores compared to those on medications (p value < 2.2 e-16) (Fig 6d). While this makes a complete uncoupling of the effect of medication and disease challenging, we nonetheless compared the transcriptome profile of drug-naïve PD subjects to controls. This revealed that 34 and 17% of up- and downregulated RNAs in drug-naïve PD blood were also seen in the PD striatum (Fig 6e, data not shown). For example, *SNCA* and *FCAR* were significantly down- and upregulated in PD blood even in drug-naïve PD subjects (Figure 6f,g). Similarly, RNAs downregulated in the brain such as the neuronal enriched gene *GPR52* and the PD gene *DNAJC6* were also downregulated in PD blood in drug-naïve patients (Figure 6f,g). In GSVA, differentially changed pathways showed significant correlation between drug-naïve and PD subjects on dopaminergic medications (Fig 6h, data not shown).

[000223] These observations were supported with data from an independent analysis that used machine learning to determine RNAs/genes that serve as classifiers to distinguish controls and PD among early stage (average disease duration of 2 years) drug-naïve PPMI subjects⁴⁵. We observed that up- and downregulated classifier RNAs/genes in the blood from early-stage drug-naïve PPMI subjects were collectively changed in the same direction in the postmortem striatum, indicating that the PD blood transcriptome reflects changes in the PD brain independent of medication status (Figure 6i).

[000224] Clinical-Molecular Analysis: Cognitive and Motor Complications

[000225] As disease or pathology in the caudate, but not putamen, is associated with Parkinson's disease dementia (PDD)^{13-16,46-48}, we next assessed whether RNAs changed in PDD did so in a region-specific manner. Sixteen donors had a diagnosis of PDD and 11 had PD without dementia (see methods, TABLE 7A and TABLE 7B). Differential gene expression analysis in caudate identified 57 RNAs that were significantly changed in PDD compared to PD without dementia, while only 8 RNAs

were significantly affected in the putamen (**Fig 7a, Fig 8a, TABLE 8A and TABLE 8B**, data not shown)

TABLE 7A

Donor	Sample ID	Dementia	Cholinesterase Inhibitor	Cognitive Test
1	2653_PD_CAU	+	+	
2	2689_PD_CAU	+	+	
3	2778_PD_CAU	+	+	
4	2780_PD_CAU	+	-	23/30(MOCA)
5	2782_PD_CAU	+	+	
6	2784_PD_CAU	+	+	
7	2786_PD_CAU	+	+	
8	2579_PD_CAU	+	+	
9	2581_PD_CAU	+	+	
10	2583_PD_CAU	+	+	
11	2585_PD_CAU	+	-	<25(BCAT)
12	2593_PD_CAU	+	+	
13	2627_PD_CAU	+	+	
14	2633_PD_CAU	+	+	
15	2645_PD_CAU	+	+	
16	2681_PD_CAU	+	-	9/30 (MMSE)
17	2679_PD_CAU	-	-	
18	2685_PD_CAU	-	-	
19	2725_PD_CAU	-	-	
20	2727_PD_CAU	-	-	
21	2788_PD_CAU	-	+	30/30 (6 YPTD); 27/30 (2 YPTD)
22	2792_PD_CAU	-	-	
24	2649_PD_CAU	-	-	
25	2713_PD_CAU	-	-	
26	2687_PD_Cau	-	-	
27	2803_PD_Cau	-	-	
MOCA: Montreal Cognitive Assessment; BCAT: Brief Cognitive Assessment Tool ; MMSE: Mini Mental State Examination; YPTD: Years prior to death				

TABLE 7B

	Control (n=40)	PD-ND (n=16)	PDD (n=11)	p value (PDD vs PD-ND)	p value (PDD vs CTRL)	p value (PD-ND vs CTRL)	Test
Age of death (years)	72.4 (11.8)	78.3 (8.3)	76.4 (6.5)	0.57	0.102	0.09	Wilcoxon
Male/Fc	28/12	8/3	15/1	0.273	0.082	1	Fisher

male							
Race (White/Black/ Hispanic/ Other)	34/2/2/2	9 (White)/2 (Black)	16 (White)	0.157	1	0.368	Fisher
Age of onset/dia gnosis (years)	NA	64.3 (9.1)	63.1 (10.1)	0.937	NA	NA	Wilcoxon
Disease duration (years)	NA	12.9 (6.9)	13.4 (7.2)	1	NA	NA	Wilcoxon
PMI (hours)	16.9 (7.6)	18.7 (8.9)	20.6 (10.1)	0.786	0.253	0.614	Wilcoxon
RIN	6.6 (1.8)	4.7 (2.2)	6.1 (2.0)	0.103	0.332	0.011	Wilcoxon
Mean (standard deviation); p values were calculated using listed tests							

TABLE 8A – Caudate RNAs PD with Dementia vs PD no dementia

ID	logFC	AveExpr	t	P.Value	adj.P.Val	B
MARS1	0.60744456	5.71126183	4.79923606	4.26E-06	0.01450274	4.01474854
CASTOR3	-0.712228	6.6820274	-4.7745573	4.73E-06	0.01450274	3.91234495
TRAPPC6A	-0.6560987	3.32147778	-4.7475176	5.30E-06	0.01450274	3.7470222
C14orf132	-0.6508011	7.80910733	-4.724178	5.85E-06	0.01450274	3.69941551
NFAT5	0.46532267	6.62572179	4.66203775	7.59E-06	0.01660117	3.48610746
LONRF3	0.9560924	1.58521707	4.75930871	5.04E-06	0.01450274	3.36855065
PPP1R15B	0.58522026	5.17089954	4.62291439	8.93E-06	0.01758013	3.34341385
LINC01877	-1.0818691	0.94966666	-4.7224575	5.89E-06	0.01450274	3.05251952
CEBPG	0.78815121	5.02103858	4.5216655	1.35E-05	0.02202875	2.96516789
HMGXB4	-0.5463224	4.80053118	-4.5042428	1.45E-05	0.02202875	2.90051006
LOC102724919	1.42800659	-0.6433406	4.9950616	1.83E-06	0.01450274	2.85513347
ZKSCAN1	-0.6034133	7.21631369	-4.4776537	1.62E-05	0.02243354	2.79632457
NUCKS1	-0.5209112	9.00305593	-4.4576825	1.76E-05	0.02243354	2.68805275
E2F1	-0.6807049	3.41647074	-4.4486208	1.82E-05	0.02243354	2.65721951
SEL1L3	1.02266679	3.79957717	4.41095003	2.12E-05	0.02383677	2.5436886
SLCO1A2	-1.3099174	7.21104272	-4.4043455	2.18E-05	0.02383677	2.53121173
LOC101928988	-2.0393905	-0.9552996	-4.8619831	3.26E-06	0.01450274	2.41780112
GPN1	0.57005302	4.04561116	4.37278446	2.47E-05	0.02403883	2.41290815
CAPN2	0.58887577	6.56503369	4.36416719	2.56E-05	0.02403883	2.38943077
PELP1	-0.6262557	6.81460873	-4.3637487	2.56E-05	0.02403883	2.38736322
SH3GL3	-0.8214278	5.8941781	-4.2426962	4.14E-05	0.03544413	1.9570154
NFATC2IP	-0.4318268	5.06137401	-4.2349315	4.27E-05	0.03544413	1.92954964
STAG3	-0.4153983	5.32406042	-4.2233861	4.46E-05	0.03544413	1.88869317
PPTC7	0.60870879	4.45163217	4.20701469	4.76E-05	0.03544413	1.83172335
ASPA	-1.0069406	6.47734212	-4.1962823	4.96E-05	0.03544413	1.79426834

CHCHD3	0.40924845	4.23098657	4.17813814	5.32E-05	0.03544413	1.73063004
CHAF1A	-0.7618758	3.51573504	-4.1719803	5.45E-05	0.03544413	1.69364892
ZEB2	-1.0855978	8.28960265	-4.1669305	5.56E-05	0.03544413	1.68604401
PPP1R14A	-1.3770837	5.77903764	-4.1583959	5.74E-05	0.03544413	1.66171434
SNX22	-0.8712326	5.14751566	-4.1523828	5.88E-05	0.03544413	1.64060021
PRKAR2A-AS1	-0.7032957	2.44541259	-4.1775972	5.33E-05	0.03544413	1.62238375
CCT5	0.70272699	6.00526711	4.14012272	6.16E-05	0.03544413	1.59842024
HPS3	0.51807594	3.4876199	4.13834263	6.21E-05	0.03544413	1.57903802
TARS1	0.5953144	5.01697074	4.13451477	6.30E-05	0.03544413	1.57890837
ADNP2	0.51063212	4.13373246	4.12350976	6.57E-05	0.03594991	1.5418217
USPL1	0.66991932	3.6944604	4.08496296	7.62E-05	0.04025491	1.40502055
FEM1C	0.43509141	5.30215835	4.07986139	7.77E-05	0.04025491	1.38982736
CTNNA3	-1.5165129	5.55512107	-4.0724038	7.99E-05	0.04027975	1.36479016
CDK19	-0.611942	6.53063501	-4.0658259	8.19E-05	0.04027975	1.34387312
TKT	0.65364636	7.39491862	4.059754	8.39E-05	0.04027975	1.32475828
OPALIN	-1.4218243	7.28926452	-4.0514273	8.65E-05	0.04050548	1.29650138
NUFIP2	0.53180401	6.20989104	4.04574517	8.84E-05	0.04050548	1.2744754
PAAF1	-0.5558087	6.22328603	-4.0172671	9.85E-05	0.04368067	1.17769032
PDIA6	0.50145528	6.17759513	4.0099209	0.00010127	0.04368067	1.15297171
PMF1	-0.5026964	4.09006269	-3.9975315	0.00010611	0.04368067	1.11521709
LINC01184	-0.4009313	4.63561065	-3.9977513	0.00010602	0.04368067	1.11332392
GPAT2	-0.6991166	4.27274572	-3.9909265	0.00010878	0.04368067	1.0923702
SLFN5	-0.5913748	3.78795086	-3.9870038	0.00011039	0.04368067	1.07944514
PPP1R3D	0.87004131	3.24067526	3.97425478	0.0001158	0.04386005	1.02098469
GDE1	-0.4614452	6.78115324	-3.9642255	0.00012023	0.04388068	1.00171507
FDX1	0.40307284	3.81325345	3.95931496	0.00012246	0.04388068	0.98784974
ARFRP1	-0.3571693	5.3778306	-3.9591451	0.00012254	0.04388068	0.9802318
BMP6	1.1077522	2.13809625	3.98334145	0.00011192	0.04368067	0.93186408
SEPTIN4	-1.0953513	9.26618715	-3.9430607	0.00013012	0.04576413	0.92659785
ALG2	0.51396139	3.54985225	3.91968217	0.00014195	0.04904682	0.85572306
DLEU2L	0.99280193	0.71213594	3.98052543	0.00011311	0.04368067	0.63102619
LOC101927948	-2.4360854	-2.7342493	-4.5359149	1.28E-05	0.02202875	0.34812049

TABLE 8B - Putamen RNAs PD with Dementia vs PD no dementia

ID	logFC	AveExpr	t	P.Value	adj.P.Val	B
RGPD5	2.43876079	4.81475803	5.47965882	2.09E-07	0.00319478	6.79668888
TMEM150C	-0.7827441	4.59432488	-5.3840176	3.24E-07	0.00319478	6.40884408
GPAT2	-0.8628188	4.27274572	-4.8997423	2.77E-06	0.01819607	4.42232664
BTN2A2	0.82521742	3.03418089	4.76280484	4.97E-06	0.02446972	3.83840579
PDE1A	-2.1598392	2.90476462	-4.5554336	1.18E-05	0.04392461	3.07825709
SYTL2	-1.2717885	3.61843354	-4.4867841	1.56E-05	0.04392461	2.83865727

BMP6	1.2011059	2.13809625	4.4941924	1.51E-05	0.04392461	2.77711075
PELO	0.51316031	3.84680792	4.44887854	1.82E-05	0.04482033	2.69897696

[000226] GSVA identified more than 300 GO terms that were significantly changed in PDD compared to PD caudate (**Fig 7b, Fig 8b**, data not shown). Interestingly, no significant GO terms were identified in the putamen in the same patients, suggesting that the region-specific changes seen in the caudate are specifically linked to dementia (**Fig 8b**). Significant GO terms in PDD caudate included circadian regulation of gene expression and stress response pathways, including protein kinase C signaling, histone H4 acetylation, mitochondrial DNA metabolic process (**Fig 7b,c**).

[000227] We next assessed the blood transcriptome in PPMI PD patients with respect to clinical measures of cognitive impairment, using the MoCA (Montreal Cognitive Assessment) scale, where MoCA ≥ 26 is normal; n=144) and MoCa < 26 is abnormal; n=332) and identified 2508 and 380 up and downregulated RNAs (**Fig 8c, TABLE 9A** and data not shown). RNAs that were differentially expressed in the caudate in PDD patients, such as *TRAPPC6A*, *ARFRP1*, *NUCKS1* and *STAG3*, progressively changed in the blood with worsening MoCA (**Fig 7d**).

TABLE 9A

	Controls (n=161)	PD- cognitive impairment (n=144)	PD- normal cognition (n=332)	p value PD- cognitive impairme nt vs PD- Normal cognition	p value (PD- cognitive impairme nt vs CTRL)	p value (PD- Norma l cogniti on vs CTRL)	Test
Age at collection (years)	59.6 (11.3)	66.3 (8.6)	59.5 (9.6)	5.80E- 13	5.50E- 08	0.517	Wilcox on
Male/Female	99/62	111/33	200/132	0.0004	0.004	0.844	Fisher test
Race (White/Black/Hispanic/ Other)	148/8/1 /4	126/2/6/10	315/5/3/ 9	0.012	0.014	0.152	Fisher test
Age of onset/diagnosis (years)	NA	64.2 (8.7)	57.5 (10.0)	2.60E- 12	NA	NA	Wilcox on
Disease duration (years)	NA	6.7 (6.3)	6.8 (6.9)	0.993	NA	NA	Wilcox on
quality (% usable bases)	40.7 (8.5)	41.3 (9.0)	41.0 (9.6)	0.730	0.396	0.465	Wilcox on
Mean (standard deviation); p values were determined using listed tests							

[000228] Interestingly, the top GO terms that differentiated subjects with and without cognitive impairment in the blood were neuronal terms, including glutamatergic signaling (glutamate binding, NMDA glutamate receptor complex, spontaneous neurotransmitter secretion) (**Fig 8d, TABLE 9B** and additional data not shown). GO terms dysregulated in PDD caudate such as histone H4 acetylation, mitochondrial DNA metabolic process and circadian regulation of gene expression were

inversely changed and also significantly altered in the blood of PPMI subjects with cognitive impairment (**Fig 8d,e**). As postmortem PDD donors had longer average disease duration (13.4 ± 7.2 years) relative to PPMI PD subjects with cognitive impairment (average disease duration 6.7 ± 6.3 years), these observations suggest that the above stress response pathways are important in development of PDD, and likely undergo dynamic changes early in the course of disease.

TABLE 9B – GO terms PD dementia vs no dementia – Blood

PATHWAY

GO_NEGATIVE_REGULATION_OF_ANION_TRANSMEMBRANE_TRANSPORT
 GO_NEGATIVE_REGULATION_OF_TOR_SIGNALING
 GO_GLUTAMATE_BINDING
 GO_REGULATION_OF_ANION_TRANSMEMBRANE_TRANSPORT
 GO_GLOMERULUS_VASCULATURE_MORPHOGENESIS
 GO_RETINOL_BINDING
 GO_ENDOPLASMIC_RETICULUM_LOCALIZATION
 GO_POSITIVE_REGULATION_OF_PROTEIN_EXIT_FROM_ENDOPLASMIC_RETICULUM
 GO_POSITIVE_REGULATION_OF_MICROTUBULE_BINDING
 GO_REGULATION_OF_GLUONEOGENESIS
 GO_MICROTUBULE_NUCLEATION_BY_MICROTUBULE_ORGANIZING_CENTER
 GO_RNA_POLYMERASE_III_GENERAL_TRANSCRIPTION_INITIATION_FACTOR_ACTIVITY
 GO_TRANSCRIPTION_DEPENDENT_TETHERING_OF_RNA_POLYMERASE_II_GENE_DNA_AT_NUCLEAR_PERIPHERY
 GO_N_ACYLPHOSPHATIDYLETHANOLAMINE_SPECIFIC_PHOSPHOLIPASE_D_ACTIVITY
 GO_HISTONE_ACETYLTRANSFERASE_ACTIVITY_H4_K5_SPECIFIC
 GO_HISTONE_H4_ACETYLATION
 GO_REGULATION_OF_INTERLEUKIN_4_PRODUCTION
 GO_CELLULAR_RESPONSE_TO_LEUCINE_STARVATION
 GO_N_GLYCAN_PROCESSING
 GO_SERINE_FAMILY_AMINO_ACID_BIOSYNTHETIC_PROCESS
 GO_COMPLEX_OF_COLLAGEN_TRIMERS
 GO_MICROTUBULE_NUCLEATION_BY_INTERPHASE_MICROTUBULE_ORGANIZING_CENTER
 GO_FATTY_ACID_TRANSMEMBRANE_TRANSPORT
 GO_CITRATE_METABOLIC_PROCESS
 GO_REGULATION_OF_PEPTIDYL_LYSINE_ACETYLATION
 GO_MRNA_CLEAVAGE_INVOLVED_IN_MRNA_PROCESSING
 GO_PEPTIDYL_LYSINE_ACETYLATION
 GO_INTERLEUKIN_4_PRODUCTION
 GO_MESENCHYMAL_TO_EPITHELIAL_TRANSITION_INVOLVED_IN_METANEPHROS_MORPHOGENESIS
 GO_HISTONE_H4_K5_ACETYLATION
 GO_SPONTANEOUS_NEUROTRANSMITTER_SECRETION
 GO_PHOSPHATIDYLINOSITOL_BIOSYNTHETIC_PROCESS
 GO_NMDA_SELECTIVE_GLUTAMATE_RECEPTOR_COMPLEX

GO_CARDIOLIPIN_METABOLIC_PROCESS
GO_MOTOR_BEHAVIOR
GO_PROTEIN_SUMOYLATION
GO_DETECTION_OF_STIMULUS
GO_NURD_COMPLEX
GO_CARDIAC_MYOFIBRIL_ASSEMBLY
GO_MUSCLE_CELL_CELLULAR_HOMEOSTASIS
GO_POSITIVE_REGULATION_OF_TRANSCRIPTION_BY_RNA_POLYMERASE_III
GO_PHOSPHOLIPID_BIOSYNTHETIC_PROCESS
GO_CELLULAR_RESPONSE_TO_GLUCOSE_STARVATION
GO_REGULATION_OF_POSTTRANSCRIPTIONAL_GENE_SILENCING
GO_TYPE_5_METABOTROPIC_GLUTAMATE_RECEPTOR_BINDING
GO_METANEPHRIC_MESENCHYMAL_CELL_DIFFERENTIATION
GO_GENE_SILENCING_BY_RNA
GO_EMBRYONIC_CAMERA_TYPE_EYE_MORPHOGENESIS
GO_LIGASE_ACTIVITY_FORMING_CARBON_NITROGEN_BONDS
GO_HYDROLASE_ACTIVITY_ACTING_ON_ESTER_BONDS
GO_TRANSCRIPTION_INITIATION_FROM_RNA_POLYMERASE_III_PROMOTER
GO_PROTEIN_ACETYLTATION
GO_TRICARBOXYLIC_ACID_METABOLIC_PROCESS
GO_SWI_SNF_COMPLEX
GO_MITOGEN_ACTIVATED_PROTEIN_KINASE_P38_BINDING
GO_REGULATION_OF_GENE_SILENCING
GO_MANNOSIDASE_ACTIVITY
GO_PINOSOME
GO_ATPASE_COMPLEX
GO_CELLULAR_RESPONSE_TO_COLD
GO_GENE_SILENCING
GO_PHOSPHOLIPID_DEPHOSPHORYLTATION
GO_POSITIVE_REGULATION_OF_PEPTIDYL_LYSINE_ACETYLTATION
GO_VASODILATION
GO_PHOSPHATIDYLINOSITOL_4_5_BISPHOSPHATE_PHOSPHATASE_ACTIVITY
GO_MLL1_2_COMPLEX
GO_EQUATORIAL_MICROTUBULE_ORGANIZING_CENTER
GO_B_CELL_LINEAGE_COMMITMENT
GO_PHOSPHATIDYLINOSITOL_PHOSPHATE_5_PHOSPHATASE_ACTIVITY
GO_REGULATION_OF_MICROTUBULE_BINDING
GO_H3_HISTONE_ACETYLTTRANSFERASE_COMPLEX
GO_EMBRYONIC_DIGESTIVE_TRACT_MORPHOGENESIS
GO_REGULATION_OF_PROTEIN_ACETYLTATION
GO_PEPTIDYL_LYSINE_TRIMETHYLATION
GO_MUSCLE_FIBER_DEVELOPMENT
GO_EPITHELIAL_TUBE_BRANCHING_INVOLVED_IN_LUNG_MORPHOGENESIS
GO_PROTEIN_DNA_COMPLEX_DISASSEMBLY

GO_IONOTROPIC_Glutamate_Receptor_Activity
GO_GPI_Anchor_Transamidase_Complex
GO_GPI_Anchor_Transamidase_Activity
GO_Dioxygenase_Activity
GO_NCRNA_EXPORT_FROM_NUCLEUS
GO_IMMUNOLOGICAL_SYNAPSE_FORMATION
GO_TRANSMITTER_GATED_CHANNEL_Activity
GO_REGULATION_OF_GENE_EXPRESSION_EPIGENETIC
GO_PEPTIDYL_LYSINE_MODIFICATION
GO_RNA_POLYMERASE_III_TRANSCRIPTION_FACTOR_COMPLEX
GO_DNA_METHYLATION_OR_DEMETHYLATION
GO_ACTIVATION_INDUCED_CELL_DEATH_OF_T_CELLS
GO_AXONEMAL_DYNEIN_COMPLEX
GO_MITOCHONDRIAL_DNA_METABOLIC_PROCESS
GO_MICROTUBULE_MINUS_END_BINDING
GO_OUTER_DYNEIN_ARM
GO_REGULATION_OF_PROTEIN_EXIT_FROM_ENDOPLASMIC_RETICULUM
GO_POSITIVE_REGULATION_OF_CHROMATIN_SILENCING
GO_REGULATION_OF_METHYLATION_DEPENDENT_CHROMATIN_SILENCING
GO_INO80_TYPE_COMPLEX
GO_PHOSPHATIDYLINOSITOL_DEPHOSPHORYLATION
GO_CIRCADIAN_REGULATION_OF_GENE_EXPRESSION
GO_PHOSPHATIDYLINOSITOL_BISPHOSPHATE_PHOSPHATASE_Activity
GO_Glutamate_Receptor_Activity
GO_LUNG_MORPHOGENESIS
GO_FOREBRAIN_REGIONALIZATION
GO_PATTERN_SPECIFICATION_INVOLVED_IN_KIDNEY_DEVELOPMENT
GO_CEREBELLAR_PURKINJE_CELL_GRANULE_CELL_PRECURSOR_CELL_SIGNALING_INVOLVE
D_IN_REGULATION_OF_GRANULE_CELL_PRECURSOR_CELL_PROLIFERATION
GO_Glutamate_Gated_Calcium_Ion_Channel_Activity
GO_DEVELOPMENTAL_INDUCTION
GO_RNA_SPLICING_VIA_ENDONUCLEOLYTIC_CLEAVAGE_AND_LIGATION
GO_OUTER_EAR_MORPHOGENESIS
GO_MONOSACCHARIDE_BIOSYNTHETIC_PROCESS
GO_ENDOPLASMIC_RETICULUM_UNFOLDED_PROTEIN_RESPONSE
GO_POSTSYNAPTIC_NEUROTRANSMITTER_RECEPTOR_Activity
GO_REGULATION_OF_INSULIN_LIKE_GROWTH_FACTOR_RECEPTOR_SIGNALING_PATHWAY
GO_METHYLATION_DEPENDENT_CHROMATIN_SILENCING
GO_PROTEIN_ACYLATION
GO_EXTRINSIC_COMPONENT_OF_MITOCHONDRIAL_INNER_MEMBRANE
GO_CILIARY_BASE
GO_MESODERMAL_CELL_FATE_COMMITMENT
GO_HISTONE_H4_K16_ACETYLATION
GO_SYNAPTIC_TRANSMISSION_GLUTAMATERGIC

GO_PHOSPHORIC_ESTER_HYDROLASE_ACTIVITY
 GO_PROTEIN_EXIT_FROM_ENDOPLASMIC_RETICULUM
 GO_CHANGES_TO_DNA_METHYLATION_INVOLVED_IN_EMBRYO_DEVELOPMENT
 GO_NEUROTRANSMITTER_RECEPTOR_ACTIVITY_INVOLVED_IN_REGULATION_OF_POSTSYNAPTIC_MEMBRANE_POTENTIAL
 GO_N_ACETYLTRANSFERASE_ACTIVITY
 GO_FRUCTOSE_METABOLIC_PROCESS
 GO_PHOSPHATIDYLINOSITOL_3_KINASE_COMPLEX
 GO_NUCLEAR_TRANSCRIPTIONAL_REPRESSOR_COMPLEX
 GO_IMMUNOLOGICAL_SYNAPSE
 GO_REGULATION_OF_TRANSCRIPTION_INVOLVED_IN_CELL_FATE_COMMITMENT
 GO_INTEGRATOR_COMPLEX
 GO_LIPOSACCHARIDE_METABOLIC_PROCESS
 GO_PHOSPHATIDYLINOSITOL_PHOSPHATE_PHOSPHATASE_ACTIVITY
 GO_RNA_POLYMERASE_II_C_TERMINAL_DOMAIN_BINDING
 GO_2_OXOGLUTARATE_DEPENDENT_DIOXYGENASE_ACTIVITY

[000229] Although PPMI PD subjects who were drug-naïve for dementia medications had significantly better cognitive profiles (**Fig 8f**), many RNAs and pathways nonetheless showed similar expression patterns with decreasing MoCA scores (**Fig 8g,h**). These studies indicate that RNAs associated with dementia in the brain show corresponding changes in the blood with worsening cognition.

[000230] We next assessed the molecular changes in caudate and putamen in PD subjects with a clinical history of levodopa-induced dyskinesia (**TABLE 10A**, see Methods), although only a small numbers of comparable donors with (n=5) or without (n=11) dyskinesia were available for analysis. There was no significant difference in the average LEDD between donors with (average LEDD 716.3 +/- 577.5 mg) and without dyskinesia (average LEDD 954.7 +/- 780.1 mg). Differential gene expression analysis identified 18 RNAs which were altered in the putamen (**TABLE 10B**), while few RNAs (only 1 RNA) were differentially expressed in the caudate (**TABLE 10C**) (**Fig 9a**, data not shown). We assessed transcriptome patterns in the blood of PPMI subjects with (n=213) and without (n=201) history of dyskinesia, but did not observe any significant difference between these groups (data not shown). In contrast to patients with PDD, where changes were preferentially observed in the caudate, patients with dyskinesia had differentially changed GO terms specifically in the putamen (**Fig 9b**, **TABLE 10D**). The caudate was not significantly affected in dyskinesia, while the putamen is selectively affected in dyskinesia. These observations were consistent with previous functional imaging studies in PD patients and animal models of PD, showing vascular pathology in the putamen in levodopa-induced dyskinesia⁴⁹⁻⁵². Here, we identified differences in regulation of endothelial cell pathology and cell death GO terms (endothelial cell apoptosis, anoikis, vascular permeability, fluid laminar shear stress, death receptor signaling; **Fig 9c,d**). Taken together, our results suggest that PD

patients with cognitive and motor complications have distinct molecular changes in the caudate and putamen respectively, some of which are reflected in the antemortem blood transcriptome.

TABLE 10A

	Control (n=40)	Dys No (n=11)	Dys Yes (n=5)	p value (Yes vs No)	p value (No vs CTRL)	p value (Yes vs CTRL)	Test
Age of death (years)	72.4 (11.8)	73.2 (6.1)	76.4 (6.7)	0.362	0.606	0.303	Wilcoxon
Male/Female	28/12	10/1	5 (Male)	1	0.25	0.303	Fisher
Race (White/Black/H ispanic/Other)	34/2/2/2	4 (White)/ 2 (Black)	10 (White)	0.125	1	1	Fisher
Age of onset/diagnosis (years)	NA	62.1 (8.0)	59.0 (6.7)	0.359	NA	NA	Wilcoxon
Disease duration (years)	NA	12.9 (6.9)	13.4 (7.2)	1	NA	NA	Wilcoxon
PMI (hours)	16.9 (7.6)	17.7 (9.5)	24.6 (13.4)	0.441	0.837	0.187	Wilcoxon
RIN (PUT)	6.6 (1.9)	5.5 (2.6)	5.1 (2.5)	0.865	0.63	0.357	Wilcoxon
RIN (CAU)	6.6 (1.8)	5.5 (2.2)	5.3 (2.6)	0.91	0.092	0.248	Wilcoxon
Mean (standard deviation); p values were calculated using listed tests							

TABLE 10B – Putamen RNAs Dyskinesia

ID	logFC	AveExpr	t	P.Value	adj.P.Val	B
NGF	-3.5563286	-1.5449134	-5.7971906	6.60E-08	0.00133031	5.34949094
EXOC3L1	-1.7588907	0.79789358	-4.955336	2.65E-06	0.01779438	4.08943701
CCDC172	-2.6676869	-1.8179418	-5.2642353	7.08E-07	0.00713621	3.67997002
ITGB3	-2.0258529	0.18335372	-4.6755028	8.42E-06	0.0423871	2.96566885
STX17-AS1	1.0778987	0.09001957	4.52437705	1.55E-05	0.06225501	2.54278191
VWA2	-1.7276366	1.03895519	-4.3758181	2.77E-05	0.07082941	2.17371376
DACT1	1.19463199	2.14693836	4.26754712	4.22E-05	0.07915671	1.94990916
CPTP	-0.8780703	4.24644636	-4.2378645	4.73E-05	0.07915671	1.79604048
LINC01574	-2.4850502	-0.7598421	-4.4158878	2.37E-05	0.07082941	1.68303067
C1QTNF3- AMACR	2.64193335	1.2781826	4.18663127	5.74E-05	0.07915671	1.63398876
MIER2	-0.7296487	4.24555016	-4.1714973	6.08E-05	0.07915671	1.56237206
C9orf129	-2.7490534	-0.5921343	-4.2409124	4.67E-05	0.07915671	1.26535179
SLCO4A1- AS1	-3.7351468	-1.2246675	-4.3496622	3.07E-05	0.07082941	1.2538872
EFCC1	-2.0161379	0.03777933	-4.162803	6.29E-05	0.07915671	1.22976739
TMEM115	-0.5390778	4.77717194	-4.0785792	8.63E-05	0.09653497	1.21704441
C1orf116	-2.5210879	-2.1256911	-4.3420251	3.16E-05	0.07082941	0.93541
DNAH8	2.36750563	-1.5732021	4.12643284	7.21E-05	0.08544571	0.87982896

CAGE1	-2.8436571	-2.4547459	-4.2008486	5.44E-05	0.07915671	0.41547423
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TABLE 10C – Caudate RNAs Dyskinesia

ID	logFC	AveExpr	t	P.Value	adj.P.Val	B
FREM1	2.26636522	0.49112821	4.95917792	2.61E-06	0.05252876	2.48254195

TABLE 10D – GO Terms Putamen Dyskinesia

PATHWAY
GO_ENTRAINMENT_OF_CIRCADIAN_CLOCK
GO_CHEMOKINE_C_X_C_MOTIF_LIGAND_2_PRODUCTION
GO_ANOIKIS
GO_NEGATIVE_REGULATION_OF_ENDOTHELIAL_CELL_APOPTOTIC_PROCESS
GO_ENTRAINMENT_OF_CIRCADIAN_CLOCK_BY_PHOTOPERIOD
GO_PHOTOPERIODISM
GO_POSITIVE_REGULATION_OF_URINE_VOLUME
GO_CHOLESTEROL_STORAGE
GO_ENDOTHELIAL_CELL_APOPTOTIC_PROCESS
GO_DEATH_RECEPTOR_BINDING
GO_BHLH_TRANSCRIPTION_FACTOR_BINDING
GO_MIDDLE_EAR_MORPHOGENESIS
GO_REGULATION_OF_NOTCH_SIGNALING_PATHWAY
GO_KERATINOCYTE_DEVELOPMENT
GO_NEGATIVE_REGULATION_OF_EPITHELIAL_CELL_APOPTOTIC_PROCESS
GO_POSITIVE_REGULATION_OF_DIGESTIVE_SYSTEM_PROCESS
GO_REGULATION_OF_VASCULAR_PERMEABILITY
GO_RESPONSE_TO_LAMINAR_FLUID_SHEAR_STRESS
GO_METANEPHRIC_GLOMERULUS_DEVELOPMENT

[000231] Clinical-Molecular Analysis: Age of Onset

[000232] Patients with late onset PD are clinically distinct from patients with early onset of disease, with late onset PD patients experiencing faster motor and non-motor progression of disease compared to early onset PD patients⁵³⁻⁵⁵. While the classic definition of early onset is arbitrary, with ages ranging from <40 to <50, previous studies have shown that for every decade for onset studied, older age of onset was associated with worse motor and non-motor disease. This led us to hypothesize that there may be distinct molecular features in the striatum that distinguish the age of PD onset.

[000233] PCA revealed that patients with later age of onset (referred to as LOPD, age of onset > 55) separated better from controls, more than patients (n=6) with earlier onset of PD (referred here as EOPD, age of onset ≤ 55) (**Fig 10a, TABLE 11**). After factoring in age at death, differential gene expression analysis in the caudate of LOPD patients identified 5266 and 5723 RNAs that were significantly up or downregulated, respectively (**Fig 10b**, data not shown). In the putamen of LOPD patients, 5599 and 6551 RNAs were up or downregulated, respectively (**Fig 10b**, data not shown).

Using more stringent criteria, 1357 differentially expressed genes were identified in caudate (LOPD vs control) and 2089 genes in putamen (LOPD vs control) (data not shown). LOPD brains showed differentially expressed RNAs compared to controls even when small sample numbers were used (n=6), again suggesting that changes in LOPD striatum are robust (**Fig 11a,b**). In contrast, few differentially expressed RNAs could be identified between EOPD patients and controls (**Fig 10b, Fig 11b**, data not shown).

TABLE 11

	Control (n=40)	EOPD (n=6)	LOPD (n=25)	p value (LOPD vs EOPD)	p value (EOPD vs CTRL)	p value (LOPD vs CTRL)	Test
Age of death (years)	72.4 (11.8)	71.3 (5.2)	77.1 (6.9)	0.014	0.857	0.003	Wilcoxon
Male/Female	28/12	5/1	19/6	1	0.66	0.777	Fisher
Race (White/Black/Hispanic/Other)	34/2/2/2	5 (White)/1 (Black)	23 (White)/1 (Black)/1 (Hispanic)	0.488	0.652	0.904	Fisher
Age of onset/diagnosis (years)	NA	50.5 (3.7)	66.0 (7.2)	8.90E-08	NA	NA	Wilcoxon
Disease duration (years)	NA	20.5 (5.1)	11.2 (5.9)	0.005	NA	NA	Wilcoxon
PMI (hours)	16.9 (7.6)	18.8 (5.8)	18.8 (5.8)	0.94	0.613	0.422	Wilcoxon
RIN (CAU)	6.6 (1.8)	6.4 (2.1)	5.6 (1.9)	0.305	0.974	0.026	Wilcoxon
RIN (PUT)	6.6 (1.9)	6.6 (2.0)	5.4 (2.0)	0.154	0.883	0.037	Wilcoxon
Mean (standard deviation); p values were calculated using listed tests							

[000234] Calcium ion transport was the top changed GO term in LOPD, consistent with significant synaptic dysregulation seen in PD. Gene set enrichment scores showed significant downregulation of this pathway in LOPD, while EOPD patients showed no significant differences relative to controls (**Fig 10c**, data not shown). A more targeted approach, looking at dopaminergic pathway differences, showed the same differences in molecular impact in LOPD but not EOPD (**Fig 10c**). Notably, these differences were seen despite the shorter disease duration in LOPD (11.24 ± 5.9 years) compared to EOPD (20.50 ± 5.1 years).

[000235] Functional imaging studies in PPMI subjects have demonstrated that dopamine dysfunction is comparable in the putamen in late and early onset PD⁵⁴. Postmortem studies have suggested that there is substantial loss of DA input into the putamen within 5 years of disease onset, although this has not been investigated in the context of age of onset of disease⁵⁶. Given the lack of molecular changes in EOPD, we tested the hypothesis that this was secondary to preserved dopamine input in

these patients. We assessed TH levels on protein extracts from caudate and putamen of donors with EOPD and LOPD to estimate loss of dopaminergic innervation in these groups. Both EOPD and LOPD showed comparable loss of TH (**Fig 11c,d**). These observations show that despite the substantial and comparable loss of nigral dopamine input and shorter disease duration compared to EOPD, LOPD patients show significant RNA changes compared to controls. Taken together, these data suggest physiologic differences in how the striatum responds to dopamine loss in EOPD and LOPD.

[000236] We next analyzed the blood transcriptome from controls (n=195), LOPD (n=330) and EOPD (n=149) individuals from the PPMI cohort (**TABLE 12**). Similar to our observations in the caudate and putamen, significant blood RNA changes were evident in LOPD but not EOPD (**Fig 10d**, data not shown). These observations suggest that LOPD and EOPD are fundamentally different in their molecular characteristics in the caudate and putamen, and these differences are mirrored in the blood.

TABLE 12

	Controls (n=195)	EOPD (n=149)	LOPD (n=330)	p value (EOPD vs LOPD)	p value (EOPD vs CTRL)	p value (LOPD vs CTRL)	Test
Age at collection (years)	60.8 (11.3)	50.1 (6.0)	66.8 (5.9)	4.5E-66	8.7E-25	2.0E-10	Wilcoxon
Male/Female	125/70	83/66	228/102	0.005	1.1E-08	5.1E-13	Fisher test
Race (White/Black/Hispanic/ Other)	180/10/1/ 4	308/5/89	136/2/1/ 10	0.130	0.029	0.039	Fisher test
Age of onset/diagnosis (years)	NA	47.5 (6.05)	65.0 (5.9)	8.5E-69	NA	NA	Wilcoxon
Disease duration (years)	NA	7.6 (8.1)	6.4 (6.0)	0.630	NA	NA	Wilcoxon
quality (% usable bases)	41.0 (8.4)	42.0 (10.0)	40.7 (9.1)	0.119	0.151	0.965	Wilcoxon
Mean (standard deviation); p values were determined using listed tests							

[000237] Clinical-Molecular Analysis: Disease Duration

[000238] Previous studies have shown an association between disease duration and loss of dopamine input into the striatum⁵⁶. This association was non-linear, with the greatest loss of dopamine input into the putamen occurring in the first four years after diagnosis. We used spline interpolation in the brain to investigate relationships between gene expression and disease duration in the striatum. GO terms significantly associated with disease duration in the caudate included oligodendrocyte development, pinocytosis and gonadotropin response pathway, consistent with extra-hypothalamic gonadotropin expressing population discovered in the striatum⁵⁷ (**Fig 12a,c** and data not shown). In the putamen, GO terms associated with increased disease duration include nuclear hormone receptor binding,

integrin signaling and cellular senescence (p38 MAP kinase, cell aging) (**Fig 12b,d** and data not shown). In PD putamen, many pathways showed downregulation with long (≥ 20 years) disease duration, which may reflect the dynamic changes that occur in the final stages of disease. In sum, these observations highlight the temporal dynamics of molecular pathways and the continuous accumulation of pathology in PD caudate and putamen over the course of the disease, from onset to death.

DISCUSSION

[000239] Loss of dopamine input into the striatum is one of the key mechanisms underlying clinical manifestations in PD. At the time of diagnosis of PD, most patients have lost roughly 60% of the nigral dopamine neurons³. Although the initial loss of dopamine input is balanced by compensatory mechanisms in the striatum, eventually, striatal dysfunction leads to onset of symptoms⁵⁸. Therefore, understanding the molecular changes in the striatum in PD has a vast potential for disease modulation. Moreover, the biological and molecular basis for clinical heterogeneity seen in PD is not understood. Identifying molecular features in blood that correlate with pathological changes in the brain and clinical trajectories offer predictive value for patients early in the course of disease. Here we present an in-depth molecular analysis of the PD striatum and correlate molecular changes in the striatum with clinical variables. We discovered that the caudate and putamen show both overlapping and distinct transcriptome changes with the caudate particularly affected in PD patients with cognitive impairment while putamen is more affected in motor complications such as dyskinesia. We show that LOPD is molecularly distinct from EOPD, even at the end of their disease course. Finally, we identify that molecular signatures of PD and its clinical heterogeneity can be identified in the peripheral blood antemortem which could ultimately be clinically useful for prognosis and treatment.

[000240] We observed that several GO terms previously linked to the death of substantia nigra dopaminergic neurons including immune response, synaptic signaling, and mitochondrial dynamics were also altered in the striatum, thus indicating a global dysregulation of these pathways in PD^{1,59}. In PDD caudate, we observed an upregulation of pathways linked to memory formation in mice, such as histone acetylation and protein kinase C signaling^{60–62} and mitochondrial DNA metabolism, consistent with a previous study in the PDD prefrontal cortex⁶³. As dopamine is a potent modulator of circadian rhythm through D2 receptor⁶⁴ and PDD caudate shows changes in circadian regulation, it is of future interest to understand if there is a bidirectional relationship between cognitive decline and PD-related circadian sleep disorders, as seen in Alzheimer's disease⁶⁵. Functional imaging studies have shown abnormal putaminal neurovascular responses in patients with levodopa-induced dyskinesia⁵², linked to increased endothelial proliferation, neo-angiogenesis and blood-brain barrier permeability^{49–51}. Our discovery of dysregulated vascular endothelial pathways provides molecular confirmation of these mechanisms in PD patients with levodopa-induced dyskinesia.

[000241] The more robust molecular changes in LOPD than EOPD, despite their longer disease duration and comparable loss of dopaminergic innervation, may explain the faster disease progression

in late onset PD patients⁵³ and indicate different pathophysiologies and response to dopamine loss in the two groups. As RNA changes associated with age of death in the two groups were factored in our comparative analysis, there is likely an additive effect of aging on disease progression, reflected in the more severe molecular changes seen in LOPD. Our findings establish a molecular basis for clinical differences with age at onset in PD and should be considered in recruitment of subjects to clinical trials, to minimize heterogeneity and improve efficacy of novel treatment measures.

[000242] A previous study that combined transcriptomics in PD substantia nigra with a mouse cell-type specific transcriptome atlas has identified that oligodendrocyte genes are significantly upregulated in PD, even in early preclinical stages⁶⁶. Our observation that RNAs involved in oligodendrocyte development are upregulated with disease duration indicates that these cells are additionally involved in PD striatum. Nuclear hormone receptor signaling, associated with disease duration in the putamen, has been shown to be crucial for the development and physiology of the striatal dopaminergic system^{67–70}. In the PD putamen, cellular senescence including cell aging and p38 kinase cascade GO terms were also strongly associated with disease duration. Cellular senescence, once thought to be limited to proliferating cells, have lately been also identified as a feature of aging post-mitotic neurons and in nigral astrocytes in PD^{71–73}. Activation of p38 MAP kinase is detrimental to neurons in Alzheimer's and Huntington's disease^{74,75}. Clearance of senescent cells have also been shown to mitigate neurodegeneration^{76,77}. These findings invite considerations for investigations into senolytics currently in clinical trials, for PD^{78,79}.

[000243] Our observations in the blood transcriptome of PPMI subjects further supports and extends our observations of striatal transcriptome changes seen in PD. Consistent with previous analysis of blood transcriptomes in PD, we noted increased immune activation in the striatum and peripheral blood²⁷. Detection of RNA changes in brain and blood may in part support the hypothesis that PD is a multi-system disorder with global molecular dysfunctions that underlie neurodegeneration. As RNAs encoding proteins involved in neuronal functions distinguish controls from PD and also correlate with motor progression and disease severity, some of the peripheral changes detected in the blood are likely secondary to changes in the brain. A recent study has reported that brain genes defined in single cell-atlas are detectable in cell-free RNA from the blood⁸⁰. Cell-free mRNA profile studies in Alzheimer's blood have reported the detection of brain RNAs resembling the dysregulation seen in postmortem brains, where downregulated brain signatures inversely correlated with increased dementia²⁴. A clear mechanism for how brain transcripts gain access to the blood in the course of neurodegeneration is lacking, and further investigation is required. Nevertheless, transcriptome changes seen in PD striatum and blood that correlate with heterogeneous features of the disease are of enormous clinical value. Molecular changes occurring in the PD brain cannot be examined non-invasively antemortem, limiting our understanding of the cause, progression and heterogeneity of the disease. The concordant transcriptome changes seen in brain and blood can be leveraged to

molecularly characterize clinical subtypes of PD and develop novel tools for antemortem clinical diagnosis, prognostication and monitoring therapeutic responses by a minimally invasive approach.

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EXAMPLE 2

[000245] The above Example studies and figures provide genes and gene groups that are associated with certain aspects of Parkinson's disease. Some genes are down regulated – that is their expression and/or the amount of corresponding RNA is reduced or lowered significantly. Some genes are up regulated – that is their expression and/or the amount of corresponding RNA is higher or increased significantly. The level of RNA is compared to control individuals or individuals without that disease condition or manifestation associate with disease to determine relative or increased or decreased expression or RNA levels.

[000246] The following genes are noted as being down regulated in PD blood, even in drug naïve patients, versus control patients: GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4. In particular, this subset of genes are down regulated in the blood of PD drug naïve patients: DNAJC6, SNCA, DLG2 and GPR52. Further, genes TOMM70 and CAMK4 are also down regulated

in caudate and putamen of PD patients. TIAM1 is decreased or down regulated in blood, caudate and putamen in PD versus controls. Details of these genes are provided below in TABLE 13.

TABLE 13 – Genes Down Regulated in PD Patient Blood

ID/Gene Name	Details and Genbank Accession
GPR52	G protein-coupled receptor 52 Gene ID: 9293 Homo sapiens G protein-coupled receptor 52 (GPR52), mRNA NCBI Reference Sequence: NM_005684.5
SNCA	synuclein alpha (also known as NACP, PARK1, PARK4, PD1) Gene ID: 6622 Homo sapiens synuclein alpha (SNCA), transcript variant 1, mRNA NCBI Reference Sequence: NM_000345.4
DNAJC6	DnaJ heat shock protein family (Hsp40) member C6 Gene ID: 9829 Homo sapiens DnaJ heat shock protein family (Hsp40) member C6 (DNAJC6), transcript variant 1, mRNA NCBI Reference Sequence: NM_001256864.2
DLG2	discs large MAGUK scaffold protein 2 Also known as: PPP1R58, PSD-93, PSD93, chapsyn-110 Gene ID: 1740 Homo sapiens discs large MAGUK scaffold protein 2 (DLG2), transcript variant 1, mRNA NCBI Reference Sequence: NM_001142699.3
TIAM1	TIAM Rac1 associated GEF 1 Also known as: NEDLDS, TIAM-1 Gene ID: 7074 Homo sapiens TIAM Rac1 associated GEF 1 (TIAM1), transcript variant 1, mRNA NCBI Reference Sequence: NM_003253.3
TOMM70	translocase of outer mitochondrial membrane 70 Also known as: TOMM70A, Tom70 Gene ID: 9868 Homo sapiens translocase of outer mitochondrial membrane 70 (TOMM70), mRNA; nuclear gene for mitochondrial product NCBI Reference Sequence: NM_014820.5
PREPL	prolyl endopeptidase like Also known as: CMS22 Gene ID: 9581 Homo sapiens prolyl endopeptidase like (PREPL), transcript variant 1, mRNA NCBI Reference Sequence: NM_006036.4
CAMK4	calcium/calmodulin dependent protein kinase IV Also known as: CaMK IV, CaMK-GR, CaMKIV, caMK Gene ID: 814 Homo sapiens calcium/calmodulin dependent protein kinase IV (CAMK4), transcript variant 1,

	mRNA NCBI Reference Sequence: NM_001744.6
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[000247] The following genes are noted as being up regulated in PD blood, even in drug naïve patients, versus control patients: FCAR, PROK2, IL1R2, HSPA6 and CHRNA10. In particular, this subset of genes are up regulated in the blood of PD drug naïve patients: FCAR, PROK2 and IL1R2. Details of these genes are provided below in TABLE 14.

TABLE 14 – Genes Up Regulated in PD Patient Blood

ID/Gene Name	Details and Genbank Accession
FCAR	Fc alpha receptor Also known as: CD89, CTB-61M7.2, FcalphaR, FcalphaRI Gene ID: 2204 Homo sapiens Fc alpha receptor (FCAR), transcript variant 1, mRNA NCBI Reference Sequence: NM_002000.4
PROK2	prokineticin 2 Also known as: BV8, HH4, KAL4, MIT1, PK2 Gene ID: 60675 Homo sapiens prokineticin 2 (PROK2), transcript variant 1, mRNA NCBI Reference Sequence: NM_001126128.2
IL1R2	interleukin 1 receptor type 2 Also known as: CD121b, CDw121b, IL-1R-2, IL-1RT-2, IL-1RT2, IL1R2c, IL1RB Gene ID: 7850 Homo sapiens interleukin 1 receptor type 2 (IL1R2), transcript variant 1, mRNA NCBI Reference Sequence: NM_004633.4
HSPA6	heat shock protein family A (Hsp70) member 6 Also known as: HSP70B' Gene ID: 3310 Homo sapiens heat shock protein family A (Hsp70) member 6 (HSPA6), mRNA NCBI Reference Sequence: NM_002155.5
CHRNA10	cholinergic receptor nicotinic alpha 10 subunit Gene ID: 57053 Homo sapiens cholinergic receptor nicotinic alpha 10 subunit (CHRNA10), transcript variant 1, mRNA NCBI Reference Sequence: NM_020402.4

[000248] Genes are identified as being down regulated or up regulated in Parkinson's disease with dementia (PDD) versus in PD without dementia. The following genes are noted as being down regulated in caudate in Parkinson's disease with dementia (PDD) versus in PD without dementia: TRAPPC6A, NUCKS1, STAG3 and ARFRP1. Details of these genes are provided below in TABLE 15. Notably, genes TRAPPC6A and ARFRP1 are also down regulated in blood in PDD patients

versus PD without dementia. TRAPPC6A and ARFRP1 provide blood markers indicative or predictive for PD with dementia in Parkinson's patients, even in drug naïve blood.

TABLE 15 – Genes Down Regulated in Caudate in PD with dementia (PDD) versus PD without dementia

ID/Gene Name	Details and Genbank Accession
TRAPPC6A	trafficking protein particle complex subunit 6A Also known as: TRS33 Gene ID: 79090 Homo sapiens trafficking protein particle complex subunit 6A (TRAPPC6A), transcript variant 1, mRNA NCBI Reference Sequence: NM_024108.3
NUCKS1	nuclear casein kinase and cyclin dependent kinase substrate 1 Also known as: JC7, NUCKS Gene ID: 64710 Homo sapiens nuclear casein kinase and cyclin dependent kinase substrate 1 (NUCKS1), mRNA NCBI Reference Sequence: NM_022731.5
STAG3	stromal antigen 3 Also known as: SPGF61 Gene ID: 10734 Homo sapiens stromal antigen 3 (STAG3), transcript variant 3, mRNA NCBI Reference Sequence: NM_001282717.2
ARFRP1	ADP ribosylation factor related protein 1 Also known as: ARL18, ARP, Arp1 Gene ID: 10139 Homo sapiens ADP ribosylation factor related protein 1 (ARFRP1), transcript variant 1, mRNA NCBI Reference Sequence: NM_003224.6

[000249] In particular, the following genes from the above table are also down regulated in the blood of patients with PDD versus PD patients without dementia: TRAPPC6A and ARFRP1. These genes provide a blood marker gene set for PDD.

[000250] The following genes are noted as being up regulated in caudate in Parkinson's disease with dementia (PDD) versus in PD without dementia: MARS1, NFAT5, LONRF3, PPP1R15B and TARS1. Details of these genes are provided below in TABLE 16.

TABLE 16 – Genes Up Regulated in Caudate in PD with dementia (PDD) versus PD without dementia

ID/Gene Name	Details and Genbank Accession
MARS1	methionyl-tRNA synthetase 1 Also known as: CMT2U, ILFS2, ILLD, MARS, METRS, MRS, MTRNS, SPG70, TTD9 Gene ID: 4141 Homo sapiens methionyl-tRNA synthetase 1 (MARS1), mRNA NCBI Reference Sequence: NM_004990.4

NFAT5	nuclear factor of activated T cells 5 Also known as: NF-AT5, NFATL1, NFATZ, OREBP, TONEBP Gene ID: 10725 Homo sapiens nuclear factor of activated T cells 5 (NFAT5), transcript variant 2, mRNA NCBI Reference Sequence: NM_138713.4
LONRF3	LON peptidase N-terminal domain and ring finger 3 Also known as: RNF127 Gene ID: 79836 Homo sapiens LON peptidase N-terminal domain and ring finger 3 (LONRF3), transcript variant 1, mRNA NCBI Reference Sequence: NM_001031855.3
PPP1R15B	protein phosphatase 1 regulatory subunit 15B Also known as: CREP, MSSGM2 Gene ID: 84919 Homo sapiens protein phosphatase 1 regulatory subunit 15B (PPP1R15B), mRNA NCBI Reference Sequence: NM_032833.5
TARS1	threonyl-tRNA synthetase 1 Also known as: TARS, TTD7, ThrRS Gene ID: 6897 Homo sapiens threonyl-tRNA synthetase 1 (TARS1), transcript variant 1, mRNA NCBI Reference Sequence: NM_152295.5

[000251] The following genes are noted as being down regulated in putamen in Parkinson's disease with dementia (PDD) versus in PD without dementia: NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115. Details of these genes are provided below in TABLE 17.

TABLE 17 – Genes Down Regulated in Putamen in PD with dementia (PDD) versus PD without dementia

ID/Gene Name	Details and Genbank Accession
NGF	nerve growth factor Also known as: Beta-NGF, HSAN5, NGFB Gene ID: 4803 Homo sapiens nerve growth factor (NGF), mRNA NCBI Reference Sequence: NM_002506.3
CCDC172	coiled-coil domain containing 172 Also known as: C10orf96 Gene ID: 374355 Homo sapiens coiled-coil domain containing 172 (CCDC172), mRNA NCBI Reference Sequence: NM_198515.3
EXOC3L1	exocyst complex component 3 like 1 Also known as: EXOC3L Gene ID: 283849 Homo sapiens exocyst complex component 3 like 1 (EXOC3L1), mRNA NCBI Reference Sequence: NM_178516.4

ITGB3	integrin subunit beta 3 Also known as: BDPLT16, BDPLT2, BDPLT24, CD61, GP3A, GPIIIa, GT, GT2 Gene ID: 3690 Homo sapiens integrin subunit beta 3 (ITGB3), mRNA NCBI Reference Sequence: NM_000212.3
VWA2	von Willebrand factor A domain containing 2 Also known as: AMACO, CCSP-2, CCSP2, NET42 Gene ID: 340706 Homo sapiens von Willebrand factor A domain containing 2 (VWA2), transcript variant 1, mRNA NCBI Reference Sequence: NM_001272046.2
C1orf116	chromosome 1 open reading frame 116 Also known as: SARG Gene ID: 79098 Homo sapiens chromosome 1 open reading frame 116 (C1orf116), transcript variant 1, mRNA NCBI Reference Sequence: NM_023938.6
CAGE1	cancer antigen 1 Also known as: CT3, CT95, CTAG3, bA69L16.7 Gene ID: 285782 Homo sapiens cancer antigen 1 (CAGE1), transcript variant 1, mRNA NCBI Reference Sequence: NM_001170692.2
C9orf129	Also known as FAM120A2P, bA165J3.3 Gene ID: 445577 Homo sapiens family with sequence similarity 120A2, pseudogene (FAM120A2P), non-coding RNA NCBI Reference Sequence: NR_166069.1
CPTP	ceramide-1-phosphate transfer protein Also known as: GLTPD1 Gene ID: 80772 Homo sapiens ceramide-1-phosphate transfer protein (CPTP), mRNA NCBI Reference Sequence: NM_001029885.2
EFCC1	EF-hand and coiled-coil domain containing 1 Also known as: C3orf73, CCDC48 Gene ID: 79825 Homo sapiens EF-hand and coiled-coil domain containing 1 (EFCC1), transcript variant 1, mRNA NCBI Reference Sequence: NM_001377500.1
MIER2	MIER family member 2 Also known as: KIAA1193, Mi-er2 Gene ID: 54531 Homo sapiens MIER family member 2 (MIER2), transcript variant 1, mRNA NCBI Reference Sequence: NM_017550.3
TMEM115	transmembrane protein 115 Also known as: PL6 Gene ID: 11070 Homo sapiens transmembrane protein 115

	(TMEM115), mRNA NCBI Reference Sequence: NM_007024.5
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[000252] The following genes are noted as being up regulated in putamen in Parkinson's disease with dementia (PDD) versus in PD without dementia: STX17AS1, DACT1, DNAH8 and CIQTNF3-AMACR. Details of these genes are provided below in TABLE 18:

TABLE 18 – Genes Up Regulated in Putamen in PD with dementia (PDD) versus PD without dementia

ID/Gene Name	Details and Genbank Accession
STX17AS1	STX17 divergent transcript Also known as STX17-DT Gene ID: 441461 Homo sapiens syntaxin 17 (STX17), mRNA NCBI Reference Sequence: NM_017919.3
DACT1	dishevelled binding antagonist of beta catenin 1 Also known as: DAPPER, DAPPER1, DPR1, FRODO, HDPRI, TBS2, THYEX3 Gene ID: 51339 Homo sapiens dishevelled binding antagonist of beta catenin 1 (DACT1), transcript variant 1, mRNA NCBI Reference Sequence: NM_016651.6
DNAH8	dynein axonemal heavy chain 8 Also known as: ATPase, SPGF46, hdhc9 Gene ID: 1769 Homo sapiens dynein axonemal heavy chain 8 (DNAH8), transcript variant 1, mRNA NCBI Reference Sequence: NM_001206927.2
CIQTNF3-AMACR	CIQTNF3-AMACR readthrough (NMD candidate) Gene ID: 100534612 Homo sapiens CIQTNF3-AMACR readthrough (NMD candidate) (CIQTNF3-AMACR), long non-coding RNA NCBI Reference Sequence: NR_037951.1

EXAMPLE 3

[000253] Additional evaluations and data analyses were conducted to characterize and determine clinically significant genes in Parkinson's Disease (PD).

Category/ Table	Tissue	Region	Comparison	Analysis	Total genes
Category A	Brain	Cau and Put	High Confidence genes (PD vs CTRL) - Up and Down	LogFC > 1 and FDR < 0.05	2161 (data not shown)
Table 19	Brain	Cau	PDD vs PD - Up and Down	log FC > 0.1 , log FC < -0.1, FDR < 0.1	216
20	Brain	Put	Dyskinesia vs No Dyskinesia - Up and Down	log FC > 0.1 , log FC < -0.1,	70

				FDR < 0.25	
21	Brain	Cau	Correlating with disease duration - Up and Down	FDR < 0.1	592
22	Brain	Put	Correlating with disease duration - Up and Down	p value < 0.01	184
23	Blood		Cau and Blood common Up (PD vs CTRL)	Log FC > 0.1 and FDR < 0.05 (Both)	241
24	Blood		Cau and Blood common Down (PD vs CTRL)	Log FC < -0.1 and FDR < 0.05 (Both)	167
25	Blood		Put and Blood Common Up (PD vs CTRL)	Log FC > 0.1 and FDR < 0.05 (Both)	254
26	Blood		Put and Blood Common Down (PD vs CTRL)	Log FC < -0.1 and FDR < 0.05 (Both)	157
27	Blood		Cau-PDD and Blood MOCA 26 absolute log FC (Up/Down)	abs(log FC) > 0 and FDR < 0.1 (Both)	48
28	Blood		Cau-PDD and Blood MOCA 23 absolute log FC (Up/Down)	abs(log FC) > 0 and FDR < 0.1 (Both)	53
29	Blood		Put- Dyskinesia and Blood Dyskinesia absolute log FC (Up/Down)	abs(log FC) > 0 and p value < 0.05 (Both)	17

[000254] High Confidence genes associated with PD vs CTRL in Brain Caudate and Putamen were identified by RNA sequence analysis, both upregulated and down regulated. A total of 2,161 genes were identified (data not shown).

[000255] Gene markers for RNAs up or down in brain caudate of PD patients with dementia (PDD) versus PD without dementia were categorized. Genes increased or decreased in caudate of PDD versus PD without dementia are shown below in TABLE 19 (216 genes).

TABLE 19

Brain Caudate PDD vs PD - Up and Down

ID	logFC	AveExpr	t	P.Value	adj.P.Val	B
MARS1	0.60744456	5.71126183	4.79923606	4.26E-06	0.01450274	4.01474854
CASTOR3	-0.712228	6.6820274	-4.7745573	4.73E-06	0.01450274	3.91234495
TRAPPC6A	-0.6560987	3.32147778	-4.7475176	5.30E-06	0.01450274	3.7470222
C14orf132	-0.6508011	7.80910733	-4.724178	5.85E-06	0.01450274	3.69941551
NFAT5	0.46532267	6.62572179	4.66203775	7.59E-06	0.01660117	3.48610746
LONRF3	0.9560924	1.58521707	4.75930871	5.04E-06	0.01450274	3.36855065
PPP1R15B	0.58522026	5.17089954	4.62291439	8.93E-06	0.01758013	3.34341385
LINC01877	-1.0818691	0.94966666	-4.7224575	5.89E-06	0.01450274	3.05251952
CEBPG	0.78815121	5.02103858	4.5216655	1.35E-05	0.02202875	2.96516789
HMGXB4	-0.5463224	4.80053118	-4.5042428	1.45E-05	0.02202875	2.90051006

LOC102724919	1.42800659	-0.6433406	4.9950616	1.83E-06	0.01450274	2.85513347
ZKSCAN1	-0.6034133	7.21631369	-4.4776537	1.62E-05	0.02243354	2.79632457
NUCKS1	-0.5209112	9.00305593	-4.4576825	1.76E-05	0.02243354	2.68805275
E2F1	-0.6807049	3.41647074	-4.4486208	1.82E-05	0.02243354	2.65721951
SEL1L3	1.02266679	3.79957717	4.41095003	2.12E-05	0.02383677	2.5436886
SLCO1A2	-1.3099174	7.21104272	-4.4043455	2.18E-05	0.02383677	2.53121173
LOC101928988	-2.0393905	-0.9552996	-4.8619831	3.26E-06	0.01450274	2.41780112
GPN1	0.57005302	4.04561116	4.37278446	2.47E-05	0.02403883	2.41290815
CAPN2	0.58887577	6.56503369	4.36416719	2.56E-05	0.02403883	2.38943077
PELP1	-0.6262557	6.81460873	-4.3637487	2.56E-05	0.02403883	2.38736322
SH3GL3	-0.8214278	5.8941781	-4.2426962	4.14E-05	0.03544413	1.9570154
NFATC2IP	-0.4318268	5.06137401	-4.2349315	4.27E-05	0.03544413	1.92954964
STAG3	-0.4153983	5.32406042	-4.2233861	4.46E-05	0.03544413	1.88869317
PPTC7	0.60870879	4.45163217	4.20701469	4.76E-05	0.03544413	1.83172335
ASPA	-1.0069406	6.47734212	-4.1962823	4.96E-05	0.03544413	1.79426834
CHCHD3	0.40924845	4.23098657	4.17813814	5.32E-05	0.03544413	1.73063004
CHAF1A	-0.7618758	3.51573504	-4.1719803	5.45E-05	0.03544413	1.69364892
ZEB2	-1.0855978	8.28960265	-4.1669305	5.56E-05	0.03544413	1.68604401
PPP1R14A	-1.3770837	5.77903764	-4.1583959	5.74E-05	0.03544413	1.66171434
SNX22	-0.8712326	5.14751566	-4.1523828	5.88E-05	0.03544413	1.64060021
PRKAR2A-AS1	-0.7032957	2.44541259	-4.1775972	5.33E-05	0.03544413	1.62238375
CCT5	0.70272699	6.00526711	4.14012272	6.16E-05	0.03544413	1.59842024
HPS3	0.51807594	3.4876199	4.13834263	6.21E-05	0.03544413	1.57903802
TARS1	0.5953144	5.01697074	4.13451477	6.30E-05	0.03544413	1.57890837
ADNP2	0.51063212	4.13373246	4.12350976	6.57E-05	0.03594991	1.5418217
USPL1	0.66991932	3.6944604	4.08496296	7.62E-05	0.04025491	1.40502055
FEM1C	0.43509141	5.30215835	4.07986139	7.77E-05	0.04025491	1.38982736
CTNNA3	-1.5165129	5.55512107	-4.0724038	7.99E-05	0.04027975	1.36479016
CDK19	-0.611942	6.53063501	-4.0658259	8.19E-05	0.04027975	1.34387312
TKT	0.65364636	7.39491862	4.059754	8.39E-05	0.04027975	1.32475828
OPALIN	-1.4218243	7.28926452	-4.0514273	8.65E-05	0.04050548	1.29650138
NUFIP2	0.53180401	6.20989104	4.04574517	8.84E-05	0.04050548	1.2744754
PAAF1	-0.5558087	6.22328603	-4.0172671	9.85E-05	0.04368067	1.17769032
PDIA6	0.50145528	6.17759513	4.0099209	0.00010127	0.04368067	1.15297171
PMF1	-0.5026964	4.09006269	-3.9975315	0.00010611	0.04368067	1.11521709
LINC01184	-0.4009313	4.63561065	-3.9977513	0.00010602	0.04368067	1.11332392
GPAT2	-0.6991166	4.27274572	-3.9909265	0.00010878	0.04368067	1.0923702
SLFN5	-0.5913748	3.78795086	-3.9870038	0.00011039	0.04368067	1.07944514
PPP1R3D	0.87004131	3.24067526	3.97425478	0.0001158	0.04386005	1.02098469
GDE1	-0.4614452	6.78115324	-3.9642255	0.00012023	0.04388068	1.00171507
FDX1	0.40307284	3.81325345	3.95931496	0.00012246	0.04388068	0.98784974
ARFRP1	-0.3571693	5.3778306	-3.9591451	0.00012254	0.04388068	0.9802318

BMP6	1.1077522	2.13809625	3.98334145	0.00011192	0.04368067	0.93186408
SEPTIN4	-1.0953513	9.26618715	-3.9430607	0.00013012	0.04576413	0.92659785
ALG2	0.51396139	3.54985225	3.91968217	0.00014195	0.04904682	0.85572306
MYO18A	-0.5257572	7.75256717	-3.8895294	0.00015871	0.05389467	0.75869325
IARS1	0.66524196	5.39534001	3.88112489	0.00016371	0.05459437	0.72219295
HSPA8	0.92161599	9.22301542	3.87684164	0.00016632	0.05459437	0.71290987
DLEU2L	0.99280193	0.71213594	3.98052543	0.00011311	0.04368067	0.63102619
CCT4	0.68564331	6.19810476	3.84709367	0.00018553	0.05990234	0.61131861
MMAB	-0.4307495	4.94850783	-3.8412583	0.00018954	0.06014145	0.59125577
PHACTR3	-0.6670602	6.77364567	-3.837195	0.00019238	0.06014145	0.58205395
THAP11	0.45397784	4.29559866	3.8129677	0.00021017	0.06467577	0.50662701
OXNAD1	0.39187184	3.03825361	3.80235954	0.00021844	0.06551568	0.46782196
ZBTB2	0.55230618	2.61778138	3.80085844	0.00021963	0.06551568	0.44445676
GPATCH3	-0.4320336	3.60855263	-3.7913942	0.00022731	0.06551568	0.4431091
ATP10D	0.4993404	3.61171813	3.78871798	0.00022953	0.06551568	0.43460351
HSPE1	0.73114352	5.95991415	3.79241629	0.00022647	0.06551568	0.43163115
ELP4	0.43014546	3.39455201	3.76354699	0.00025141	0.06782939	0.35377573
LOC101927948	-2.4360854	-2.7342493	-4.5359149	1.28E-05	0.02202875	0.34812049
ZNF229	0.52507766	2.63261015	3.7659922	0.0002492	0.06782939	0.3364004
CPED1	0.68219255	2.24929388	3.77443904	0.00024171	0.06704901	0.32667783
NORAD	-0.4346929	9.34950119	-3.7272645	0.00028646	0.07327049	0.23885735
MLX	0.40816324	4.35676586	3.72947467	0.0002842	0.07327049	0.23820374
MMADHC	0.4532312	4.58012439	3.72809716	0.00028561	0.07327049	0.23084389
RAC1	-0.5093176	8.7781693	-3.7229918	0.00029088	0.07344708	0.22746436
SLC5A3	0.9899425	5.37483997	3.69868606	0.00031728	0.07496893	0.13228909
SPRED2	0.64336919	4.7073481	3.69399397	0.00032263	0.07496893	0.12018767
MHENCN	-0.5352024	2.22491391	-3.7020868	0.00031345	0.07496893	0.11250442
KIAA1841	-0.3848105	4.09783042	-3.6882017	0.00032935	0.07496893	0.11133729
CHAC2	0.95072824	0.81572939	3.78181802	0.00023534	0.06621482	0.10299511
PLEKHA8	0.36895507	3.57875007	3.6815135	0.00033728	0.07496893	0.098275
XBP1	0.71695316	4.86617906	3.68572623	0.00033226	0.07496893	0.09261445
PYGM	0.89433711	5.54623952	3.67920759	0.00034005	0.07496893	0.06912476
BRD3	-0.5427959	6.64462865	-3.6769037	0.00034284	0.07496893	0.0673305
NENF	-0.4733747	6.47597504	-3.6695699	0.00035188	0.07496893	0.0433017
RHBDL2	-0.602916	3.3840331	-3.6623189	0.00036104	0.07496893	0.03935575
PXN-AS1	-0.6417213	1.41041286	-3.7088558	0.00030597	0.07496893	0.03746321
SFMBT2	0.49136	4.36827635	3.66435453	0.00035845	0.07496893	0.03192609
CHAF1B	-0.5231133	3.08370913	-3.6592072	0.00036504	0.07496893	0.02678115
CES2	-0.4143713	5.62833046	-3.6610604	0.00036265	0.07496893	0.01107833
SRRM1	-0.6410121	6.82902576	-3.6520731	0.00037437	0.07496893	-0.0091132
MERTK	0.778359	4.70752807	3.65262699	0.00037363	0.07496893	-0.0100079
DCAF16	-0.4977666	4.80623287	-3.6522222	0.00037417	0.07496893	-0.0134303

RNF141	-0.5611703	6.72291368	-3.6493475	0.00037799	0.07496893	-0.0174235
MMP19	-0.6683962	3.74481964	-3.6445411	0.00038446	0.07496893	-0.0181374
TRAPPC2L	-0.3625431	4.96263509	-3.6488728	0.00037862	0.07496893	-0.0250335
SLC25A16	-0.3884118	4.64531455	-3.64622	0.00038218	0.07496893	-0.0302806
CD83	0.62835128	3.13902611	3.63966699	0.00039112	0.07552115	-0.0308995
MYO6	-0.7309471	7.20263174	-3.6357821	0.00039651	0.07564364	-0.0562071
AIF1L	-0.8953086	8.02477942	-3.6314907	0.00040255	0.07564364	-0.0602035
MIS18A	-0.4599581	2.63236696	-3.6164551	0.0004244	0.07564364	-0.1141018
CHST11	0.58921342	4.99218102	3.61549055	0.00042584	0.07564364	-0.1297138
GNAZ	-0.429253	6.25942423	-3.6139873	0.00042809	0.07564364	-0.1329575
WTAP	0.28683318	5.50071137	3.61207878	0.00043096	0.07564364	-0.1430798
TMEM44-AS1	-0.6624166	1.89062578	-3.6238874	0.00041346	0.07564364	-0.1449947
G3BP1	0.36040909	6.18944518	3.60972465	0.00043453	0.07564364	-0.1469071
KLHL25	0.74842406	3.87291191	3.59508168	0.00045738	0.07584216	-0.171608
RTF1	-0.5154758	6.57270024	-3.5927881	0.00046106	0.07584216	-0.1946385
HBA1	-2.4704729	5.91000243	-3.5895896	0.00046624	0.07584216	-0.2021267
DHRS12	-0.4647893	2.78109517	-3.5808728	0.00048064	0.07584216	-0.2120125
RUFY2	-0.361761	5.15729673	-3.5886866	0.00046771	0.07584216	-0.2151681
HSPA4L	0.87919917	5.50239159	3.58162099	0.00047938	0.07584216	-0.2367455
SYPL2	1.04538245	0.97468861	3.64660964	0.00038166	0.07496893	-0.2378594
PCBP1	0.5134788	7.23648655	3.57434876	0.00049168	0.07584216	-0.2439825
POR	0.45065973	5.4270364	3.57870732	0.00048428	0.07584216	-0.2455858
ENTPD7	0.66914084	1.27903574	3.61270959	0.00043001	0.07564364	-0.2536155
MOBP	-1.509916	9.43075715	-3.5644268	0.00050894	0.07593626	-0.2578022
ZCCHC17	-0.4644721	5.90321179	-3.5743584	0.00049167	0.07584216	-0.2590325
NOTCH2	0.9034052	6.33793529	3.57179583	0.00049607	0.07584216	-0.2612421
HERPUD1	0.51917839	5.92548726	3.5727268	0.00049446	0.07584216	-0.2634746
RCC2	0.34804874	5.51068451	3.5729261	0.00049412	0.07584216	-0.2642395
TMEM134	-0.4080204	4.5455537	-3.5680909	0.0005025	0.07584216	-0.2707068
DYRK1A	0.35562006	5.77237729	3.56720504	0.00050405	0.07584216	-0.2808008
LDB3	-1.0193772	5.37858494	-3.5669723	0.00050446	0.07584216	-0.2809467
NEK3	-0.8143145	3.31856776	-3.549016	0.00053688	0.07661203	-0.3045517
KANSL1	0.31773282	5.78497079	3.55468701	0.00052644	0.07661203	-0.3199216
TAGAP	0.98491543	1.01012037	3.6050638	0.00044169	0.07564364	-0.3204411
SRD5A3-AS1	-0.5589791	3.22677437	-3.5428424	0.00054848	0.07661203	-0.3222236
DNAJB4	0.8000642	5.53814086	3.54994892	0.00053515	0.07661203	-0.3348268
RAVER2	0.51292299	4.38091407	3.54560187	0.00054327	0.07661203	-0.3359845
TMEM266	-0.6127027	2.19569237	-3.5488254	0.00053724	0.07661203	-0.3362788
ZNF500	-0.4003702	4.54913164	-3.5447116	0.00054494	0.07661203	-0.3425663
NOP2	0.40891772	4.03161602	3.53402194	0.00056546	0.07803033	-0.3612462
PRKCQ-AS1	-0.7730771	2.99079283	-3.527708	0.00057791	0.07803033	-0.3674791
PDE3A	0.73126767	2.81477145	3.52744839	0.00057843	0.07803033	-0.3713107

NFIC	-0.4749791	7.96817694	-3.5291211	0.0005751	0.07803033	-0.3731511
SHTN1	-1.0444313	8.18892088	-3.5268377	0.00057965	0.07803033	-0.3789405
ACTRT3	1.46468155	0.13457945	3.6841174	0.00033417	0.07496893	-0.3801452
FAM177A1	-0.5209486	5.59945761	-3.5254606	0.0005824	0.07803033	-0.4104858
NUDT9	0.43969872	4.80120736	3.52118186	0.00059105	0.07865406	-0.4178463
CRYZL1	-0.3067089	5.28903034	-3.5189434	0.00059563	0.07873063	-0.4303976
PEX12	0.51693992	3.32187087	3.50397459	0.00062707	0.07930216	-0.4387739
ZNF510	0.55120409	3.84569319	3.50577682	0.00062321	0.07930216	-0.4434821
TMED5	0.57628785	5.02796473	3.51189518	0.00061024	0.07930216	-0.4492994
BMT2	0.5911403	3.54863886	3.50115231	0.00063317	0.07942907	-0.4497206
DBNL	-0.2993489	6.23945493	-3.5081537	0.00061814	0.07930216	-0.458213
NOP53	-0.4413582	6.62924521	-3.5063144	0.00062206	0.07930216	-0.4597582
NR1D1	0.71832409	5.64421891	3.50828223	0.00061787	0.07930216	-0.461761
BTBD16	-1.2940938	0.58837908	-3.5719126	0.00049587	0.07584216	-0.4701901
PRMT5	0.47360003	4.81114716	3.50348093	0.00062814	0.07930216	-0.4722287
GPR89A	0.45678976	3.36789456	3.48789799	0.00066258	0.08105319	-0.4859158
TMEM150C	-0.5100881	4.59432488	-3.4979558	0.00064015	0.07963496	-0.4859553
DHX33	-0.3166335	4.58147028	-3.494119	0.00064862	0.07984144	-0.4973126
ENOSF1	-0.6218352	5.36895178	-3.4967049	0.0006429	0.07963496	-0.4977446
KCTD14	0.85878175	0.15362381	3.6060667	0.00044014	0.07564364	-0.5242596
SLC38A2	0.86846658	6.52744262	3.48394562	0.0006716	0.08164886	-0.527894
EFCAB7	0.5350022	3.15475177	3.47259723	0.00069813	0.08223221	-0.5294769
NKRF	0.67489822	3.7247499	3.47380043	0.00069527	0.08223221	-0.5349253
PYCR1	0.66470252	3.62155861	3.47211645	0.00069927	0.08223221	-0.5368274
AFMID	-0.7228447	4.87259216	-3.4765744	0.00068872	0.08223221	-0.5559335
LLCFC1	-1.5967201	-1.1998154	-3.7497136	0.00026427	0.07033384	-0.5742363
SH3BGR	0.67395212	4.38856884	3.46294925	0.00072145	0.08307927	-0.5819979
LINC02724	-0.7644928	0.43878527	-3.546908	0.00054082	0.07661203	-0.6009325
GREM1	-0.9838412	6.21495234	-3.4612871	0.00072555	0.08307927	-0.6016082
ZCCHC24	-0.7700425	8.3290566	-3.4330138	0.00079858	0.08885871	-0.6558629
LOC100506725	-0.8704833	3.8988306	-3.4355912	0.00079164	0.08885871	-0.6565597
TAF1A	0.58554937	1.28295815	3.46819634	0.00070868	0.08223221	-0.6591942
EAF2	0.63725733	1.09025965	3.47360426	0.00069573	0.08223221	-0.6686416
SLC25A25	0.77381484	4.94128566	3.43703831	0.00078778	0.08885871	-0.6687414
LINC00486	-1.3352084	-0.7041655	-3.6202589	0.00041877	0.07564364	-0.6775824
URB2	0.5276611	2.67048114	3.4217266	0.00082962	0.0906314	-0.678191
TLR4	0.74161601	4.78350279	3.4342148	0.00079534	0.08885871	-0.6793145
NT5E	0.78296577	4.22730311	3.42962085	0.00080779	0.08937899	-0.6797941
CLP1	0.58948545	1.59294439	3.44465997	0.0007677	0.08739761	-0.6827785
TSFM	0.39863856	4.05794848	3.42055024	0.00083292	0.0906314	-0.702182
AFDN	-0.4150394	6.38085998	-3.4209696	0.00083174	0.0906314	-0.7202038
MIR219A2	-1.1360697	3.20890702	-3.4069464	0.00087197	0.09133384	-0.7236474

RBP1	-0.566064	4.69230236	-3.4187934	0.00083787	0.09066909	-0.7240409
CA8	0.88163212	3.91938624	3.41044214	0.00086178	0.09133384	-0.7270832
MAL	-0.8306563	6.59901244	-3.4164568	0.00084449	0.09088683	-0.7287611
HSPA1L	0.88297424	2.56325741	3.40643051	0.00087349	0.09133384	-0.7289243
MYH15	-0.6991908	2.37957418	-3.4061299	0.00087437	0.09133384	-0.7313727
PRKD1	0.45148033	3.8142327	3.40541721	0.00087647	0.09133384	-0.7391366
UPF3A	-0.7182053	6.56954278	-3.4065191	0.00087323	0.09133384	-0.7613494
TRIM7	-0.4587359	2.33490456	-3.3962509	0.00090388	0.0922381	-0.761884
GTF3C3	0.41420848	4.15073364	3.39962459	0.0008937	0.09215416	-0.7655218
HACD3	0.55041041	6.7486237	3.40006684	0.00089237	0.09215416	-0.7736954
ZC3H13	-0.9009182	7.87608012	-3.3900225	0.00092296	0.09227296	-0.7895128
FNBP1	-0.4758651	7.20288326	-3.3921278	0.00091647	0.09227296	-0.7921604
SMIM14	-0.2973412	6.16364063	-3.3968432	0.00090209	0.0922381	-0.7932807
LUC7L3	-1.0701875	8.26073208	-3.3844593	0.00094033	0.09263674	-0.8002525
ATP1B3	0.42623044	5.22425293	3.39381146	0.00091131	0.09227296	-0.8057042
C7orf50	-0.4661441	5.85003264	-3.3908314	0.00092046	0.09227296	-0.8139141
MOB4	0.4932857	4.70203126	3.38800923	0.00092921	0.09242844	-0.8152159
PSAT1	0.53736718	7.01189527	3.38054522	0.00095272	0.09335279	-0.8279403
FGF1	-0.8649301	8.38831728	-3.3724265	0.00097893	0.09544585	-0.8321284
OPA3	-0.3163403	5.08629292	-3.3843364	0.00094071	0.09263674	-0.8332367
PGAP2	-0.4240457	3.50566609	-3.3671849	0.00099621	0.09617807	-0.8442114
SEC24A	0.35832787	3.66016246	3.36763302	0.00099472	0.09617807	-0.8446103
GIN54	-0.6430284	2.40740211	-3.3637951	0.00100753	0.09632704	-0.8517167
SPRY2	0.53169434	5.14864194	3.36442468	0.00100542	0.09632704	-0.891657
C18orf25	0.42835126	4.63443883	3.35830643	0.00102613	0.09726307	-0.9021889
LHFPL2	0.55723589	4.47357872	3.35647924	0.00103239	0.09726307	-0.9026977
TMLHE	0.43830403	3.27787426	3.34167646	0.00108444	0.09887972	-0.9092793
MRPS6	0.77024869	5.1012363	3.35699672	0.00103061	0.09726307	-0.9105218
LARP4	0.41445195	4.9498369	3.3547472	0.00103835	0.09726307	-0.9178968
MRPL18	0.55286133	4.92816694	3.35368885	0.00104202	0.09726307	-0.9200557
SMARCA4	-0.3906567	7.22276364	-3.3427016	0.00108076	0.09887972	-0.9357044
DNAJB9	0.47401001	4.62950645	3.34542426	0.00107103	0.09857004	-0.9393303
ANGPTL7	1.25339907	-1.1322599	3.55001149	0.00053504	0.07661203	-1.077411
TNFSF8	1.31860299	-1.3304809	3.46773302	0.0007098	0.08223221	-1.2676977
DTL	-1.5988536	-2.3152552	-3.6134416	0.00042891	0.07564364	-1.3096022
CCDC172	-1.2206087	-1.8338551	-3.3488905	0.00105877	0.09833426	-1.6783005
SELP	-1.626028	-1.9181411	-3.3475557	0.00106348	0.09833426	-1.7087178
KRT83	-2.4177898	-2.9499333	-3.4703875	0.00070341	0.08223221	-1.8632074

[000256] Gene markers for RNAs up or down in brain putamen of PD patients with Dyskinesia versus no dyskinesia were categorized. Genes increased or decreased in putamen of PD patients with Dyskinesia versus no dyskinesia are shown below in TABLE 20 (70 genes).

TABLE 20

Brain Putamen - Dyskinesia vs No Dyskinesia - Up and Down

ID	logFC	AveExpr	t	P.Value	adj.P.Val	B
NGF	-3.5563286	-1.5449134	-5.7971906	6.60E-08	0.00133031	5.34949094
EXOC3L1	-1.7588907	0.79789358	-4.955336	2.65E-06	0.01779438	4.08943701
CCDC172	-2.6676869	-1.8179418	-5.2642353	7.08E-07	0.00713621	3.67997002
ITGB3	-2.0258529	0.18335372	-4.6755028	8.42E-06	0.0423871	2.96566885
STX17-AS1	1.0778987	0.09001957	4.52437705	1.55E-05	0.06225501	2.54278191
VWA2	-1.7276366	1.03895519	-4.3758181	2.77E-05	0.07082941	2.17371376
DACT1	1.19463199	2.14693836	4.26754712	4.22E-05	0.07915671	1.94990916
CPTP	-0.8780703	4.24644636	-4.2378645	4.73E-05	0.07915671	1.79604048
LINC01574	-2.4850502	-0.7598421	-4.4158878	2.37E-05	0.07082941	1.68303067
C1QTNF3-AMACR	2.64193335	1.2781826	4.18663127	5.74E-05	0.07915671	1.63398876
MIER2	-0.7296487	4.24555016	-4.1714973	6.08E-05	0.07915671	1.56237206
C9orf129	-2.7490534	-0.5921343	-4.2409124	4.67E-05	0.07915671	1.26535179
SLCO4A1-AS1	-3.7351468	-1.2246675	-4.3496622	3.07E-05	0.07082941	1.2538872
EFCC1	-2.0161379	0.03777933	-4.162803	6.29E-05	0.07915671	1.22976739
TMEM115	-0.5390778	4.77717194	-4.0785792	8.63E-05	0.09653497	1.21704441
EXOSC4	-0.7975434	3.49183897	-4.0369434	0.0001007	0.10391855	1.13630112
MIGA2	-0.5134789	4.9439291	-4.0045948	0.00011349	0.10391855	0.96145209
C1orf116	-2.5210879	-2.1256911	-4.3420251	3.16E-05	0.07082941	0.93541
DNAH8	2.36750563	-1.5732021	4.12643284	7.21E-05	0.08544571	0.87982896
FTO-IT1	2.05784749	-0.4819705	3.96498667	0.00013127	0.11497381	0.65618667
NPR1	-1.6282753	1.00175207	-3.872251	0.00018389	0.14014166	0.5753591
LINC01770	-2.4982303	-0.7476768	-4.0046832	0.00011345	0.10391855	0.56502554
FZD4-DT	-1.6073123	-0.5388105	-3.9153342	0.00015733	0.13206176	0.46031453
TRAF7	-0.4792585	5.01377008	-3.8537749	0.00019654	0.14014166	0.45333402
CAGE1	-2.8436571	-2.4547459	-4.2008486	5.44E-05	0.07915671	0.41547423
GPANK1	-0.5227669	3.91974276	-3.8266324	0.00021663	0.14014166	0.41251593
RADIL	-0.8291901	3.42267768	-3.8054942	0.00023362	0.14014166	0.37612621
TANGO2	-0.4512707	4.71708233	-3.8018421	0.00023668	0.14014166	0.2893136
FTCDNL1	0.86514197	1.90544367	3.73452173	0.00030042	0.15269165	0.2080281
MGAT4B	-0.4454096	4.8770756	-3.7717068	0.00026344	0.14014166	0.18623885
PPM1F	-0.5433279	5.44048051	-3.7707296	0.00026435	0.14014166	0.17799674
FOXN3-AS2	-2.7118228	-2.2554771	-4.0063828	0.00011274	0.10391855	0.08783468
SPATA20	-0.8650915	5.41926899	-3.7319207	0.00030319	0.15269165	0.0539323
ZRANB2	0.4254386	5.94478772	3.69256638	0.00034806	0.17101428	-0.0687153
SPINK13	-2.2244883	-1.617527	-3.8570802	0.00019421	0.14014166	-0.077199
AXIN1	-0.5697593	4.85460581	-3.682204	0.00036088	0.17309292	-0.1002355
GRK1	-2.2598626	-1.8204593	-3.8434116	0.00020399	0.14014166	-0.2031895
MAP1LC3C	-2.2323589	-1.7606441	-3.8084199	0.0002312	0.14014166	-0.2376832

OTOGL	1.7528641	-0.8710496	3.64422977	0.0004118	0.18853959	-0.2657017
DESI1	-0.453309	6.30682196	-3.6285419	0.00043476	0.19462961	-0.2667153
SNORD62A	-2.1437988	-1.7096915	-3.7761775	0.0002593	0.14014166	-0.2910844
PRB1	-3.3988186	-2.2656303	-3.8457345	0.0002023	0.14014166	-0.3097481
LOC388242	-1.7016118	-0.7784718	-3.6608753	0.00038869	0.18209893	-0.3394487
MCEE	0.83157592	1.49424793	3.53394828	0.00060103	0.23515885	-0.3927248
RAD51AP1	1.11440746	0.12325323	3.54978822	0.00056953	0.23515885	-0.4080748
TCF3	-0.5788283	4.70617521	-3.5829905	0.0005085	0.22269058	-0.4092732
HNF1A	-2.5885036	-2.0644326	-3.7710342	0.00026407	0.14014166	-0.4638382
CCDC138	0.8840971	1.43906959	3.49739102	0.0006801	0.23515885	-0.4988433
ESRP1	-2.5354322	-2.4085706	-3.7823343	0.00025369	0.14014166	-0.5052725
MAF1	-0.5463188	5.91831232	-3.5441199	0.00058062	0.23515885	-0.5393367
EEFSEC	-0.5689397	3.39906185	-3.50933	0.00065326	0.23515885	-0.5513861
PCDHA11	1.21743485	1.35135776	3.45976037	0.00077166	0.24026105	-0.6075149
RNPEP	-0.5432284	3.94237697	-3.4997155	0.00067479	0.23515885	-0.6222098
C1orf56	-0.6437368	2.39957407	-3.4595109	0.00077231	0.24026105	-0.6339512
TMEM256- PLSCR3	-3.3563758	0.18905148	-3.509116	0.00065373	0.23515885	-0.6358148
ECSIT	-0.5447072	5.0929074	-3.493648	0.00068873	0.23515885	-0.6963574
STK11	-0.5330754	5.55980167	-3.4936551	0.00068871	0.23515885	-0.6984311
USP32P2	0.66976852	5.00858438	3.4875282	0.00070305	0.23605016	-0.7149215
LPA	-1.9184018	-1.0871712	-3.533408	0.00060213	0.23515885	-0.7280704
MIR3663HG	2.26742824	-0.8064232	3.4724249	0.00073962	0.24026105	-0.7379861
DNM3-IT1	1.90612241	-1.3787453	3.50257225	0.00066832	0.23515885	-0.7528258
LINC02044	-1.1279068	-0.2975095	-3.4495765	0.00079837	0.24357978	-0.7599149
LST1	0.85070629	3.12189626	3.42571883	0.00086438	0.24875533	-0.7829809
C2-AS1	1.43983704	-0.9954113	3.45838211	0.00077523	0.24026105	-0.7979653
GOLGA6A	-1.5678508	-0.5271487	-3.4369676	0.00083264	0.24666962	-0.827709
FAM138D	-2.4133868	-1.6248481	-3.5262666	0.00061689	0.23515885	-0.8316218
RAPGEF6	0.58093788	4.83607182	3.43232733	0.0008456	0.24687753	-0.8792576
AIRN	-1.9979629	-1.8971163	-3.5280297	0.00061321	0.23515885	-0.9454511
SPATA22	-2.026591	-1.5897228	-3.4759908	0.00073083	0.24026105	-1.0033556
LINGO4	-2.2875325	-2.5107804	-3.4451973	0.00081012	0.24357978	-1.3046248

[000257] Gene markers for RNAs up or down that correlate or associate with disease duration in PD patients were categorized. Genes increased or decreased in caudate of PD patients correlating with disease duration are shown below in TABLE 21 (592 genes). Positive numbers for AveExp indicates an up or upregulated gene, a gene or RNA whereby expression of the gene or the amount of RNA for that gene is increased or greater with disease duration. Negative numbers for AveExp indicates a down or downregulated gene, a gene or RNA whereby expression of the gene or the amount of RNA for that gene is reduced or less with disease duration.

TABLE 21

Brain Caudate - Correlating with disease duration - Up and Down

ID	AveExpr	F	P.Value	adj.P.Val
GALNT4	2.16246911	19.8910251	2.12E-10	3.82E-06
TMEFF1	1.65971489	15.551074	9.81E-09	7.76E-05
ERC1	6.69360702	15.2630713	1.29E-08	7.76E-05
ZNF670	0.26246335	11.413987	6.37E-07	0.00287589
TSPAN8	0.03084124	10.8554753	1.17E-06	0.00308696
INKA2-AS1	-0.7571866	10.8182595	1.22E-06	0.00308696
NA	3.27925878	10.8005642	1.24E-06	0.00308696
KRT19	-0.1238483	10.7153494	1.37E-06	0.00308696
PLP1	11.5281435	9.29919642	6.82E-06	0.01293266
VPS9D1-AS1	1.88046725	9.22657352	7.43E-06	0.01293266
TEN1	1.68436503	9.1196227	8.42E-06	0.01293266
VAMP7	4.4159774	9.10233537	8.59E-06	0.01293266
STAT6	5.52193183	9.00647316	9.62E-06	0.01336124
SPAST	4.63952804	8.91253484	1.07E-05	0.01386014
LOC100506725	3.50213383	8.80138325	1.23E-05	0.01399734
GJB1	4.24537281	8.7431405	1.31E-05	0.01399734
FER1L5	3.09572715	8.70565095	1.37E-05	0.01399734
SULT1A2	1.13998343	8.66592576	1.44E-05	0.01399734
LMNTD2	1.10061218	8.64694915	1.47E-05	0.01399734
UFM1	5.28125045	8.33267636	2.15E-05	0.01847324
LPAR1	8.3369559	8.31724106	2.19E-05	0.01847324
ABCC8	3.57860139	8.27302418	2.31E-05	0.01847324
NUTM2G	2.48401976	8.24545249	2.38E-05	0.01847324
B3GNTL1	2.40520084	8.22179695	2.45E-05	0.01847324
SLC22A13	-0.8727468	8.15123905	2.67E-05	0.01899333
RNASE1	6.70416375	8.13295699	2.73E-05	0.01899333
SERINC5	5.69783116	8.02775953	3.11E-05	0.02078981
LINC01679	-0.8420998	7.95844973	3.38E-05	0.02141718
NET1	5.14447017	7.94230289	3.45E-05	0.02141718
MTG1	3.89821944	7.91727535	3.56E-05	0.02141718
CARMIL3	2.76686515	7.63703148	5.02E-05	0.02873405
CLCA4	3.00825444	7.60520779	5.22E-05	0.02873405
DLEU2L	0.72089166	7.59159932	5.31E-05	0.02873405
PRKCQ-AS1	2.66148598	7.57739337	5.41E-05	0.02873405
RGS12	6.33869904	7.43871306	6.43E-05	0.03145663
NAAA	3.64268928	7.43228182	6.48E-05	0.03145663
BCAP29	5.13194059	7.43145736	6.48E-05	0.03145663
DKK1	-1.1363901	7.4152676	6.62E-05	0.03145663
NIPAL4	2.13771496	7.39283584	6.80E-05	0.03152069
TMEM125	3.41829266	7.36269081	7.07E-05	0.03190569

SNX6	5.88091518	7.34312875	7.24E-05	0.03190569
CENPN	1.85022567	7.30083332	7.64E-05	0.03213043
LINC00960	2.08506527	7.29949787	7.65E-05	0.03213043
ITGB1	6.82856574	7.24853896	8.15E-05	0.03345456
BNIP3L	6.47836105	7.23109869	8.33E-05	0.03345456
AGA	2.58941493	7.19689768	8.70E-05	0.03416548
MED7	3.05990488	7.16788379	9.02E-05	0.03468253
PCNP	6.4303531	7.08065013	0.00010073	0.03753185
USP17L25	0.27284607	7.05358545	0.00010424	0.03753185
SOX2-OT	7.84230436	7.04677587	0.00010514	0.03753185
DDX51	4.74887179	7.01441142	0.00010954	0.03753185
RHOA	6.18330502	7.01297781	0.00010974	0.03753185
GPR35	2.12326315	6.98271231	0.00011403	0.03753185
STAB2	-0.6482445	6.97823901	0.00011468	0.03753185
HDAC10	4.11404962	6.94704713	0.00011931	0.03753185
CFL2	6.49994204	6.91364372	0.00012448	0.03753185
VAR2	5.22498858	6.91009833	0.00012504	0.03753185
HMCN1	0.11018561	6.90066851	0.00012655	0.03753185
FHOD1	3.451503	6.89393876	0.00012764	0.03753185
CREBBP	6.87731225	6.87280545	0.00013112	0.03753185
CNTD1	0.59738436	6.84650672	0.00013559	0.03753185
SEPTIN8	8.04061039	6.83125226	0.00013825	0.03753185
CARD9	2.04060415	6.80183975	0.00014354	0.03753185
LINC02582	1.46021629	6.79482697	0.00014483	0.03753185
FAM13C	4.45992879	6.78851068	0.000146	0.03753185
TMT4	4.36231421	6.7757158	0.00014841	0.03753185
STRC	3.34392664	6.77486898	0.00014857	0.03753185
ERMN	8.42579974	6.76443123	0.00015057	0.03753185
SLX1A	3.41260367	6.76041263	0.00015134	0.03753185
PRRG1	5.00908819	6.7590056	0.00015161	0.03753185
LOC101928651	0.48084915	6.7552903	0.00015234	0.03753185
RHPN1	5.08017729	6.7552108	0.00015235	0.03753185
PLAC4	2.3007345	6.7534023	0.0001527	0.03753185
TP53TG3D	-1.1499287	6.74810178	0.00015374	0.03753185
SGCB	5.80389071	6.73319223	0.0001567	0.03774469
TARP	1.4875018	6.7086885	0.0001617	0.03822895
GPIHBP1	3.90658606	6.70268758	0.00016295	0.03822895
OTUD7A	5.36987731	6.68486745	0.00016671	0.03861077
VAC14-AS1	3.5885804	6.64816174	0.00017475	0.03926629
RARS2	3.16928433	6.64740992	0.00017492	0.03926629
REC8	3.23138957	6.64233652	0.00017606	0.03926629
CCZ1	4.97218422	6.60583979	0.00018452	0.04064991

DCTN6	4.90486252	6.54927356	0.00019845	0.0428878
PLLP	6.54667348	6.54549152	0.00019942	0.0428878
PRKCQ	2.79056781	6.50893659	0.00020905	0.04433473
EPOR	2.86533153	6.4854851	0.00021548	0.04433473
RGS5	6.69717378	6.48432171	0.0002158	0.04433473
PLCD4	3.27008894	6.48371794	0.00021597	0.04433473
ELOVL1	5.46093854	6.46878101	0.00022018	0.0446908
CLEC12A-AS1	2.8719656	6.45590669	0.00022387	0.04493588
LINC01596	-0.2524682	6.43445168	0.00023017	0.04569269
EVI2A	5.55203361	6.39481657	0.00024229	0.04640547
CLCA2	-1.0933225	6.38007925	0.00024697	0.04640547
TWF1	5.39149976	6.3720437	0.00024955	0.04640547
SLCO1B7	-1.1263347	6.36969092	0.00025032	0.04640547
EXOC5	5.82032067	6.34638708	0.000258	0.04640547
HHIP	5.30682768	6.34541195	0.00025833	0.04640547
GZMM	-0.7420709	6.34524284	0.00025838	0.04640547
KIAA1549	4.88998204	6.3432836	0.00025904	0.04640547
PLXNA3	5.15944307	6.3408188	0.00025987	0.04640547
RHOG	5.2431175	6.33940147	0.00026035	0.04640547
ELOA3	0.47393783	6.32153377	0.00026646	0.04640547
SRD5A3	3.42596699	6.3082465	0.0002711	0.04640547
ALPK3	2.83867208	6.3032403	0.00027287	0.04640547
PTCH2	3.18231939	6.30019852	0.00027396	0.04640547
SNX1	6.39525026	6.29826898	0.00027464	0.04640547
ATG3	4.95079458	6.2976599	0.00027486	0.04640547
KATNAL1	4.79084418	6.25356756	0.0002911	0.0486913
H3-3B	7.89010614	6.2286011	0.00030072	0.04903327
MAEL	-0.2935043	6.21039544	0.00030795	0.04903327
HAGLR	2.8384217	6.20690754	0.00030935	0.04903327
BLNK	1.65264083	6.19270536	0.00031514	0.04903327
ESPNL	-0.9640813	6.1923759	0.00031528	0.04903327
CDK10	5.1478318	6.18874529	0.00031677	0.04903327
PHF10	6.36828677	6.187438	0.00031731	0.04903327
TIMM10B	4.51783729	6.18060527	0.00032016	0.04903327
FOSL2	5.63180782	6.16801341	0.00032547	0.04903327
FAM107B	6.9539772	6.16525443	0.00032664	0.04903327
PCBP4	5.94568515	6.16439503	0.00032701	0.04903327
H2AZ2	7.2569476	6.16389713	0.00032722	0.04903327
RBP7	2.19247743	6.16108856	0.00032843	0.04903327
MED4	4.2636627	6.13917671	0.00033797	0.04952452
REEP3	5.28007103	6.13679298	0.00033903	0.04952452
JAKMIP2-AS1	-0.1859473	6.13473319	0.00033994	0.04952452

PBX4	0.48865417	6.10974916	0.00035124	0.05075986
AKAP12	7.10896994	6.10368454	0.00035404	0.05075986
CHMP2B	4.47160234	6.09002935	0.00036043	0.05126244
RNF13	5.76610349	6.08362928	0.00036347	0.05126244
MTG2	4.40885633	6.07432194	0.00036793	0.05126244
BLOC1S5-TXNDC5	-1.7204198	6.07231488	0.0003689	0.05126244
KIAA1656	2.10139655	6.06085129	0.00037448	0.05164163
DMGDH	1.6359714	6.0520741	0.00037882	0.05184392
UBR2	5.40921653	6.04221343	0.00038375	0.05212425
TLCD5	4.69194537	6.02874241	0.0003906	0.05265833
ANKRD24	4.22012743	5.99182289	0.00041002	0.05486644
ZFPM2-AS1	-0.8566304	5.97708419	0.00041804	0.05503679
MID1IP1-AS1	-0.5666545	5.97327857	0.00042014	0.05503679
HOXD1	-0.3147883	5.9714967	0.00042113	0.05503679
ARRDC1-AS1	3.64134028	5.95809276	0.00042862	0.05503679
IRF6	1.36610225	5.94949335	0.0004335	0.05503679
COL3A1	-0.0235005	5.94694236	0.00043496	0.05503679
PLK5	1.62242247	5.94451989	0.00043635	0.05503679
GNB3	2.23324303	5.94402399	0.00043664	0.05503679
HRAT92	1.11561549	5.94042917	0.00043871	0.05503679
PTPRH	1.43680148	5.92820087	0.00044584	0.05554498
RASSF2	7.69474927	5.91010533	0.0004566	0.05649633
CDNF	-0.2562559	5.88978447	0.000469	0.05709126
PDZD7	4.34318168	5.87501299	0.00047824	0.05709126
FEN1	2.85384527	5.87280022	0.00047964	0.05709126
CPPED1	4.55712227	5.87110145	0.00048072	0.05709126
PMP2	7.87634489	5.86925029	0.00048189	0.05709126
SPOPL	4.69044048	5.86685156	0.00048342	0.05709126
COX16	4.45002125	5.86668272	0.00048353	0.05709126
KLHL4	3.65981281	5.86061484	0.00048742	0.05717699
TRAFFD1	4.3060215	5.84422455	0.00049809	0.05751033
RBM7	3.7611313	5.84353627	0.00049855	0.05751033
CLDN11	6.74253386	5.84161662	0.00049981	0.05751033
SLC23A1	0.33547031	5.83364622	0.00050511	0.05773682
FAM27C	2.39133652	5.82907057	0.00050817	0.05773682
IFT172	5.3023676	5.80154731	0.00052702	0.05950401
BZW1	6.12033615	5.79648322	0.00053057	0.05953223
MRPL57	4.64469415	5.78499482	0.0005387	0.06007179
RERE	7.29417723	5.77339788	0.00054704	0.06010929
SAMD8	6.16422518	5.77311318	0.00054725	0.06010929
PER1	6.18735916	5.75883055	0.00055771	0.06010929
TGFA	3.90212249	5.75814943	0.00055821	0.06010929

MIR7-3HG	1.26268705	5.75617087	0.00055968	0.06010929
MAGED4B	3.3407398	5.75582889	0.00055993	0.06010929
CALU	5.62092769	5.75015408	0.00056416	0.06010929
LSMEM1	1.15609492	5.74815809	0.00056566	0.06010929
PSPH	4.48274107	5.7357132	0.00057507	0.06031008
HIGD1A	6.82211349	5.73065839	0.00057894	0.06031008
AMDHD2	3.61951305	5.73017718	0.00057931	0.06031008
MIR3936HG	2.64425007	5.72656758	0.0005821	0.06031008
TBL3	4.25864904	5.72379892	0.00058424	0.06031008
LOC101928565	1.53272346	5.71575126	0.00059051	0.06039193
ASB2	-0.8986304	5.71130138	0.00059401	0.06039193
LINC00266-3	3.3647325	5.70987568	0.00059514	0.06039193
STXBP3	5.33572985	5.70575848	0.0005984	0.06039193
GJC2	3.47395611	5.70014102	0.00060289	0.06050627
SH3BGR1	5.94248262	5.68567597	0.00061459	0.06111552
LINC00472	1.94325569	5.68422243	0.00061578	0.06111552
ADCY7	3.62350524	5.68016591	0.00061911	0.06111552
RBP1	4.34534004	5.66889279	0.00062846	0.06111945
SLC35B2	3.9994331	5.66215519	0.00063411	0.06111945
GALNT7	3.66686405	5.66203916	0.00063421	0.06111945
GCNT7	-0.7621545	5.66103279	0.00063506	0.06111945
MC1R	2.57476284	5.65744017	0.0006381	0.06111945
GJD4	-0.0473953	5.65307219	0.00064182	0.06111945
TGM1	0.25258922	5.64475386	0.00064897	0.06111945
CYTH4	2.70049597	5.64292415	0.00065055	0.06111945
GOLGA6L9	3.99305902	5.63984118	0.00065323	0.06111945
HSF4	3.74515135	5.63598237	0.00065659	0.06111945
ARIH2OS	1.10526001	5.6350775	0.00065738	0.06111945
TRAM2-AS1	2.70437855	5.63085448	0.00066109	0.06111945
ST3GAL4	4.20765648	5.62376288	0.00066737	0.06111945
CAD	4.61018056	5.6217646	0.00066915	0.06111945
MIR4738	-0.2449284	5.61753321	0.00067293	0.06111945
ABCB6	4.64647254	5.61700855	0.0006734	0.06111945
KAT2B	6.51518248	5.61338193	0.00067666	0.06111945
PTOV1-AS2	1.82004293	5.60923538	0.00068041	0.06115239
STRADB	4.60516528	5.58972365	0.00069834	0.06123799
CCNE2	2.29245804	5.58856368	0.00069943	0.06123799
FRS2	5.22878983	5.58687668	0.000701	0.06123799
CNOT3	5.01345507	5.5867021	0.00070116	0.06123799
POLR2M	5.79844931	5.58180257	0.00070576	0.06123799
LINC02232	-0.8393731	5.572766	0.00071432	0.06123799
TMEM87A	5.49143944	5.56991558	0.00071705	0.06123799

APPL1	5.31833222	5.56646019	0.00072036	0.06123799
NAA11	-0.0382084	5.56600379	0.0007208	0.06123799
PSEN1	6.22202176	5.56586016	0.00072094	0.06123799
RPL10A	7.33278176	5.56434951	0.00072239	0.06123799
TATDN3	3.75889712	5.56171447	0.00072494	0.06123799
PAXBP1-AS1	2.33788688	5.56120588	0.00072543	0.06123799
FLCN	6.75777976	5.55184002	0.00073456	0.06157653
SLC7A11-AS1	2.63636428	5.54851926	0.00073783	0.06157653
ADAM20	-0.5200778	5.54367954	0.00074261	0.06157653
LRRK1	7.07552093	5.54309918	0.00074319	0.06157653
MVB12B	6.52257346	5.53824112	0.00074803	0.06157653
NEK7	6.19705966	5.53637595	0.00074989	0.06157653
APOOL	4.71297297	5.52601857	0.00076035	0.06215233
PLS3	5.29287445	5.52093983	0.00076553	0.06229387
LINC01730	0.58833177	5.50732303	0.00077959	0.06266012
L3MBTL1	4.44018528	5.50610527	0.00078087	0.06266012
HGH1	3.29394926	5.5036565	0.00078343	0.06266012
NFYB	5.26969579	5.49972412	0.00078756	0.06266012
LRATD2	4.20389635	5.49962266	0.00078767	0.06266012
GINM1	4.65524182	5.49661873	0.00079084	0.06266012
COL7A1	3.66608586	5.48720821	0.00080086	0.06317718
ADGRE5	2.91590329	5.48280509	0.0008056	0.06327435
EP400P1	4.50694497	5.47042489	0.00081906	0.06405353
BLOC1S2	4.69670882	5.46125382	0.00082919	0.06456577
TBC1D29P	0.8925923	5.45494884	0.00083622	0.06483408
TTC39B	4.77892881	5.44749291	0.00084462	0.06496048
TRAM1L1	1.72910277	5.44098025	0.00085203	0.06496048
WASHC5	4.49589227	5.44061426	0.00085244	0.06496048
MPC1	5.48919458	5.43856163	0.00085479	0.06496048
TBX15	-0.2927879	5.43765606	0.00085583	0.06496048
UTP20	4.0949827	5.42775274	0.00086727	0.06543125
SLC44A1	8.30718159	5.42603206	0.00086928	0.06543125
CATSPER2	4.8382955	5.41507319	0.00088215	0.06612486
RWDD4	3.56261951	5.40578832	0.00089321	0.06644995
SPTSSA	4.52007767	5.40526129	0.00089385	0.06644995
RBM34	4.55808862	5.39744624	0.00090327	0.0666288
TMC4	1.37893769	5.39715367	0.00090363	0.0666288
NUPR2	-0.828272	5.38514842	0.00091832	0.06743652
ZNF629	4.56445793	5.38103848	0.0009234	0.06747896
SKIV2L	4.64811724	5.37814513	0.000927	0.06747896
EIF3C	7.31209766	5.37297253	0.00093346	0.06747896
RFFL	5.88225682	5.37134378	0.00093551	0.06747896

MIR219A2	2.6050074	5.36952476	0.0009378	0.06747896
ACTA1	-1.0011695	5.36674659	0.00094131	0.06747896
APOC1	5.91681805	5.36313461	0.00094589	0.06753937
CLDND1	8.81868788	5.35204732	0.00096009	0.06813902
PAOX	2.31201491	5.35070441	0.00096183	0.06813902
SYNJ2BP	5.81867508	5.34767013	0.00096576	0.0681504
LOC100130548	-0.5950681	5.33051631	0.00098831	0.06947016
FAM156B	-0.5849988	5.32699137	0.00099301	0.06952998
SHISA4	6.26418344	5.31858454	0.00100431	0.0700498
NPIPA7	2.80487172	5.31450226	0.00100985	0.07016499
PABPC5	0.90949084	5.30316127	0.00102539	0.07097196
ADAM33	3.06474532	5.29530463	0.0010363	0.07116469
LINC01179	-0.9372744	5.29241637	0.00104034	0.07116469
METTL15	3.82360749	5.29218268	0.00104067	0.07116469
IGIP	6.03265181	5.28787979	0.00104672	0.07116469
ZNF205-AS1	1.43954268	5.285663	0.00104985	0.07116469
UBLCP1	3.98264772	5.28428173	0.00105181	0.07116469
SHPK	3.87247015	5.27964836	0.0010584	0.07134337
NFKBID	0.97129426	5.26751531	0.00107586	0.07201702
PKP4	9.06575943	5.26716504	0.00107637	0.07201702
PCGF5	6.31834708	5.26409355	0.00108084	0.07204914
FUNDC1	3.60661278	5.25939472	0.00108771	0.0722168
GLB1L3	4.09455585	5.25692009	0.00109135	0.0722168
FBXO45	5.13454844	5.2509982	0.0011001	0.07232454
CARD11	1.41677805	5.24951348	0.00110231	0.07232454
VBP1	4.84462783	5.2454064	0.00110844	0.07232454
TIMM8B	4.05781411	5.24503652	0.00110899	0.07232454
TNXB	5.18837484	5.23758855	0.0011202	0.07243046
ARMC1	5.08025423	5.23713497	0.00112088	0.07243046
EFS	5.01945894	5.23550102	0.00112336	0.07243046
MLKL	3.52405079	5.23333242	0.00112665	0.07243046
CMTM5	4.4859549	5.22662019	0.00113691	0.0728308
HR	4.54930125	5.22173045	0.00114444	0.07305435
GABRP	2.98374505	5.21834566	0.00114969	0.07306988
SLC26A11	4.12791552	5.21636021	0.00115278	0.07306988
FAM138A	0.69409531	5.21227985	0.00115915	0.07321694
SETD1A	5.13430561	5.20387113	0.0011724	0.07359941
DTD1	4.00392617	5.20158824	0.00117602	0.07359941
TRIM2	7.9312153	5.20070381	0.00117743	0.07359941
FUS	6.90696636	5.18778828	0.00119817	0.07463768
SESTD1	5.71144584	5.18434126	0.00120377	0.07464429
CAV2	3.89889785	5.18039562	0.00121021	0.07464429

KLHL6	3.0023958	5.17422775	0.00122035	0.07464429
CNP	9.7918451	5.17307513	0.00122225	0.07464429
INKA1	0.97793763	5.17213208	0.00122382	0.07464429
LOC101928123	1.58567675	5.17038103	0.00122672	0.07464429
RNASEH1-AS1	2.22148804	5.17009145	0.0012272	0.07464429
LOC100506422	0.83324564	5.16599008	0.00123403	0.07467152
SH3TC2	4.24700824	5.15823774	0.00124705	0.07467152
IDUA	2.53674279	5.1578334	0.00124773	0.07467152
ZDHH9	6.14028334	5.15721772	0.00124877	0.07467152
ETV3	4.20035241	5.1571007	0.00124897	0.07467152
CHTF18	2.04836622	5.15504523	0.00125245	0.07467152
ACER3	5.83684722	5.15022493	0.00126065	0.07491322
DCUN1D1	5.26256045	5.13565292	0.00128578	0.07592232
BCAS1	9.5148055	5.13550449	0.00128604	0.07592232
ALG5	3.17541833	5.12859383	0.00129813	0.07601204
MROH6	2.15342492	5.12801094	0.00129916	0.07601204
H3C15	2.69705834	5.12540812	0.00130375	0.07601204
ZCCHC2	4.40554114	5.12207814	0.00130965	0.07601204
MED25	4.93376962	5.12045154	0.00131254	0.07601204
TSHR	2.21178255	5.1186796	0.00131569	0.07601204
SAP18	7.24096567	5.11794251	0.00131701	0.07601204
CPED1	2.37428273	5.11463649	0.00132292	0.07610388
TMCC3	5.14907391	5.11235345	0.00132703	0.07610388
TCEAL8	5.12476037	5.10762132	0.00133557	0.07635138
KLHL5	6.18234126	5.10131363	0.00134704	0.07676439
NMRAL1	4.77986504	5.09890715	0.00135145	0.07677317
MIR4292	-0.9423786	5.09388795	0.00136068	0.07705537
B3GALT6	3.09764202	5.07796193	0.00139041	0.07806456
NFKB2	3.72625965	5.07449176	0.00139697	0.07806456
APBB1IP	2.78014115	5.07366025	0.00139855	0.07806456
MTFR1	3.1579299	5.07326183	0.00139931	0.07806456
PRELID3B	4.61293929	5.0703904	0.00140477	0.07806456
SFT2D3	1.25186652	5.06895607	0.00140751	0.07806456
CREB5	5.26384176	5.06830771	0.00140875	0.07806456
ZGLP1	2.11568271	5.05103122	0.0014422	0.07929245
TIMM17A	4.65379017	5.04961972	0.00144496	0.07929245
SPATC1	-0.7979783	5.04941105	0.00144537	0.07929245
RERE-AS1	-0.9537233	5.04783907	0.00144846	0.07929245
UFSP1	-0.8049778	5.04455333	0.00145495	0.07938659
CCDC138	1.53963578	5.03847617	0.00146701	0.07938659
LOC101927972	-0.4945307	5.03755653	0.00146885	0.07938659
KCTD3	5.26145015	5.0349213	0.00147412	0.07938659

TMEM132E	2.37875617	5.03408698	0.00147579	0.07938659
LOC101928834	-0.0866806	5.03370795	0.00147655	0.07938659
USP12	5.47684556	5.02578405	0.00149254	0.08000832
SPOCK3	6.5033708	5.0078255	0.00152945	0.08114617
TCEAL6	4.22909876	4.99891344	0.00154811	0.08114617
KIAA0232	6.16312738	4.99881256	0.00154832	0.08114617
DNAJC14	4.82304108	4.99793938	0.00155016	0.08114617
VPS54	4.50056156	4.9927875	0.00156107	0.08114617
CLPX	4.89378273	4.99132357	0.00156419	0.08114617
DND1	0.54875378	4.99077437	0.00156536	0.08114617
SLC25A13	3.12505943	4.99026321	0.00156645	0.08114617
KY	1.91675612	4.98771713	0.00157188	0.08114617
ASPSR1	5.10009793	4.98633257	0.00157485	0.08114617
SERPINI2	1.21338916	4.98599482	0.00157558	0.08114617
C12orf76	5.0499422	4.98402199	0.00157981	0.08114617
UBL3	6.81954626	4.98291697	0.00158219	0.08114617
ANO4	3.75837661	4.97824485	0.00159229	0.08114617
ENDOD1	5.98303755	4.97753855	0.00159382	0.08114617
RMDN1	4.95152376	4.97671079	0.00159562	0.08114617
WDR90	4.07948393	4.97445994	0.00160052	0.08114617
GPR89A	3.24388394	4.97048693	0.0016092	0.08114617
CMPK1	6.33654795	4.96991817	0.00161045	0.08114617
POLD1	2.74758212	4.96846063	0.00161365	0.08114617
ANTKMT	3.65596668	4.9648104	0.0016217	0.08114617
FDXR	2.93144334	4.96376431	0.00162401	0.08114617
BCORL1	4.32099105	4.96130093	0.00162947	0.08114617
QDPR	9.29233194	4.96065534	0.00163091	0.08114617
STX12	5.83459327	4.9603659	0.00163155	0.08114617
FAM98A	5.02720952	4.96011215	0.00163211	0.08114617
TIGD1	5.84428342	4.95879204	0.00163505	0.08114617
ZC3H7A	4.77994388	4.95607888	0.00164111	0.08119711
TNFRSF10D	2.65409996	4.95431094	0.00164507	0.08119711
GCSH	5.70667744	4.94662231	0.0016624	0.081829
ENPEP	0.44453244	4.9429036	0.00167085	0.08189702
TSEN15	3.92265952	4.94011446	0.00167722	0.08189702
APOL3	3.2351582	4.93684626	0.00168471	0.08189702
SLC25A37	6.11402439	4.93643249	0.00168566	0.08189702
TMEFF2	4.42866172	4.93443234	0.00169026	0.08189702
SEPTIN7	8.52968661	4.93077282	0.00169872	0.08189702
ATM	6.13995768	4.92831981	0.00170441	0.08189702
TMEM128	3.36276535	4.92780994	0.0017056	0.08189702
PRKRIP1	3.02164773	4.92748534	0.00170635	0.08189702

CFAP298	4.2300177	4.9244059	0.00171354	0.08189702
TECPR1	5.50758582	4.92435853	0.00171365	0.08189702
P3H3	3.12975979	4.92077962	0.00172204	0.08208075
TRMT2A	4.34386556	4.89489709	0.00178397	0.08480877
S1PR5	4.28542489	4.89110607	0.00179323	0.08502524
THBS3	4.34439885	4.88820935	0.00180033	0.08504796
BTBD3	5.35373255	4.88707733	0.00180312	0.08504796
ATXN7	4.82366598	4.88451661	0.00180944	0.08512372
C18orf32	6.48620089	4.88036853	0.00181972	0.08538513
KCTD10	5.20852039	4.87554565	0.00183175	0.0856039
DPF1	5.28869356	4.871177	0.00184272	0.0856039
ZNF701	2.93787155	4.8692891	0.00184748	0.0856039
ING2	2.93164059	4.86916615	0.00184779	0.0856039
VMO1	0.20890071	4.86885031	0.00184859	0.0856039
SAMD13	0.09069387	4.86717968	0.00185282	0.0856039
SPRTN	2.58572501	4.85894447	0.00187379	0.08629207
SFI1	5.09077008	4.85759053	0.00187726	0.08629207
HLA-F-AS1	2.9684617	4.85212621	0.00189134	0.08669505
STK39	5.71386906	4.85047119	0.00189563	0.08669505
DPYD	3.37007686	4.84496543	0.00190996	0.08682437
TMEM101	3.91388128	4.84348225	0.00191384	0.08682437
TPM4	6.48488563	4.84279425	0.00191564	0.08682437
SEPTIN10	3.92434403	4.84201492	0.00191768	0.08682437
SAMSN1	0.73033019	4.83407153	0.00193864	0.08699789
DIPK2A	4.15376871	4.83293068	0.00194166	0.08699789
ELP6	4.20929197	4.83168263	0.00194498	0.08699789
ACPP	0.98957182	4.82866361	0.00195304	0.08699789
STYX	3.50311841	4.82830184	0.001954	0.08699789
KIAA2013	5.12363825	4.82653032	0.00195875	0.08699789
CASZ1	2.33669602	4.82627599	0.00195943	0.08699789
LMAN1L	-1.1731195	4.82604763	0.00196004	0.08699789
SLC17A9	0.96467681	4.81837218	0.00198074	0.08723625
ST6GALNAC3	3.53203282	4.81816609	0.0019813	0.08723625
ZNF266	3.88995501	4.81670354	0.00198527	0.08723625
CYP1B1-AS1	4.189676	4.81626959	0.00198645	0.08723625
RESP18	2.87898285	4.81512924	0.00198956	0.08723625
EDNRA	0.92600789	4.80787704	0.00200941	0.08789353
TRIM59	3.70101207	4.80419115	0.00201958	0.08812497
EDRF1-AS1	-0.0572106	4.79793456	0.00203696	0.08842781
DNAJB1	8.22302311	4.79732611	0.00203866	0.08842781
TSPAN15	4.45080808	4.79558374	0.00204353	0.08842781
MXD1	4.44748339	4.79466734	0.0020461	0.08842781

VEZT	5.1143117	4.7915315	0.00205491	0.08846401
FMOD	0.89388063	4.79088487	0.00205673	0.08846401
CLEC14A	2.69078558	4.78856579	0.00206328	0.08853477
ZNF366	2.17808609	4.78651381	0.00206909	0.08857369
RGL3	3.52728722	4.78337851	0.002078	0.0887448
KLRC3	0.40179638	4.77436822	0.00210382	0.08944954
DBNDD2	8.35985511	4.77416696	0.0021044	0.08944954
CROCC	6.07320014	4.77079315	0.00211416	0.08960588
MBD4	4.05557114	4.76930278	0.00211849	0.08960588
LOC101927950	-0.1021448	4.76683488	0.00212567	0.08960588
FAM177A1	5.48816303	4.76569266	0.002129	0.08960588
PEX5	6.36196371	4.76436341	0.00213288	0.08960588
ELF5	-0.6996137	4.76166409	0.00214079	0.08968399
GPR37	5.8087486	4.75725306	0.00215378	0.08968399
ZNF322	4.75728096	4.75667406	0.0021555	0.08968399
RTP4	-0.03841	4.75366822	0.0021644	0.08968399
LINC01006	-0.3684257	4.7535152	0.00216486	0.08968399
PIP4K2A	8.55225736	4.75285758	0.00216681	0.08968399
NEMP2	1.64028119	4.75195556	0.00216949	0.08968399
ETFRF1	4.52559838	4.73481627	0.00222113	0.09120442
ELOA2	-0.4458164	4.73403597	0.00222351	0.09120442
HAPLN2	5.73322184	4.73282905	0.00222719	0.09120442
HIPK3	6.11037331	4.73263614	0.00222778	0.09120442
ZNF814	4.62933638	4.73080557	0.00223339	0.09120442
STK11IP	3.81430903	4.72741629	0.00224381	0.09120442
RCN3	2.06251924	4.72719164	0.0022445	0.09120442
RAB33B	3.57048585	4.7264758	0.0022467	0.09120442
ENPP4	4.77639731	4.72485456	0.00225171	0.09120442
GSDMB	4.08843306	4.71824094	0.00227226	0.09149709
TOP3B	3.51401313	4.71720715	0.00227548	0.09149709
PON1	-0.2658781	4.71669308	0.00227709	0.09149709
WASHC2C	4.94830703	4.71602007	0.0022792	0.09149709
PDZD8	5.96519685	4.71124777	0.00229419	0.09181855
PAQR4	5.40134988	4.71023849	0.00229737	0.09181855
CLEC2D	3.041354	4.70572289	0.00231167	0.09189766
SNX32	3.77654135	4.70492345	0.00231421	0.09189766
CRAMP1	4.85662514	4.70479659	0.00231461	0.09189766
MCAT	2.93409773	4.6968976	0.00233987	0.09217496
ANLN	6.98734191	4.69588428	0.00234313	0.09217496
TF	8.52445508	4.69510296	0.00234565	0.09217496
KLHDC4	4.74726437	4.69352763	0.00235073	0.09217496
LINC00842	0.96435477	4.6932592	0.0023516	0.09217496

UHRF1BP1	4.14505491	4.69307125	0.00235221	0.09217496
ECSCR	0.86889021	4.69092008	0.00235917	0.09220338
AIF1	2.2407029	4.68969765	0.00236314	0.09220338
CILP2	-0.5002635	4.68608351	0.00237491	0.09236133
KCNJ11	4.05560004	4.68516966	0.0023779	0.09236133
THAP12	4.5734189	4.68375467	0.00238253	0.09236133
INTS3	6.41366261	4.68171826	0.00238921	0.09242198
GCA	3.76697633	4.67890549	0.00239847	0.09258188
LRP4-AS1	1.03441855	4.67523778	0.0024106	0.09281723
CAAP1	3.27335111	4.67140352	0.00242334	0.09281723
NUP54	3.27470582	4.6713391	0.00242356	0.09281723
NINJ2	3.09259403	4.67087123	0.00242512	0.09281723
LOC101928304	1.15060953	4.66924607	0.00243054	0.09282827
SUCLG2	4.07553784	4.66406903	0.00244792	0.09329449
MAP3K12	4.93764079	4.66248397	0.00245326	0.09330133
FRY-AS1	0.20452365	4.65811904	0.00246804	0.0934127
PRSS8	0.95080276	4.65757049	0.0024699	0.0934127
DKFZP434H168	0.52887296	4.65658358	0.00247326	0.0934127
C1GALT1	4.11432991	4.65552253	0.00247687	0.0934127
RBM12B-AS1	-0.6003986	4.65131056	0.00249127	0.09376001
SCNN1D	3.38093153	4.64478946	0.00251373	0.09410016
ENSA	7.05778597	4.64392437	0.00251673	0.09410016
BPGM	3.67826401	4.64017729	0.00252974	0.09410016
ENOPH1	5.62702574	4.63921271	0.00253311	0.09410016
TSC2	6.27807399	4.63828923	0.00253633	0.09410016
GPSM2	4.97760241	4.63811968	0.00253692	0.09410016
ANAPC2	4.69957087	4.63676825	0.00254165	0.09410016
C9orf131	1.62948035	4.63667292	0.00254198	0.09410016
KCNE4	4.57123608	4.634269	0.00255041	0.09421094
CCR5	-0.6790162	4.63284834	0.0025554	0.09421094
NLRC3	3.54645106	4.6306638	0.0025631	0.09430235
NPC1L1	0.5616225	4.62750939	0.00257426	0.09441666
IPO11-LRRC70	2.48227874	4.62683273	0.00257666	0.09441666
RAB11B	6.68095329	4.62499424	0.0025832	0.09446444
ABHD17B	4.50464196	4.62333106	0.00258912	0.09448984
ZNF83	5.72482569	4.62055635	0.00259904	0.09466047
RETREG1	5.84489496	4.61743808	0.00261023	0.09487673
SLC12A2	6.1584315	4.61398742	0.00262267	0.09496929
MIR570HG	5.8478483	4.61377104	0.00262345	0.09496929
QTRT1	4.64780406	4.61236277	0.00262854	0.09496929
VMA21	5.27330527	4.6103621	0.0026358	0.0950414
SLC13A5	3.28717415	4.60736725	0.0026467	0.09524437

PPIL3	3.44056509	4.60456528	0.00265694	0.09542015
PPP4R1	4.88004841	4.60235719	0.00266504	0.09542015
STX18	4.02546509	4.60048192	0.00267194	0.09542015
ABCC5-AS1	-0.2436159	4.60027155	0.00267271	0.09542015
RXYLT1	3.62917986	4.59760683	0.00268255	0.09558242
ZNF324	4.49399984	4.59505086	0.00269202	0.09573102
JAK3	3.90897924	4.59020619	0.00271006	0.09602869
SLC20A2	5.57625286	4.58994953	0.00271102	0.09602869
GM2A	5.9371944	4.58124511	0.00274376	0.0969082
SETD5	7.11014734	4.58006941	0.00274822	0.0969082
SPTBN4	6.22233749	4.5790864	0.00275195	0.0969082
MUC20	4.21129341	4.57475418	0.00276844	0.09729943
YWHAE	9.288265	4.56582948	0.00280274	0.09768704
ZNF625-ZNF20	1.32011653	4.56320259	0.00281292	0.09768704
NOS2	0.38262987	4.56300878	0.00281368	0.09768704
KPNA5	5.19122784	4.56252709	0.00281555	0.09768704
TMEM144	6.99935692	4.56059139	0.00282308	0.09768704
EPS15	6.69049905	4.55543538	0.00284324	0.09768704
ZNF594	3.54212326	4.55448766	0.00284696	0.09768704
COA5	5.00474294	4.55386812	0.0028494	0.09768704
UGT8	6.4315176	4.55372502	0.00284996	0.09768704
SKA2	5.1338964	4.5529571	0.00285299	0.09768704
THUMPD3-AS1	4.58372048	4.55185549	0.00285733	0.09768704
KIAA0408	4.820663	4.55013723	0.00286411	0.09768704
HARBI1	2.42854397	4.54932096	0.00286734	0.09768704
FBF1	4.83405456	4.54891851	0.00286894	0.09768704
IL16	2.67840993	4.5476471	0.00287398	0.09768704
SERPINH1	5.60628387	4.54760193	0.00287416	0.09768704
OR2H2	1.0737598	4.54293632	0.00289273	0.09768704
LINC00923	2.91384303	4.54268367	0.00289374	0.09768704
ATF6B	5.75351269	4.54257641	0.00289417	0.09768704
CZIB	4.65816255	4.54164177	0.00289791	0.09768704
TRAPPC1	5.11337537	4.54157379	0.00289818	0.09768704
ADNP-AS1	0.45794895	4.54151053	0.00289844	0.09768704
TBX3	2.52259985	4.53743811	0.00291478	0.09805508
HGFAC	0.9285869	4.53393954	0.0029289	0.09834694
MAMDC4	3.23391502	4.53142356	0.0029391	0.09839085
MEF2C-AS1	0.72970217	4.528614	0.00295053	0.09839085
ERVH48-1	2.4751616	4.52719767	0.00295631	0.09839085
APBB2	6.09664733	4.52678297	0.00295801	0.09839085
GRM3	6.32455428	4.52561258	0.00296279	0.09839085
ENGASE	4.78779784	4.52390001	0.00296981	0.09839085

NRAS	4.28863602	4.52380299	0.00297021	0.09839085
LINC-PINT	5.23353803	4.52293269	0.00297378	0.09839085
HBP1	5.48455474	4.51937546	0.00298844	0.09869494
CEBPZ	5.03467314	4.51624788	0.00300138	0.09886898
PTS	3.26355965	4.51545982	0.00300465	0.09886898
PTPN12	5.48846456	4.5104039	0.00302573	0.09917758
ARPC5	5.90359662	4.50816911	0.00303509	0.09917758
TMEM209	3.59055545	4.50738557	0.00303838	0.09917758
BAIAP2	6.85939835	4.50722309	0.00303906	0.09917758
TYMS	2.88893051	4.50481042	0.00304921	0.09917758
SLC16A5	-0.2981166	4.50464582	0.00304991	0.09917758
SERHL2	3.93696084	4.50404009	0.00305246	0.09917758
LOC155060	2.79814625	4.50107406	0.00306501	0.09940636
GNAI1	5.37775362	4.49688388	0.00308282	0.09942056
ZNF483	5.14790732	4.49656023	0.0030842	0.09942056
PEX16	4.25275822	4.49646901	0.00308459	0.09942056
ADAM8	1.55647194	4.49465696	0.00309233	0.09942056
PZP	1.19967316	4.49450839	0.00309296	0.09942056
SCGB3A2	2.16986279	4.49032743	0.0031109	0.09950916
COL9A2	6.30607007	4.48987669	0.00311284	0.09950916
GPBP1	6.35765679	4.48774864	0.00312202	0.09950916
PLEKHA8	3.60116071	4.48746729	0.00312323	0.09950916
PNRC2	5.73065544	4.48746059	0.00312326	0.09950916
LRWD1	3.98203175	4.48162753	0.00314857	0.09979266
PRR5L	3.79916934	4.4787627	0.00316107	0.09979266
TMEM243	3.04579799	4.47471597	0.00317882	0.09979266
HSPG2	4.61854921	4.47296526	0.00318653	0.09979266
GPS1	5.70461701	4.47279724	0.00318727	0.09979266
ATP1A4	1.33475486	4.47277042	0.00318739	0.09979266
POLR2K	4.61816459	4.47174576	0.00319191	0.09979266
QKI	9.36323557	4.46881672	0.00320488	0.09979266
HDGFL2	5.29541684	4.4664025	0.00321561	0.09979266
TMEM189- UBE2V1	-0.9441722	4.46514443	0.00322121	0.09979266
LIN7C	5.40458438	4.46375891	0.0032274	0.09979266
VASH1-AS1	4.21972321	4.46347063	0.00322869	0.09979266
LINC00840	-0.8283417	4.46305793	0.00323053	0.09979266
MRPL2	3.95594998	4.46269544	0.00323215	0.09979266
GALNT1	4.60392426	4.46131087	0.00323835	0.09979266
ATMIN	5.59531411	4.4601013	0.00324378	0.09979266
CALML4	1.58306797	4.45937861	0.00324703	0.09979266
VAMP3	6.24882329	4.45812475	0.00325267	0.09979266
VAMP1	4.37066023	4.45807489	0.00325289	0.09979266

CAPN13	0.56472717	4.45689242	0.00325822	0.09979266
TRIM69	2.73347751	4.4565448	0.00325979	0.09979266
TMEM145	3.70605952	4.45584231	0.00326296	0.09979266
CCDC62	1.96542339	4.45489852	0.00326723	0.09979266
DCDC2B	0.90750904	4.45471182	0.00326808	0.09979266
PRR18	4.87110357	4.45422931	0.00327026	0.09979266

[000258] Genes increased or decreased in brain putamen of PD patients correlating with disease duration are shown below in TABLE 22 (184 genes). Positive numbers for AveExp indicates an up or upregulated gene, a gene or RNA whereby expression of the gene or the amount of RNA for that gene is increased or greater with disease duration. Negative numbers for AveExp indicates a down or downregulated gene, a gene or RNA whereby expression of the gene or the amount of RNA for that gene is reduced or less with disease duration.

TABLE 22 Brain Putamen - Correlating with disease duration - Up and Down

ID	AveExpr	F	P.Value	adj.P.Val	Up or Down
ZNF286B	3.26173981	6.61214794	0.00018303	0.67035965	
FHL1	6.65094105	6.04020798	0.00038477	0.67035965	
DUSP1	5.6826297	6.00470662	0.00040313	0.67035965	
USP17L15	-0.0451614	5.96933633	0.00042233	0.67035965	
NEAT1	9.86310425	5.96524884	0.0004246	0.67035965	
CTBP1-DT	-0.1462198	5.88695471	0.00047076	0.67035965	
ROPN1B	0.82631839	5.86145571	0.00048688	0.67035965	
ZNF585A	4.73830598	5.85754052	0.0004894	0.67035965	
KCNE4	4.57123608	5.70840574	0.0005963	0.67035965	
FOS	5.89887397	5.67487209	0.00062348	0.67035965	
KLF6	5.95265656	5.56556503	0.00072122	0.67035965	
ANKRD18B	3.06380091	5.56167852	0.00072497	0.67035965	
CDC20	0.41733908	5.42324836	0.00087253	0.67035965	
STX18	4.02546509	5.36283243	0.00094627	0.67035965	
KCNS3	1.19617648	5.30384716	0.00102444	0.67035965	
WDPCP	5.30875084	5.19266386	0.0011903	0.67035965	
CEP95	4.36806156	5.17515629	0.00121882	0.67035965	
HSPA1B	9.3881947	5.17091525	0.00122583	0.67035965	
MORC4	5.88417545	5.14467674	0.00127016	0.67035965	
NT5DC3	4.43164774	5.13956857	0.00127897	0.67035965	
ZNF233	2.99339005	5.02048457	0.00150334	0.67035965	
ORC4	5.77328284	5.00929563	0.00152639	0.67035965	
UGGT2	3.95700735	4.99845747	0.00154907	0.67035965	
SPARC	9.5338708	4.90373427	0.00176257	0.67035965	
PPP4R2	5.8899076	4.90337953	0.00176342	0.67035965	
MCL1	6.97169399	4.80660399	0.00201292	0.67035965	

TARP	1.4875018	4.79719181	0.00203904	0.67035965	
RPRML	1.77209867	4.76737974	0.00212408	0.67035965	
TNFAIP8L2	0.89765468	4.7669877	0.00212522	0.67035965	
LINC01429	0.57799624	4.76598147	0.00212816	0.67035965	
SST	3.41637837	4.76550399	0.00212955	0.67035965	
CLDN1	-0.4433943	4.7352038	0.00221994	0.67035965	
KCNA5	2.12045271	4.73432071	0.00222264	0.67035965	
SCRG1	6.22729265	4.71864102	0.00227101	0.67035965	
SRD5A1	5.3238839	4.71165447	0.00229291	0.67035965	
KANSL1-AS1	-0.3084233	4.66623053	0.00244065	0.67035965	
TMEM212	4.91372258	4.63408383	0.00255106	0.67035965	
FTO-IT1	-0.2479915	4.61580393	0.00261611	0.67035965	
FOSL2	5.63180782	4.6134456	0.00262462	0.67035965	
FLJ22447	4.87513421	4.54260274	0.00289407	0.67035965	
B3GALT6	3.09764202	4.52293746	0.00297376	0.67035965	
DNAJB1	8.22302311	4.49642287	0.00308478	0.67035965	
CBWD6	2.56446026	4.49621742	0.00308566	0.67035965	
TUT4	5.73497673	4.48014128	0.00315505	0.67035965	
REM2	0.38386635	4.44148299	0.0033285	0.67035965	
DISC1-IT1	3.01437282	4.41341571	0.00346052	0.67035965	
BLOC1S6	7.16138612	4.40430917	0.00350449	0.67035965	
NEDD4	6.76034515	4.36882309	0.00368136	0.67035965	
RSRC2	6.15534184	4.35623119	0.0037463	0.67035965	
LINC01341	1.39408282	4.34093748	0.00382673	0.67035965	
UNC45B	-0.5130714	4.33229003	0.00387299	0.67035965	
OTULIN	4.17998326	4.3222079	0.00392765	0.67035965	
GPR75-ASB3	5.4326442	4.32025988	0.0039383	0.67035965	
ODF2L	5.60484522	4.30922886	0.00399917	0.67035965	
UGDH-AS1	7.01510319	4.30130043	0.00404352	0.67035965	
AGO3	5.97146228	4.29064014	0.00410393	0.67035965	
FADS2	7.87312256	4.28154995	0.00415618	0.67035965	
F8A1	4.50020172	4.27352808	0.00420284	0.67035965	
HERC4	5.7288381	4.24129523	0.00439582	0.67035965	
TCF4	7.52872927	4.21950051	0.00453141	0.67035965	
DENND1C	2.39882502	4.21248292	0.00457597	0.67035965	
NAV3	5.08551113	4.19587314	0.00468323	0.67035965	
FAM241A	6.30140368	4.19484743	0.00468993	0.67035965	
LOC100507557	5.16295134	4.18398721	0.00476155	0.67035965	
RTL9	-0.5337938	4.18377162	0.00476298	0.67035965	
NME1-NME2	1.8176249	4.16214978	0.00490895	0.67035965	
TMEM39B	3.15596611	4.15592545	0.00495182	0.67035965	
PKP4-AS1	1.21683747	4.15412833	0.00496426	0.67035965	

USP46-AS1	-1.1657648	4.14617351	0.00501974	0.67035965	
ACAA1	5.87782082	4.12939331	0.00513884	0.67035965	
KLHL41	0.55086303	4.12755364	0.00515207	0.67035965	
MGA	5.93337233	4.12306793	0.00518448	0.67035965	
FAM216A	3.21670177	4.12061765	0.00520227	0.67035965	
LSM11	2.89177739	4.10172942	0.00534153	0.67035965	
HSPB8	7.72573673	4.08910866	0.00543669	0.67035965	
RNF165	3.40650018	4.0869622	0.00545304	0.67035965	
NIPBL	6.26715507	4.08676238	0.00545457	0.67035965	
TMEM45A	6.54614817	4.07725391	0.00552764	0.67035965	
ITGB1	6.82856574	4.06798749	0.00559982	0.67035965	
ZNF561	4.27679119	4.06793226	0.00560025	0.67035965	
MIAT	7.34792985	4.06222694	0.00564517	0.67035965	
AMDHD2	3.61951305	4.05112553	0.00573363	0.67035965	
FBXW7	5.76160175	4.04529409	0.00578067	0.67035965	
EIF3C	7.31209766	4.04347389	0.00579543	0.67035965	
ISG20L2	4.32006278	4.04291521	0.00579996	0.67035965	
DNAJC25- GNG10	3.1341942	4.03987832	0.0058247	0.67035965	
REL	5.63679489	4.03848447	0.00583608	0.67035965	
OCA2	-0.257572	4.03473431	0.00586684	0.67035965	
LDHB	8.40898536	4.03225641	0.00588725	0.67035965	
RBPMS	4.23394482	4.03082774	0.00589905	0.67035965	
FXR1	6.86650259	4.02860738	0.00591743	0.67035965	
NUTM2B-AS1	5.45615562	4.01740739	0.00601107	0.67035965	
P2RY12	1.49639265	4.01536718	0.00602829	0.67035965	
ZNF784	1.66576189	4.00509722	0.00611574	0.67035965	
ARL10	5.65945877	3.99669615	0.00618824	0.67035965	
ZNF559	3.49056213	3.99289091	0.00622136	0.67035965	
CPLANE1	5.38575588	3.9917502	0.00623133	0.67035965	
NA	0.53614867	3.99009216	0.00624584	0.67035965	
CYSLTR1	4.59758451	3.98635017	0.00627872	0.67035965	
TSIX	6.42716652	3.97727414	0.00635921	0.67035965	
ETFBKMT	3.59395894	3.97579285	0.00637244	0.67035965	
GTF3C3	4.13018888	3.97314978	0.00639613	0.67035965	
ERN1	3.35343245	3.95274164	0.00658206	0.67035965	
ITPA	3.59969126	3.94801329	0.00662592	0.67035965	
INKA1	0.97793763	3.94575734	0.00664695	0.67035965	
SHF	3.92717801	3.94458853	0.00665787	0.67035965	
ZNF292	6.11385468	3.94254241	0.00667704	0.67035965	
MTG1	3.89821944	3.93742234	0.00672524	0.67035965	
MXD1	4.44748339	3.93515585	0.00674669	0.67035965	
LOC440896	2.18308192	3.93454355	0.0067525	0.67035965	

CHRM3-AS2	1.04594346	3.93439889	0.00675387	0.67035965	
GADD45B	5.23921567	3.91714955	0.00691961	0.67035965	
PLAUR	3.50993262	3.91511589	0.00693942	0.67035965	
RESF1	4.47802354	3.90937494	0.00699565	0.67035965	
CNMD	1.47617558	3.90844719	0.00700479	0.67035965	
NUDT18	1.89378472	3.89130419	0.00717572	0.67035965	
FUT1	2.36535142	3.88990222	0.00718989	0.67035965	
LETMD1	5.08920077	3.88181371	0.00727217	0.67035965	
CYP2C8	-0.5142253	3.87372421	0.00735543	0.67035965	
BEX5	4.97335313	3.87009017	0.00739314	0.67035965	
AKAP3	1.70651377	3.86844741	0.00741026	0.67035965	
ARNTL2	3.09707861	3.86530721	0.00744308	0.67035965	
LOC102724265	-0.9496934	3.86000202	0.00749888	0.67035965	
MCTP2	2.27747094	3.84970597	0.00760838	0.67035965	
PPP1R3C	6.24462106	3.84307255	0.00767978	0.67035965	
IFITM3	7.4945151	3.83981778	0.00771507	0.67035965	
CLCA4	3.00825444	3.83385796	0.00778011	0.67035965	
ZBTB10	4.90454207	3.82777795	0.00784704	0.67035965	
SHPRH	5.40554412	3.82695857	0.0078561	0.67035965	
SPECC1L	6.05891553	3.82368796	0.00789239	0.67035965	
KCNJ1	-0.3263972	3.82233301	0.00790747	0.67035965	
NME1	4.55859459	3.82134601	0.00791848	0.67035965	
LOC100129434	4.64125183	3.82087015	0.00792379	0.67035965	
CPEB4	6.7871934	3.81959202	0.00793808	0.67035965	
GLUD1	8.3791938	3.81799931	0.00795591	0.67035965	
PCDH9-AS4	-0.3615315	3.81754855	0.00796097	0.67035965	
DDIT3	5.2295128	3.8158209	0.00798037	0.67035965	
ATP1B2	8.94935867	3.81510874	0.00798839	0.67035965	
LRRK1	7.07552093	3.80829575	0.00806547	0.67035965	
TASOR	5.8661788	3.80821571	0.00806638	0.67035965	
CARS1	5.79130469	3.79824534	0.00818056	0.67035965	
DCBLD2	4.28990215	3.79694996	0.00819552	0.67035965	
MLKL	3.52405079	3.79662886	0.00819923	0.67035965	
CMSS1	4.44576661	3.79451904	0.00822366	0.67035965	
RHOA	7.86285825	3.79373106	0.0082328	0.67035965	
TSC22D3	6.54167906	3.79010896	0.00827496	0.67035965	
ATP10B	4.59381436	3.77887001	0.00840717	0.67035965	
PGM1	5.57444474	3.77761109	0.00842212	0.67035965	
OPN4	1.3348694	3.77716254	0.00842745	0.67035965	
SEC14L4	0.66698239	3.77702353	0.0084291	0.67035965	
CHD2	7.75019802	3.77494485	0.00845385	0.67035965	
ZSCAN30	5.76478661	3.77357245	0.00847024	0.67035965	

METAP1D	2.35408408	3.76419411	0.00858306	0.67035965	
PCF11	5.49730494	3.76234295	0.00860551	0.67035965	
ASTN2	6.24959419	3.76008158	0.00863302	0.67035965	
PPFIA2	5.51970524	3.75957758	0.00863916	0.67035965	
ZNF347	4.60953706	3.75710846	0.00866932	0.67035965	
SLC25A5	6.12139095	3.73478664	0.00894686	0.67035965	
CDC42EP4	7.13235564	3.72972985	0.00901098	0.67035965	
CFAP54	5.29859861	3.72675394	0.00904893	0.67035965	
MET	1.9698334	3.72672101	0.00904935	0.67035965	
SAT1	6.45859623	3.72288858	0.00909847	0.67035965	
EIF5	8.29880415	3.72119845	0.00912021	0.67035965	
INHA	0.36926786	3.71907912	0.00914756	0.67035965	
EDRF1-AS1	-0.0572106	3.71641349	0.00918207	0.67035965	
SALL2	6.49456982	3.71470326	0.00920428	0.67035965	
CREBRF	6.49050218	3.71104501	0.00925197	0.67035965	
ARV1	3.760951	3.70986228	0.00926745	0.67035965	
PPP1R14C	1.82142409	3.70563593	0.00932296	0.67035965	
NDRG2	10.5046894	3.69705884	0.00943665	0.67035965	
NPAP1	2.71846699	3.69262855	0.00949592	0.67035965	
CDKN1A	5.13720597	3.68976054	0.0095345	0.67035965	
MFAP4	2.56666067	3.68141869	0.0096476	0.67035965	
SHISAL1	3.79668774	3.68073077	0.00965699	0.67035965	
NONO	6.57702596	3.67969158	0.00967119	0.67035965	
HSPA4	6.97212999	3.67950203	0.00967378	0.67035965	
PDZD4	7.34322208	3.67733398	0.00970348	0.67035965	
CRABP2	1.77950383	3.67695309	0.00970871	0.67035965	
MRPS9-AS2	-0.8540305	3.6712037	0.00978796	0.67035965	
MCM2	1.79517485	3.66819909	0.00982964	0.67035965	
ARID2	4.8253378	3.66451296	0.00988102	0.67035965	
SYNE2	5.76171722	3.66423923	0.00988485	0.67035965	
ROR1-AS1	4.39992327	3.66260751	0.00990769	0.67035965	
LOC100506476	-0.0077305	3.6573901	0.00998108	0.67035965	

[000259] Genes were identified that are up regulated or their expression or activity are increased in both blood and caudate of PD patients versus control. These genes are identified as up or upregulated genes, a gene or RNA whereby expression of the gene or the amount of RNA for that gene is increased or greater with PD disease or in a PD patient compared to a control patient or subject. The table below TABLE 23 provides 241 genes.

TABLE 23 Blood - Cau and Blood common Up (PD vs CTRL)

ID	logFC.Cau	AveExpr.Cau	t.Cau	B.Cau	logFC.Blood	AveExpr.Blood	t.Blood	B.Blood
BCL6	1.13097151	5.95377161	7.85653433	18.8315931	0.19282698	7.07976275	4.07312251	1.65386255
MKNK2	1.32446508	6.31396926	7.64121664	17.6562983	0.12470437	5.96459764	3.34471564	-0.9169368
BNIP1	1.2525553	1.08322012	7.64166925	17.3792012	0.10029314	1.02231323	3.70707193	0.40535677
RAF1	0.34514705	6.14441228	7.47028067	16.7302734	0.13581631	7.56091769	5.22287676	6.64101134
IRS2	0.66148343	7.0369316	7.28790477	15.7660204	0.1380668	5.26174637	3.57404184	-0.1682224
TMEM216	0.75542907	3.27505849	7.24810425	15.5826114	0.10258625	2.51193721	4.63212185	3.94789569
LSMEM1	1.26770852	0.76111462	7.26676613	15.3959694	0.17795882	2.93540322	4.14588691	1.95830359
DHX34	0.67009285	4.2691448	7.10360167	14.7968448	0.1361262	5.50350212	3.67831341	0.19109128
MAPKAPK2	0.76934682	5.76807271	7.04168874	14.4496555	0.12057889	5.13347206	4.00536521	1.37884277
RNF24	0.43131324	6.06207696	7.00333881	14.2519849	0.22394113	6.67033402	4.36826764	2.81966892
LRG1	1.2722891	1.03686916	7.00124261	14.0745874	0.19296577	5.08204422	4.26115122	2.37595415
PRRG4	0.85342637	2.9838165	6.8331952	13.4337566	0.16053196	5.04009263	3.84546557	0.78642854
LAT2	0.86483854	3.95984871	6.72267949	12.8402663	0.10933008	6.5262541	3.86282063	0.86010944
LTBR	0.68886437	4.16660252	6.60769442	12.2506854	0.13306715	3.7828585	3.9648761	1.24522016
C3orf62	0.5802735	4.35416552	6.59851846	12.1911539	0.11558467	5.00144552	4.26605498	2.39536916
CLEC4E	0.75490632	2.19649235	6.49744991	11.7413464	0.23607677	6.02721785	4.82537283	4.78181052
ZBTB16	1.34823419	5.3668085	6.42092499	11.2811276	0.1375089	3.66392529	3.40044855	-0.7157186
JDP2	0.93849571	4.73848149	6.39542065	11.1611357	0.14235472	4.68672841	4.47316251	3.24755903
PLAUR	0.73182779	3.23054756	6.2485598	10.5123143	0.14332323	5.21523435	4.10548265	1.76215366
TNFSF14	1.08249033	1.22919655	6.19840318	10.2172737	0.11366837	5.74919111	3.71921536	0.33667917
IFRD1	0.6327604	5.25357095	6.18610722	10.1144223	0.1350929	7.14628716	3.76645188	0.52187178
HSPA6	3.34050447	3.23521526	6.08294222	9.73014804	0.20458093	6.76822933	5.30582336	7.0454807
CFLAR	0.43072873	7.17039968	6.04630484	9.46683495	0.11167085	9.90221505	4.69965387	4.23910653
CASP4	0.95199869	2.67767547	5.87802229	8.77156117	0.1034603	7.48570251	3.32389044	-0.956147
UBALD2	0.66002324	4.6660109	5.86705953	8.59924374	0.12626758	4.54927536	3.792997	0.60213264
RGL2	0.4286843	5.28201664	5.8681086	8.58405215	0.10886636	5.49839456	3.22938281	-1.2820093

CEBPB	0.78580702	4.4213453	5.84613788	8.50995954	0.16592532	6.82668713	4.83653728	4.83554471
FOSL2	1.06532535	5.48396423	5.83990312	8.4564518	0.16365718	6.88927854	4.37340235	2.84272651
IL12B	0.88279104	-0.1543612	5.8285325	8.34283892	0.11477254	1.02704859	3.12572102	-1.4150923
MLANA	0.67660404	1.30501173	5.75687664	8.20124549	0.1170362	2.0464219	3.92991242	1.1696575
CASC3	0.6495974	7.92981174	5.76200628	8.14186705	0.10225276	5.98176726	3.10732227	-1.6450605
MEFV	0.85413202	2.10651464	5.73468509	8.11846676	0.10269663	7.21238087	2.72831305	-2.6748914
RAB11FIP1	0.74439447	3.74127453	5.75096814	8.11687839	0.11192237	8.07069939	3.57910423	-0.1109524
RBM47	0.9741017	3.22232259	5.73529427	8.08973918	0.15596296	6.83504626	4.54712143	3.56804573
KIF27	0.64037988	4.13691217	5.74402867	8.05430278	0.12472037	4.73614576	3.2124291	-1.3315234
SOCS3	2.21089062	3.64835054	5.70889047	7.94909575	0.15056581	4.69305147	2.93420973	-2.1456733
STEAP4	0.65960322	2.33749112	5.69236551	7.92080206	0.19213622	8.21103614	4.21566254	2.22203174
IRF1	0.75427132	3.82949244	5.67745886	7.76938814	0.11512091	8.69401269	4.12412927	1.87005579
CARD14	0.66762886	2.39290822	5.6003146	7.49688645	0.13400997	0.53079271	2.91547672	-1.9732085
ITPRIP	0.94898403	3.01282677	5.5726522	7.3435459	0.16545279	6.33155325	5.0417213	5.77729504
C5AR2	0.72053747	3.17757392	5.53318119	7.15781734	0.12707029	6.86442317	3.96974605	1.25965735
TNFRSF1A	0.93627175	4.95612832	5.54737653	7.10595321	0.17058904	6.06085397	4.80553652	4.69253817
C16orf54	0.7323164	1.72413494	5.49500955	7.04200283	0.11801858	6.11293015	4.09072179	1.71027894
CEBPD	1.46405173	4.37493257	5.49127867	6.89337539	0.19139417	6.13986325	4.46714575	3.22491093
AVIL	0.50833862	3.5337738	5.47128022	6.83801031	0.15183962	4.06937097	3.74817987	0.44781639
LUCAT1	1.20412497	0.37183499	5.4691159	6.83288094	0.15366424	8.00261909	4.14406951	1.9398203
BOC	0.77797172	4.20465236	5.46271215	6.75777536	0.12837724	0.42027588	2.89042544	-2.0368647
MXD1	0.53345856	4.28060354	5.45251444	6.70121451	0.17602718	9.35439083	4.72649548	4.35587241
SBNO2	0.83514751	4.20242812	5.43792966	6.64422512	0.15381997	5.95442829	3.38009541	-0.8039094
MAB21L3	1.08697256	5.3043021	5.40802343	6.47273558	0.17324266	1.41122441	3.53446079	-0.1786887
RASGRP4	0.63271714	2.11325276	5.35845212	6.43592493	0.14508813	4.27139223	2.81139447	-2.4750515
BCL3	1.1069034	2.33245827	5.35032163	6.39592806	0.19419376	3.18615176	3.79657971	0.65315321
CLEC1A	0.86678417	1.7058996	5.32376723	6.29430494	0.10768829	1.52827886	3.0734388	-1.5907103
NR6A1	0.40696688	2.56871238	5.30647207	6.18255298	0.12668254	2.9162595	3.74629736	0.48163189
FFAR2	0.84290804	1.71191683	5.27196583	6.0714012	0.15441487	6.06248232	3.61673738	-0.0166072
FUT1	0.67101619	2.14111977	5.22612402	5.86255745	0.10487547	1.85161632	4.56714818	3.66856586
OLAH	0.91100168	0.27542586	5.1779687	5.61420886	0.24668253	0.35697706	5.13828351	6.01200888
CDA	1.34684017	0.49996684	5.15232725	5.52879425	0.20585682	3.52584611	4.08916249	1.72503905

NCR1	1.3492252	-1.1685616	5.22839109	5.52450285	0.14928966	2.49957898	3.21814236	-1.2185617
TBL1X	0.38883867	6.08219643	5.19454364	5.52398534	0.10401632	6.19368711	3.30431865	-1.0403477
ERN1	0.36624409	3.26402755	5.16196142	5.50292063	0.1011034	6.34832942	2.97774649	-2.0142791
CLLU1	1.10516272	-0.0814346	5.13911235	5.41366487	0.10772602	1.83999341	4.19822133	2.18140141
NABP1	0.50532603	3.57619976	5.11896376	5.30053827	0.11512905	9.05246024	3.41349004	-0.6382837
KLHL21	0.49268024	6.27825128	5.13972079	5.29228184	0.15983008	5.6443478	5.33469487	7.18744505
LILRB3	0.80071377	1.60597981	5.08376603	5.27502476	0.16320131	5.46359973	3.20188716	-1.3667053
LILRA2	0.53314222	2.2224538	5.06285106	5.16321832	0.1742757	5.71547045	4.85602523	4.919068
LILRA5	1.26680707	0.73611443	5.04809011	5.10278788	0.16261803	6.2450694	3.76769411	0.51376028
KCNJ15	0.7642289	2.49216569	4.9579312	4.71539078	0.18417042	7.55012946	3.63768079	0.07899742
SESN2	0.97252513	3.8610441	4.96333115	4.60766048	0.11980967	2.19750893	3.64203858	0.15429504
ERGIC1	0.22335143	6.19668658	4.97412473	4.58042788	0.13738751	7.10441746	4.21485796	2.20643929
ARHGAP9	0.84823683	1.65295853	4.91125625	4.55442636	0.13492904	6.19676172	3.27744182	-1.1257948
FKBP5	1.08695673	5.86267783	4.92711485	4.37549247	0.14407408	6.4990547	3.00584874	-1.932114
CXCL1	1.67908451	-0.0601619	4.87050049	4.32850477	0.1696272	1.26971069	2.99952013	-1.772915
ZNF438	0.37317543	3.11008934	4.84597124	4.17940661	0.12419358	4.55543826	3.46663326	-0.5225025
NLRP12	0.82265201	0.90281047	4.80354133	4.13216087	0.16150088	6.87690061	4.72806566	4.35226739
DOK3	0.59178867	2.28666626	4.75761293	3.8853535	0.16163696	5.46015173	3.96430598	1.22504066
CCNJL	0.50889429	1.65182935	4.70836295	3.7412609	0.21781862	5.2009009	4.93407821	5.27462236
CSRNP1	0.76077958	4.21601851	4.74942596	3.68590028	0.15874235	4.54112874	4.40665038	2.97148083
FLJ40194	0.88923006	-0.471908	4.68511148	3.59055346	0.11560815	-0.0468436	3.08389099	-1.4934114
CNN2	0.68215157	3.48755762	4.68430166	3.49482779	0.14735503	6.64392179	3.70294096	0.29032409
NFIL3	0.76216395	3.14359315	4.67463046	3.48681452	0.14661687	4.24101602	3.81007913	0.66943016
ERVH48-1	0.55087359	2.32620068	4.64991816	3.45656751	0.24337216	-1.3505821	3.47906289	-0.4650427
PLIN5	0.64802138	3.96474265	4.68651785	3.45617166	0.17016738	3.32166623	4.05302363	1.59066022
PLEKHG6	0.6374032	0.02184398	4.63329518	3.4432647	0.10918883	0.05650106	2.80797155	-2.2220535
PYGL	0.46926977	3.67856733	4.67417905	3.42090615	0.12490179	7.57398776	3.00112352	-1.9220649
SLC11A1	0.99175149	3.75339119	4.66474061	3.39484837	0.14323454	7.32521191	3.15193176	-1.4878436
TLE3	0.63622983	5.05322361	4.6548283	3.25505785	0.12140703	7.00759352	3.2843664	-1.0891409
NCF1	0.59595855	2.53185299	4.57842072	3.16661971	0.13567058	7.36177432	3.25735264	-1.1663819
CEP19	0.40345789	3.4296701	4.59964272	3.15341298	0.14448697	4.26877397	3.7336032	0.39606956
TIMP1	0.75166241	4.85855106	4.61820563	3.12281762	0.13410854	3.1124804	2.85035244	-2.3134186
FCAR	0.72433902	0.8926717	4.539962	3.10906092	0.24457	4.56807896	5.457603	7.80144254

		8	5		963		05	
SH2B2	0.73132729	2.06964207	4.54607271	3.07469652	0.1462601	2.52304872	3.53547059	-0.2175081
VDR	0.89561794	-0.4424666	4.52919252	3.01243384	0.1296172	2.97176057	3.57321382	-0.1150021
G6PC	0.91774442	0.10181387	4.49282329	2.91567202	0.11636079	0.52147173	3.43545686	-0.4715151
LSM10	0.35227656	4.5297871	4.54747464	2.84269102	0.11526892	3.41055617	4.96510659	5.42552374
SMIM3	0.65183713	3.14891152	4.49687708	2.78320749	0.10245973	3.12936335	3.24453239	-1.1754295
IGF1R	0.36389944	6.37460368	4.50005102	2.64939528	0.11847293	6.7142758	3.2157437	-1.3057899
METRNL	0.67395537	3.27437449	4.46124519	2.63491446	0.11171013	5.1720597	3.55686489	-0.2258267
PPP1R15A	0.85394141	5.40720422	4.49445725	2.61587368	0.14061721	4.60920536	3.78395161	0.56762412
PGS1	0.32484816	4.75638713	4.4864033	2.58736779	0.12737566	6.67911301	3.71725188	0.34095245
ISG20	0.51656128	2.35943573	4.33470126	2.24074226	0.11133191	6.16675845	3.99448424	1.3442143
IFITM3	0.73551613	7.37574777	4.35579992	2.1208982	0.31469571	1.41668468	3.38178477	-0.6564969
ABHD4	0.51301846	5.0051584	4.34741263	2.04408422	0.14864478	3.89693617	4.95605654	5.38098939
TMEM45B	0.66130213	1.32268348	4.25710534	2.04008014	0.17118887	2.89471565	4.12059386	1.86144339
NEDD9	0.58983581	4.19877574	4.3263839	2.01295567	0.12532054	7.16111838	4.2101289	2.18846936
MIR3945HG	1.08515213	0.21720964	4.20628834	1.88124698	0.2207366	1.62648126	4.21464915	2.24509018
XKR8	0.25629236	4.30978196	4.29544858	1.87731259	0.16897548	3.60343373	4.62467778	3.90639249
MAP3K3	0.21838897	5.36507971	4.21302078	1.52796847	0.11602319	6.21517843	3.55728977	-0.2168227
RILPL1	0.2973758	5.59302873	4.20771786	1.50878433	0.10847638	3.08460792	4.6777758	4.14107933
LINC01127	0.95365726	-0.0578826	4.06550678	1.38754644	0.17884576	4.40039481	3.31015119	-1.0254953
TSC22D3	0.44959199	6.43933687	4.11233029	1.17460144	0.18401308	6.98242984	5.28074683	6.92259303
PADI4	0.99701173	-1.0098421	3.96978372	1.0276591	0.18495414	5.27172851	3.32173393	-0.9949657
BTNL8	0.91179839	-0.9797993	3.96821105	1.0235027	0.1774017	4.22909862	3.72532634	0.36514341
ZBTB34	0.2385675	3.90515783	4.04692539	0.99050687	0.10263008	6.58810965	3.85195269	0.82148978
UPK1A-AS1	0.83571466	0.16401225	3.94547703	0.98347625	0.11264443	-0.0283783	3.19375042	-1.187764
TNFRSF12A	0.90667104	0.5927235	3.93457423	0.93862947	0.11772954	2.54434502	3.06884575	-1.6620683
HSH2D	0.59120361	1.38660057	3.92171604	0.84667581	0.15508688	5.04874101	3.9844673	1.30009297
RALGAPA2	0.27982097	4.67886304	4.01305118	0.81119909	0.10652551	7.16315834	3.5898826	-0.0905073
ADGRE2	0.43756106	3.04776851	3.9559995	0.78402076	0.1426745	6.50524942	3.5622481	-0.1957355
APOBEC3A	0.95220062	-1.045078	3.89455329	0.7722174	0.18415328	6.96563764	4.20125491	2.15059746
IL1R2	1.83961661	-1.8374108	3.9057915	0.75025322	0.21391379	5.79544304	4.39437778	2.92029225
TREML2	0.91848884	-1.4186588	3.88949123	0.7417853	0.1928066	5.40793277	5.40926439	7.55847401

DENND3	0.4834155	4.9930065 5	3.977464 36	0.67369224	0.13596 77	8.23145668	3.416634 86	-0.6441341
IER3	0.49359447	2.6977187 1	3.898036 66	0.62297017	0.19012 939	1.46578602	3.919867 37	1.14533407
DDIT3	0.60036853	5.0251516	3.955207 05	0.59759108	0.11833 86	3.32331168	3.734708 94	0.43135911
EPHB4	0.51222442	3.2057268 1	3.908496 52	0.59546513	0.20651 881	2.59310524	4.062237 87	1.64836926
ADIPOQ	0.80270158	0.8225120 1	3.825745 31	0.57196676	0.12401 403	0.16773637	3.445671 01	-0.4401331
MX2	0.33528126	3.9481505 8	3.919703 44	0.54529897	0.13418 723	7.34437553	3.635167 05	0.06691612
HLX	0.73288688	0.5506671 8	3.777891 49	0.41510191	0.20577 052	3.75010522	5.365545 97	7.3395204
CHRNA10	0.65168254	-0.0744684	3.751300 17	0.34671867	0.11363 355	1.41810682	3.746704 19	0.5351299
C5AR1	0.82193841	1.7963389 7	3.782772 09	0.32483222	0.17960 316	5.61838816	4.123836 64	1.83453767
LYN	0.36905385	3.5511782	3.817022 37	0.23643599	0.12322 278	8.10097709	3.957169 16	1.23031078
PPP1R3B	0.3987059	2.5740803 6	3.744665 73	0.11033177	0.16867 067	6.82671493	4.452070 42	3.16759531
ROR1-AS1	0.40782485	4.1900898 8	3.800210 14	0.10466658	0.11542 067	3.79483657	3.499444 56	-0.3982654
CXCR2	0.84602612	-0.0750785	3.658204 65	0.05517789	0.17033 614	7.70813068	3.454305 75	-0.5319853
KIAA1257	0.32697395	3.3979067 5	3.743150 96	0.00238829	0.10721 927	4.05056464	3.886124 93	0.94519528
ADAMTS L4-AS1	0.57378189	0.6355136 1	3.629725 13	-0.0653706	0.12255 232	5.40980061	3.395195 49	-0.7598754
TFE3	0.24349611	6.4051174 2	3.730619 87	-0.1702875	0.10084 814	4.45299989	2.820549 02	-2.4555205
ARL11	0.45416638	1.1985392 3	3.609621 62	-0.1705615	0.14189 802	5.46720571	4.771011 57	4.53634481
CLEC3A	0.64321976	0.4527297 3	3.579548 53	-0.2155739	0.12883 522	0.40271045	3.492175 23	-0.2940936
STX11	0.81458636	-0.5832006	3.562718 43	-0.2355581	0.15353 761	5.66344912	4.060147 48	1.58945125
NIM1K	0.21833905	3.8610209 6	3.680101 67	-0.2807585	0.10161 322	1.69699005	3.613277 43	0.07159105
RAMP1	0.35750992	6.3462171 9	3.699322 61	-0.2812896	0.27205 722	-0.9826853	3.733811 11	0.30305172
MIR1255B 2	0.59582725	0.0830218 6	3.540319 59	-0.3179832	0.11919 121	0.31394768	3.663253 75	0.25201071
ITPKB-IT1	1.03558793	-1.6960676	3.532092 26	-0.3574381	0.11891 105	2.70939152	3.581857 42	-0.0747136
ZNF516	0.37297757	4.7949724 2	3.667708 54	-0.3927132	0.16035 289	7.0217226	4.664961 29	4.07671085
ADAM8	0.51611444	1.4905881 4	3.507165 57	-0.5412046	0.13644 953	7.33591446	3.895916	0.99199758
VPS37B	0.23570129	4.9477464 4	3.576932 36	-0.6971271	0.10504 048	4.86181911	3.622394 27	-0.0030227
LRP10	0.3942925	6.5507365 7	3.564561 72	-0.7184446	0.15205 631	6.30587313	3.678669 3	0.20004488
TG	0.55258398	0.0866324 3	3.407147 98	-0.7235551	0.19259 389	3.01128263	4.172256 36	2.05669212
SP110	0.39806531	4.0311134 2	3.534965 67	-0.7514639	0.11295 375	6.70006257	3.734970 49	0.40390783
MIDN	0.46074941	5.5093071 9	3.544702 34	-0.8079912	0.13937 238	5.03966182	3.698114 14	0.2595749
LINC0122 0	0.88482345	-1.7348492	3.369051 13	-0.8233563	0.19659 184	0.97160193	4.17114	2.05990105
NFE4	0.42814516	0.0217086 3	3.354480 44	-0.8818548	0.28281 699	2.47577169	4.657623 57	4.05732485

UNC119	0.25883139	4.3714117	3.47558453	-0.996399	0.1042303	5.32248331	3.99359032	1.33496714
ZNF429	0.23277156	3.77675204	3.4334486	-1.0599353	0.10787459	3.66060787	3.29019705	-1.0625368
CPQ	0.25252963	5.11888314	3.45954519	-1.0815379	0.10999192	6.56530252	3.65680748	0.12895178
RUBCNL	0.36710985	2.5838821	3.35318781	-1.1520182	0.15665989	5.80162715	3.69077749	0.23748563
TACC3	0.31806598	1.97075205	3.3040669	-1.216415	0.10654659	5.279564	2.99949092	-1.9656594
SERPINA1	0.8215701	2.31774944	3.31972511	-1.2165609	0.17478113	7.08125892	4.13437179	1.8899398
GPSM3	0.47109187	2.6840913	3.31112069	-1.2921384	0.12407705	4.69295576	3.00027059	-1.959203
CRISPLD2	0.51103849	3.71256956	3.34710206	-1.3119905	0.15802176	6.24025958	2.90130131	-2.2307882
CASS4	0.36362926	1.95881137	3.24851809	-1.3762823	0.12639915	5.34940083	4.11303607	1.79174374
SECTM1	0.88441041	-0.1539601	3.16514075	-1.4048969	0.15289322	5.35483583	3.26713856	-1.1658631
RNF149	0.23340658	4.2885757	3.34061029	-1.4118532	0.1487891	9.05993869	4.90401232	5.14663029
MADCAM1	0.48757388	1.14927545	3.1749021	-1.4963567	0.18527083	-1.1071917	2.92456467	-1.93543
C19orf38	0.56476698	0.63737262	3.1498331	-1.5164374	0.10896699	4.53336456	3.52800821	-0.3167905
IFTM1	0.6173501	5.31587678	3.31745916	-1.5249089	0.14962333	6.86731841	3.67545287	0.19729901
PAQR5	0.3897521	2.60424101	3.22404423	-1.535511	0.10192065	0.84206618	2.86127428	-2.1326617
PTAFR	0.42108092	3.49678484	3.24579315	-1.6028822	0.10349707	7.48303049	2.83945787	-2.3731117
CYSTM1	0.31280137	5.87214967	3.27425909	-1.6551917	0.14287269	3.79639754	3.54688674	-0.235893
IGF2R	0.24699166	5.77227302	3.27276727	-1.6598533	0.11603094	9.73940667	2.75804713	-2.5283608
ARHGAP26	0.26103305	6.26479575	3.26683195	-1.6644704	0.12557563	8.50583286	3.67656785	0.23056196
PTGS2	0.87826684	0.64022439	3.0716332	-1.7236649	0.12827923	4.99958166	2.75472066	-2.6348378
TOR4A	0.42836021	1.64550089	3.09513826	-1.776649	0.11305859	3.32171015	3.41545958	-0.6484264
ADM	0.69724194	3.58121862	3.17667915	-1.8139288	0.18231004	4.68805959	3.29157095	-1.0846228
FCGR2A	0.591259	3.36455898	3.13394183	-1.9217079	0.19467233	8.90981821	5.20860689	6.56807974
LINC00908	0.39828178	1.42555895	3.03101148	-1.9271976	0.1357355	1.09998362	3.56406855	-0.0721181
S100A9	1.33880775	2.18154633	3.05445448	-1.9413967	0.15775072	10.7779005	3.18048985	-1.3265753
MRVI1	0.40274858	7.22585379	3.15944887	-1.9456699	0.17859955	5.41726305	4.07942821	1.66219929
ST20	0.33018514	1.11484834	3.00766628	-1.9624963	0.15761317	4.43632061	4.1764727	2.04426263
SLC25A34	0.33279998	2.39528515	3.04750125	-2.0194042	0.10846828	1.02009306	4.14050769	1.95387593
LINC01136	0.56402017	0.25238857	2.93218995	-2.0514228	0.15045448	1.68367147	3.58025563	-0.0316015
SULT1B1	0.28153875	4.78641002	3.13131398	-2.0679803	0.10911719	7.56930826	3.12228459	-1.5686046
SLC16A3	0.50584967	3.02382213	3.05997394	-2.0758225	0.12032222	7.70127755	3.57580907	-0.1296779
NUAK2	0.34083133	1.80188029	2.98251737	-2.1140072	0.14701963	5.39914809	4.32381007	2.62903191

ALPK1	0.22369457	4.52185265	3.06652209	-2.240745	0.11305318	7.35833037	3.17307887	-1.4222238
LINC00671	0.44984423	-0.1437094	2.84576079	-2.251829	0.14829159	1.26599015	3.56502379	-0.0701333
ZFP36	0.7963585	4.84423735	3.06326376	-2.2570458	0.14348988	5.04997007	3.95753985	1.19958804
C2CD4A	0.51957145	-0.0086272	2.84407057	-2.2648871	0.13510068	-0.0377716	3.08302085	-1.4977199
KIAA0040	0.47337931	2.80677565	2.95397864	-2.3297929	0.10810496	6.62612435	3.91965718	1.07032514
PHF12	0.14392995	5.39991988	3.03984402	-2.3494646	0.12402	5.71502217	3.8272055	0.72177301
LRRC25	0.38192204	1.34414294	2.82018051	-2.4868112	0.16993454	5.27169266	4.73483571	4.37505639
KLLN	0.51447029	3.78693555	2.92486689	-2.525517	0.10968947	1.82727313	3.45900845	-0.4350577
IL1R1	0.60459576	3.23147076	2.88073009	-2.5892259	0.20954517	4.44914187	3.84095231	0.77332708
ACSS3	0.36751773	4.41491288	2.9172629	-2.6479459	0.17323894	4.3149129	3.58049183	-0.1361085
FCGR2B	0.57676625	1.03003468	2.69177745	-2.7798406	0.11450839	6.85968499	3.43187116	-0.622239
CEACAM1	0.34527265	1.27784475	2.69623716	-2.7839025	0.13082101	3.79559565	3.1153504	-1.6002999
RAB3D	0.1805108	4.63957006	2.84230591	-2.8746171	0.14757776	6.26832271	3.74125676	0.4199823
PROK2	0.82733324	-1.5430029	2.54522609	-2.884643	0.24659246	6.03827335	4.50284571	3.37473879
ENTPD1	0.15295605	4.76177824	2.83889609	-2.8879374	0.13505808	7.20200128	4.07342719	1.65656743
UBTD1	0.24897994	3.70229826	2.79338899	-2.9051013	0.1462801	1.0017266	3.75521722	0.56966739
C9orf139	0.2680018	2.57119302	2.69687515	-2.9796946	0.10748916	3.52686096	3.27080172	-1.1155116
CNPY3	0.17915409	5.30940832	2.81029867	-2.981008	0.10068146	5.13853955	4.00231669	1.36798419
NINJ1	0.2597504	5.24028022	2.78910263	-3.0363006	0.15821877	4.45691791	4.3254569	2.63977837
TRIM25	0.19693891	4.59939366	2.77285463	-3.0572254	0.18157607	7.53715191	4.66045187	4.06036289
KCNE3	0.25521866	2.18696693	2.62634549	-3.0964606	0.13018711	6.95069661	4.25251369	2.35407446
LINC00877	0.498861	1.29740273	2.54661924	-3.1397171	0.12375569	3.62564703	3.29890972	-1.0358446
FAM53C	0.11677225	5.64850611	2.74368593	-3.1527579	0.17385715	5.7306366	4.98173433	5.49575731
LPO	0.2651932	0.79683991	2.51576472	-3.1612882	0.17774266	1.66518451	4.14724366	1.98619989
SRGN	0.55480453	4.73833681	2.7328537	-3.1668016	0.13039117	9.51849956	2.91519366	-2.1186278
IRF2BPL	0.24010227	5.53395196	2.73666416	-3.1730112	0.10263199	4.8276577	2.90179978	-2.2390464
NUMB	0.12399303	5.44332922	2.69888185	-3.271378	0.12600857	6.92608148	4.09268935	1.72716334
ADGRG3	0.88667956	-1.8618066	2.3320008	-3.2961039	0.24001778	4.92413888	4.27099194	2.41559521
AZU1	0.57550819	-0.780599	2.33254342	-3.38567	0.21133126	0.07742291	2.77157815	-2.3079495
IL18R1	0.76628141	0.32489067	2.37763392	-3.3899366	0.10372719	5.12031818	2.78379855	-2.5597753
LINC00664	0.33008273	1.09151325	2.4110365	-3.4204156	0.14083114	1.08399745	2.75318179	-2.4284555
MTG2	0.14030959	4.35065631	2.60993001	-3.4528777	0.102642	4.01807851	3.90909921	1.03136595

FUT7	0.39956786	-0.0409308	2.334203 87	-3.4615845	0.12683 851	5.3387821	3.281120 05	-1.1204132
KY	0.28467006	1.8796218 1	2.457627 94	-3.4624674	0.18935 432	0.12240266	3.772746 31	0.60807371
NQO2	0.17002073	5.4260428 3	2.616101 45	-3.4801453	0.14901 876	5.37195853	3.943284 13	1.14607382
PEL12	0.20468309	4.0511414 1	2.584366 13	-3.4833202	0.10174 668	6.62892115	3.707762 28	0.3071513
FCGRT	0.29528977	5.3746417 4	2.609040 52	-3.4973362	0.10564 294	6.69871459	3.376576 46	-0.8036355
SIPA1L2	0.20321316	5.0106918 7	2.581875 02	-3.5583277	0.18862 481	5.53428411	3.779924 68	0.55052318
NPL	0.30982354	4.7178991 9	2.546523 45	-3.6337787	0.10904 2	6.68700659	3.300055 24	-1.0457491
MED25	0.19703709	4.9996552 7	2.544236 71	-3.6518548	0.10113 062	5.20895798	3.296351 78	-1.0747324
MIR646H G	0.35691914	0.5817062 6	2.281454 61	-3.6535305	0.10796 983	3.46572146	3.036570 81	-1.8187392
SLC2A3	0.33175143	5.7263867 2	2.510670 51	-3.7310477	0.11907 877	7.93508597	2.975711 16	-1.986348
ZNF487	0.27281144	2.7503435	2.383378 05	-3.7695503	0.12982 24	3.60218166	5.118266 55	6.14048622
FAM157B	0.29923473	3.1455821 8	2.409610 51	-3.774899	0.19485 513	5.60371031	3.214451 14	-1.3269979
SPOCD1	0.30431271	1.9759372 3	2.283820 01	-3.844378	0.14515 694	0.57257068	3.345994 98	-0.747924
FOS	0.74426704	5.8450079 9	2.435883 29	-3.8876991	0.25737 548	4.80906935	5.506705 95	8.05032228
BOK	0.36928142	7.0220787 2	2.399198 4	-3.9484964	0.37581 569	-1.2243245	3.351478 62	-0.8308108
FLOT1	0.13536994	7.4551284 7	2.385686 64	-3.9517412	0.12529 379	5.85036924	3.918490 61	1.0575726
KCNE1	0.3230041	1.8128404 6	2.224541 9	-3.9535523	0.11961 254	4.50528034	3.102828 36	-1.6597946
MTMR3	0.14038127	6.2388314 1	2.399704 47	-3.9786051	0.10717 988	7.15251261	3.506238 71	-0.3723489
SEMA4B	0.27993104	5.3797535 9	2.396189 53	-4.00555	0.12430 228	4.59341514	3.372398 27	-0.8295731
KCTD21	0.19756035	4.5806987 7	2.371735 77	-4.036922	0.13872 343	2.76406702	5.000025 25	5.58452537
RNF130	0.1553788	7.0207572 8	2.327876 23	-4.1063814	0.11649 604	7.33749643	4.393058 93	2.92773324
TPD52L2	0.11796031	6.211748	2.263161 69	-4.2848645	0.11729 052	6.32833272	4.377220 72	2.85332877
8.79568951	8.79568951	8.7956895 1	8.795689 51	8.79568951	8.79568 951	8.79568951	8.795689 51	8.79568951

[000260] Genes were identified that are down regulated or their expression or activity are decreased in both blood and caudate of PD patients versus control. These genes are identified as down or downregulated genes, a gene or RNA whereby expression of the gene or the amount of RNA for that gene is decreased or less with PD disease or in a PD patient compared to a control patient or subject. The table below, TABLE 24, provides 167 genes.

TABLE 24 Blood - Cau and Blood common Down (PD vs CTRL)

ID	logFC.Cau	AveExpr. Cau	t.Cau	B.Cau	logFC. Blood	AveExpr. Blood	t.Blood	B.Blood
HMGCS1	-0.8591308	5.20804702	-8.385695	21.779414	-0.100517	4.27087423	-4.244981	2.31823293
GDAP1	-0.9648024	5.2789733	-8.240723	20.9653403	-0.115056	2.71029357	-3.927159	1.14044337
HLTF	-0.6491336	4.77062209	-7.899566	19.0695853	-0.146474	3.90320924	-4.045754	1.5490277
SNX4	-0.6242956	3.99557851	-7.800686	18.5374474	-0.124711	3.42170941	-2.845299	-2.3382337
PLK4	-1.5697162	0.5481061	-7.932191	18.4864795	-0.135287	0.95611261	-3.087214	-1.5140113
IBTK	-0.5419449	5.03917737	-7.549906	17.1578358	-0.126904	5.50599846	-4.742664	-4.410918
FARSB	-0.759986	4.64433514	-7.501751	16.9019245	-0.104511	3.77916582	-4.79341	-4.64381197
PEX3	-0.4303736	3.2629031	-7.243068	15.5541621	-0.105903	3.03311402	-2.889391	-2.2002612
ATAD1	-0.6354435	5.30613957	-7.194516	15.2552109	-0.115738	5.05401069	-3.272313	-1.1451966
ORC5	-0.5917976	2.98494195	-7.124503	14.9342666	-0.118022	3.86282326	-3.836235	-0.77276635
RTN4IP1	-0.6580427	2.2221256	-6.987713	14.2179004	-0.115021	2.30608765	-4.487905	-3.34069215
NUDT21	-0.5553011	5.94966765	-6.942807	13.938327	-0.109956	5.49216983	-3.407297	-0.7178517
ABCE1	-0.4812684	4.55458716	-6.906146	13.7522342	-0.156318	4.67188329	-4.228793	-2.25058867
ARL6	-0.8330283	3.4034117	-6.787305	13.1769566	-0.132523	2.07879894	-3.042806	-1.7085828
OPA1	-0.6342119	5.98336888	-6.771473	13.0541267	-0.118995	6.28158224	-4.539058	-3.52983457
MBLAC2	-0.8053942	2.98157465	-6.730986	12.9042399	-0.123965	2.54288431	-2.782042	-2.4514585
RFC3	-0.8552547	1.16457412	-6.694368	12.6703955	-0.116416	2.82598353	-3.962865	-1.26909901
SLC39A10	-0.7401854	5.30845441	-6.674661	12.5546765	-0.133115	5.87091271	-4.360908	-2.78443279
USP5	-0.473932	6.31655093	-6.513574	11.7494654	-0.119204	4.29134137	-4.34334	-2.71371757
LRRC40	-0.6311984	3.30708912	-6.469356	11.5772104	-0.134965	3.54686646	-3.464296	-0.496576
UCHL5	-0.4737365	4.6170369	-6.418889	11.2728352	-0.119932	4.72233356	-3.132678	-1.5679436
VAMP4	-0.4187995	4.78115476	-6.410283	11.2253876	-0.117124	4.41239698	-3.158336	-1.4868191
MTX2	-0.4856809	4.08442157	-6.395971	11.1763288	-0.108059	2.86331837	-3.560153	-0.1505517
CASD1	-0.5764515	5.12834369	-6.336987	10.8565726	-0.123627	5.14169061	-3.356629	-0.8805526
ANXA6	-0.7522475	6.71364194	-6.257087	10.4884128	-0.126617	7.4457311	-4.261615	-2.39672274
THNSL1	-0.5542763	3.33119635	-6.199821	10.251191	-0.147947	1.94238074	-3.266123	-1.043112

GUF1	- 0.3879951	4.2425519 9	- 6.207172	10.240543 1	-0.117596	4.5546471 6	-4.073984	1.6454933 7
WDR11	- 0.4385598	4.8328500 5	- 6.165298	10.016249 8	-0.108991	6.1555293	-4.855631	4.9191609 2
DLAT	- 0.5392604	4.6195267 4	- 6.131706	9.8588477 2	-0.106554	3.1381168 5	-4.802178	4.6886486 1
FAM3C	- 0.6204708	5.0726966 7	- 6.099144	9.6938574 4	-0.124716	4.1056590 9	-3.041841	- 1.8234673
LRPPRC	- 0.5070142	6.0625240 8	- 6.026374	9.3477383 4	-0.120959	5.6364362 5	-4.486761	3.3051937 1
MBTPS2	- 0.5029543	3.5016294 6	- 5.950791	9.0465697 7	-0.110122	3.1814800 1	-4.740106	4.4133900 2
INPP4B	- 0.5308737	3.3085759	- 5.891035	8.7762082 8	-0.142707	6.8861246 6	-3.813562	0.6874575 9
AP1AR	- 0.6443993	4.0987941 8	- 5.892784	8.7316706	-0.111137	3.7751511 7	-2.849226	- 2.3474402
TOMM70	- 1.0212671	6.3754601	- 5.848993	8.5184830 1	-0.127176	4.8810538 6	-4.507374	3.3919685 2
PRKACB	- 0.6137733	7.4619994	- 5.788155	8.2610584 1	-0.174203	6.1345967 2	-3.998287	1.3596569 9
SLC25A46	- 0.4697776	4.9933482 3	- 5.790639	8.2224663	-0.114771	5.5757605 3	-3.504212	- 0.3984102
TRAPPC13	- 0.4224395	4.0118476 9	- 5.705221	7.8597711 5	-0.103606	3.9654469 5	-3.244652	-1.211437
FBXO4	- 0.5457999	1.5733061 6	- 5.639339	7.6865616 4	-0.115382	2.6346759 8	-3.268709	- 1.0723647
LMBRD2	- 0.4497653	5.2489776 2	- 5.545113	7.0838680 3	-0.104969	5.2400142 7	-3.186972	- 1.4086799
C10orf88	- 0.4605571	2.7041221 4	- 5.494064	6.9894909 5	-0.102379	2.8774187 9	-3.782943	0.6160480 8
RNF14	- 0.3064761	5.5276473 8	- 5.519217	6.9653797 4	-0.110581	5.9107286 2	-3.268489	- 1.1554796
CHIC1	- 0.5879046	4.4913872 3	- 5.479965	6.8032744 6	-0.142045	4.0698403 7	-3.665799	0.1627553 6
GOLT1B	- 0.4577608	4.4035308 2	- 5.450783	6.6753868 2	-0.146474	4.4827852 5	-3.832411	0.7480996
SQLE	- 0.7134466	4.1408122 3	- 5.432476	6.6045671 7	-0.166091	2.3226322 8	-4.921205	5.2175377 1
MSMO1	-0.497515	5.0336061 8	- 5.432854	6.5770596 4	-0.142973	3.4950713 8	-4.653937	4.0346434
MRPL32	- 0.4498292	3.7340589 8	- 5.369402	6.3501751 6	-0.135004	3.4695364 8	-3.650259	0.1314870 3
VPS50	- 0.3703403	4.0182789 2	- 5.353416	6.2639410 2	-0.144372	5.1435287 9	-3.935506	1.1201668 7
DCK	- 0.6078702	4.4121338 9	- 5.348661	6.2162498 2	-0.117002	5.7201664 7	-4.054954	1.5716745 1
PREPL	- 0.9173059	7.6666288 9	- 5.285453	5.9926734	-0.112065	5.0706553 6	-4.894557	5.0938676 6
AKAP11	- 0.5472489	7.4459497 7	- 5.245855	5.8019252 8	-0.113472	6.2113299 5	- 4.1671993	2.0095368 8
PIGK	- 0.4714775	4.4824008 2	- 5.244457	5.7533166 4	-0.131024	4.1350399 7	-3.191856	- 1.3770359
FANCM	- 0.6738839	1.7754693 3	- 5.160049	5.5797850 3	-0.104799	3.6806806 4	-3.086111	- 1.6774467
RAD17	- 0.3312119	3.7359486 3	- 5.160515	5.4405898 7	-0.100401	3.8211207 7	-3.950226	1.1919074 3
CYP51A1	- 0.4795985	5.4843233 9	- 5.174111	5.4297162 3	-0.124477	3.4521473 6	-4.199838	2.156422
PYROXD1	- 0.4301249	3.3356478 2	- 5.144306	5.4087258 1	-0.124886	4.6360170 2	-3.677266	0.1923968 3
P2RY12	- 1.1498818	2.0818856 1	- 5.080218	5.1974929 6	-0.153341	2.1796420 8	-3.017134	- 1.7847918
PRPF19	- 0.4273342	6.1114796 1	- 5.065618	4.9735484 2	-0.117996	4.9809158 1	-4.451982	3.1574657 5
HNRNPA0	-0.301711	6.1301771	-	4.9349109	-0.113718	5.2406915	-4.530464	3.4890184

		3	5.056967	1		8		1
DDB1	-0.317261	7.3477384 4	- 5.024001	4.8374366 9	-0.101347	6.7611741 3	-3.816699	0.6965051 6
ATR	-0.387531	3.9681236 6	- 4.993345	4.7007267 2	-0.102769	6.3159582 9	-4.135658	1.8872089 1
VRK1	-0.434697	3.0017656 7	- 4.931511	4.5327482 4	-0.126844	4.1983324	-3.159213	-1.474542
MTX3	-0.387271	4.7493897	- 4.727949	3.5547248 1	-0.134063	4.5002233 8	-4.580618	3.7057131 6
ZNF10	-0.360281	3.0645618 5	- 4.668682	3.4427052 3	-0.100879	2.8467885 7	-3.161639	-1.413283
SNCA	-0.519813	6.0559147 9	- 4.689038	3.3988384 7	-0.166417	9.7735398 5	-2.752191	-2.546752
EIF2A	-0.418545	4.7482085 5	- 4.615529	3.0999250 8	-0.110449	4.9900903 3	-3.158809	-1.492273
FASTKD2	-0.325835	3.8394071 8	- 4.580216	3.0140981 3	-0.114005	4.3348962 6	-3.869106	0.8811352 6
CMAS	- 0.3117273	5.1796236 9	- 4.536364	2.7767980 3	-0.121745	3.6230251 9	-3.849855	0.8314018
MYBBP1A	- 0.4642896	5.2268369 3	- 4.519746	2.7112692 5	-0.106476	2.9210406 7	-3.177473	- 1.3735318
HDAC9	-0.399802	3.7434780 9	- 4.493682	2.6846751 3	-0.160746	5.1439233 4	-4.248559	2.3259808 5
UBE2K	- 0.3232988	5.7589809 9	- 4.485757	2.5800171 8	-0.104815	5.5846416 1	-4.121756	1.8278843 5
PDIK1L	- 0.3434718	2.8635201	- 4.305554	2.0539641	-0.136435	3.1714044 8	-3.108114	- 1.5842215
ABHD10	-0.300035	5.0909334 1	- 4.343393	2.0244268 1	-0.101165	4.2709453 4	-2.895362	- 2.2403562
TMX3	- 0.3351197	4.5747305 1	- 4.335858	2.0098836	-0.144462	5.7899544 1	-3.556491	- 0.2216501
UBA5	- 0.2706443	4.4443971 1	- 4.317494	1.9488617 9	-0.125677	4.3082844 7	-3.675552	0.1915859 3
HNRNPAIL 2	- 0.4555417	1.3461147	- 4.223434	1.8974864 9	-0.138034	1.8549508 4	-3.622998	0.0994843 2
PTGFRN	- 0.3560326	3.9364540 4	- 4.255889	1.7455629 7	-0.14842	0.6271511 7	-3.166723	-1.281639
UFL1	-0.300294	4.7855425 1	- 4.255249	1.6980099 6	-0.130429	5.0200594	-3.603169	-0.065115
HCFC2	-0.309529	3.8920161 4	- 4.232182	1.6679116 4	-0.116073	4.5301445 4	-3.751594	0.4551789 3
EIF1AX	-0.262307	6.5761475 2	- 4.236407	1.6430856 7	-0.141995	4.7236116 3	-3.371319	-0.827773
NUFIP1	-0.235648	3.0114588 4	- 4.190282	1.6085923 2	-0.107433	1.0649605 5	-3.263271	-1.010444
MASTL	-0.458982	1.7097253 9	- 4.114955	1.4726611 1	-0.134465	3.1814245 7	-3.741113	0.4573577 1
SLC25A36	-0.231696	5.2542331 2	- 4.193382	1.4560213 8	-0.129455	5.4525949 5	-3.436578	-0.621738
TIAM1	-0.423051	5.7896638 3	- 4.163303	1.3521694 4	-0.114666	5.7171769 4	- 3.6898111	0.233515
UFM1	-0.250302	5.4663383 1	- 4.128445	1.2150404	-0.137175	5.2826711	-3.379257	-0.806382
GNL3	-0.251749	4.3032484 5	- 4.100931	1.1503163 2	-0.109296	4.0331310 8	-2.917829	-2.170985
APBB1	-0.302123	7.6359988 9	- 4.083091	1.1291573 8	-0.107191	3.4382384	-3.173783	-1.412945
GLS	-0.643709	6.0768890 1	- 4.066087	1.0080709 1	-0.127048	7.3962905 4	-3.891391	0.9768016 9
ACTR6	-0.236763	4.3450252 7	- 3.963046	0.6526111	-0.130965	3.2225340 8	-2.822135	-2.390669
POLR2K	-0.257023	4.7947812 5	- 3.946229	0.5658953 2	-0.186481	2.2334167 9	-2.812571	-2.338011
GNPDA2	-0.295635	4.0905036 6	- 3.927648	0.5412748 9	-0.140713	3.4089656 1	-3.466775	-0.483347

GPR180	-0.338565	4.1601293 6	-3.89631	0.4239536	-0.131666	3.6348872 1	-3.353261	-0.860917
CARNMT1	-0.535154	3.8531545 8	- 3.853627	0.2943587 1	-0.133036	4.1952306 8	-4.088428	1.7073688 5
RHOU	-0.543498	6.4726083 4	- 3.856076	0.2669611 3	-0.127874	3.9077674 7	-3.794551	0.6215895 4
DDX54	-0.408119	5.7227857 7	- 3.831792	0.1624090 8	-0.103978	3.6420588 3	-3.821146	0.7211962 2
GSPT2	-0.331721	3.4104980 7	- 3.765301	0.0417991 8	-0.104864	1.6447005 4	-3.173146	-1.304903
SMPD3	-0.870131	5.2173846 1	- 3.794581	0.0369285 9	-0.236257	2.3549567 5	-2.899175	-2.133911
TOP2B	-0.25046	6.6540751 7	- 3.785487	0.0264582 1	-0.103987	6.979627	-3.430087	-0.625155
CAMK4	-1.004395	6.1106955 6	- 3.785379	0.0254702 5	-0.134885	6.5767117	-3.293605	-1.065718
AP1S2	-0.295436	5.3916762 4	- 3.770062	-0.057278	-0.153031	6.1214499 6	-3.084174	-1.709413
RRN3	-0.262134	4.7555239 1	- 3.740802	-0.147447	-0.108172	4.7063806 2	-4.387348	2.8915033 3
ABCD2	-0.484834	3.0448627 9	- 3.689844	-0.161948	-0.199717	4.8177847	-4.174511	2.0360530 8
MRPS30	-0.339806	3.0591674	- 3.664797	-0.250739	-0.100757	5.0125718 1	-3.601622	-0.071957
IQCB1	-0.266252	3.3297432 7	- 3.643923	-0.344732	-0.105893	4.5299901 4	-3.402865	-0.727886
DCLRE1A	-0.298435	3.0480456 1	- 3.602672	-0.449346	-0.148264	2.7205126	-3.846066	0.8484883 1
XPO4	-0.255911	4.1327166 6	- 3.624757	-0.497751	-0.108786	5.6303332	-4.830946	4.8060494 9
ZDBF2	- 0.4898599	4.7056966 4	- 3.616232	-0.562975	-0.147123	3.1768815	-2.855395	-2.302841
MAD1L1	-0.279667	4.5726220 8	- 3.549002	-0.774803	-0.124287	4.9199678 5	-4.138521	1.8906873 2
TTC37	-0.213395	5.4231174 9	- 3.349854	-1.428237	-0.128899	6.1071067 5	-4.288185	2.4897390 7
ARMC1	-0.229016	5.2103608 6	- 3.335621	-1.470878	-0.126376	4.0160807 9	-4.583291	3.7226606 1
RGS5	-0.512432	7.1027703 3	- 3.315198	-1.471941	-0.114206	2.3166842 5	- 3.5223062	-0.255192
AGPAT5	-0.251135	5.3481116 9	- 3.317839	-1.526817	-0.127888	4.0887856 4	-3.989647	1.3321318 5
KCNIP2	-0.786693	6.8333725 4	- 3.256148	-1.648376	-0.123092	0.8070435 5	-2.976606	-1.823385
BANK1	-0.443809	0.6086434 6	- 3.072112	-1.745092	-0.167823	5.0494284 7	-2.968978	-2.049048
PLD4	-0.663409	2.3259599 3	- 3.143444	-1.803651	-0.142535	2.3645060 1	-3.123693	-1.498812
ZNF253	-0.327004	3.3501709 4	- 3.175986	-1.815289	-0.110558	3.1914285 3	-3.168523	-1.409313
CD101	-0.367894	0.3036373	- 3.025438	-1.844272	-0.165379	3.8408589	-3.466863	-0.505586
KBTBD8	-0.420444	1.2982267 1	- 3.056803	-1.880225	-0.194356	2.8701100 2	-3.292649	-1.009406
SDAD1	-0.188474	4.6967035 3	- 3.181848	-1.920273	-0.123233	4.4335714 3	-4.566924	3.6478435 5
NMD3	-0.222892	4.7687312 7	- 3.174678	-1.943323	-0.112166	4.1957079 8	-2.812316	-2.464365
GCNT4	-0.362827	2.5914798 3	- 3.083296	-1.953695	-0.128083	4.1271614 7	-3.116982	-1.605077
NAA30	-0.211733	4.8033362 5	- 3.168585	- 1.9652353	-0.11197	4.8134665 6	-4.082128	1.6746264 3
RAP2A	-0.201859	6.4287821 8	- 3.150805	-2.003153	- 0.1475737	5.2571299 9	- 3.5608812	- 0.2083105
LIMA1	-0.220676	4.1138894	-	-2.039111	-0.116889	2.7080849	-	-

		8	3.126532			8	3.5278077	0.2539132
USP12	-0.198981	5.5988782 3	- 3.135609	-2.071592	-0.207093	6.2657707	- 4.4061389	2.9724199 7
ZFAND1	-0.203791	3.8645315 9	- 3.081198	-2.146488	-0.115606	3.7235959 9	-2.936954	-2.103928
NUS1	-0.231629	4.7990650 8	- 3.102469	-2.160926	-0.140778	4.5402134	-4.019444	1.4379078 9
CPSF6	-0.208529	5.4910384 3	- 3.103179	-2.166042	-0.122006	6.2215302 1	-3.310744	-1.019133
PTPN4	-0.190114	4.7715321 8	- 3.073912	-2.239424	-0.104981	7.0627328 7	-3.196579	-1.358081
WDR75	-0.179063	3.9067606 2	-3.0384	-2.270356	-0.103537	5.0129659 6	-3.969189	1.2445240 7
RIMKLB	-0.215294	5.5166488 2	- 3.049585	-2.320055	-0.106365	3.9945485	-4.172231	2.0337765 9
SLITRK4	-0.41304	4.6672046	- 3.029928	-2.361024	-0.138263	2.2576860 9	-3.071828	-1.63776
HOOK1	-0.529815	3.3724593 9	- 2.986662	-2.386229	-0.160303	2.6817682 6	-3.107586	-1.563664
SACS	-0.417006	5.9955793 5	- 3.009944	-2.418253	-0.175098	5.5533762 5	-3.932105	1.1080920 5
BYSL	-0.258505	2.6411721	- 2.892848	-2.514383	-0.106421	1.3722681 7	-3.794247	0.7015954 4
HNRNPA1	-0.239711	8.8257255 1	- 2.882016	-2.631498	-0.134566	7.8424693 3	-3.265816	-1.128353
PTPRO	-0.638195	3.5122301 4	- 2.900885	-2.649148	-0.127099	3.4760382 2	-3.076048	-1.697998
TBC1D12	-0.314765	5.2804651 7	- 2.837785	-2.906445	-0.109535	2.9275857 4	-2.957727	-2.005906
CAND1	-0.156086	6.4460812 5	- 2.790355	-3.005778	-0.105073	6.3854788 5	-4.233815	2.2745754 4
ZNF441	-0.233229	3.4716861 3	- 2.734868	-3.040329	-0.144394	3.8725709 6	-2.947448	-2.082345
LRRC8C	-0.259296	3.9119781 9	- 2.760309	-3.041008	-0.118568	6.0743781 8	-4.707547	4.2576447 1
TMEM237	-0.233741	4.1927077 7	- 2.751545	-3.085487	-0.100288	1.6081126 5	-2.799823	-2.346115
YTHDC2	-0.210333	4.2076504 7	- 2.693759	-3.234935	-0.103339	5.9095203 3	-3.967414	1.2411393 2
NOLC1	-0.142448	6.0193379	- 2.673871	-3.323837	-0.117253	3.8450568	-5.101774	6.0617599 6
NSFP1	-0.790195	-2.051713	- 2.287882	-3.395658	-1.061549	1.0670967 6	-2.795101	-2.311686
UTP15	-0.169591	2.9593132	- 2.522421	-3.485914	-0.124062	3.75056	-4.946882	5.3396087 9
MPP6	-0.266362	5.3453701	- 2.589587	-3.544724	- 0.1111172	4.1471955 9	-3.266468	-1.152691
MAGOH	-0.194469	2.6746802 9	- 2.473211	-3.563143	-0.100532	3.4349964 8	-3.337255	-0.904112
PCED1B	-0.315136	0.9083249 2	- 2.344217	-3.592032	-0.101644	3.7224484 2	-2.760221	-2.592556
TRIM59	-0.402646	3.9139592 9	- 2.521681	-3.629548	-0.104812	3.6989235 2	-3.527868	-0.294857
CSTF3	-0.127251	4.1428529 2	- 2.510899	-3.679052	-0.122283	4.2907752 1	-4.619574	3.8753305 9
RANBP6	-0.204599	4.3430805 5	- 2.515887	-3.688927	-0.134572	4.5126860 4	-3.059017	-1.780283
MRPL50	- 0.1677414	4.2016344	- 2.506985	- 3.6937238	-0.131862	3.4350703 2	-2.806585	-2.442776
PWAR5	-0.297241	5.5493476 5	- 2.520019	-3.711444	-0.162471	4.3727040 8	-4.66421	4.0682022 7
RFESD	-0.300474	0.3678399 7	- 2.235327	-3.748505	-0.139174	1.8629961 7	-3.689634	0.3303805 2
NUCKS1	-0.170794	9.0027335 2	- 2.405842	-3.809626	-0.115139	6.6697489 6	-4.440797	3.1193724 6

CCDC14	-0.190758	4.2753767 4	- 2.436334	-3.865402	-0.111492	5.5460118 3	-4.095548	1.7257880 8
TBCEL	-0.161844	4.0130307	- 2.405373	-3.907356	-0.160014	5.5924997 3	-4.112455	1.7922854 3
DIAPH2	-0.323036	4.2055696	- 2.417961	-3.914346	-0.102993	5.2607289	-4.020756	1.4381758
ARL14EP	-0.171511	4.2651789 7	- 2.404156	-3.943487	-0.105783	4.8471086 4	-2.795484	-2.523674
WDR89	-0.134235	3.2604253 9	- 2.338017	-3.958678	-0.131609	3.4094176 9	-2.751207	-2.590584
COPS2	-0.157946	5.3504937 5	- 2.414609	-3.963139	-0.169251	4.7799238 2	-3.573042	-0.165094
LIPA	-0.350971	6.0760278 2	- 2.397544	-3.984066	-0.118474	5.2418515	-3.279599	-1.125805
TDRD3	-0.150072	4.0648212	- 2.343728	-4.049233	-0.103427	4.2768714 4	-3.972982	1.2654136
UTP3	-0.131992	4.0302645 5	- 2.334201	-4.072403	-0.117126	3.9084212 6	-3.536859	-0.272476
BBS10	-0.218463	3.8513801 6	- 2.305401	-4.129526	-0.101337	3.9071169 4	-2.853122	-2.343613
CYBB	-0.455667	3.2793974 8	- 2.259158	-4.158785	-0.118791	8.9007596	-3.429405	-0.589994

[000261] Genes were identified that are up regulated or their expression or activity are increased in both blood and putamen of PD patients versus control. These genes are identified as up or upregulated genes, a gene or RNA whereby expression of the gene or the amount of RNA for that gene is increased or greater with PD disease or in a PD patient compared to a control patient or subject. The table below, TABLE 25, provides 254 genes.

TABLE 25 Blood - Put and Blood Common Up (PD vs CTRL)

ID	logFC.Put	AveExpr.Put	t.Put	B.Put	logFC.Blood	AveExpr.Blood	t.Blood	B.Blood
BCL6	1.16104051	5.95377161	7.99873166	19.6126913	0.19282698	7.07976275	4.07312251	1.65386255
RAB11FIP1	1.03006898	3.74127453	7.90652704	19.1232147	0.11192237	8.07069939	3.57910423	-0.1109524
IRS2	0.70094049	7.0369316	7.65384028	17.7293022	0.1380668	5.26174637	3.57404184	-0.1682224
KCNJ15	1.18433668	2.49216569	7.65030701	17.6856596	0.18417041	7.55012946	3.63768079	0.07899742
MAPKAPK2	0.82875272	5.76807271	7.51866916	16.9822475	0.12057888	5.13347206	4.00536521	1.37884277
PRRG4	0.93045238	2.9838165	7.38176134	16.2853864	0.16053196	5.04009263	3.84546557	0.78642854
FFAR2	1.16639428	1.71191683	7.26101437	15.5491149	0.15441487	6.06248232	3.61673738	-0.0166072
C3orf62	0.63556082	4.35416552	7.17154773	15.1465156	0.11558467	5.00144552	4.26605498	2.39536916
RAF1	0.3329174	6.14441228	7.14087559	14.9687931	0.13581631	7.56091769	5.22287676	6.64101134
RNF24	0.44276095	6.06207696	7.12482564	14.8826885	0.22394113	6.67033401	4.36826764	2.81966892
CLEC4E	0.82882252	2.19649235	7.08908006	14.7276972	0.23607676	6.02721785	4.82537283	4.78181052
LTBR	0.74213574	4.16660252	7.06104473	14.5766729	0.13306715	3.7828585	3.9648761	1.24522016
MAB21L3	1.41999487	5.3043021	7.00127189	14.236974	0.17324266	1.41122441	3.53446079	-0.1786887
DHX34	0.65801514	4.2691448	6.91926434	13.8294056	0.1361262	5.50350212	3.67831341	0.19109128
LRG1	1.2582499	1.03686916	6.88109719	13.4991647	0.19296577	5.08204422	4.26115122	2.37595415
MKNK2	1.1939388	6.31396926	6.83074411	13.3523713	0.12470437	5.96459764	3.34471564	-0.9169368
NABP1	0.67435842	3.57619976	6.78517385	13.1731796	0.11512905	9.05246024	3.41349004	-0.6382837
CLLU1	1.48333227	-0.0814346	6.85230964	13.0873347	0.10772602	1.83999341	4.19822133	2.18140141
C5AR2	0.88598914	3.17757392	6.76201276	13.0674026	0.12707029	6.86442317	3.96974605	1.25965734
CFLAR	0.47883164	7.17039968	6.6594938	12.493894	0.11167085	9.90221505	4.69965387	4.23910653
ZBTB16	1.39680665	5.3668085	6.59744145	12.1598582	0.1375089	3.66392528	3.40044855	-0.7157186
TNFSF14	1.1583152	1.22919655	6.5905968	12.1078148	0.11366837	5.74919111	3.71921536	0.33667916
MEFV	0.97883709	2.10651464	6.53485545	11.9193563	0.10269663	7.21238087	2.72831305	-2.6748914
CLEC1A	1.06400227	1.7058996	6.50330081	11.7418677	0.10768829	1.52827886	3.0734388	-1.5907103
CEBPD	1.73741752	4.37493257	6.46643487	11.5335888	0.19139417	6.13986325	4.46714575	3.22491093
RBM47	1.10392503	3.22232259	6.45186757	11.5151946	0.15596296	6.83504626	4.54712143	3.56804572

CASC3	0.733586 36	7.9298117 4	6.447249 34	11.44263 75	0.1022527 6	5.98176726	3.107322 27	-1.64506 05
CASP4	1.047461 3	2.6776754 6	6.420270 14	11.36724 96	0.1034603	7.48570251	3.323890 44	- 0.956147
AVIL	0.597109 7	3.5337737 9	6.390313 14	11.17923 63	0.1518396 2	4.06937097	3.748179 87	0.447816 39
BNIP1	1.048656 3	1.0832201 2	6.343666 55	10.90907 49	0.1002931 4	1.02231323	3.707071 93	0.405356 77
TNFRSF1A	1.052848 85	4.9561283 2	6.185301 46	10.11083 51	0.1705890 4	6.06085397	4.805536 52	4.692538 17
RASGRP4	0.728738 59	2.1132527 6	6.134140 08	9.981713 79	0.1450881 3	4.27139223	2.811394 47	-2.47505 15
NLRP12	1.058191 07	0.9028104 7	6.145732 77	9.948461 49	0.1615008 8	6.87690061	4.728065 66	4.352267 39
UBALD2	0.696439 46	4.6660109	6.141690 15	9.906020 27	0.1262675 8	4.54927536	3.792997	0.602132 63
ADIPOQ	1.294430 98	0.8225120 1	6.139603 22	9.887521 2	0.1240140 3	0.16773637	3.445671 01	-0.44013 31
OLAH	1.082587 18	0.2754258 6	6.119291 98	9.734956 91	0.2466825 3	0.35697706	5.138283 51	6.012008 88
LILRA5	1.536020 83	0.7361144 3	6.091735 56	9.654332 72	0.1626180 3	6.2450694	3.767694 1	0.513760 28
TBL1X	0.459649 63	6.0821964 3	6.086744 45	9.626266 83	0.1040163 2	6.19368711	3.304318 65	-1.04034 77
SOCS3	2.358358 39	3.6483505 4	6.038190 31	9.489020 97	0.1505658 1	4.69305147	2.934209 73	-2.14567 33
STEAP4	0.700259 1	2.3374911 2	6.010971 37	9.396915 42	0.1921362 2	8.21103614	4.215662 54	2.222031 74
LAT2	0.781483 33	3.9598487 1	6.009283 27	9.306845 85	0.1093300 8	6.5262541	3.862820 62	0.860109 44
KIF27	0.673733 46	4.1369121 7	5.984943 89	9.182131 36	0.1247203 7	4.73614576	3.212429 1	-1.33152 34
TIMP1	0.969704 21	4.8585510 6	5.907286 74	8.777326 42	0.1341085 4	3.1124804	2.850352 44	-2.31341 86
FUT1	0.757483 98	2.1411197 7	5.869601 34	8.737830 87	0.1048754 7	1.85161632	4.567148 18	3.668565 86
MLANA	0.683328 33	1.3050117 3	5.778681 3	8.305223 77	0.1170362	2.0464219	3.929912 42	1.169657 49
TMEM216	0.608727 41	3.2750584 8	5.774308 49	8.243852 92	0.1025862 5	2.51193721	4.632121 85	3.947895 69
BOC	0.830782 35	4.2046523 6	5.776800 32	8.191076 56	0.1283772 4	0.42027588	2.890425 44	-2.03686 47
CCNJL	0.623082 95	1.6518293 5	5.725111 11	8.073277 54	0.2178186 2	5.2009009	4.934078 21	5.274622 36
CDA	1.508242 02	0.4999668 4	5.738921 33	8.054826 88	0.2058568 2	3.52584611	4.089162 49	1.725039 05
LSMEM1	1.009103 1	0.7611146 2	5.716023 84	7.986659 7	0.1779588 2	2.93540322	4.145886 91	1.958303 59
PLAUR	0.673790 99	3.2305475 5	5.705035 72	7.929514 67	0.1433232 3	5.21523435	4.105482 65	1.762153 66
IRF1	0.760368 34	3.8294924 4	5.675008 11	7.749666 09	0.1151209 1	8.69401269	4.124129 27	1.870055 79
BCL3	1.178077 92	2.3324582 7	5.651257 12	7.733706 82	0.1941937 6	3.18615176	3.796579 71	0.653153 21
MIR3945HG	1.469220 59	0.2172096 4	5.673988 61	7.712439 04	0.2207366	1.62648126	4.214649 15	2.245090 18
ITPRIP	0.972372 13	3.0128267 7	5.650853 72	7.694078 38	0.1654527 9	6.33155325	5.041721 3	5.777295 04
LINC01127	1.339664 91	-0.0578826	5.679426 35	7.683974 49	0.1788457 6	4.40039481	3.310151 19	-1.02549 53
LUCAT1	1.242930 68	0.3718349 9	5.615723 38	7.479592 31	0.1536642 4	8.00261909	4.144069 51	1.939820 3
ROR1-AS1	0.606626 94	4.1900898 8	5.613236 72	7.427060 04	0.1154206 7	3.79483657	3.499444 56	-0.39826 54
LILRA2	0.581619	2.2224538	5.480574	6.967772	0.1742757	5.71547045	4.856025	4.919068

	36		27	55			23	
PLIN5	0.766467 59	3.9647426 5	5.493137 69	6.904690 12	0.1701673 8	3.32166623	4.053023 63	1.590660 22
LILRB3	0.865056 28	1.6059798 1	5.458044 8	6.879129 09	0.1632013 1	5.46359972	3.201887 16	-1.36670 53
JDP2	0.811486 27	4.7384814 9	5.485089 02	6.819631 27	0.1423547 2	4.68672841	4.473162 51	3.247559 03
IL12B	0.832201 47	-0.1543612	5.464969 57	6.789419 08	0.1147725 4	1.02704859	3.125721 02	-1.41509 23
FKBP5	1.211168 72	5.8626778 3	5.441765 68	6.607949 37	0.1440740 8	6.4990547	3.005848 74	- 1.932114
FCAR	0.862874 11	0.8926717 8	5.381321 85	6.522435 69	0.2445796 3	4.56807896	5.457603 05	7.801442 54
METRNL	0.820458 54	3.2743744 9	5.384048 81	6.472458 98	0.1117101 3	5.1720597	3.556864 89	-0.22582 67
MIR1255B2	0.902496 47	0.0830218 6	5.338033 53	6.274643 12	0.1191912 1	0.31394768	3.663253 75	0.252010 71
HSH2D	0.799040 71	1.3866005 7	5.270502 22	6.065073 19	0.1550868 8	5.04874101	3.984467 29	1.300092 97
ERN1	0.376284 83	3.2640275 5	5.259001 16	5.915823 6	0.1011034	6.34832942	2.977746 49	-2.01427 91
CEBPB	0.712225 3	4.4213453	5.253428 93	5.798645 32	0.1659253 2	6.82668713	4.836537 28	4.835544 71
APOBEC3A	1.279681 62	-1.045078	5.211659 95	5.513746 91	0.1841532 8	6.96563764	4.201254 91	2.150597 46
TLE3	0.710831 46	5.0532236 1	5.160110 9	5.361651 29	0.1214070 3	7.00759352	3.284366 4	-1.08914 09
UPK1A-AS1	1.075098 79	0.1640122 5	5.045270 3	5.072056 86	0.1126444 3	-0.0283783	3.193750 42	-1.18776 4
NEDD9	0.698274 99	4.1987757 4	5.082446 04	5.068359 29	0.1253205 4	7.16111838	4.210128 9	2.188469 36
EPHB4	0.666288 69	3.2057268 1	5.044166 75	4.995436 37	0.2065188 1	2.59310524	4.062237 87	1.648369 26
C16orf54	0.670148 4	1.7241349 4	4.994338 59	4.898103 82	0.1180185 8	6.11293015	4.090721 79	1.710278 94
MXD1	0.495822 55	4.2806035 4	5.026381 24	4.821775 45	0.1760271 8	9.35439083	4.726495 48	4.355872 41
CRISPLD2	0.761418 37	3.7125695 6	4.954589 88	4.571019 03	0.1580217 6	6.24025958	2.901301 31	-2.23078 82
ABHD4	0.590435 74	5.0051584	4.961345 37	4.508234 05	0.1486447 8	3.89693617	4.956056 54	5.380989 39
TOR4A	0.678349 37	1.6455008 9	4.882487 39	4.435811 47	0.1130585 9	3.32171015	3.415459 58	-0.64842 64
SULT1B1	0.447585 71	4.7864100 2	4.940227 04	4.426507 08	0.1091171 9	7.56930826	3.122284 59	-1.56860 46
CXCL1	1.697077 14	-0.0601619	4.886296 58	4.400821 62	0.1696272	1.26971069	2.999520 13	-1.77291 5
KIAA1257	0.429696 13	3.3979067 5	4.881610 86	4.293269 41	0.1072192 7	4.05056464	3.886124 93	0.945195 28
PYGL	0.492699 47	3.6785673 3	4.867271 84	4.200142 29	0.1249017 8	7.57398776	3.001123 52	-1.92206 49
SP110	0.551240 53	4.0311134 2	4.856014 74	4.134596 23	0.1129537 5	6.70006257	3.734970 49	0.403907 83
ADGRE2	0.536915 72	3.0477685 1	4.820488 42	4.077552 22	0.1426744 9	6.50524942	3.562248 1	-0.19573 55
CNN2	0.707542 74	3.4875576 2	4.822508 53	4.046957 85	0.1473550 3	6.64392179	3.702940 96	0.290324 09
SMIM3	0.699423 06	3.1489115 2	4.791558 18	3.950005 61	0.1024597 3	3.12936335	3.244532 39	-1.17542 95
KLLN	0.849435 95	3.7869355 5	4.802588 59	3.949370 92	0.1096894 7	1.82727313	3.459008 45	-0.43505 77
TMEM45B	0.744390 92	1.3226834 8	4.757850 83	3.948124 43	0.1711888 7	2.89471565	4.120593 86	1.861443 39
ZNF438	0.372170 8	3.1100893 4	4.784549 82	3.918544 35	0.1241935 8	4.55543826	3.466633 26	-0.52250 25

CSRNP1	0.776653 76	4.2160185 1	4.803348 97	3.896156 32	0.1587423 5	4.54112874	4.406650 38	2.971480 83
IFRD1	0.494504 36	5.2535709 5	4.795504 88	3.811366 11	0.1350929	7.14628715	3.766451 88	0.521871 78
RGL2	0.350266 37	5.2820166 4	4.755873 5	3.646288 45	0.1088663 6	5.49839456	3.229382 81	-1.28200 93
LINC00664	0.642667 76	1.0915132 5	4.669125 84	3.603249 38	0.1408311 4	1.08399745	2.753181 79	-2.42845 55
CEP19	0.417311 31	3.4296701	4.711870 11	3.593823 45	0.1444869 7	4.26877397	3.733603 2	0.396069 56
MX2	0.405874 66	3.9481505 8	4.710119 66	3.532921 65	0.1341872 3	7.34437553	3.635167 05	0.066916 12
ZNF429	0.320511 25	3.7767520 4	4.694899 64	3.485816 88	0.1078745 9	3.66060786	3.290197 05	-1.06253 68
SLC11A1	1.003089 64	3.7533911 9	4.676238 26	3.430369 26	0.1432345 4	7.32521191	3.151931 76	-1.48784 36
G6PC	0.947416 6	0.1018138 7	4.610106 73	3.359869 19	0.1163607 8	0.52147173	3.435456 86	-0.47151 51
TSC22D3	0.515939 76	6.4393368 7	4.675768 12	3.337665 33	0.1840130 8	6.98242984	5.280746 83	6.922593 03
NUAK2	0.528401 09	1.8018802 9	4.581041 37	3.223650 93	0.1470196 3	5.39914809	4.323810 07	2.629031 91
KLHL21	0.446715 37	6.2782512 8	4.622930 55	3.121430 62	0.1598300 8	5.6443478	5.334694 87	7.187445 05
RALGAPA2	0.324550 77	4.6788630 4	4.616240 22	3.094399 47	0.1065255 1	7.16315834	3.589882 6	-0.09050 73
CXCR2	1.054720 89	-0.0750785	4.534019 1	3.063139 54	0.1703361 4	7.70813068	3.454305 75	-0.53198 53
PTAFR	0.582111 67	3.4967848 4	4.442504 37	2.515287 64	0.1034970 7	7.48303049	2.839457 87	-2.37311 17
SBNO2	0.690657 66	4.2024281 2	4.458715 68	2.513571 28	0.1538199 7	5.95442829	3.380095 41	-0.80390 94
HLX	0.855776 69	0.5506671 8	4.373162 21	2.485676 57	0.2057705 1	3.75010522	5.365545 97	7.339520 4
IFITM3	0.757725 17	7.3757477 7	4.447754 38	2.463762 22	0.3146957 1	1.41668468	3.381784 77	-0.65649 69
MAP3K3	0.232053 94	5.3650797 1	4.439335 47	2.378822 39	0.1160231 9	6.21517843	3.557289 77	-0.21682 27
LINC00908	0.574791 09	1.4255589 5	4.343402 9	2.342554 7	0.1357355	1.09998362	3.564068 55	-0.07211 81
LINC00671	0.681549 02	-0.1437094	4.293012 4	2.187180 71	0.1482915 9	1.26599015	3.565023 78	-0.07013 33
NCR1	1.115536 67	-1.1685616	4.300262 18	2.118293 95	0.1492896 6	2.49957898	3.218142 36	-1.21856 17
KCNE3	0.420846 14	2.1869669 3	4.299860 18	2.115544 83	0.1301871 1	6.95069661	4.252513 69	2.354074 46
ADAMTSL4- AS1	0.674599 57	0.6355136 1	4.244651 26	2.016345 05	0.1225523 2	5.40980061	3.395195 49	-0.75987 54
MRVI1-AS1	0.570707 25	0.4511382 8	4.243337 25	2.011698 03	0.2237162 7	1.02671046	3.938297 77	1.210758 2
MRVI1	0.557248 47	7.2258537 9	4.330594 57	2.010905 29	0.1785995 5	5.41726305	4.079428 21	1.662199 29
F11R	0.487027 45	4.2001537 3	4.321263 58	1.981833 22	0.1441370 9	5.18744609	4.022715 67	1.444486 62
C5AR1	0.936974 41	1.7963389 7	4.232640 65	1.903796 78	0.1796031 6	5.61838816	4.123836 64	1.834537 67
VDR	0.832954 4	-0.4424666	4.183290 24	1.785605 23	0.1296172	2.97176057	3.573213 82	-0.11500 21
ARL11	0.529441 19	1.1985392 3	4.178577 08	1.756406 33	0.1418980 2	5.46720571	4.771011 57	4.536344 81
SIPAIL2	0.339216 65	5.0106918 7	4.275739 5	1.755613 17	0.1886248 1	5.53428411	3.779924 68	0.550523 18
IER3	0.535354 05	2.6977187 1	4.190894 28	1.660466 15	0.1901293 9	1.46578602	3.919867 37	1.145334 07
BTNL8	0.960046	-0.9797993	4.153839	1.648187	0.1774017	4.22909862	3.725326	0.365143

	62		57	35			33	4
NR6A1	0.322921 41	2.5687123 8	4.179939 23	1.629439 52	0.1266825 3	2.9162595	3.746297 36	0.481631 89
RAMP1	0.411493 81	6.3462171 9	4.218713 48	1.552980 24	0.2720572 2	-0.9826853	3.733811 11	0.303051 72
IFITM1	0.788598 7	5.3158767 8	4.200975 21	1.472878 4	0.1496233 3	6.86731841	3.675452 87	0.197299 01
GPSM3	0.592370 36	2.6840913	4.120326 42	1.399204 64	0.1240770 5	4.69295576	3.000270 59	- 1.959203
FOSL2	0.767549 16	5.4839642 3	4.174850 34	1.380514 01	0.1636571 8	6.88927854	4.373402 35	2.842726 51
SH2B2	0.660267 17	2.0696420 7	4.064935 36	1.271154 71	0.1462601	2.52304872	3.535470 59	-0.21750 81
ERVH48-1	0.485279 04	2.3262006 8	4.069595 29	1.251221 31	0.2433721 6	-1.3505821	3.479062 89	-0.46504 27
ARHGAP26	0.333744 74	6.2647957 5	4.136012 62	1.246337 37	0.1255756 3	8.50583286	3.676567 85	0.230561 96
RUBCNL	0.448417 34	2.5838821	4.070811 01	1.227604 86	0.1566598 9	5.80162715	3.690777 49	0.237485 63
MIDN	0.540676 77	5.5093071 9	4.124792 71	1.189190 16	0.1393723 8	5.03966182	3.698114 14	0.259574 9
IGF1R	0.335182 81	6.3746036 8	4.109347 98	1.151258 65	0.1184729 3	6.7142758	3.215743 7	-1.30578 99
SESN2	0.804381 73	3.8610441	4.069206 4	1.084637 23	0.1198096 7	2.19750893	3.642038 58	0.154295 04
TNFRSF12A	0.921742 02	0.5927235	3.961444 56	1.026937 88	0.1177295 4	2.54434502	3.068845 75	-1.66206 83
LRP10	0.452157 36	6.5507365 7	4.051207 68	0.944503 3	0.1520563 1	6.30587313	3.678669 3	0.200044 88
CPQ	0.298365 28	5.1188831 4	4.052257 05	0.924622 06	0.1099919 2	6.56530252	3.656807 48	0.128951 78
UNC119	0.303558 44	4.3714117	4.042721 88	0.921864 35	0.1042303	5.32248331	3.993590 32	1.334967 14
KIAA0040	0.641202 1	2.8067756 5	3.979847 48	0.887187 39	0.1081049 6	6.62612435	3.919657 18	1.070325 14
TREML2	0.925032 34	-1.4186588	3.891866 87	0.758450 44	0.1928066	5.40793277	5.409264 39	7.558474 01
LYN	0.386733 89	3.5511782	3.962407 53	0.731890 35	0.1232227 8	8.10097709	3.957169 16	1.230310 78
IL1R2	1.837929 35	-1.8374108	3.878423 49	0.677910 72	0.2139137 9	5.79544304	4.394377 78	2.920292 25
ENTPD1	0.215909 45	4.7617782 4	3.974295 38	0.656346 02	0.1350580 8	7.20200128	4.073427 19	1.656567 43
NSUN7	0.791245 67	0.0166668 7	3.781909 64	0.437039 8	0.1747682 1	3.01911301	3.872618 97	0.930620 58
KCNE1	0.562043 65	1.8128404 6	3.817121 77	0.436131 96	0.1196125 4	4.50528034	3.102828 36	-1.65979 46
CEACAM1	0.488982 06	1.2778447 5	3.794589 33	0.413534 81	0.130821	3.79559565	3.115350 4	-1.60029 99
XKR8	0.234445 5	4.3097819 6	3.898252 65	0.412385 93	0.1689754 8	3.60343373	4.624677 78	3.906392 49
HSPA6	2.120626 62	3.2352152 6	3.819947 08	0.338487 56	0.2045809 3	6.76822933	5.305823 36	7.045480 7
PADI4	0.946060 27	-1.0098421	3.746494 84	0.322709 71	0.1849541 4	5.27172851	3.321733 93	-0.99496 57
NPL	0.475718 42	4.7178991 9	3.877640 98	0.314757 3	0.109042	6.68700659	3.300055 24	-1.04574 91
SLC25A34	0.415946 67	2.3952851 5	3.782531 07	0.247619 17	0.1084682 8	1.02009306	4.140507 69	1.953875 93
ACSS3	0.487213 18	4.4149128 8	3.834986 58	0.191546 53	0.1732389 4	4.3149129	3.580491 83	-0.13610 85
RILPL1	0.270881 94	5.5930287 3	3.800220 1	0.031226 72	0.1084763 8	3.08460792	4.677775 8	4.141079 33
CHRNA10	0.637587	-0.0744684	3.643526 29	0.001076 39	0.1136335 5	1.41810682	3.746704 19	0.535129 9

C9orf139	0.370455 09	2.5711930 2	3.704269 32	-0.03599 05	0.1074891 6	3.52686096	3.270801 72	-1.11551 16
ACOXL	0.454313 78	0.7263101 4	3.618542 09	-0.12256 36	0.1185516 3	1.1439264	3.367743 93	-0.69971 67
ZFP36	0.977226 93	4.8442373 5	3.730710 24	-0.18336 93	0.1434898 8	5.04997007	3.957539 84	1.199588 04
SERPINA1	0.912043 84	2.3177494 4	3.631666 57	-0.2420 333	0.1747811 3	7.08125892	4.134371 79	1.889939 8
CARD14	0.435005 78	2.3929082 2	3.623051 37	-0.28612 27	0.1340099 7	0.53079271	2.915476 72	-1.97320 85
NCF1	0.475941 38	2.5318529 8	3.613464 26	-0.31828	0.1356705 8	7.36177432	3.257352 64	-1.16638 19
ALPK1	0.271009 37	4.5218526 5	3.681834 79	-0.34035 58	0.1130531 8	7.35833037	3.173078 87	-1.42222 38
RPGRIP1	0.620506 99	1.9137472 4	3.527223 75	-0.49816 44	0.1387343 5	2.70115461	3.234965 57	-1.18546 96
ARHGAP9	0.615323 78	1.6529585 3	3.522979 77	-0.51539 49	0.1349290 4	6.19676172	3.277441 82	-1.12579 48
IL18R1	1.127562 24	0.3248906 7	3.479532 38	-0.51719 49	0.1037271 9	5.12031817	2.783798 55	-2.55977 53
ADM	0.792913 08	3.5812186 2	3.575353 3	-0.58974 42	0.1823100 4	4.68805959	3.291570 95	-1.08462 28
CCDC153	0.642547 65	1.6526088 1	3.458698 64	-0.70591 57	0.1067361 7	1.83654177	3.141376 08	-1.41143 82
S100A9	1.531288 35	2.1815463 3	3.474396 58	-0.70683 16	0.1577507 2	10.7779005	3.180489 85	-1.32657 53
NFIL3	0.574275 18	3.1435931 5	3.480615 4	-0.8311 05	0.1466168 7	4.24101602	3.810079 13	0.669430 16
HCG27	0.452396 46	1.7402022 4	3.402016 47	-0.90077 85	0.2144958 7	6.99895018	6.215582 65	11.85532 02
FLJ40194	0.637496 14	-0.471908	3.331741 9	-0.92032 67	0.1156081 5	-0.0468436	3.083890 99	-1.49341 14
PLP2	0.575323 1	2.6589728 8	3.420960 56	-0.95472 19	0.1227994 3	4.29409648	2.800531 97	-2.50397 22
C2CD4A	0.607587 32	-0.0086272	3.302941 91	- 1.025864	0.1351006 8	-0.0377716	3.083020 85	-1.49771 99
CASS4	0.377421 31	1.9588113 7	3.339953 3	-1.11328 14	0.1263991 5	5.34940083	4.113036 07	1.791743 74
CYP4F3	0.681046 62	2.6560314 4	3.363470 17	-1.11909 95	0.1963802 4	7.05012067	3.934910 03	1.132314 24
S100A11	0.545951 33	3.7031082 7	3.391414 04	- 1.195657	0.1827581 8	4.43359346	4.178205 04	2.051488 58
PPP1R3B	0.358146 93	2.5740803 6	3.329338 77	-1.23054 78	0.1686706 7	6.82671493	4.452070 42	3.167595 31
ERGIC1	0.154520 76	6.1966865 8	3.411254 06	-1.23599 87	0.1373875 1	7.10441746	4.214857 96	2.206439 29
RNF149	0.239519 58	4.2885756 9	3.396353 4	-1.25251 89	0.1487890 9	9.05993868	4.904012 32	5.146630 29
SECTM1	0.902274 18	-0.1539601	3.203092 28	-1.30447 79	0.1528932 2	5.35483583	3.267138 56	-1.16586 31
LINC01136	0.613905 09	0.2523885 7	3.171595 12	- 1.410798	0.1504544 8	1.68367147	3.580255 63	-0.03160 15
IL1RAP	0.239162 03	3.7793440 6	3.305069 83	- 1.483678	0.1334812 1	6.93066297	3.631804 73	0.048355 13
B4GALT1	0.428608 5	3.6806716 5	3.287645 38	-1.49866 62	0.1163127 4	5.58793387	4.349069 75	2.732925 98
LINC01047	0.624816 59	-1.2371424	3.115206 92	-1.50424 66	0.1120609 7	-0.4957834	3.285696 18	-0.93612 38
LPO	0.335360 16	0.7968399 1	3.160629 65	-1.50864 13	0.1777426 6	1.66518451	4.147243 66	1.986199 89
LRRC25	0.431071 08	1.3441429 4	3.152187 18	-1.59217 53	0.1699345 4	5.27169266	4.734835 71	4.375056 39
KCTD21	0.274562 6	4.5806987 7	3.268849 75	-1.66861 62	0.1387234 3	2.76406702	5.000025 25	5.584525 36
SPOCD1	0.416856	1.9759372	3.110496	-1.78761	0.1451569	0.57257068	3.345994	-

	61	3	22	84	4		98	0.747924
LINC01220	0.792918 61	-1.7348492	2.985629 29	-1.83250 17	0.1965918 4	0.97160193	4.17114	2.059901 04
RAB3D	0.205302 21	4.6395700 6	3.208213 95	-1.85445 16	0.1475777 6	6.26832271	3.741256 76	0.419982 3
CDC42EP4	0.392437 15	7.126223	3.182152 3	-1.89434 03	0.1439879 6	1.43303992	3.808783 15	0.751135
DAPK2	0.341065 53	4.0829416 9	3.166193 2	-1.92363 49	0.1242707 2	5.90294771	3.361547 94	-0.86310 62
PAQR5	0.376326 92	2.6042410 1	3.089214 63	- 1.940954	0.1019206 5	0.84206618	2.861274 27	-2.13266 17
PLEKHG6	0.407810 92	0.0218439 8	2.939016 07	-2.03393 87	0.1091888 2	0.05650106	2.807971 55	-2.22205 35
SRGN	0.641228 35	4.7383368 1	3.130628 6	-2.08625 27	0.1303911 7	9.51849956	2.915193 66	-2.11862 78
1-Mar	0.279621 79	4.2839915 5	3.116195 1	-2.10222 37	0.1865346 4	5.21474997	4.295476 19	2.513925
NQO2	0.204200 26	5.4260428 3	3.115739 87	-2.14674 96	0.1490187 6	5.37195853	3.943284 13	1.146073 82
BOK	0.478157 37	7.0220787 2	3.075495 97	-2.21355 08	0.3758156 9	-1.2243245	3.351478 61	-0.83081 08
ZBTB34	0.181778 37	3.9051578 3	3.057281 56	- 2.232002 3	0.1026300 8	6.58810965	3.851952 69	0.821489 77
LSM10	0.239978 31	4.5297871	3.072752 25	-2.24083 91	0.1152689 2	3.41055617	4.965106 59	5.425523 74
CLEC3A	0.520040 88	0.4527297 3	2.872297 45	-2.24870 52	0.1288352 2	0.40271045	3.492175 23	-0.29409 36
ST20	0.322050 5	1.1148483 3	2.901366 19	-2.25789 46	0.1576131 7	4.43632061	4.176472 7	2.044262 63
KIF13A	0.260368 89	6.0627008 1	3.073012 07	-2.25916 89	0.1077167 4	6.47129378	3.169659 64	-1.45024 42
TG	0.468199 34	0.0866324 3	2.854344 95	- 2.260288	0.1925938 9	3.01128263	4.172256 36	2.056692 11
STX11	0.652821 37	-0.5832006	2.822797 65	-2.28596 95	0.1535376 1	5.66344912	4.060147 48	1.589451 25
CXCR1	1.330340 09	-2.2564811	2.785388 42	-2.31401 69	0.1884927 9	7.72371256	4.152544 8	1.969268 35
TRIM25	0.215788 79	4.5993936 6	3.013838 25	-2.41699 81	0.1815760 7	7.53715191	4.660451 87	4.060362 89
DOK3	0.364932 27	2.2866662 6	2.907743 34	-2.41829 06	0.1616369 6	5.46015173	3.964305 98	1.225040 66
CSF3R	0.351335 54	3.7860692 7	2.948829 08	-2.51629 64	0.1616051 5	9.29909544	3.771131 95	0.573885 71
DENND3	0.365578 9	4.9930065 5	2.982374 35	-2.51938 13	0.1359677	8.23145668	3.416634 86	-0.64413 41
LINC00877	0.550132 52	1.2974027 3	2.788597 39	-2.55792 07	0.1237556 9	3.62564703	3.298909 72	-1.03584 46
MTG2	0.158978 04	4.3506563 1	2.934528 15	-2.61925 09	0.102642	4.01807851	3.909099 21	1.031365 95
FPR2	0.798662 67	-1.6475686	2.630321 73	-2.68017 71	0.1836954 4	7.21320036	4.022928 63	1.464510 78
ZNF516	0.298780 06	4.7949724 2	2.915028 05	-2.70138 93	0.1603528 9	7.0217226	4.664961 29	4.076710 85
ADAM8	0.408249 73	1.4905881 4	2.751122 57	-2.70480 29	0.1364495 3	7.33591446	3.895916	0.991997 58
CHIT1	0.468427 92	0.7908537 7	2.700500 54	-2.72581 48	0.1605473 9	2.1697333	4.010966 9	1.467338 88
ITPKB-IT1	0.770412 92	-1.6960676	2.606896 75	-2.73143 97	0.1189110 5	2.70939152	3.581857 42	- 0.074713 6
NUMB	0.134430 31	5.4433292 2	2.901772 88	-2.75038 28	0.1260085 7	6.92608148	4.092689 35	1.727163 33
MADCAM1	0.414870 87	1.1492754 5	2.679400 85	-2.83046 97	0.1852708 3	-1.1071917	2.924564 67	-1.93543

C19orf38	0.480439 28	0.6373726 2	2.649918 31	-2.83674 41	0.1089669 9	4.53336456	3.528008 21	-0.31679 05
SLC16A3	0.464506 38	3.0238221 3	2.784619 53	-2.83985 69	0.1203222 2	7.70127755	3.575809 06	-0.12967 79
IL1R1	0.587084 74	3.2314707 6	2.778743 71	-2.87552 75	0.2095451 7	4.44914187	3.840952 31	0.773327 08
NCF4	0.429954 51	0.9024933 1	2.644680 79	-2.88824 14	0.1498470 3	5.39285079	3.802575 9	0.631154 6
FCGR1B	0.487837 3	1.4661206 3	2.641523 51	-2.94881 16	0.2187187 1	4.16783746	3.257087 38	-1.17943 89
PLEKHO2	0.321119 15	5.7088199 4	2.820937 67	-2.96437 36	0.1255427 3	5.10133022	3.329826 46	-0.96959 42
BLOC1S3	0.145672 99	3.618898	2.768445 19	-2.98326 69	0.1029629	2.68338168	3.823019 47	0.766249 19
MKX-AS1	0.530985 7	-0.7974946	2.516586 18	-2.99421 34	0.1506035	-0.6552659	3.664150 58	0.172095 29
RASSF3	0.360794 82	3.3160867 7	2.735250 44	-3.01109 98	0.1121120 6	7.28925993	4.304217 81	2.565057 84
ABHD5	0.301699 93	3.0811965 9	2.708072 19	-3.05420 13	0.1653126	7.37145974	4.249157 07	2.345577 3
VPS37B	0.183875 51	4.9477464 4	2.767486 22	-3.10091 94	0.1050404 8	4.86181911	3.622394 27	-0.00302 27
NFE4	0.316262	0.0217086 3	2.460761 57	-3.21165 76	0.2828169 9	2.47577169	4.657623 57	4.057324 85
SEMA4B	0.320679 44	5.3797535 9	2.722459 54	-3.22629 26	0.1243022 8	4.59341514	3.372398 27	-0.82957 31
PELI2	0.214424 05	4.0511414 1	2.681251 28	-3.25586 89	0.1017466 8	6.62892115	3.707762 28	0.307151 3
PSG6	0.626411 15	-0.8246605	2.383417 53	-3.27881 99	0.1467740 3	1.55937473	3.215396 56	-1.17946 49
ST6GALNAC 2	0.399990 03	2.7827945 1	2.586700 35	-3.30213 81	0.1567633 8	4.03869558	3.435997 63	-0.61130 37
DDIT3	0.410801 99	5.0251516	2.684640 13	-3.31203 15	0.1183386	3.32331168	3.734708 94	0.431359 11
MIR646HG	0.385367 74	0.5817062 6	2.443901 56	-3.31220 13	0.1079698 3	3.46572146	3.036570 81	-1.81873 92
PALMD	0.401646 12	3.3145410 9	2.582264 3	- 3.380702	0.1251296 7	-0.1427454	3.265039 7	- 0.983828
MTMR3	0.155326 58	6.2388314 1	2.632338 88	-3.43624	0.1071798 8	7.15251261	3.506238 71	- 0.372389
RNF130	0.174919 08	7.0207572 8	2.596841 75	- 3.489729	0.1164960 4	7.33749643	4.393058 93	2.927733 24
PGS1	0.190353 55	4.7563871 3	2.607457 55	- 3.503905	0.1273756 6	6.679113	3.717251 88	0.340952 45
FCGRT	0.296664 24	5.3746417 4	2.599229 68	- 3.537742	0.1056429 4	6.69871459	3.376576 46	- 0.803655
ERV3-1	0.200100 4	3.4840755 1	2.489407 4	- 3.651627	0.1261695 9	6.19088157	3.677426 26	0.195139 58
GAB2	0.389200 26	7.8223873	2.502725 13	- 3.678069	0.1676105 2	5.96338582	4.056941 73	1.579317 2
SIGLEC9	0.534480 07	0.7344068 9	2.270152 11	- 3.710322	0.1429591	5.34252672	4.219926 55	2.211299 15
TFE3	0.163212 37	6.4051174 1	2.478750 35	- 3.803638	0.1008481 4	4.45299989	2.820549 02	- 2.455505
CKAP4	0.205514 53	4.3127699 2	2.426003 16	- 3.902254	0.1332757	4.58556325	3.514188 65	- 0.365388
LINC00173	0.324385 09	2.117186	2.267909 15	- 3.928056	0.2035757 5	1.68215153	5.238619 89	6.655417 72
LAMTOR4	0.183574 96	5.9873326	2.419038 4	- 3.961429	0.1150359 5	5.59852984	3.859421 07	0.839912 97
ISG20	0.263765 44	2.3594357 3	2.197304 4	- 4.111557	0.1113319 1	6.16675845	3.994484 24	1.344214 3
UBTD1	0.201810 46	3.7022982 6	2.246284 53	- 4.230242	0.1462801	1.0017266	3.755217 22	0.569667 39
MKNK1	0.140247	4.4854479	2.229092	-	0.1325550	5.95598922	4.393453	2.917361

	1		3	4.359444	2		24	43
IGF2R	0.167063 86	5.7722730 2	2.195351 78	- 4.459572	0.1160309 4	9.73940667	2.758047 13	- 2.528308

[000262] Genes were identified that are down regulated or their expression or activity are decreased in both blood and putamen of PD patients versus control. These genes are identified as decreased, down or downregulated genes, a gene or RNA whereby expression of the gene or the amount of RNA for that gene is reduced, decreased or less with PD disease or in a PD patient compared to a control patient or subject. The table below, TABLE 26, provides 157 genes.

TABLE 26 Blood - Put and Blood Common Down (PD vs CTRL)

ID	logFC.Put	AveExpr. Put	t.Put	B.Put	logFC. Blood	AveExpr. Blood	t.Blood	B.Blood
FARSB	-0.851233	4.6443351 4	- 8.3317697	21.475341 7	- 0.1045711	3.7791658 2	-4.79341	4.6438119 7
GDAP1	- 0.9566722	5.2789733	- 8.1105267	20.234282 7	- 0.1150056	2.7102935 7	- 3.9271959	1.1404433 7
ATAD1	- 0.6990268	5.3061395 7	- 7.8481032	18.779335 8	- 0.1157438	5.0540106 9	- 3.2723413	- 1.1451966
USP5	- 0.5690093	6.3165509 3	-7.752686	18.262336 6	- 0.1192404	4.2913413 7	-4.34334	2.7137175 7
THNSL1	- 0.6970261	3.3311963 5	- 7.7056729	18.027081 1	- 0.1479347	1.9423807 4	- 3.2661223	- 1.0431132
MBLAC2	-0.932014	2.9815746 5	- 7.6963513	17.977079 2	- 0.1239565	2.5428843 1	- 2.7820742	- 2.4514585
HLTF	- 0.6383287	4.7706220 9	- 7.6992469	17.966431 9	-0.146474	3.9032092 4	- 4.0457054	- 1.5490277
PLK4	- 1.5513295	- 0.5481061	- 7.8017182	17.872245	- 0.1352987	0.9561126 1	- 3.0872814	- 1.5140113
MTX2	- 0.5831777	4.0844215 7	- 7.6112484	17.500110 9	- 0.1080659	2.8633183 7	- 3.5601253	- 0.1505517
RTN4IP1	- 0.7106338	2.2221256	- 7.4752304	16.766073	- 0.1150321	2.3060876 5	- 4.4879305	3.3406921 5
SNX4	- 0.6005067	3.9955785 1	- 7.4395911	16.577154 7	- 0.1247711	3.4217094 1	-2.845299	- 2.3382337
HMGCS1	- 0.7661272	5.2080470 2	- 7.4195017	16.449266 6	- 0.1005417	4.2708742 3	- 4.2449281	2.3182329 3
ABCE1	- 0.5210007	4.5545871 6	- 7.4111429	16.410463 2	- 0.1563718	4.6718832 9	- 4.2287393	2.2505886 7
ANXA6	- 0.8866277	6.7136419 4	- 7.3102177	15.880762 4	- 0.1266117	7.4457311	- 4.2616515	2.3967227 4
OPA1	-0.676104	5.9833688 8	- 7.1592023	15.066237 1	- 0.1189195	6.2815822 4	- 4.5390158	3.5298345 7
NUDT21	- 0.5665076	5.9496676 5	- 7.0247152	14.35846	- 0.1099556	5.4921698 3	- 3.4072197	- 0.7178517
ARL6	- 0.8678826	3.4034117	- 7.0012849	14.276404 6	- 0.1325123	2.0787989 4	- 3.0428806	- 1.7085828
FBXO4	- 0.6859344	1.5733061 6	- 6.9979421	14.234719	- 0.1153082	2.6346759 8	- 3.2687609	- 1.0723647
DLAT	- 0.6209591	4.6195267 4	- 6.9947091	14.204301 6	- 0.1065354	3.1381168 5	- 4.8021678	4.6886486 1
VAMP4	- 0.4607572	4.7811547 6	-6.993309	14.193804 4	- 0.1171624	4.4123969 8	- 3.1583836	- 1.4868191
AP1AR	- 0.7503659	4.0987941 8	- 6.8013973	13.217066 3	- 0.1111837	3.7751511 7	- 2.8492526	- 2.3474402
TRAPPC13	- 0.5067615	4.0118476 9	- 6.7828241	13.126769	- 0.1036706	3.9654469 5	- 3.2446052	-1.211437
FAM3C	- 0.6930805	5.0726966 7	- 6.7567038	12.966476 1	- 0.1247916	4.1056590 9	- 3.0418741	- 1.8234673
TOMM70	- 1.1851745	6.3754601	- 6.7289657	12.841011	- 0.1271776	4.8810538 6	- 4.5073474	3.3919685 2
DCK	-0.764761	4.4121338 9	- 6.6584711	12.476062 9	- 0.1170402	5.7201664 7	- 4.0549554	1.5716745 1
RFC3	- 0.8541267	1.1645741 2	- 6.6213958	12.318378 4	- 0.1164216	2.8259835 3	- 3.9628265	1.2690990 1

ORC5	-	2.9849419	-	12.241920	-	3.8628232	-	0.7727663
	0.5530339	5	6.5999443	9	0.1180222	6	3.8362335	5
MRPL32	-	3.7340589	-	12.079738	-	3.4695364	-3.650259	0.1314870
	0.5559621	8	6.5746556	4	0.1350004	8		3
SLC39A10	-	5.3084544	-	11.986142	-	5.8709127	-	2.7844327
	0.7336943	1	6.5642239	5	0.1331615	1	4.3609808	9
SLC25A46	-	4.9933482	-	11.857587	-0.114771	5.5757605	-	-
	0.5350374	3	6.5387903	6		3	3.5042812	0.3984102
IBTK	-	5.0391773	-	11.764661	-	5.5059984	-	4.410918
	0.4718213	7	6.5203925	2	0.1269004	6	4.7426664	
P2RY12	-	2.0818856	-	11.573962	-	2.1796420	-	-
	1.5010355	1	6.4625285	8	0.1533341	8	3.0171534	1.7847918
LRRC40	-	3.3070891	-	11.076355	-	3.5468664	-	-0.496576
	0.6267904	2	6.3695528		0.1349965	6	3.4642696	
MYBBP1A	-	5.2268369	-	10.981611	-	2.9210406	-	-
	0.6591195	3	6.3639885	7	0.1064476	7	3.1774273	1.3735318
UCHL5	-	4.6170369	-6.345006	10.897241	-0.119932	4.7223335	-	-
	0.4721467					6	3.1326278	1.5679436
HNRNPA0	-	6.1301771	-	10.664569	-	5.2406915	-	3.4890184
	0.3788887	3	6.2982969		0.1137518	8	4.5304864	1
GOLT1B	-	4.4035308	-6.262363	10.494831	-	4.4827852	-	0.7480996
	0.5305629	2			0.1464374	5	3.8324511	
WDR11	-	4.8328500	-	10.221114	-	6.1555293	-	4.9191609
	0.4456092	5	6.2090528	5	0.1089791		4.8556331	2
LRPPRC	-	6.0625240	-	9.9270518	-0.120959	5.6364362	-4.486761	3.3051937
	0.5216945	8	6.1480711	3		5		1
SNCA	-0.684439	6.0559147	-	9.8025172	-	9.7735398	-	-
		9	6.1223477	9	0.1664317	5	2.7521191	2.5467532
PREPL	-	7.6666288	-	9.6861975	-	5.0706553	-	5.0938676
	1.0658077	9	6.0873252	8	0.1120365	6	4.8945557	6
SQLE	-	4.1408122	-	9.6247452	-	2.3226322	-4.921205	5.2175377
	0.8080739	3	6.0814861	5	0.1664091	8		1
CHIC1	-	4.4913872	-	9.5378910	-	4.0698403	-	0.1627553
	0.6565273	3	6.0666026	4	0.1420645	7	3.6657299	6
MRPS30	-	3.0591674	-	9.4945046	-	5.0125718	-	-
	0.5680636		6.0402065	2	0.1007757	1	3.6016022	0.0719557
ZNF10	-	3.0645618	-	9.0587062	-	2.8467885	-	-
	0.4644742	5	5.9486526	3	0.1008079	7	3.1616239	1.4132893
PRPF19	-	6.1114796	-	8.8025828	-	4.9809158	-	3.1574657
	0.5031476	1	5.9137204	2	0.1179296	1	4.4519182	5
CASD1	-	5.1283436	-	8.7142179	-	5.1416906	-	-
	0.5407431	9	5.8972883	8	0.1236927	1	3.3566429	0.8805526
MBTPS2	-	3.5016294	-	8.4277614	-	3.1814800	-	4.4133900
	0.4963152	6	5.8212296	8	0.1101022	1	4.7401006	2
DDX54	-	5.7227857	-	8.240563	-	3.6420588	-	0.7211962
	0.6223627	7	5.7962904		0.1039578	3	3.8211346	2
GUF1	-0.361682	4.2425519	-	7.9883332	-	4.5546471	-	1.6454933
		9	5.7373479	4	0.1175696	6	4.0739584	7
PRKACB	-	7.4619994	-	7.9759698	-	6.1345967	-	1.3596569
	0.6129244		5.7288252	7	0.1742403	2	3.9982587	9
EIF2A	-	4.7482085	-	7.5258558	-	4.9900903	-	-
	0.5162289	5	5.6420787	1	0.1104349	3	3.1588309	1.4922723
ATR	-	3.9681236	-	7.1590744	-	6.3159582	-	1.8872089
	0.4350475	6	5.5541185	2	0.1027169	9	4.1356458	1
CMAS	-	5.1796236	-	6.3265405	-	3.6230251	-	0.8314018
	0.3725896	9	5.3798243	3	0.1217745	9	3.8498455	
VPS50	-	4.0182789	-	6.1778862	-	5.1435287	-	1.1201668
	0.3720559	2	5.3364834	2	0.1443472	9	3.9355406	7
RNF14	-	5.5276473	-5.307992	6.0050605	-	5.9107286	-	-
	0.2971688	8			0.1105381	2	3.2684889	1.1554796
INPP4B	-	3.3085759	-	5.8862094	-	6.8861246	-	0.6874575
	0.4766541		5.2582212		0.1427607	6	3.8135262	9
FASTKD2	-	3.8394071	-	5.8792797	-	4.3348962	-	0.8811352
	0.3781865	8	5.2662367	9	0.1140905	6	3.8691406	6
RAD17	-	3.7359486	-	5.8649086	-	3.8211207	-	1.1919074

	0.3405594	3	5.2601767	3	0.1004101	7	3.9502526	3
TMX3	-0.4077575	4.5747305 1	-5.2280559 2	5.6666774 1	-0.1444362	5.7899544 1	-3.556491	-0.2216501
UBA5	-0.330054	4.4443971 1	-5.2165676 1	5.6246077 1	-0.1256377	4.3082844 7	-3.6755452	0.1915859 3
GLS	-0.8268136	6.0768890 1	-5.1789609 1	5.4553428 1	-0.1270848	7.3962905 4	-3.8913391	0.9768016 9
UBE2K	-0.3748989	5.7589809 9	-5.1584967 1	5.3531595 1	-0.1048015	5.5846416 1	-4.121756	1.8278843 5
HNRNPA1L 2	-0.5459163	1.3461147 1	-5.010285 6	4.9658762 6	-0.1380334	1.8549508 4	-3.6229098	0.0994843 2
AKAP11	-0.5264996	7.4459497 7	-5.0016558 8	4.7383436 8	-0.1134172	6.2113299 5	-4.1671993	2.0095368 8
RFESD	-0.6733892	0.3678399 7	-4.9485499 4	4.7113854 4	-0.139174	1.8629961 7	-3.6896434	0.3303805 2
LMBRD2	-0.4089118	5.2489776 2	-5.0018362 5	4.6751443 5	-0.1049569	5.2400142 7	-3.1869972	-1.4086799
BYSL	-0.442086	2.6411721 4	-4.8984777 2	4.4145549 2	-0.1064521	1.3722681 7	-3.7942947	0.7015954 4
SMPD3	-1.1371236	5.2173846 1	-4.9220783 2	4.3453819 2	-0.2362657	2.3549567 5	-2.8991075	-2.1339191
MTX3	-0.4058627	4.7493897 4	-4.9139768 3	4.3126385 3	-0.1340963	4.5002233 8	-4.5806518	3.7057131 6
PIGK	-0.4381327	4.4824008 2	-4.8335829 2	3.9862802 2	-0.1310124	4.1350399 7	-3.1918556	-1.3770359
PEX3	-0.2830018	3.2629031 4	-4.7262099 3	3.6519505 3	-0.1059603	3.0331140 2	-2.8893491	-2.2002612
C10orf88	-0.3983976	2.7041221 4	-4.7090442 9	3.6321127 9	-0.1023879	2.8774187 9	-3.782943	0.6160480 8
CYP51A1	-0.441424	5.4843233 9	-4.7228133 4	3.5127877 4	-0.1244877	3.4521473 6	-4.1998348	-2.156422
MASTL	-0.5197723	1.7097253 9	-4.6188453 8	3.3636507 8	-0.1344565	3.1814245 7	-3.7411913	0.4573577 1
DDB1	-0.2955233	7.3477384 4	-4.6413448 8	3.2419769 8	-0.1013947	6.7611741 3	-3.816699	0.6965051 6
MAD1L1	-0.3688195	4.5726220 8	-4.6465446 4	3.2186700 4	-0.1242587	4.9199678 5	-4.1385321	1.8906873 2
SLC25A36	-0.256509	5.2542331 2	-4.6031707 1	3.0275834 1	-0.1294055	5.4525949 5	-3.4365578	-0.621738
HDAC9	-0.4105841	3.7434780 9	-4.5619834 4	2.9442489 4	-0.1607946	5.1439233 4	-4.2485459	2.3259808 5
GPR180	-0.3915441	4.1601293 6	-4.4667926 4	2.5284562 4	-0.1316566	3.6348872 1	-3.3532861	-0.8609107
KBTBD8	-0.5948642	1.2982267 1	-4.2849024 6	2.1128951 6	-0.1943556	2.8701100 2	-3.2926149	-1.009406
KCNIP2	-1.0555365	6.8333725 4	-4.327559 8	2.0075860 8	-0.1230692	0.8070435 5	-2.9766406	-1.8233885
MSMO1	-0.3981133	5.0336061 8	-4.3114047 8	1.8908436 8	-0.1429173	3.4950713 8	-4.6539037	4.0346434
ZNF253	-0.4435558	3.3501709 4	-4.2660772 4	1.8372199 4	-0.1105058	3.1914285 3	-3.1685523	-1.4093103
TIAM1	-0.4353962	5.7896638 3	-4.2499473 9	1.6618014 9	-0.1146366	5.7171769 4	-3.6898111	-0.233515
FANCM	-0.5472145	1.7754693 3	-4.1601432 9	1.6143291 9	-0.1047499	3.6806806 4	-3.0861511	-1.6774467
GNL3	-0.2594439	4.3032484 5	-4.1910922 4	1.4696215 4	-0.1092296	4.0331310 8	-2.9178729	-2.1709815
RRN3	-0.2946601	4.7555239 1	-4.169534 1	1.3629871 1	-0.1081872	4.7063806 2	-4.3873448	2.8915033 3
ABHD10	-0.2881329	5.0909334 1	-4.1375951 8	1.2369045 8	-0.1011365	4.2709453 4	-2.8953262	-2.2403562
CARNMT1	-0.5761554	3.8531545 8	-4.117124 7	1.2213418 7	-0.1330236	4.1952306 8	-4.0884628	-1.7073688 5
POLR2K	-0.2692325	4.7947812 5	-4.0992527 4	1.1037545 4	-0.1864581	2.2334167 9	-2.8125671	-2.3380171

PTGFRN	- 0.3435296	3.9364540 4	-4.065471	1.0299013 5	-0.14842	0.6271511 7	- 3.1667123	- 1.2816309
CAMK4	- 1.0901732	6.1106955 6	- 4.0723525	1.0263655 5	- 0.1348785	6.5767117	- 3.2936805	- 1.0657188
DCLRE1A	-0.337379	3.0480456 1	- 4.0331152	1.0164151 5	-0.148264	2.7205126	- 3.8460666	0.8484883 1
GNPDA2	- 0.3079074	4.0905036 6	- 4.0551613	0.9841686 2	- 0.1407313	3.4089656 1	- 3.4667775	- 0.4833467
ACTR6	- 0.2440661	4.3450252 7	- 4.0511152	0.9553216 7	- 0.1309265	3.2225340 8	-2.822135	- 2.3906689
AP1S2	- 0.3182818	5.3916762 4	- 4.0272584	0.8328940 8	- 0.1530131	6.1214499 6	- 3.0841074	- 1.7094193
NUFIP1	- 0.2248647	3.0114588 4	- 3.9665984	0.7872809 4	- 0.1074933	1.0649605 5	- 3.2632671	-1.010444
IQCB1	- 0.2873373	3.3297432 7	- 3.8922716	0.4880649 1	- 0.1058493	4.5299901 4	- 3.4028865	- 0.7278816
PYROXD1	- 0.3231701	3.3356478 2	- 3.8378895	0.3028378 5	- 0.1248786	4.6360170 2	- 3.6772566	0.1923968 3
APBB1	-0.283494	7.6359988 9	- 3.7958944	0.1015047 9	- 0.1071791	3.4382384	- 3.1737583	- 1.4129475
UFL1	- 0.2674902	4.7855425 1	-3.756682	-0.106195	- 0.1304829	5.0200594	-3.603169	- 0.0651165
GSPT2	- 0.3308586	3.4104980 7	- 3.7185096	- 0.1290513	- 0.1048634	1.6447005 4	- 3.1731446	- 1.3049073
VRK1	- 0.3238165	3.0017656 7	- 3.6533337	- 0.2844984	- 0.1268844	4.1983324	- 3.1592713	- 1.4745472
ARMC1	- 0.2547541	5.2103608 6	- 3.6805165	- 0.3750221	-0.126376	4.0160807 9	- 4.5832291	3.7226606 1
UFM1	- 0.2244474	5.4663383 1	-3.671433	- 0.4059985	- 0.1371275	5.2826711	-3.379257	- 0.8063862
PLD4	- 0.7685637	2.3259599 3	- 3.5617587	- 0.5239198	- 0.1425135	2.3645060 1	-3.123693	- 1.4988182
HCFC2	- 0.2636744	3.8920161 4	- 3.5753018	- 0.6504562	- 0.1160473	4.5301445 4	- 3.7515094	0.4551789 3
RANBP6	- 0.2936844	4.3430805 5	- 3.5797984	- 0.6768922	- 0.1345372	4.5126860 4	- 3.0590417	- 1.7802813
NUS1	- 0.2682584	4.7990650 8	- 3.5629016	- 0.7567325	- 0.1407978	4.5402134	- 4.0194444	1.4379078 9
LINC00920	- 0.9934214	- 1.5438552	- 3.3761669	- 0.7847601	- 0.2059161	1.1162717	- 3.4947249	- 0.2939671
PDIK1L	-0.2741	2.8635201	- 3.4055621	-1.064069	- 0.1364335	3.1714044 8	- 3.1081714	- 1.5842215
BANK1	-0.466771	0.6086434 6	- 3.2044646	- 1.3810434	- 0.1678923	5.0494284 7	- 2.9689978	- 2.0490408
RGS5	- 0.5205375	7.1027703 3	- 3.3353576	- 1.4234292	- 0.1142406	2.3166842 5	- 3.5223062	-0.255192
ZNF510	- 0.3004448	3.8467924 7	-3.311436	- 1.4834793	- 0.1146862	4.2978052 6	- 3.3300149	- 0.9547247
ABCD2	- 0.4294407	3.0448627 9	- 3.2396547	- 1.5999124	- 0.1997917	4.8177847	- 4.1745211	2.0360530 8
HOOK1	- 0.5768608	3.3724593 9	- 3.2281987	- 1.7036287	- 0.1603603	2.6817682 6	- 3.1075986	-1.563664
RHO	- 0.4601396	6.4726083 4	- 3.2327678	- 1.7687609	- 0.1278274	3.9077674 7	- 3.7945951	0.6215895 4
NAA30	- 0.2155197	4.8033362 5	- 3.1993992	- 1.8892428	-0.11197	4.8134665 6	- 4.0821328	1.6746264 3
GCNT4	- 0.3682357	2.5914798 3	- 3.1097844	- 1.8927808	- 0.1280283	4.1271614 7	-3.116982	-1.605077
NOLC1	- 0.1715248	6.0193379	- 3.1916856	- 1.9123873	- 0.1172553	3.8450568	- 5.1017674	6.0617599 6
MAPK11	- 0.2782645	5.1183696 8	- 3.1202218	-2.129896	- 0.1214169	0.5255956 3	- 2.9460344	- 1.8842135
TOP2B	- 0.2066415	6.6540751 7	- 3.0961102	- 2.1684847	- 0.1039887	6.979627	- 3.4300787	- 0.6251515
CYBB	-	3.2793974	-	-	-	8.9007596	-	-

	0.6226288	8	3.0253965	2.2519394	0.1187951		3.4294075	0.5899934
PFKL	- 0.2453058	7.2680372 1	- 3.0143754	- 2.3669941	-0.123483	5.5411367 9	- 4.0104394	1.3994183
ZDBF2	- 0.4118508	4.7056966 4	- 3.0188227	- 2.4122537	- 0.1471223	3.1768815	- 2.8553295	- 2.3028441
MAGOHB	- 0.2318547	2.6746802 9	- 2.9219001	- 2.4412382	- 0.1005332	3.4349964 8	- 3.3372855	-0.904112
ARL14EP	- 0.2128445	4.2651789 7	- 2.9558701	- 2.5578916	- 0.1057783	4.8471086 4	- 2.7954784	- 2.5236764
ZFAND1	- 0.1951828	3.8645315 9	-2.923679	-2.602851	- 0.1156806	3.7235959 9	- 2.9369254	- 2.1039278
ANO9	- 0.7821603	- 1.1587185	- 2.6612421	-2.658677	- 0.1449803	3.3812509 4	- 3.4763438	-0.457827
LRRC8C	- 0.2743054	3.9119781 9	- 2.8958086	- 2.6956788	- 0.1185668	6.0743781 8	- 4.7075147	4.2576447 1
TMEM237	- 0.2494979	4.1927077 7	- 2.9013007	- 2.6986524	- 0.1002588	1.6081126 5	- 2.7998723	- 2.3461115
LIPA	- 0.4228854	6.0760278 2	- 2.8641993	- 2.8340805	- 0.1184774	5.2418515	- 3.2795799	- 1.1258005
HNRNPA1	- 0.2319838	8.8257255 1	- 2.7646029	- 2.9571463	- 0.1345366	7.8424693 3	- 3.2658716	-1.128353
TTC37	- 0.1812951	5.4231174 9	-2.822148	- 2.9647472	- 0.1288099	6.1071067 5	- 4.2881485	2.4897390 7
RAP2A	- 0.1802798	6.4287821 8	- 2.7884524	- 3.0269678	- 0.1475737	5.2571299 9	- 3.5608812	- 0.2083105
PTPRO	- 0.6120892	3.5122301 4	- 2.7543873	- 3.0525377	- 0.1270799	3.4760382 2	-3.076048	- 1.6979978
SACS	- 0.3848039	5.9955793 5	-2.753789	- 3.1284885	- 0.1750298	5.5533762 5	- 3.9321105	1.1080920 5
EIF1AX	- 0.1699588	6.5761475 2	- 2.7192377	- 3.2020905	- 0.1419695	4.7236116 3	- 3.3713419	- 0.8277733
CPSF6	- 0.1850223	5.4910384 3	-2.730869	- 3.2028657	- 0.1220306	6.2215302 1	- 3.3107144	-1.019133
CSTF3	- 0.1364267	4.1428529 2	- 2.6686148	- 3.3064362	- 0.1222783	4.2907752 1	- 4.6195774	3.8753305 9
BBS10	- 0.2470211	3.8513801 6	- 2.5810004	- 3.5016504	- 0.1013437	3.9071169 4	- 2.8531422	- 2.3436153
COPS2	- 0.1693054	5.3504937 5	- 2.5665265	- 3.6178706	- 0.1692651	4.7799238 2	- 3.5730442	- 0.1650924
CD101	- 0.2815076	0.3036373	- 2.2965495	- 3.6195646	- 0.1653779	3.8408589	- 3.4668363	- 0.5055886
SDAD1	- 0.1510018	4.6967035 3	- 2.5292607	- 3.6911025	-0.123233	4.4335714 3	- 4.5669224	3.6478435 5
MANEA	- 0.2217909	3.0565865	- 2.3508314	- 3.9254961	- 0.1048025	3.8260134 1	-2.766892	- 2.5736907
ZGPAT	- 0.2314651	4.1248543 6	- 2.3763419	- 4.0060934	- 0.1042084	4.9030838 7	- 3.6081161	- 0.0513515
USP12	- 0.1533821	5.5988782 3	- 2.3970404	- 4.0182409	- 0.2070793	6.2657707	- 4.4061389	2.9724199 7
XPO4	-0.168079	4.1327166 6	-2.361576	- 4.0450971	- 0.1087886	5.6303332	- 4.8309946	4.8060494 9
CAND1	- 0.1337579	6.4460812 5	- 2.3698664	- 4.0527041	- 0.1050273	6.3854788 5	- 4.2338915	2.2745754 4
NMD3	- 0.1681623	4.7687312 7	- 2.3721834	- 4.0590757	- 0.1121066	4.1957079 8	- 2.8123516	- 2.4643655
RAPH1	- 0.3802571	3.9653315 2	- 2.3275984	- 4.1189278	- 0.1242628	2.8050322 7	- 3.7092428	0.3566407 5
ITGB3BP	- 0.2148429	2.9437641 2	- 2.2017694	- 4.2267858	- 0.1059058	3.2042254 7	- 2.8037222	- 2.4422138
C12orf29	- 0.1665184	4.5513712 9	-2.273997	- 4.2720511	- 0.1245943	3.716546	- 3.3724442	-0.799945
SLITRK4	- 0.3105543	4.6672046	- 2.2625029	- 4.3044226	- 0.1382963	2.2576860 9	- 3.0718828	-1.63776
DIAPH2	-0.302248	4.2055696	- 2.2440757	- 4.3190007	- 0.1029193	5.2607289	- 4.0207256	1.4381758

MPP6	-0.234575	5.3453701	- 2.2618083	- 4.3212672	- 0.1111172	4.1471955 9	- 3.2664268	- 1.1526961
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[000263] Genes, markers or RNA markers were identified that are up regulated or down regulated or their expression or activity are altered and increased or decreased in both blood and caudate of PD patients with dementia (PDD) at a certain absolute log level readout cut off. These genes or markers are identified as decreased, down or downregulated genes, a gene or RNA whereby expression of the gene or the amount of RNA for that gene is reduced, decreased or less with PD with dementia or increased or upregulated genes, a gene or RNA whereby expression of the gene or the amount of RNA for that gene is increased, higher or raised with PD with dementia. The table below, TABLE 27, provides 48 genes.

TABLE 27

Blood - Cau-PDD and Blood MOCA 26 absolute log FC (Up/Down)

B.Blood	3.4352968 ⁻	1.8916294 ⁻	3.8852084 ⁻	2.2428089 ⁻	3.5620609 ⁻	-4.275619	2.6433517 ⁻	4.4113539 ⁻	2.6811029 ⁻	2.1620528 ⁻
adj.P.Val. Blood	0.0381606 ²	0.0110054 ⁶	0.0518342 ²	0.0195884 ⁹	0.0403994 ⁶	0.0745111 ⁵	0.0378191 ⁶	0.0742890 ⁹	0.0210108 ⁹	0.0288943 ³
P.Value. Blood	0.0047744 ⁸	0.0008281 ²	0.0074468 ¹	0.0017948 ⁶	0.0051681 ⁵	0.0131131 ³	0.0047105	0.0130531 ⁶	0.0019758 ¹	0.0031162 ⁵
t.Blood	2.8323721 ⁻	3.3601487 ⁻	2.6852422 ⁻	3.1361773 ⁹	2.8066043 ⁻	2.4880476 ⁻	2.836741	2.4896942 ⁻	3.1074362 ⁻	2.9679903 ⁵
AveExpr. Blood	3.1616307	6.2212504 ⁸	6.6724448	0.4259098	6.5647562 ²	2.4730300 ¹	1.8443413 ⁻	5.2215279 ¹	3.9025580 ³	1.9450525 ⁻
logFC. Blood	0.0876008 ⁻	0.0512806 ⁻	0.0830225 ⁻	0.1787049	0.0840963 ⁻	0.0857985 ⁻	0.2453601 ²	0.0619161 ⁻	0.0930492 ⁻	0.26495
B.Cau	3.7470222	2.7963245 ⁷	2.6880527 ⁵	2.5312117 ³	2.3894307 ⁷	2.3873632 ²	1.9570154	1.9295496 ⁴	1.8886931 ⁷	1.6617143 ⁴
adj.P.Val. Cau	0.0145027 ⁴	0.0224335 ⁴	0.0224335 ⁴	0.0238367 ⁷	0.0240388 ³	0.0240388 ³	0.0354441 ³	0.0354441 ³	0.0354441 ³	0.0354441 ³
P.Value. Cau	5.30E-06	1.62E-05	1.76E-05	2.18E-05	2.56E-05	2.56E-05	4.14E-05	4.27E-05	4.46E-05	5.74E-05
t.Cau	4.7475176 ⁻	4.4776537 ⁻	4.4576825 ⁻	4.4043455 ⁻	4.3641671 ⁹	4.3637487 ⁻	4.2426962 ⁻	4.2349315 ⁻	4.2233861 ⁻	4.1583959 ⁻
AveExpr. Cau	3.3214777 ⁸	7.2163136 ⁹	9.0030559 ³	7.2110427 ²	6.5650336 ⁹	6.8146087 ³	5.8941781	5.0613740 ¹	5.3240604 ²	5.7790376 ⁴
logFC. Cau	0.6560987 ⁻	0.6034133 ⁻	0.5209112 ⁻	1.3099174 ⁻	0.5888757 ⁷	0.6262557 ⁻	0.8214278 ⁻	0.4318268 ⁻	0.4153983 ⁻	1.3770837 ⁻
ID	TRAPPC6 ^A	ZKSCAN1	NUCKS1	SLCO1A2	CAPN2	PELP1	SH3GL3	NFATC2 ^P	STAG3	PPP1R14 ^A

1.7144511	-	4.6327644	-	4.7312233	-	3.8123096	-	3.9420423	-	4.5596412	-	-2.748705	-	3.9933251	-	4.2812606	-	4.1607753	-	0.9523697	-	4.5338414	-
0.0205244	6	0.0887777	3	0.0955391	8	0.0481194	6	0.0609737	4	0.0886446		0.0261542		0.0564246	8	0.0740875	7	0.0624075	9	0.0082051	8	0.0816574	4
0.0019096	6	0.0171459	9	0.0191155	1	0.0066735	4	0.0096019	3	0.0170953	6	0.0026999	6	0.0085118	5	0.0129761	1	0.0099230	7	0.0005597	5	0.0150141	9
3.1176512	2	-	-	-2.349582		2.7221253	-	2.5981307	-	2.3912671	-	3.0124453	4	2.6397159	-	2.4918201	-	2.5866855	-	3.4689211	8	2.4390159	-
-2.395465		4.0345201	4	4.1624028	3	5.1882219	9	1.8606760	3	2.9565202	3	1.3548872	2	7.0511595	3	2.6837448	5	4.4447479	4	0.5891868	-	5.2146992	
0.3255379	4	0.0364924	-	0.0731729	-	0.0741963	-	0.0843905	-	0.0545798	-	0.1689787	6	0.1202614	-	0.0566996	-	0.0729939	-	0.1627941	2	0.0730387	-
1.3647901	6	1.1776903	2	1.1133239	2	0.9802318		0.6310261	9	0.5912557	7	0.5820539	5	0.4678219	6	0.4431091		0.0673305		0.0393557	5	0.0319260	9
0.0402797	5	0.0436806	7	0.0436806	7	0.0438806	8	0.0436806	7	0.0601414	5	0.0601414	5	0.0655156	8	0.0655156	8	0.0749689	3	0.0749689	3	0.0749689	3
7.99E-05		9.85E-05		0.0001060	2	0.0001225	4	0.0001131	1	0.0001895	4	0.0001923	8	0.0002184	4	0.0002273	1	0.0003428	4	0.0003610	4	0.0003584	5
4.0724038	-	4.0172671	-	3.9977513	-	3.9591451	-	3.9805254	3	3.8412583	-	-3.837195		3.8023595	4	3.7913942	-	3.6769037	-	3.6623189	-	3.6643545	3
5.5551210	7	6.2232860	3	4.6356106	5	5.3778306		0.7121359	4	4.9485078	3	6.7736456	7	3.0382536	1	3.6085526	3	6.6446286	5	3.3840331		4.3682763	5
1.5165129	-	0.5558087	-	0.4009313	-	0.3571693	-	0.9928019	3	0.4307495	-	0.6670602	-	0.3918718	4	0.4320336	-	0.5427959	-	-0.602916		0.49136	
CTNNA3		PAAF1		LINC0118	4	ARFRP1		DLEU2L		MMAB		PHACTR3		OXNAD1		GPATCH3		BRD3		RHBDL2		SFMBT2	

3.7192934	-	2.2882524	2.87E-05	-4.696667	2.0751542	-	3.0694732	3.4124076	-	2.8427518	-	4.6132234	-	3.0470298	-	3.9659721	-	2.9412189	-
0.0462546 2	0.0150144 2	0.0049977 1	0.0944011 6	0.0126220 6	0.0330600 2	0.0610277 9	0.0300409 8	0.0933797 9	0.0283346	0.0540335	0.0253436 4								
0.0062737 7	0.0012569 8	0.000298	0.0188071 7	0.0009963 8	0.0038243 7	0.0096154 6	0.0033400 3	0.0185002 3	0.0030490 6	0.0079471 9	0.0025867 7								
2.7427315	-	3.2409162	3.6382284 4	2.3556865	3.3077394	-	2.9035476 6	2.5976415 7	2.9462935 8	2.3618512	2.9747832	-	2.6631713	-	3.0256181	-			
3.7438372	5.4427208 7	-	2.7946691	7.0432906 1	4.9162485 2	1.4558404 9	1.1292602	-	0.7398058 6	2.8472509	3.4335196 8	5.3017417 8	4.2728381 5						
0.0704514	-	0.0731574	0.4445835 5	0.0565511	0.0714243	-	0.1077163 5	0.1596030 6	0.1202276 4	0.0823502	0.0893905	-	0.1200753	-	-0.063989				
0.0110783 3	-	0.0134303	0.0602035	0.1469071	0.1946385	-	0.2367455	0.2378594	0.2809467	0.3425663	0.3612462	-	0.3674791	-	0.4303976	-			
0.0749689 3	0.0749689 3	0.0756436 4	0.0756436 4	0.0758421 6	0.0758421 6	0.0749689 3	0.0758421 6	0.0766120 3	0.0780303 3	0.0780303 3	0.0787306 3								
0.0003626 5	0.0003741 7	0.0004025 5	0.0004345 3	0.0004610 6	0.0004793 8	0.0003816 6	0.0005044 6	0.0005449 4	0.0005654 6	0.0005779 1	0.0005956 3								
3.6610604	-	3.6522222	3.6314907	3.6097246 5	3.5927881	-	3.5816209 9	3.6466096 4	3.5669723	3.5447116	3.5340219 4	-3.527708	3.5189434						
5.6283304 6	4.8062328 7	8.0247794 2	6.1894451 8	6.5727002 4	5.5023915 9	0.9746886 1	5.3785849 4	4.5491316 4	4.0316160 2	2.9907928 3	5.2890303 4								
0.4143713	-	0.4977666	0.8953086	0.3604090 9	0.5154758	-	0.8791991 7	1.0453824 5	1.0193772	-	0.4089177 2	-	0.7730771	-	0.3067089	-			
CES2	DCAF16	AIIFL	G3BP1	RTF1	HSPA4L	SYPL2	LDB3	ZNF500	NOP2	PRKCQ-AS1	CRYZL1								

1.0744409	-	2.8853227	-	0.6832275	7	3.9704464	-	3.0967705	-	4.2951779	-	11.404500	8	3.8022719	4	0.0984288	9	4.2570106	-	3.093076	-	3.7104688	-
0.0096333	8	0.0252102	8	0.0012245		0.0971084	5	0.0291112	7	0.0719789	1	5.00E-07		0.0001301	7	0.0039087	2	0.0676955	4	0.0002723	6	0.0521158	3
0.0006912	2	0.0025670	9	5.27E-05		0.0196361	4	0.0031677		0.0124333	8	1.43E-09		3.77E-06		0.0002181	5	0.0112150	9	8.80E-06		0.0075249	4
3.4106923		-3.027963		-		2.3394674	2	-		2.5071191	-	6.1480179	8	4.6666445	3	3.7195759	6	-		4.4831223	5	-	
0.9465773	-	3.3081810	6	4.5478157	8	1.4423829	-	3.5695366	5	3.1891487	1	1.5791025	-	1.1868616	-	1.5295395	-	6.5243051	5	-1.672694		1.9276163	4
0.1876258	9	0.0559896	-	0.1546062	-	0.1631060	8	-0.078329		0.0673533	-	0.4387780	2	0.3995105	1	0.3355822	3	0.0700606	-	0.3754563	6	0.0786162	-
0.4859553	-	0.4973126	-	0.4977446	-	0.6775824	-	-0.678191		-0.702182		0.7240409	-	0.7313727	-	0.7391366	-	0.7921604	-	0.8321284	-	0.8442114	-
0.0796349	6	0.0798414	4	0.0796349	6	0.0756436	4	0.0906314		0.0906314		0.0906690	9	0.0913338	4	0.0913338	4	0.0922729	6	0.0954458	5	0.0961780	7
0.0006401	5	0.0006486	2	0.0006429		0.0004187	7	0.0008296	2	0.0008329	2	0.0008378	7	0.0008743	7	0.0008764	7	0.0009164	7	0.0009789	3	0.0009962	1
3.4979558	-	-3.494119		-		3.4967049	-	3.4217266		3.4205502	4	3.4187934	-	3.4061299	-	3.4054172	1	3.3921278	-	3.3724265	-	3.3671849	-
4.5943248	8	4.5814702	8	5.3689517	8	0.7041655	-	2.6704811	4	4.0579484	8	4.6923023	6	2.3795741	8	3.8142327		7.2028832	6	8.3883172	8	3.5056660	9
0.5100881	-	0.3166335	-	0.6218352	-	1.3352084	-	0.5276611		0.3986385	6	-0.566064		0.6991908	-	0.4514803	3	0.4758651	-	0.8649301	-	0.4240457	-
TMEM150	C	DHX33		ENOSF1		LINC0048	6	URB2		TSFM		RBP1		MYH15		PRKD1		FNBP1		FGF1		PGAP2	

3.7613046	-	2.5565749	-
0.0464658	3	0.0262947	4
0.0063248		0.0027250	2
2.7400361	-	3.0095966	2
4.6919694	2	0.3776669	6
0.0979414	-	0.1991861	3
0.9357044	-	1.3096022	-
0.0988797	2	0.0756436	4
0.0010807	6	0.0004289	1
3.3427016	-	3.6134416	-
7.2227636	4	2.3152552	-
0.3906567	-	1.5988536	-
SMARCA4		DTL	

[000264] Genes, markers or RNA markers were identified that are up regulated or down regulated or their expression or activity are altered and increased or decreased in both blood and caudate of PD patients with dementia (PDD) at a certain absolute log level readout cut off. These genes or markers are identified as decreased, down or downregulated genes, a gene or RNA whereby expression of the gene or the amount of RNA for that gene is reduced, decreased or less with PD with dementia or increased or upregulated genes, a gene or RNA whereby expression of the gene or the amount of RNA for that gene is increased, higher or raised with PD with dementia. The table below, TABLE 28, provides 53 genes.

TABLE 28

Blood - Cau-PDD and Blood MOCA 23 absolute log FC (Up/Down)

B.Blood	0.81177151	-0.5508144	-4.4337454	-0.6265108
adj.P.Val. Blood	0.00052327	0.00202315	0.05127544	0.0030771
P.Value. Blood	4.82E-05	0.00027929	0.01510503	0.000469
t.Blood	-4.0994225	3.65942399	-2.438157	3.52084758
AveExpr. Blood	3.16463147	0.43066884	2.48450712	-1.8512601
logFC. Blood	-0.1819437	0.31399267	-0.1224282	0.48357037
B.Cau	3.7470222	2.53121173	2.38736322	1.9570154
adj.P.Val. Cau	0.01450274	0.02383677	0.02403883	0.03544413
P.Value.Cau	5.30E-06	2.18E-05	2.56E-05	4.14E-05
t.Cau	-4.7475176	-4.4043455	-4.3637487	-4.2426962
AveExpr. Cau	3.32147778	7.21104272	6.81460873	5.8941781
logFC.Cau	-0.6560987	-1.3099174	-0.6262557	-0.8214278
ID	TRAPPC6A	SILCO1A2	PELP1	SH3GL3

-3.0341284	-4.9649223	-3.8800238	-1.8854166	3.63865895	-3.0680541	-3.9228833	-1.881037	-5.0806933	-1.979547
0.01331124	0.08764946	0.06352831	0.01027635	0.00011754	0.0134351	0.02873812	0.00577534	0.08429173	0.00567497
0.00283021	0.02981622	0.01981974	0.00207221	5.95E-06	0.00286301	0.00735736	0.00101399	0.02834958	0.000992
-3.0002751	-2.1786725	2.33715562	3.09569331	4.57670884	-2.9967009	-2.6910865	3.3058597	-2.1987147	-3.3121323
3.90872987	2.02874538	-1.9418463	-2.3890482	-4.1746763	5.18948867	5.4960161	1.35791963	3.84247728	2.67974948
-0.1376134	-0.1031861	0.31525452	0.49090244	1.01943111	-0.1161046	-0.1515353	0.27527613	-0.0785782	-0.1032146
1.88869317	1.69364892	1.66171434	1.36479016	1.29650138	0.9802318	0.75869325	0.58205395	0.50662701	0.4431091
0.03544413	0.03544413	0.03544413	0.04027975	0.04050548	0.04388068	0.05389467	0.06014145	0.06467577	0.06551568
4.46E-05	5.45E-05	5.74E-05	7.99E-05	8.65E-05	0.00012254	0.00015871	0.00019238	0.00021017	0.00022731
-4.2233861	-4.1719803	-4.1583959	-4.0724038	-4.0514273	-3.9591451	-3.8895294	-3.837195	3.8129677	-3.7913942
5.32406042	3.51573504	5.77903764	5.55512107	7.28926452	5.3778306	7.75256717	6.77364567	4.29559866	3.60855263
-0.4153983	-0.7618758	-1.3770837	-1.5165129	-1.4218243	-0.3571693	-0.5257572	-0.6670602	0.45397784	-0.4320336
STAG3	CHAF1A	PPP1R14A	CTNNA3	OPALIN	ARFRP1	MYO18A	PHACTR3	THAP1	GPATCH3

-4.6431435	-5.0313393	-4.3222019	-3.2719596	0.32612173	-4.2122049	-4.5141499	-2.2334368	-1.1491108	-3.6324319
0.06529719	0.07890862	0.0708633	0.01659962	0.00149966	0.04740173	0.04903973	0.00784163	0.00446352	0.02748743
0.02052449	0.02605569	0.02280502	0.00371572	0.00018987	0.01373644	0.01432278	0.0014814	0.0007423	0.00695782
-2.3239199	-2.2319363	2.28365299	-2.9148813	3.75980933	-2.4727108	-2.45755	3.19580247	3.39418572	2.70993207
1.98704775	4.44404636	-0.5985947	3.74070982	-2.7766613	1.36096084	4.91381933	1.45561024	-1.115797	1.42792189
-0.1592059	-0.0915904	0.16640004	-0.1047253	0.71642899	-0.1407375	-0.0769823	0.17777179	0.31154791	0.14483844
0.06912476	0.0673305	0.03935575	0.01107833	-0.0602035	-0.171608	-0.1946385	-0.2367455	-0.2378594	-0.2578022
0.07496893	0.07496893	0.07496893	0.07496893	0.07564364	0.07584216	0.07584216	0.07584216	0.07496893	0.07593626
0.00034005	0.00034284	0.00036104	0.00036265	0.00040255	0.00045738	0.00046106	0.00047938	0.00038166	0.00050894
3.67920759	-3.6769037	-3.6623189	-3.6610604	-3.6314907	3.59508168	-3.5927881	3.58162099	3.64660964	-3.5644268
5.54623952	6.64462865	3.3840331	5.62833046	8.02477942	3.87291191	6.57270024	5.50239159	0.97468861	9.43075715
0.89433711	-0.5427959	-0.602916	-0.4143713	-0.8953086	0.74842406	-0.5154758	0.87919917	1.04538245	-1.509916
PYGM	BRD3	RHBDL2	CES2	ALFIL	KLHL25	RTF1	HSPA4L	SYPL2	MOBP

-4.8866161	-2.5606956	-4.0847907	-2.4888942	-4.2445217	-4.5090144	-0.8638331	-2.9344904	0.05887337	-1.3053016
0.0938491	0.00984665	0.0463149	0.00870863	0.04022578	0.05178391	0.00451481	0.01219467	0.00213533	0.00497908
0.03259644	0.00196282	0.01332333	0.00168847	0.01116619	0.01530364	0.00075416	0.00253922	0.00029854	0.00084912
2.14290567	3.11204826	2.48374029	-3.1570879	-2.546802	-2.4333746	3.38974272	3.03376157	3.64184894	3.35634799
0.73626695	2.0367136	0.54946614	2.85024321	3.4429438	3.23392594	-2.8197642	3.79159175	-4.1666048	-0.9481255
0.13112863	0.12771931	0.16474061	-0.1577933	-0.1117464	-0.1499266	0.53037917	0.11062082	0.78600131	0.28405359
-0.2809467	-0.3222236	-0.3362788	-0.3425663	-0.3612462	-0.3731511	-0.3801452	-0.4178463	-0.4701901	-0.4859553
0.07584216	0.07661203	0.07661203	0.07661203	0.07803033	0.07803033	0.07496893	0.07865406	0.07584216	0.07963496
0.00050446	0.00054848	0.00053724	0.00054494	0.00056546	0.0005751	0.00033417	0.00059105	0.00049587	0.00064015
-3.5669723	-3.5428424	-3.5488254	-3.5447116	3.53402194	-3.5291211	3.6841174	3.52118186	-3.5719126	-3.4979558
5.37858494	3.22677437	2.19569237	4.54913164	4.03161602	7.96817694	0.13457945	4.80120736	0.58837908	4.59432488
-1.0193772	-0.5589791	-0.6127027	-0.4003702	0.40891772	-0.4749791	1.46468155	0.43969872	-1.2940938	-0.5100881
LDB3	SRD5A3- ASI	TMEM266	ZNF500	NOP2	NFIC	ACTRT3	NUDT9	BTBD16	TMEM150C

-3.6740226	-4.4502211	-1.9407374	-3.4811443	-2.6035724	-4.2906518	3.26286561	4.51446886	5.55722799	-3.2470807
0.02316173	0.09029571	0.00524414	0.01988086	0.01709447	0.0403906	0.00015717	5.65E-05	3.03E-05	0.03117712
0.00561028	0.03104078	0.00090441	0.00465936	0.00386651	0.01121889	9.25E-06	1.87E-06	5.73E-07	0.00816606
-2.7816298	2.16257967	3.33847073	-2.8423171	2.90223215	2.54513662	4.47972434	4.82344698	5.06510824	2.65560301
4.56667913	-1.3117026	2.99540452	3.80407457	-1.4311371	4.29068996	-4.6801453	-1.6040166	-1.1783188	-1.5392341
-0.1595806	0.27252658	0.17634345	-0.1026561	0.29947016	0.25300505	0.98781124	0.53044998	0.65650875	0.376492
-0.4977446	-0.5819979	-0.6016082	-0.6687414	-0.6775824	-0.7202038	-0.7236474	-0.7240409	-0.7313727	-0.7391366
0.07963496	0.08307927	0.08307927	0.08885871	0.07564364	0.0906314	0.09133384	0.09066909	0.09133384	0.09133384
0.0006429	0.00072145	0.00072555	0.00078778	0.00041877	0.00083174	0.00087197	0.00083787	0.00087437	0.00087647
-3.4967049	3.46294925	-3.4612871	3.43703831	-3.6202589	-3.4209696	-3.4069464	-3.4187934	-3.4061299	3.40541721
5.36895178	4.38856884	6.21495234	4.94128566	-0.7041655	6.38085998	3.20890702	4.69230236	2.37957418	3.8142327
-0.6218352	0.67395212	-0.9838412	0.77381484	-1.3352084	-0.4150394	-1.1360697	-0.566064	-0.6991908	0.45148033
ENOSF1	SH3BGR	GREM1	SLC25A25	LINC00486	AFDN	MIR219A2	RBP1	MYH15	PRKD1

-4.9467946	1.40080746	-3.2518965	-4.2871103	0.86143175	-4.0403815	-2.167067	-4.8522973	3.14746615
0.07624828	0.00054088	0.0188901	0.04006405	0.00110753	0.04768709	0.01572716	0.07062965	0.00016975
0.02498893	5.05E-05	0.0043663	0.01111285	0.00012881	0.01384513	0.00348259	0.02270435	1.03E-05
-2.2482575	4.0885932	-2.8632987	-2.5484944	3.85852486	2.46985758	2.93538983	-2.2853548	4.45555772
3.362548	-1.6714495	1.93393452	4.69698927	-4.5750822	0.35801154	-3.6974132	3.19614905	-4.3594749
-0.1092411	0.52432925	-0.121921	-0.1335792	0.79077021	0.24344861	0.55612676	-0.2022062	0.97006469
-0.8139141	-0.8321284	-0.8442114	-0.9357044	-1.077411	-1.3096022	-1.6783005	-1.7087178	-1.8632074
0.09227296	0.09544585	0.09617807	0.09887972	0.07661203	0.07564364	0.09833426	0.09833426	0.08223221
0.00092046	0.00097893	0.00099621	0.00108076	0.00053504	0.00042891	0.00105877	0.00106348	0.00070341
-3.3908314	-3.3724265	-3.3671849	-3.3427016	3.55001149	-3.6134416	-3.3488905	-3.3475557	-3.4703875
5.85003264	8.38831728	3.50566609	7.22276364	-1.1322599	-2.3152552	-1.8338551	-1.9181411	-2.9499333
-0.4661441	-0.8649301	-0.4240457	-0.3906567	1.25339907	-1.5988536	-1.2206087	-1.626028	-2.4177898
C7orf50	FGF1	PGAP2	SMARCA4	ANGPTL7	DTL	CCDC172	SELP	KRT83

[000265] Following up on the earlier dyskinesia data and Table 3, genes, markers or RNA markers were identified that are up regulated or down regulated or their expression or activity are altered and increased or decreased in both blood and putamen of PD patients with dyskinesia. These genes or markers are identified as decreased, down or downregulated genes, a gene or RNA whereby expression of the gene or the amount of RNA for that gene is reduced, decreased or less with PD with

dyskinesia or increased or upregulated genes, a gene or RNA whereby expression of the gene or the amount of RNA for that gene is increased, higher or raised with PD with dyskinesia. The table below, TABLE 29, provides 17 genes.

TABLE 29

Brain Put- Dyskinesia and Blood Dyskinesia absolute log FC (Up/Down)

B.blood	-0.784487	3.0762694	-	4.0683884	-	3.7640623	-	3.1792293	-	-1.542949	-	2.9872778	-	3.6017836	-	-3.817383
adj.P.Val. blood	0.9997846 4	0.9997846 4	0.9997846 4	0.9997846 4	0.9997846 4	0.9997846 4	0.9997846 4	0.9997846 4	0.9997846 4	0.9997846 4	0.9997846 4	0.9997846 4	0.9997846 4	0.9997846 4	0.9997846 4	0.9997846 4
P.Value. blood	0.0008717 9	0.0139539 3	0.0496142 3	0.0496142 3	0.0329611 9	0.0185487 7	0.0022180 2	0.0138059 2	0.0332612 4	0.0371053 5						
t.blood	3.3464232 8	2.4659633 -	1.9674083 1	2.1376878 -	2.3611631 2	3.0731447 1	2.4698218 9	2.1340246 1	2.0894364 6							
AveExpr. blood	1.3332214 7	6.4422460 1	3.5077716 2	4.1803430 9	0.5732636 2	1.3711738 7	1.8078445 2	0.4185722 5	3.1418956 5							
logFC. blood	0.1089936 1	0.1238484 -	0.0648502 7	0.1243676 -	0.1697390 6	0.2934241 5	0.0691668 5	0.0890475 2	0.0612498 2							
B.put	0.2080281	0.5393367 -	1.0821469 -	1.4080403 -	2.2076636 -	2.7792795 -	3.2999789 -	3.3726983 -	3.5287826 -							
adj.P.Val. put	0.1526916 5	0.2351588 5	0.2564065 3	0.2775840 4	0.3478054 1	0.4309939 7	0.4733141 9	0.5200593 6	0.4893501 6							
P.Value. put	0.0003004 2	0.0005806 2	0.0011317 3	0.0016535 2	0.0040357 5	0.0109268 3	0.0153331 7	0.0236497 8	0.0181899 4							
t.put	3.7345217 3	3.5441199 -	3.3439186 -	-3.226441 -	2.9374337 -	2.5892066 9	2.4630761 -	2.2948335 2	2.3977282 -							
AveExpr. put	1.9054436 7	5.9183123 2	3.6925161 2	3.7165758 5	1.9372252 -	0.3002274 7	3.1423035 8	0.2325926 6	3.7632328 2							
logFC.put	0.8651419 7	0.5463188 -	0.4022171 6	0.4947026 -	1.9532138 -	1.8780416 -	0.3762906 -	0.8663682 -	0.4188372 -							
ID	FTCDNL1	MAF1	THEM4	TSTA3	XKRX	KANSL1- AS1	NUDT15	LINC0026 9	TMEM80							

3.6851909	-	3.4263281	-	3.8742155	-	3.3539337	-	3.5232327	-	4.0101939	-	2.7917114	-	3.5918416	-
0.9997846	4	0.9997846	4	0.9997846	4	0.9997846	4	0.9997846	4	0.9997846	4	0.9997846	4	0.9997846	4
0.0365767	1	0.0232666	6	0.0372022	9	0.0209504		0.0238204	9	0.0445477	6	0.0101052	9	0.0268130	1
2.0953267	7	2.2750804	-	2.0883641	-	2.3152196	-	2.2660011	7	2.0132872	-	2.5807102	-	2.2198997	-
1.0988668	6	9.7980549	6	5.2429932	9	3.2450367	4	5.1261801	3	6.0599513	3	3.0431207	3	7.1372571	6
0.0719575	3	0.2486379	-	0.0598775	-	0.2476453	-	0.0762897	6	0.0893846	-	0.0920898	-	0.1533157	-
3.6058829	-	3.6451544	-	3.6728686	-	3.8056393	-	3.8175305	-	4.0436792	-	4.1680832	-	4.4026769	-
0.570888		0.5770543	1	0.4986138	1	0.6061285	6	0.5238041	6	0.5518033	4	0.5708988	4	0.6090939	
0.0348444	4	0.0364222	7	0.0201468	4	0.0449822	8	0.0252744	6	0.0300832	7	0.0348917	9	0.0463930	4
2.1367652	4	2.1181892	5	2.3580459	-	2.0280659	3	2.2682777	4	2.1976147	-	2.1361973	-	2.0146527	-
1.2253658	-	0.7469757	-	6.6522953	5	-3.588584		7.6055071	6	5.2784615	6	5.3333689	2	5.1329167	3
0.8772718	9	2.3529064	1	0.5419716	-	1.7880713	5	0.5100812	5	0.2539343	-	0.3207387	-	0.3245024	-
TMPO-ASI		ALAS2		TUBB4B		AHSP		EIF3C		WDR45		KIFC3		CDC34	

[000266] The 17 genes identified above as altered in expression in PD patient blood as well as in patient brain putamen with dyskinesia are further characterized in the table, TABLE 30, below:

TABLE 30

ID/Gene Name	Details and Genbank Accession	Up or Down
FTCDNL1	formiminotransferase cyclodeaminase N-terminal like Also known as: FONG Gene ID: 348751 Homo sapiens formiminotransferase cyclodeaminase N-terminal like (FTCDNL1), transcript variant 4, mRNA NCBI Reference Sequence: NM_001363886.2	Up in both
MAF1	MAF1 homolog, negative regulator of RNA polymerase III	Down in both

	Gene ID: 84232 Homo sapiens MAF1 homolog, negative regulator of RNA polymerase III (MAF1), mRNA NCBI Reference Sequence: NM_032272.5	
THEM4	thioesterase superfamily member 4 Also known as: CTMP Gene ID: 117145 Homo sapiens thioesterase superfamily member 4 (THEM4), mRNA NCBI Reference Sequence: NM_053055.5	Up in both
TSTA3	tissue specific transplantation antigen P35B Gene ID: 420292 (gallus) GFUS GDP-L-fucose synthase [<i>Homo sapiens</i> (human) Gene ID: 7264 NC_000008.11 NM_003313.4	Down in both
XKRX	XK related X-linked Also known as: XKR2, XPLAC, XRG2 Gene ID: 402415 Reference gene seq: NG_021224.1 Homo sapiens XK related X-linked (XKRX), mRNA NCBI Reference Sequence: NM_212559.3	Down in brain, Up in blood
KANSL1-AS1	KANSL1 antisense RNA 1 Gene ID: 644246 NC_000017.11	Up in both
NUDT15	Nudix hydrolase 15 Also known as: MTH2, NUDT15D Gene ID 55270 NCBI Reference Sequence: NG_047021.1	Down in brain, Up in blood
LINC00269	long intergenic non-protein coding RNA 269 Also known as: CXorf62, NCRNA00269 Gene ID 100996279 NCBI RNA Reference Sequence: NR_103715.1	Up in both
TMEM80	Transmembrane protein 80 Gene ID 283232 NCBI Reference Sequence: NG_034156.2 Homo sapiens transmembrane protein 80 (TMEM80), transcript variant 1, mRNA NCBI Reference Sequence: NM_174940.4	Down in brain, Up in blood
TMPO-AS1	TMPO antisense RNA 1; Gene ID 100128191 Homo sapiens TMPO antisense RNA 1 (TMPO-AS1), long non-coding RNA NCBI Reference Sequence: NR_027157.1 NCBI Reference Sequence: NG_021393.1	Up in both
ALAS2	5'-aminolevulinatase synthase 2 (<i>Homo sapiens</i> (human)) Gene ID: 212	Up in brain, Down in blood

	Also known as ASB; ANH1; XLSA; ALASE; XLDPP; XLEPP; ALAS-E; SIDBA1 Reference sequence: NM_000032.5	
TUBB4B	tubulin beta 4B class IVb Also known as: Beta2, LCAEOD, TUBB2, TUBB2C Gene ID: 10383 Homo sapiens tubulin beta 4B class IVb (TUBB4B), mRNA NCBI Reference Sequence: NM_006088.6	Down in both
AHSP	alpha hemoglobin stabilizing protein Also known as: EDRF, ERAF Gene ID: 51327 NCBI Reference Sequence: NG_046852.1 Homo sapiens alpha hemoglobin stabilizing protein (AHSP), transcript variant 1, mRNA NCBI Reference Sequence: NM_016633.4	Up in brain, Down in blood
EIF3C	eukaryotic translation initiation factor 3 subunit C Gene ID: 8663 Also known as EIF3CL; EIF3S8; eIF3-p110 NCBI Ref: NC_000016.10 NCBI Ref: NM_003752.5	Up in both
WDR45	WD repeat domain 45 Also known as: JM5, NBIA4, NBIA5, WDRX1, WIPI-4, WIPI4 Gene ID: 11152 Reference Gene seq: NG_033004.2 Homo sapiens WD repeat domain 45 (WDR45), transcript variant 1, mRNA NCBI Reference Sequence: NM_007075.4	Down in both
KIFC3	kinesin family member C3 Gene ID: 3801 Homo sapiens kinesin family member C3 (KIFC3), transcript variant 2, mRNA NCBI Reference Sequence: NM_001130100.2	Down in both
CDC34	cell division cycle 34, ubiquitin conjugating enzyme Also known as: E2-CDC34, UBC3, UBCH3, UBE2R1 Gene ID: 997 Homo sapiens cell division cycle 34, ubiquitin conjugating enzyme (CDC34), mRNA NCBI Reference Sequence: NM_004359.2	Down in both

[000267] This invention may be embodied in other forms or carried out in other ways without departing from the spirit or essential characteristics thereof. The present disclosure is therefore to be considered as in all aspects illustrated and not restrictive, the scope of the invention being indicated by the appended Claims, and all changes which come within the meaning and range of equivalency are intended to be embraced therein.

[000268] Various references are cited throughout this Specification, each of which is incorporated herein by reference in its entirety.

WHAT IS CLAIMED IS:

1. A method for assessing or evaluating Parkinson's disease (PD) in a patient or individual comprising:
 - (a) isolating a sample from said patient;
 - (b) evaluating the sample for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (i) markers as provided in Table 4;
 - (ii) markers as provided in Table 13 or 14;
 - (iii) markers as provided in Table 23, 24, 25 or 26;
 - (iv) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4;
 - (v) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL, CAMK4, FCAR, PROK2, IL1R2, HSPA6 and CHRNA10; and
 - (vi) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
 - (c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

2. The method of claim 1 for assessing or evaluating Parkinson's disease (PD) in a patient or individual comprising:
 - (a) isolating a sample from said patient;
 - (b) evaluating the sample for expression or quantitatively increased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (i) markers as provided in Table 14;
 - (ii) markers as provided in Table 23 or 25; and
 - (iii) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
 - (c) wherein the expression or quantitatively increased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

3. The method of claim 1 for assessing or evaluating Parkinson's disease (PD) in a patient or individual comprising:
 - (a) isolating a sample from said patient;
 - (b) evaluating the sample for expression or quantitatively decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (i) markers as provided in Table 13;

- (ii) markers as provided in Table 24 or 26;
- (iii) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4; and
- (iv) markers selected from GPR52, SNCA, DNAJC6 and DLG2;
- (c) wherein the expression or quantitatively decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

4. The method of claim 1, wherein a blood sample is isolated and evaluated for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (ii) markers as provided in Table 13 or 14;
- (iii) markers as provided in Table 23, 24, 25 or 26;
- (iv) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4;
- (v) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10; and
- (vi) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL, CAMK4, FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

5. The method of claim 2, wherein a blood sample is isolated and evaluated for expression or quantitatively increased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (i) markers as provided in Table 14;
- (ii) markers as provided in Table 23 or 25; and
- (iii) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (c) wherein the expression or quantitatively increased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

6. The method of claim 3, wherein a blood sample is isolated and evaluated for expression or quantitatively decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (i) markers as provided in Table 13;
- (ii) markers as provided in Table 24 or 26;

(iii) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4; and

(iv) markers selected from GPR52, SNCA, DNAJC6 and DLG2;

(c) wherein the expression or quantitatively decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) in a patient or individual.

7. A method for assessing or evaluating Parkinson's disease with dementia (PDD) in a patient or individual comprising:

(a) isolating a sample from said patient;

(b) evaluating the sample for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

(i) markers as provided in Table 15, 16, 17, 18, 19, 27 or 28;

(ii) markers as provided in Table 27 or 28;

(iv) markers selected from TRAPPC6A, NUCKS1, STAG3 and ARFRP1;

(v) markers selected from MARS1, NFAT5, LONRF3, PPP1R15B and TARSI;

(vi) markers selected from NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;

(vii) markers selected from STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;

(vii) markers selected from TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2, TMEM115, MARS1, NFAT5, LONRF3, PPP1R15B, TARSI, STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;

(viii) markers selected from TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;

(vii) markers selected from MARS1, NFAT5, LONRF3, PPP1R15B, TARSI, STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR; and

(c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease with dementia (PDD) in a patient or individual.

8. The method of claim 7 for assessing or evaluating Parkinson's disease with dementia (PDD) in a patient or individual comprising:

(a) isolating a sample from said patient;

(b) evaluating the sample for expression or quantitatively increased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (i) markers as provided in Table 16 or 18;
 - (ii) markers selected from MARS1, NFAT5, LONRF3, PPP1R15B and TARSI;
 - (iii) markers selected from STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;
 - (iv) markers selected from MARS1, NFAT5, LONRF3, PPP1R15B, TARSI STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR; and
 - (c) wherein the expression or quantitatively increased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease with dementia (PDD) in a patient or individual.
9. The method of claim 7 for assessing or evaluating Parkinson's disease with dementia (PDD) in a patient or individual comprising:
- (a) isolating a sample from said patient;
 - (b) evaluating the sample for expression or quantitatively decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
 - (i) markers as provided in Table 15 or 17;
 - (ii) markers selected from TRAPPC6A, NUCKS1, STAG3 and ARFRP1;
 - (ii) markers selected from NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115; and
 - (iv) markers selected from TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;
 - (c) wherein the expression or quantitatively decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease with dementia (PDD) in a patient or individual.
10. The method of claim 7, wherein a blood sample is isolated and evaluated for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:
- (i) markers as provided in Table 27 or 28;
- (c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease with dementia (PDD) in a patient or individual.
11. A method for assessing or evaluating Parkinson's disease (PD) with dyskinesia in a patient or individual comprising:
- (a) isolating a sample from said patient;

(b) evaluating the sample for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (i) markers as provided in Table 20;
- (ii) markers as provided in Table 29 and/or 30; and
- (iv) markers selected from FTCDNL1, MAF1, THEM4, TSTA3, XKRX, KANSL1-AS1, NUDT15, LINC00269, TMEM80, TMPO-AS1, ALAS2, TUBB4B, AHSP, EIF3C, WDR45, KIFC3 and CDC34;

(c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) with dyskinesia in a patient or individual.

12. The method of claim 11, wherein a blood sample is isolated and evaluated for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (i) markers as provided in Table 29 and/or 30; and
- (ii) markers selected from FTCDNL1, MAF1, THEM4, TSTA3, XKRX, KANSL1-AS1, NUDT15, LINC00269, TMEM80, TMPO-AS1, ALAS2, TUBB4B, AHSP, EIF3C, WDR45, KIFC3 and CDC34;

(c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) with dyskinesia in a patient or individual.

13. A method for assessing or evaluating Parkinson's disease (PD) with disease duration in a patient or individual comprising:

- (a) isolating a sample from said patient;
- (b) evaluating the sample for expression or quantitatively increased or decreased amounts of one or more sets of gene markers, RNA markers, or associated protein markers selected from:

- (i) markers as provided in Table 21 and/or 22;
- (c) wherein the expression or quantitatively increased or decreased amounts of the marker gene expression, RNA or encoded protein is associated with and indicative of Parkinson's disease (PD) with dyskinesia in a patient or individual.

14. The method of any of claims 1-13, wherein a subset of at least 20 of the markers are evaluated.

15. The method of any of claims 1-13, wherein a subset of at least 10 of the markers are evaluated.

16. The method of any of claims 1-13, wherein a subset of at least 4 of the markers are evaluated.
17. The method of any of claims 1-13, wherein all of the markers listed in at least one set of markers are evaluated.
18. The method of any of claims 1-13, wherein RNA expression is assessed by RT PCR.
19. The method of any of claims 1-13, wherein protein expression is assessed using specific antibodies.
20. The method of any of claims 1-13, further comprising treating the patient thereby diagnosed with Parkinson's disease (PD), Parkinson's disease with dementia (PDD), PD with dyskinesia, or PD with disease duration by administering a therapeutically effective amount of one or more agent or therapy for treating PD, dementia, or dyskinesia.
21. A set of RNA or protein markers for assessing or evaluating Parkinson's disease (PD), Parkinson's disease with dementia (PDD), Parkinson's disease dyskinesia or Parkinson's with disease duration in a patient comprising the markers selected from:
 - (i) markers as provided in Table 4;
 - (ii) markers as provided in Table 13 or 14;
 - (iii) markers as provided in Table 23, 24, 25 or 26;
 - (iv) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4;
 - (v) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
 - (vi) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL, CAMK4, FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
 - (vii) markers selected from GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4; and
 - (viii) markers selected from FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
 - (ix) markers as provided in Table 15, 16, 17, 18, 19, 27 or 28;
 - (x) markers as provided in Table 27 or 28;
 - (xi) markers selected from TRAPPC6A, NUCKS1, STAG3 and ARFRP1;
 - (xii) markers selected from MARS1, NFAT5, LONRF3, PPP1R15B and TARS1;
 - (xiii) markers selected from NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;
 - (xiv) markers selected from STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;

- (xv) markers selected from TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2, TMEM115, MARS1, NFAT5, LONRF3, PPP1R15B, TARS1, STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;
- (xvi) markers selected from TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;
- (xvii) markers selected from MARS1, NFAT5, LONRF3, PPP1R15B, TARS1, STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR; and
- (xviii) markers as provided in Table 20;
- (xix) markers as provided in Table 29 and/or 30; and
- (xx) markers selected from FTCDNL1, MAF1, THEM4, TSTA3, XKRX, KANSL1-AS1, NUDT15, LINC00269, TMEM80, TMPO-AS1, ALAS2, TUBB4B, AHSP, EIF3C, WDR45, KIFC3 and CDC34; and
- (xxi) markers as provided in Table 21 an/or 22.

22. A system or kit for assessing or evaluating Parkinson's disease (PD), Parkinson's disease with dementia (PDD), Parkinson's disease dyskinesia or Parkinson's with disease duration in a patient comprising a set of markers of claim 20 or a set of probes and/or antibodies for evaluating a set of markers of claim 20.

23. The system or kit of claim 22, comprising a set of probes and/or antibodies for evaluating a set of markers selected from:

- (i) markers GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4;
- (ii) markers FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (iii) markers GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL, CAMK4, FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (iv) markers GPR52, SNCA, DNAJC6, DLG2, TIAM1, TOMM70, PREPL and CAMK4; and
- (v) markers FCAR, PROK2, IL1R2, HSPA6 and CHRNA10;
- (vi) markers TRAPPC6A, NUCKS1, STAG3 and ARFRP1;
- (vii) markers MARS1, NFAT5, LONRF3, PPP1R15B and TARS1;
- (viii) markers NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;
- (ix) markers STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;

(x) markers TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2, TMEM115, MARS1, NFAT5, LONRF3, PPP1R15B, TARS1, STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR;

(xi) markers TRAPPC6A, NUCKS1, STAG3, ARFRP1, NGF, CCDC172, EXOC3L1, ITGB3, VWA2, C1orf116, CAGE1, C9orf129, CPTP, EFCC1, MIER2 and TMEM115;

(xii) markers MARS1, NFAT5, LONRF3, PPP1R15B, TARS1 STX17AS1, DACT1, DNAH8 and C1QTNF3-AMACR; and

(xiii) markers FTCDNL1, MAF1, THEM4, TSTA3, XKRX, KANSL1-AS1, NUDT15, LINC00269, TMEM80, TMPO-AS1, ALAS2, TUBB4B, AHSP, EIF3C, WDR45, KIFC3 and CDC34.

FIG. 1A

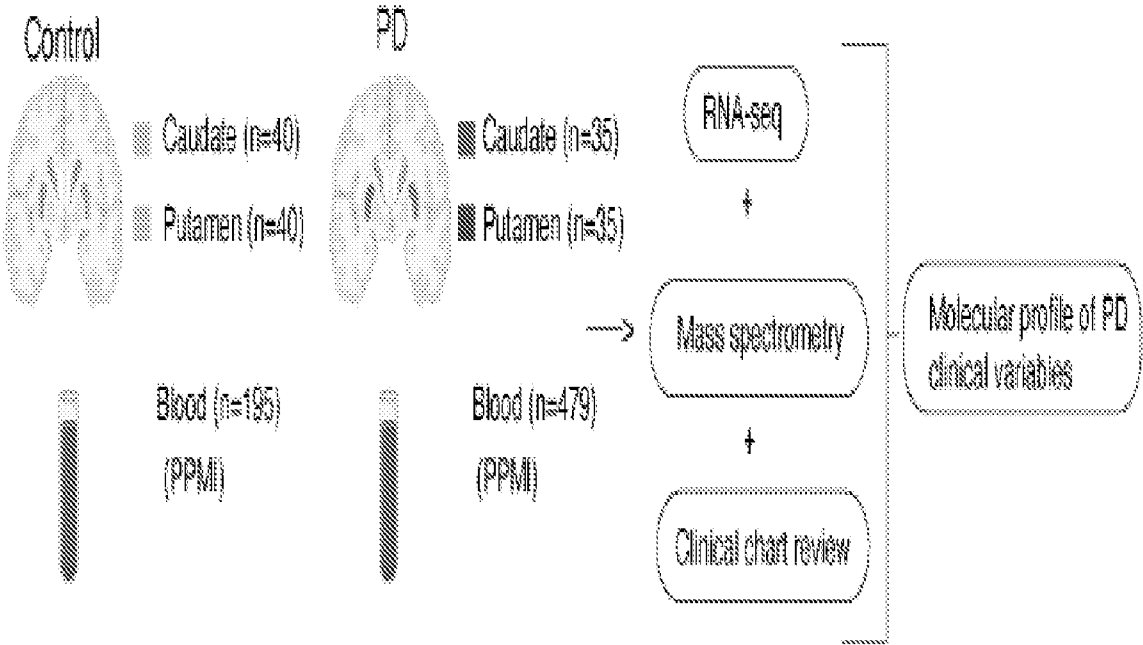


FIG. 1B

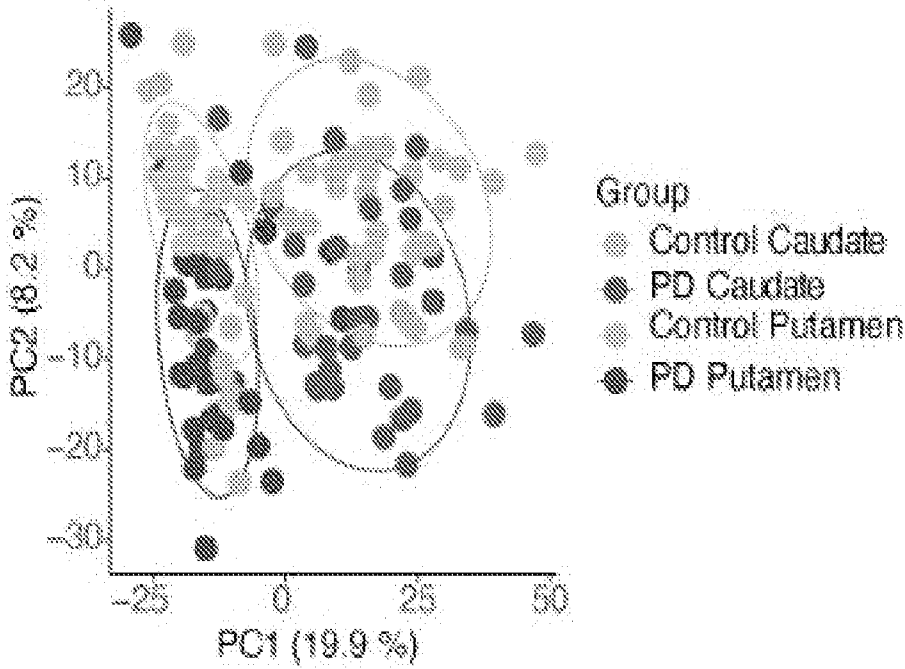


FIG. 1C

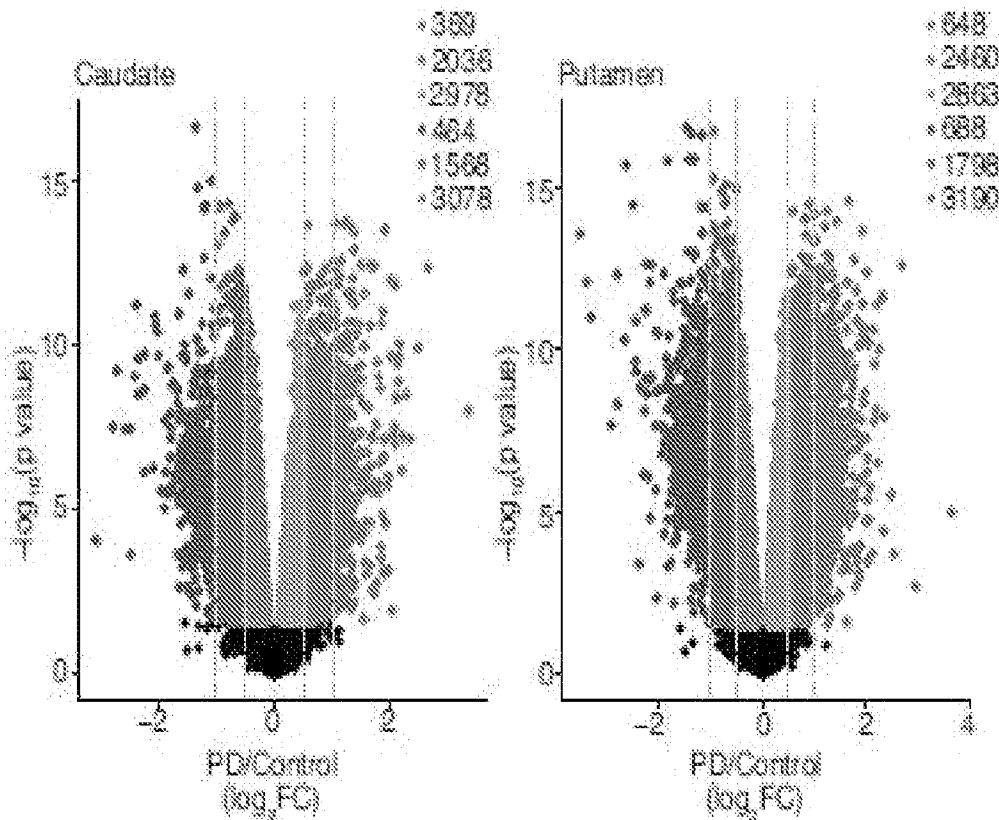


FIG. 1D

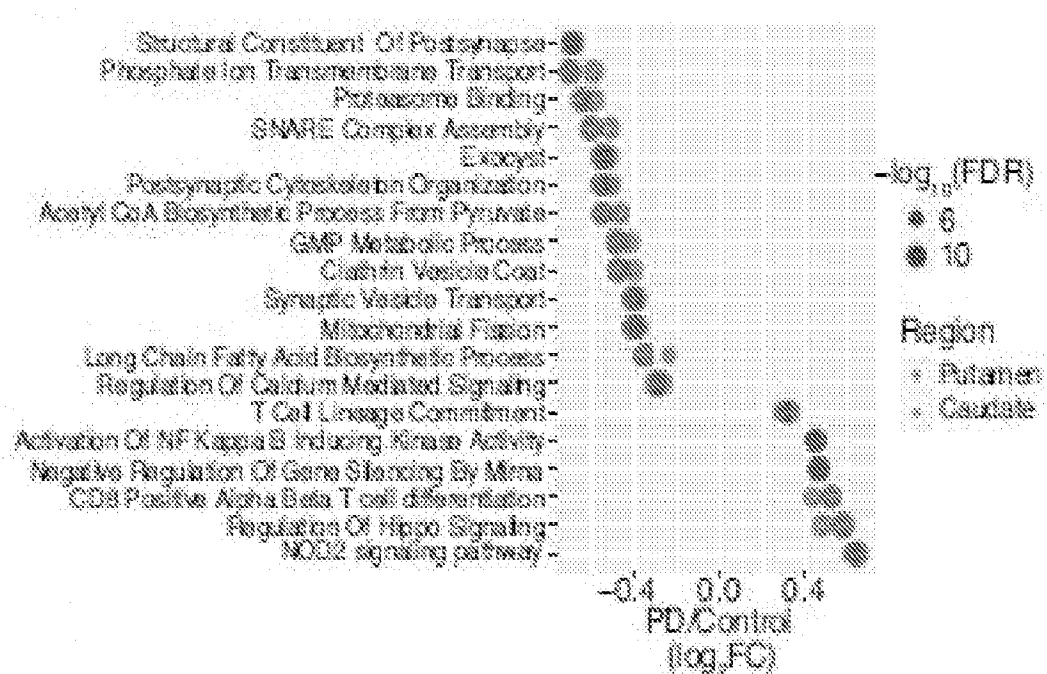


FIG. 1E

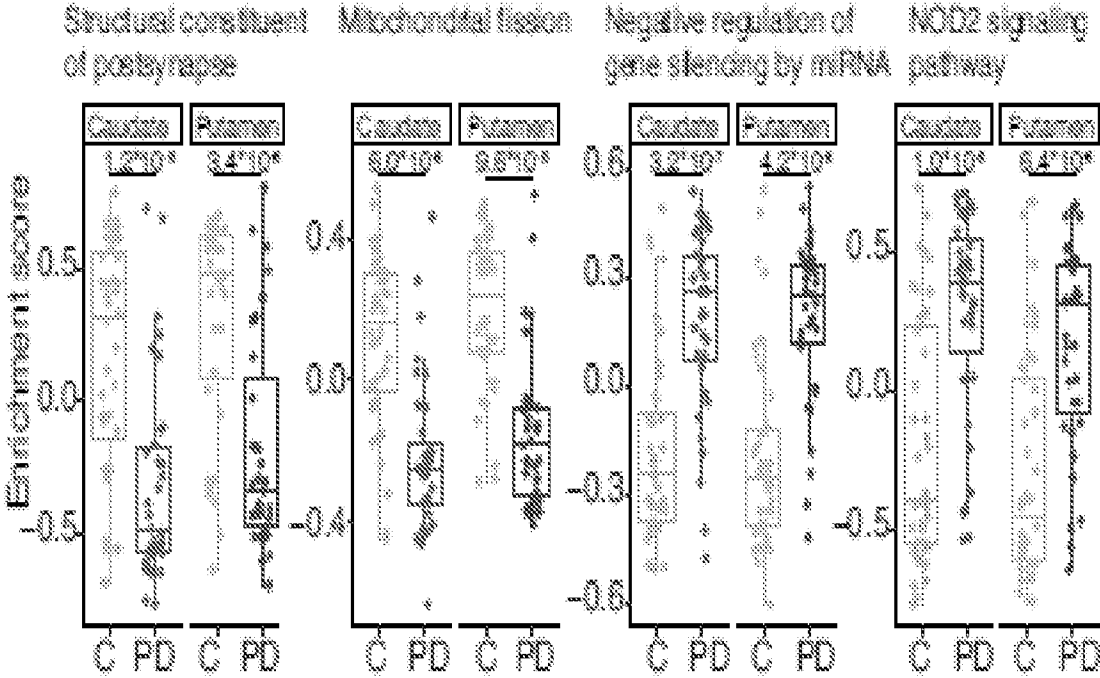


FIG. 1F

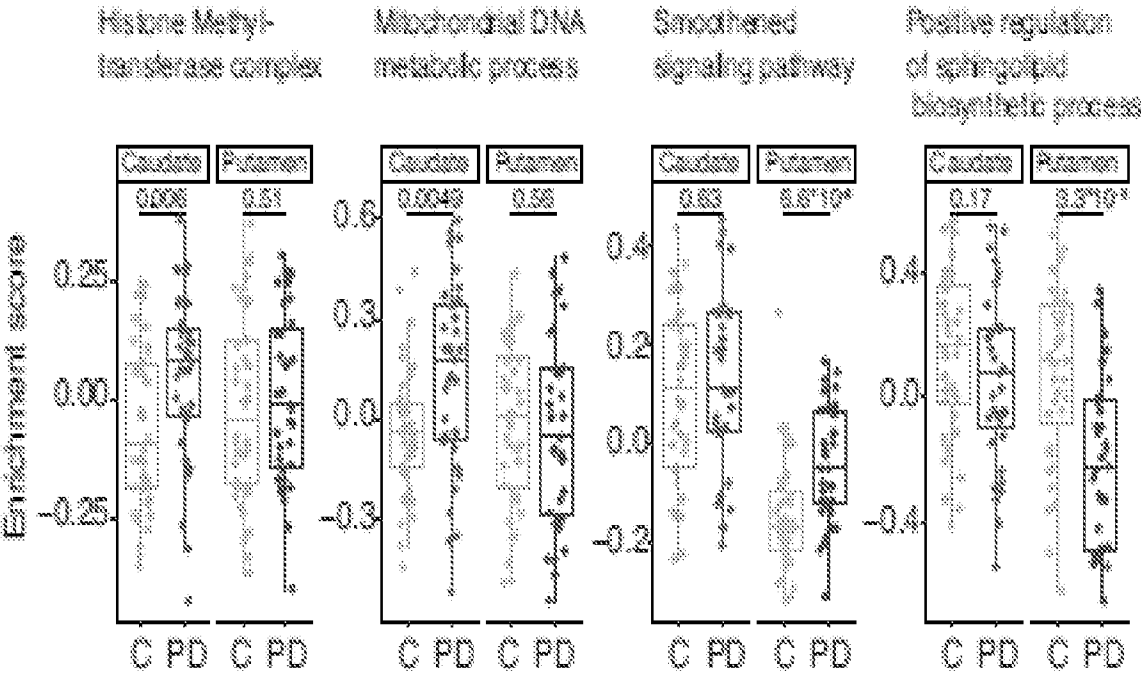


FIG. 1G

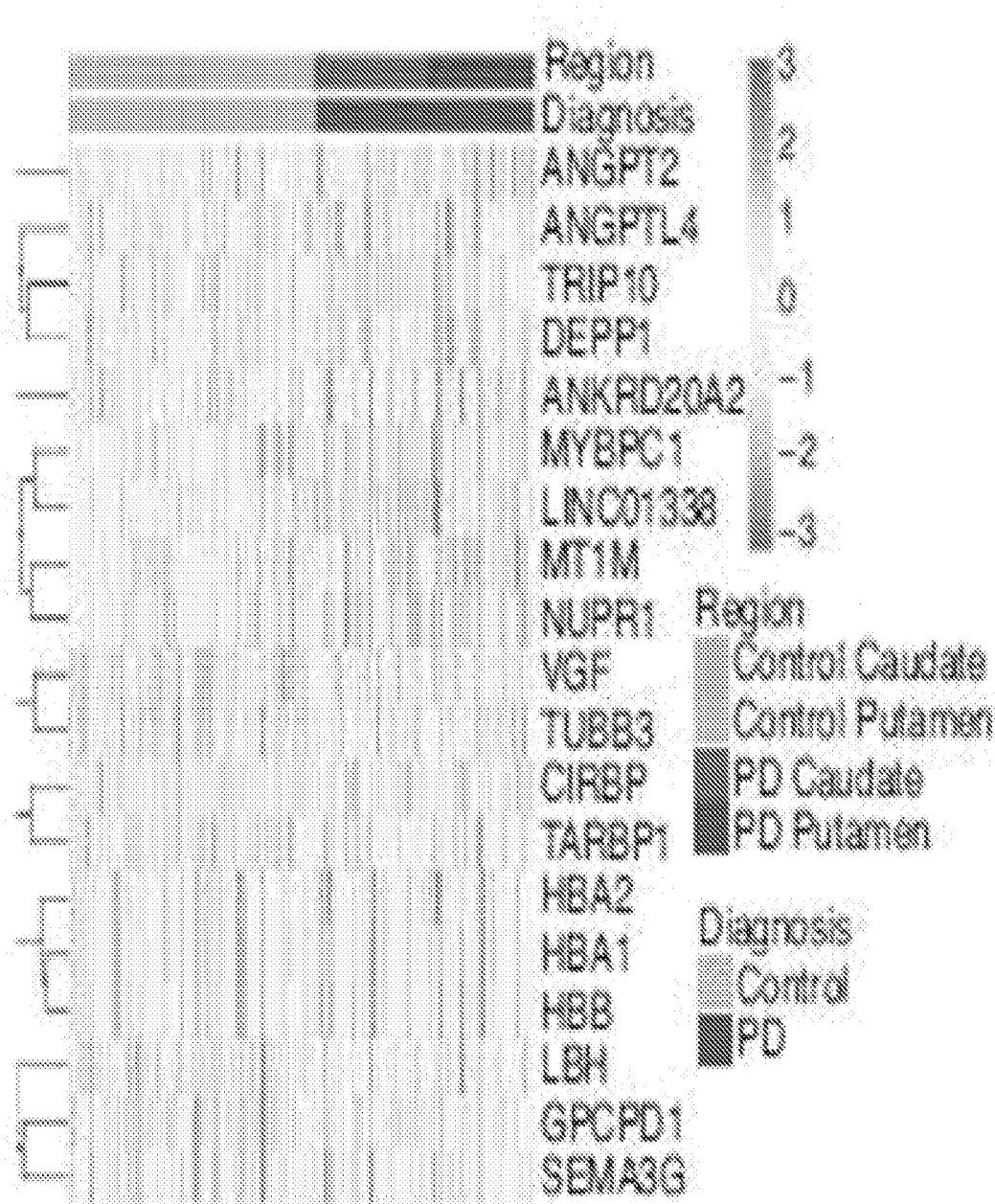


FIG. 2A

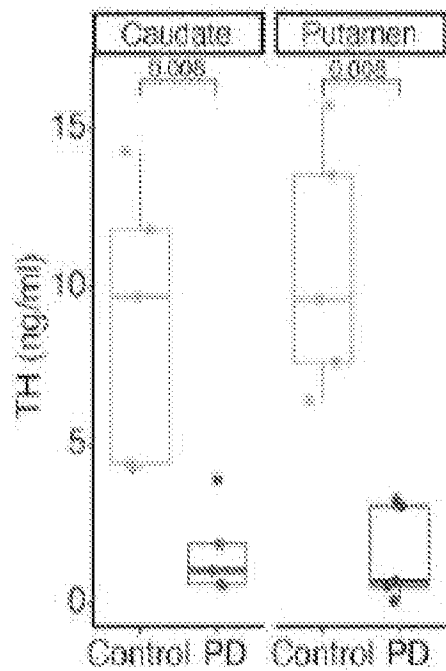


FIG. 2B

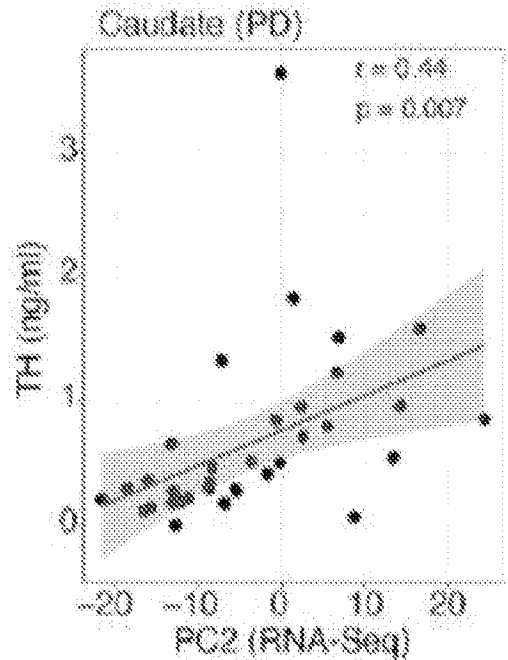


FIG. 2C

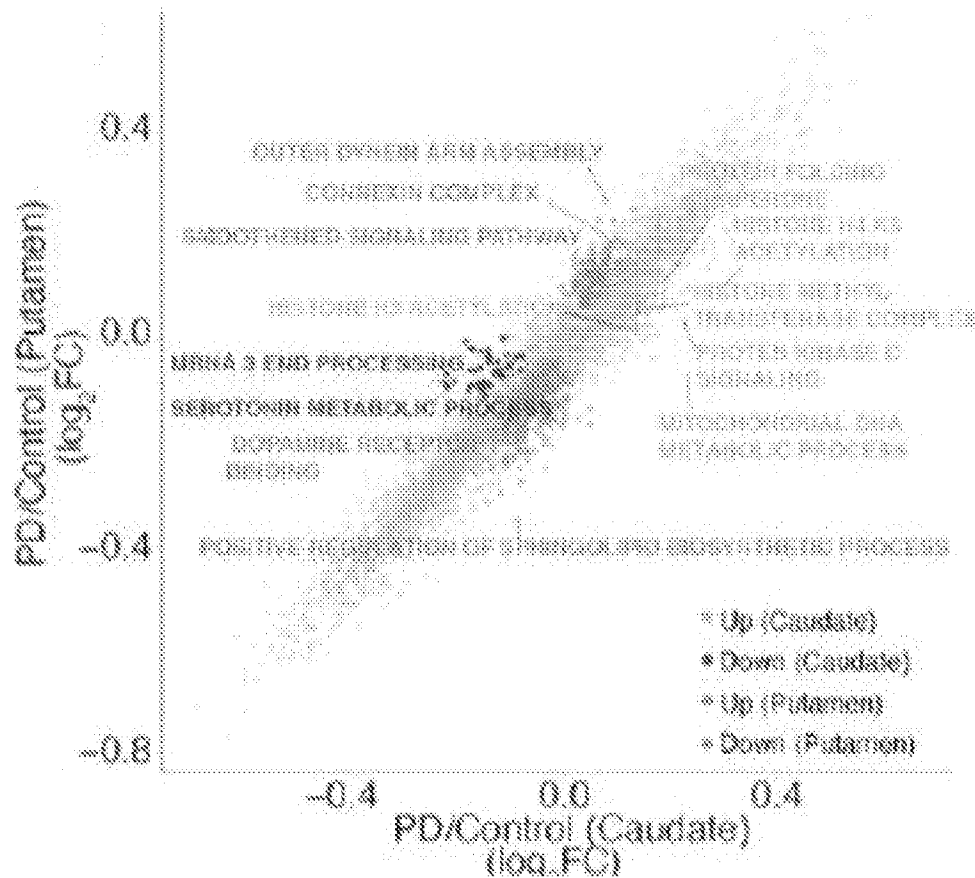


FIG. 2D

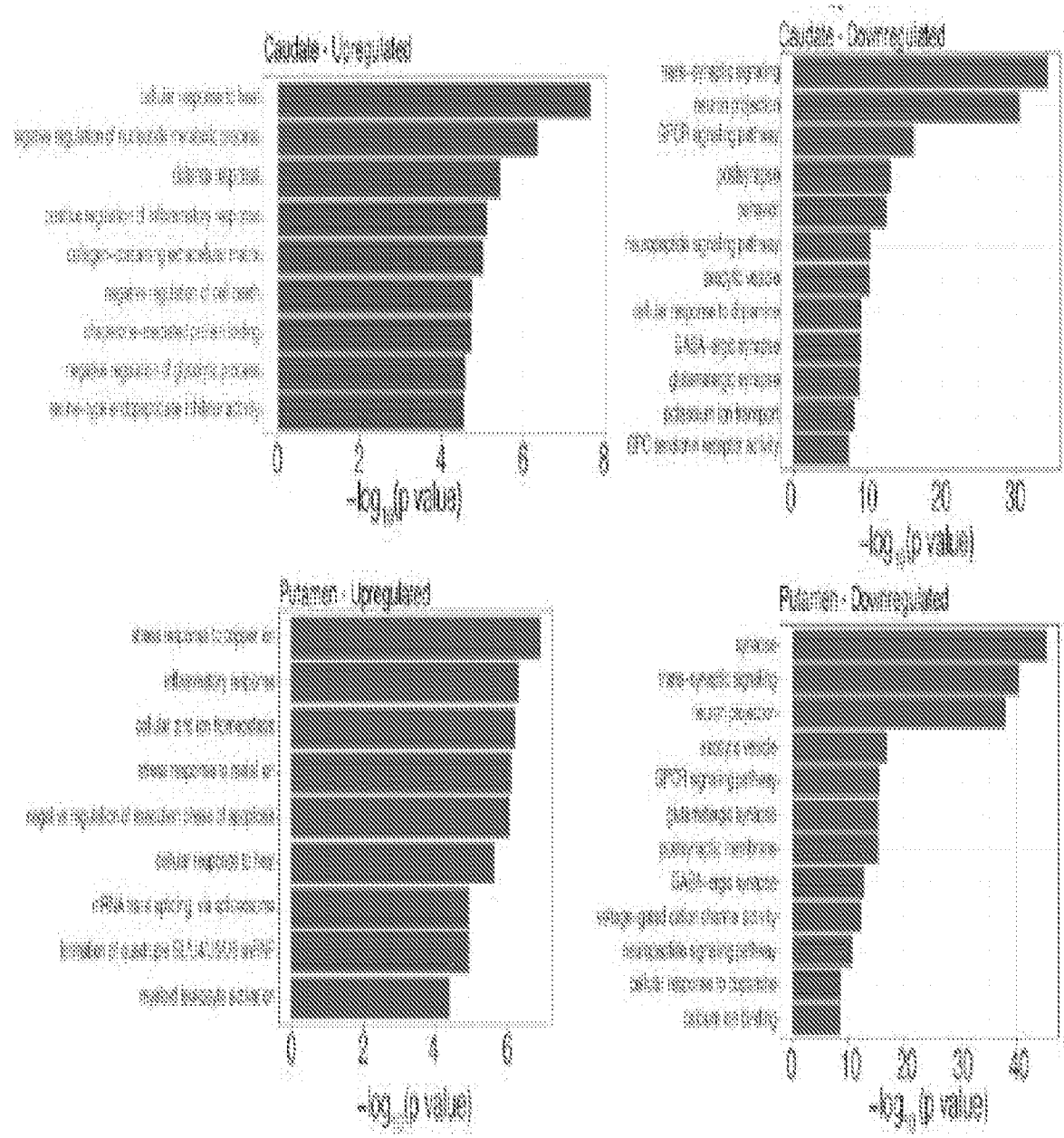


FIG. 2E

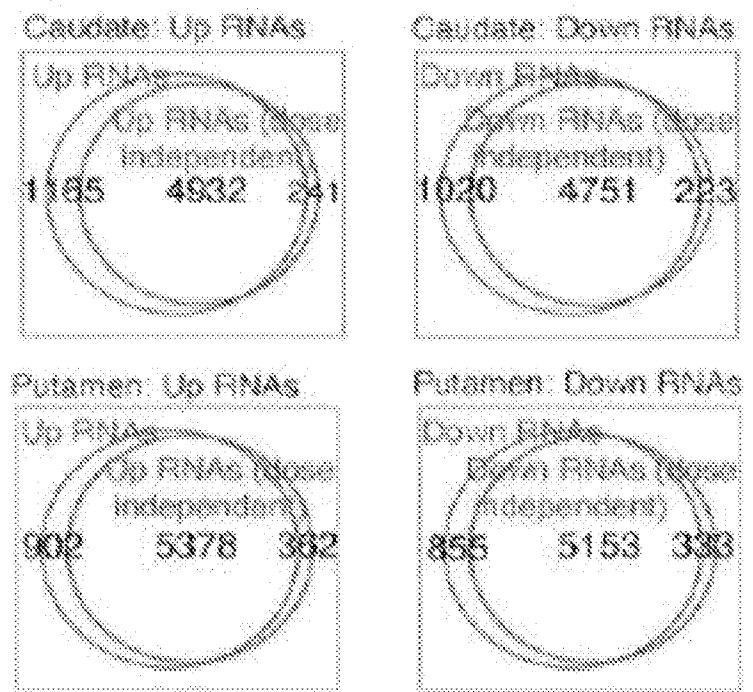


FIG. 2F

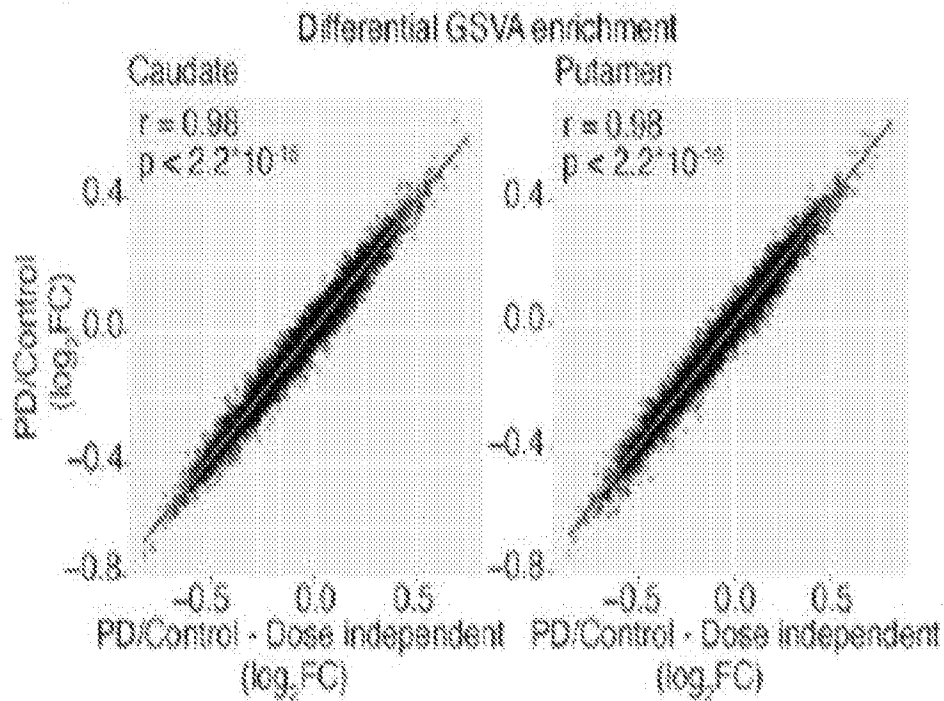


FIG. 3A

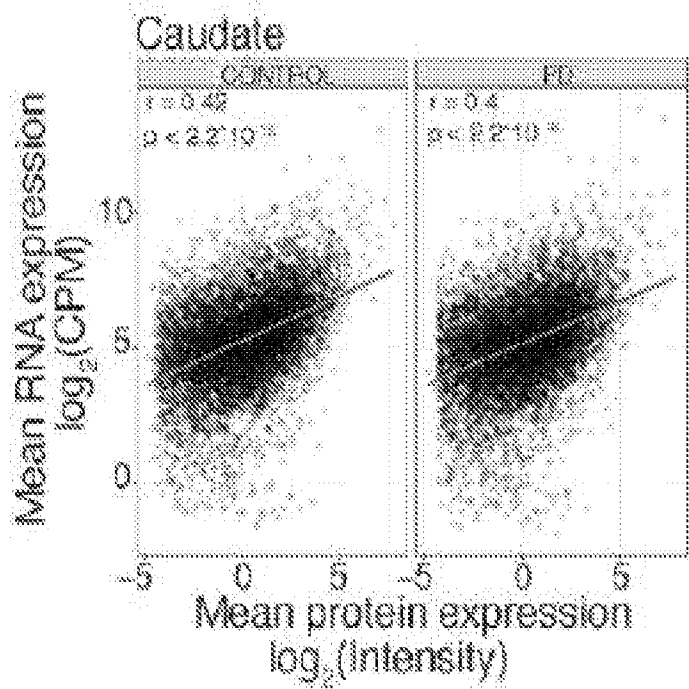


FIG. 3B

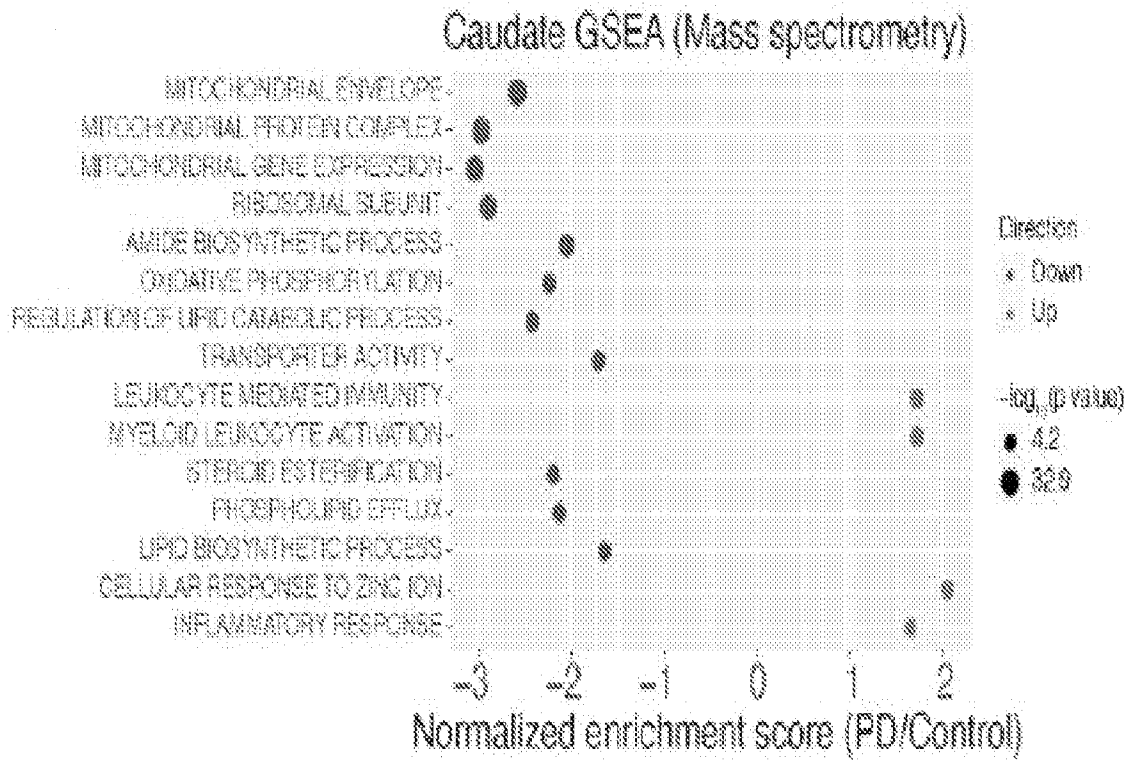


FIG. 3C

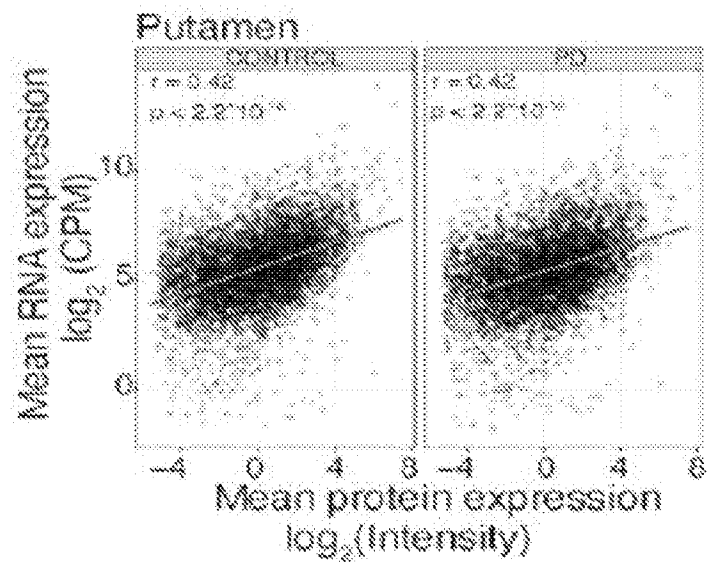


FIG. 3D

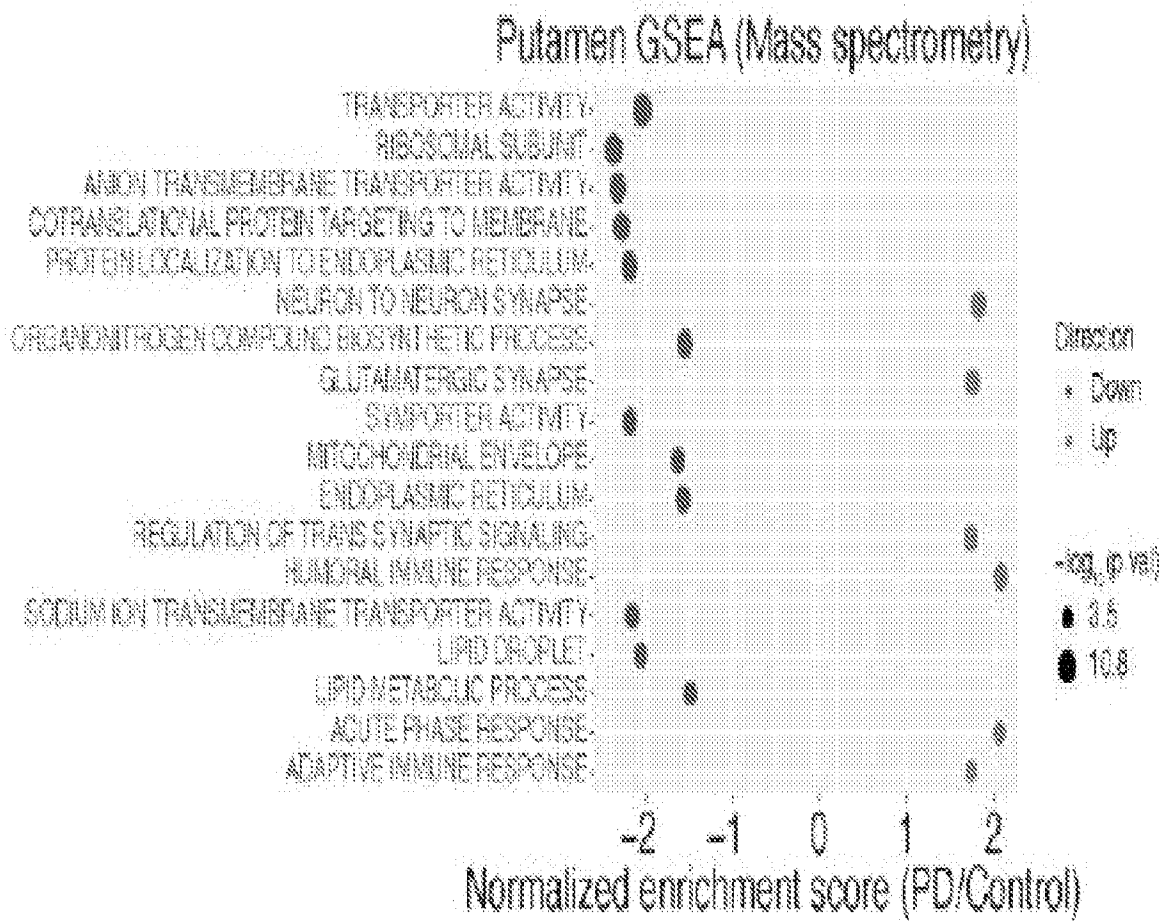


FIG. 4A

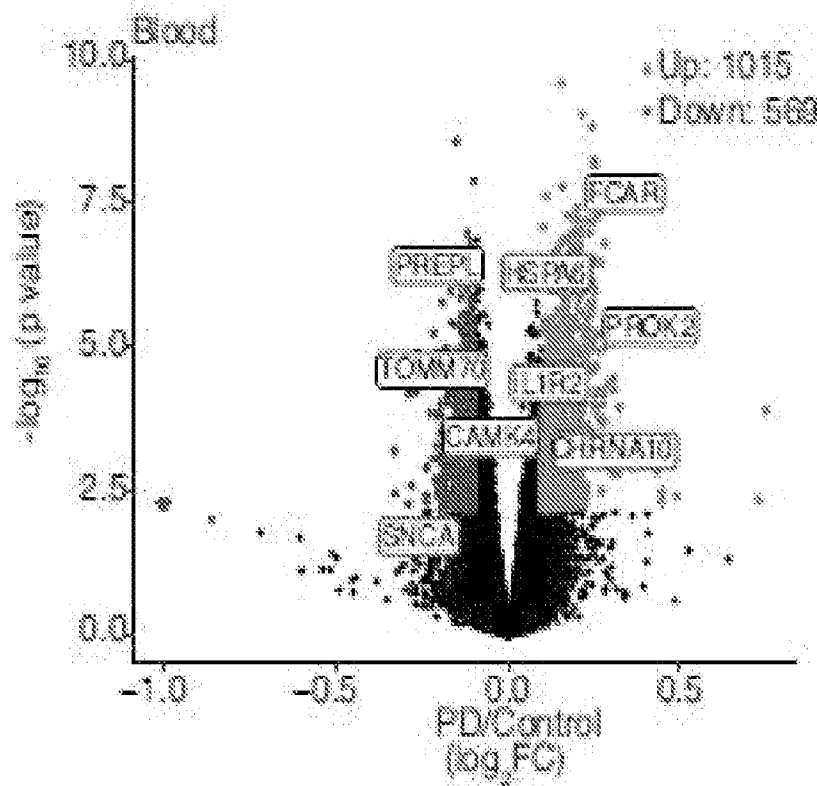


FIG. 4B

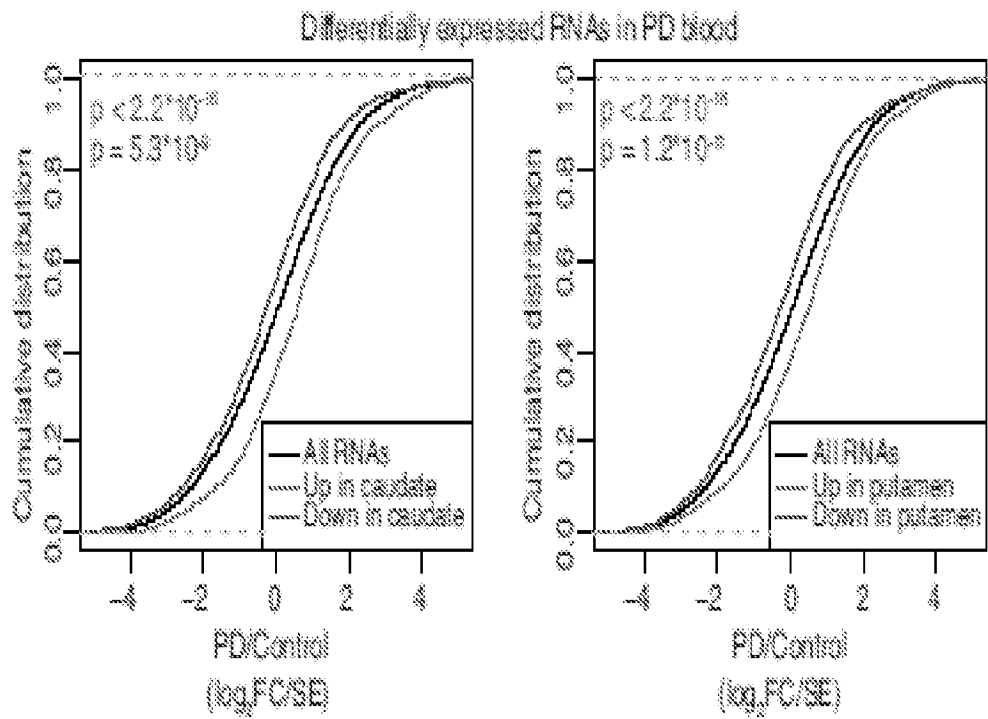


FIG. 4C

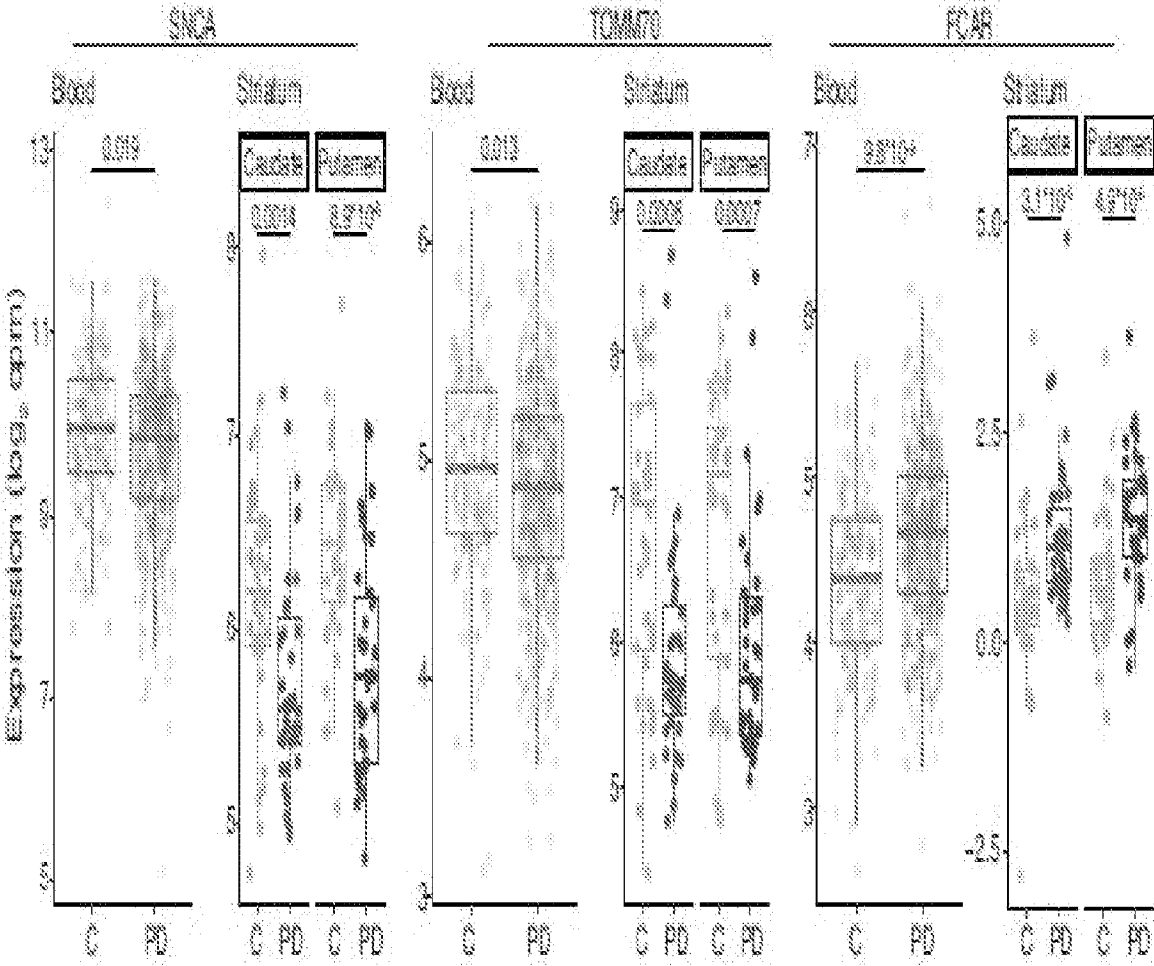


FIG. 4D

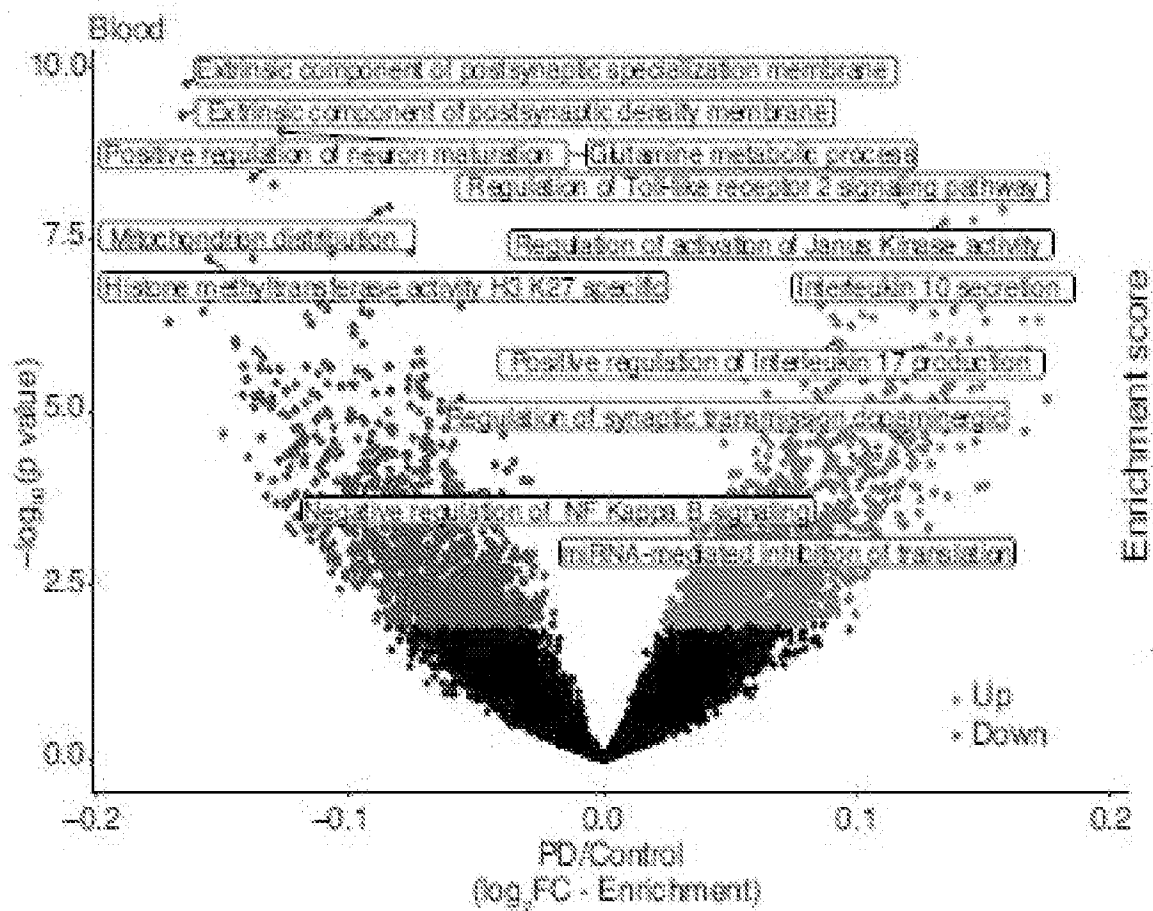


FIG. 4E

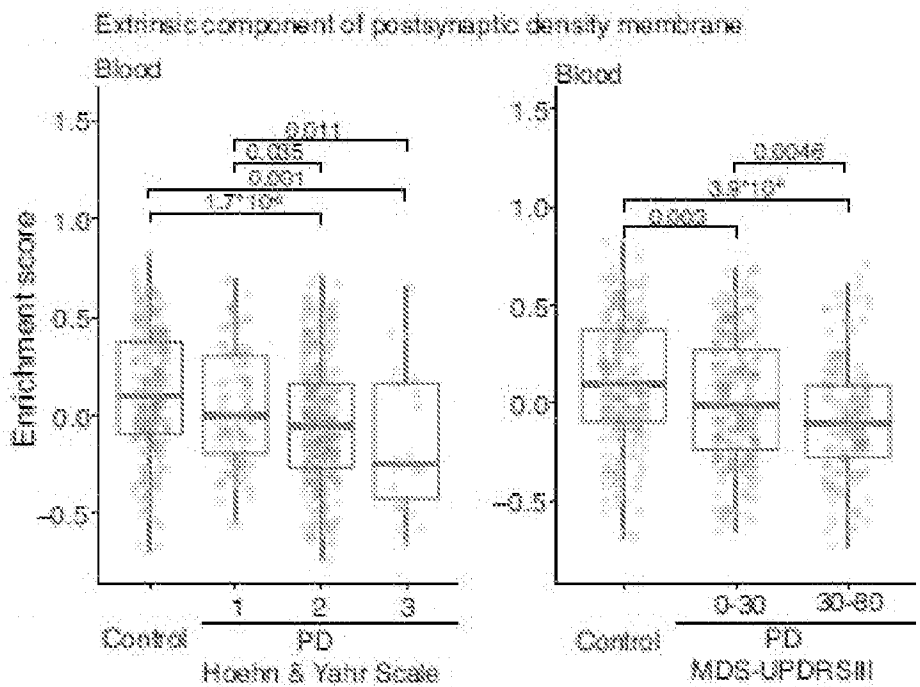


FIG. 5A

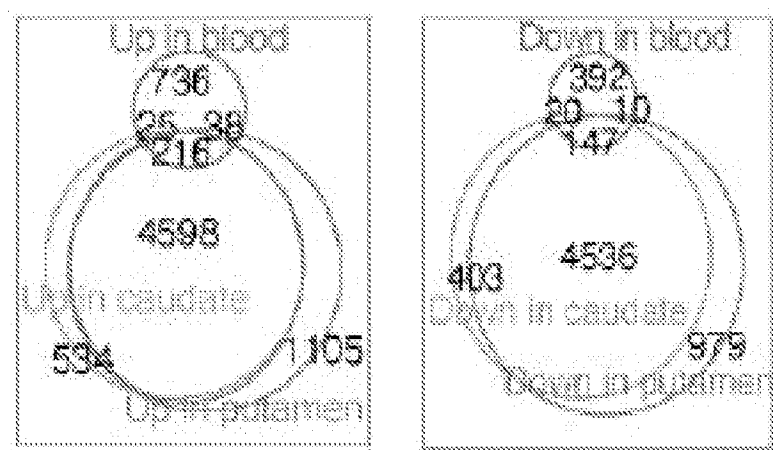


FIG. 5B

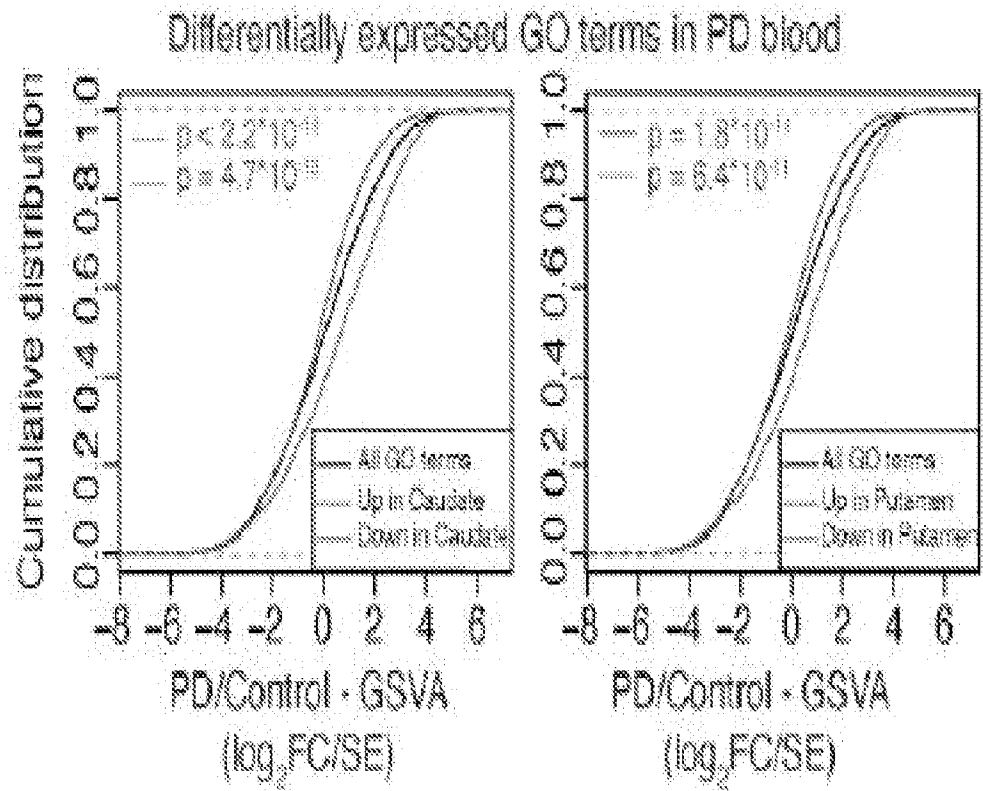


FIG. 5C

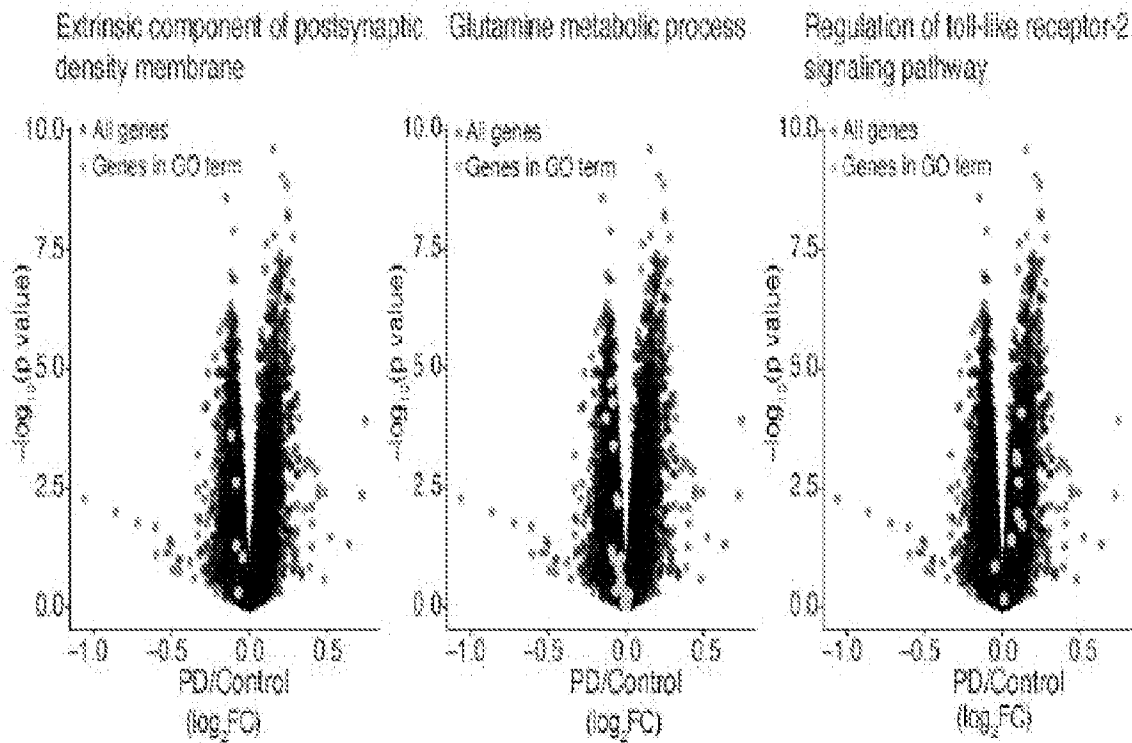


FIG. 5D

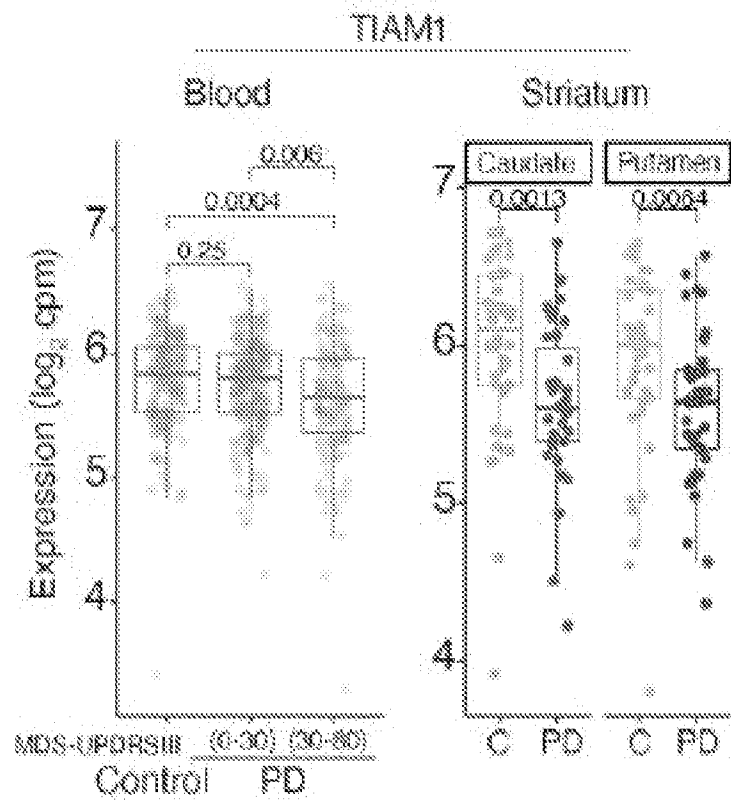


FIG. 5E

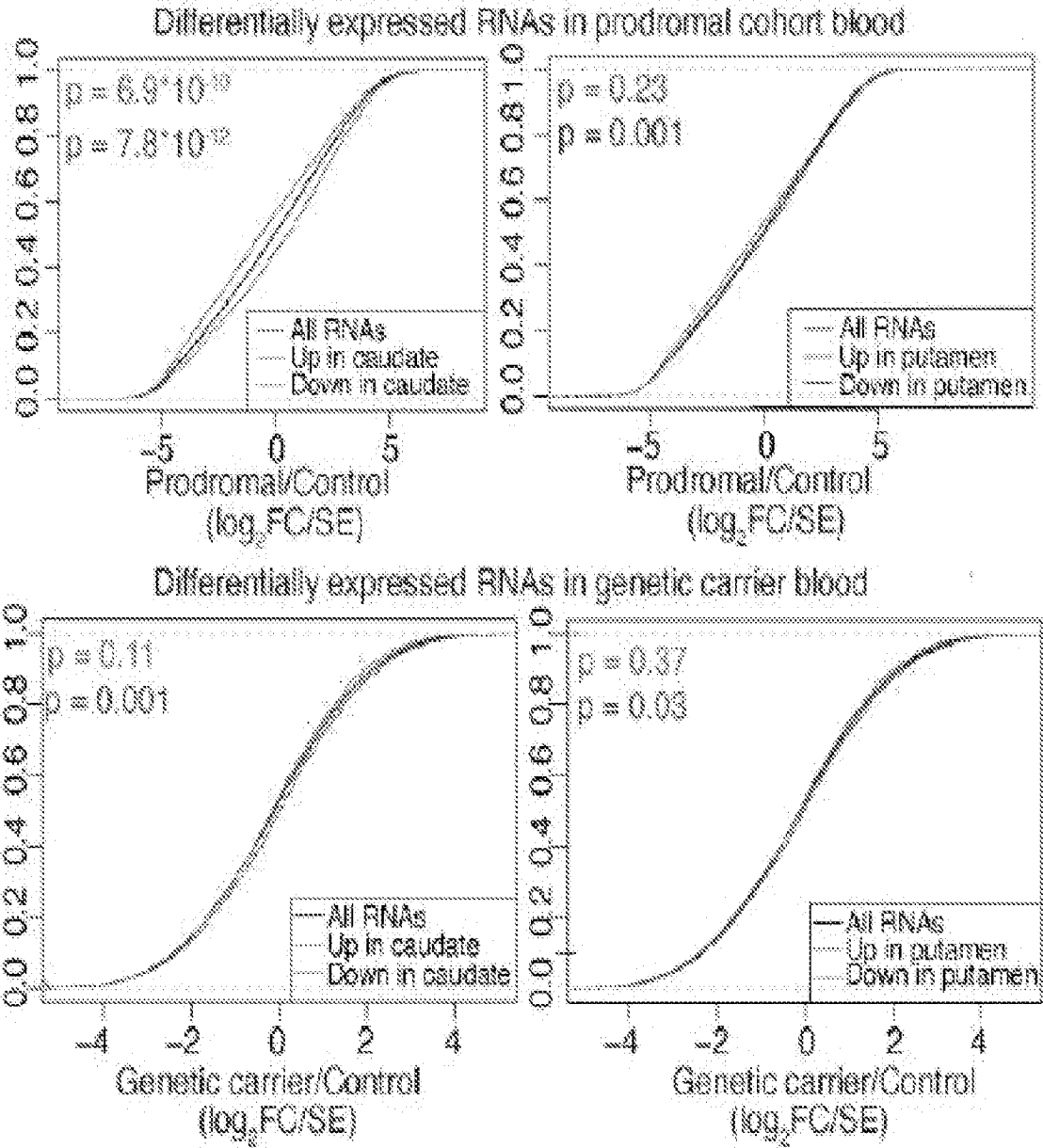


FIG. 6A

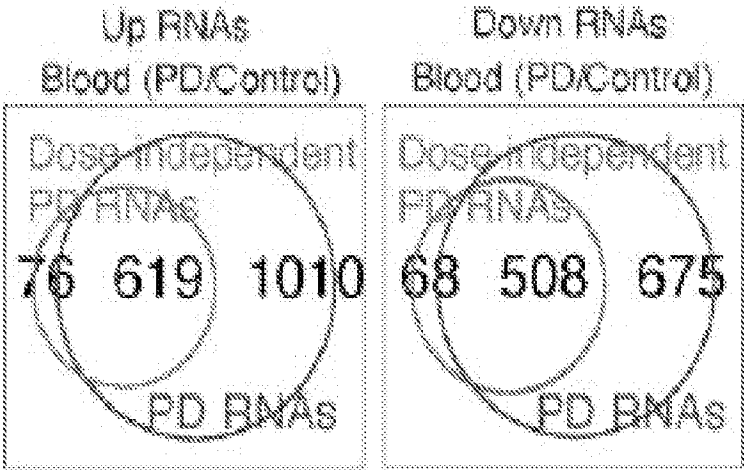


FIG. 6B

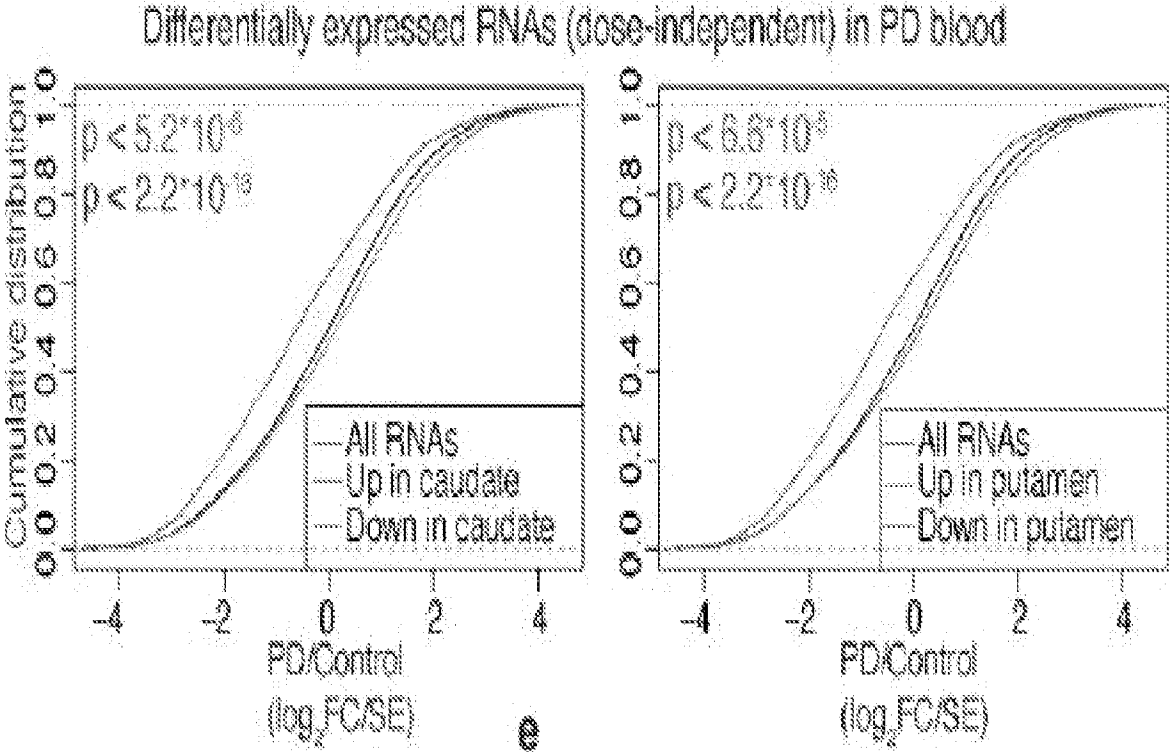


FIG. 6C

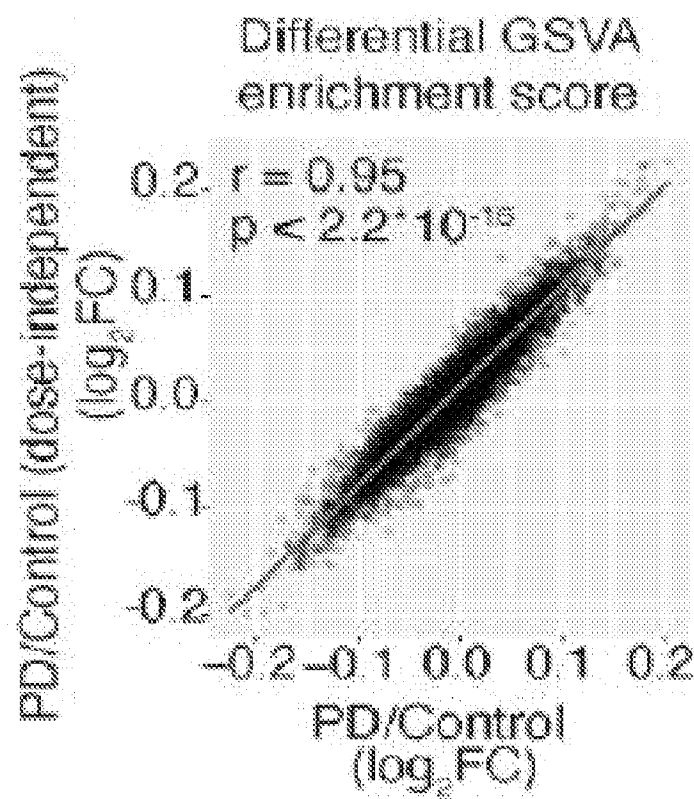


FIG. 6D

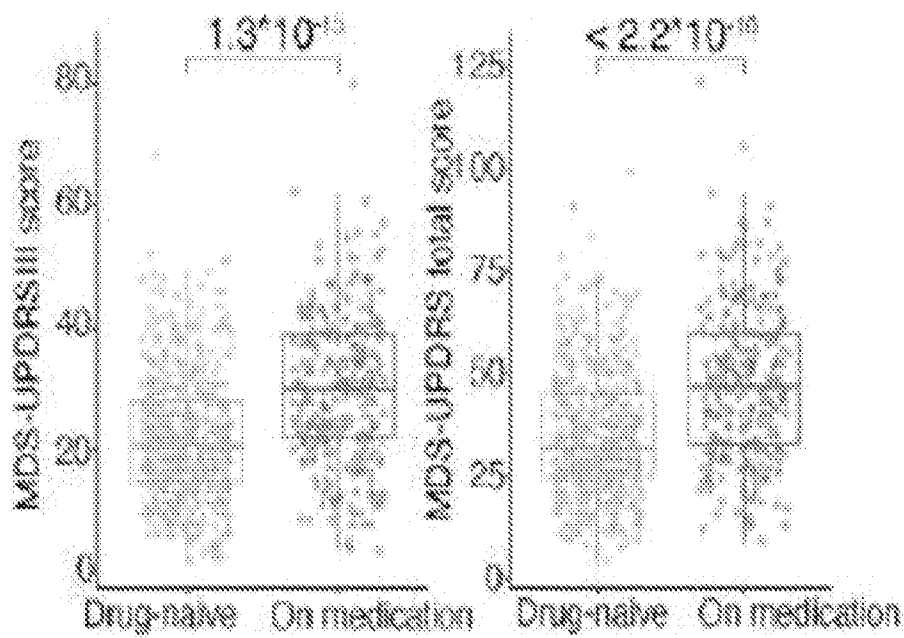


FIG. 6E

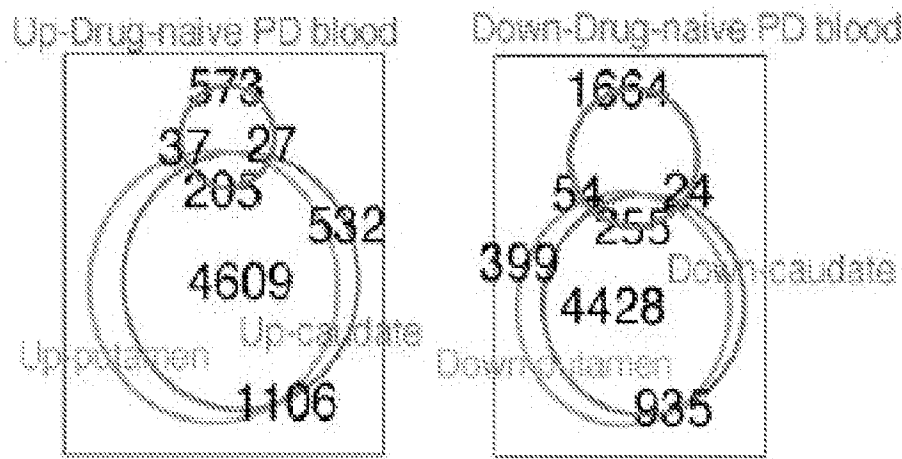


FIG. 6F

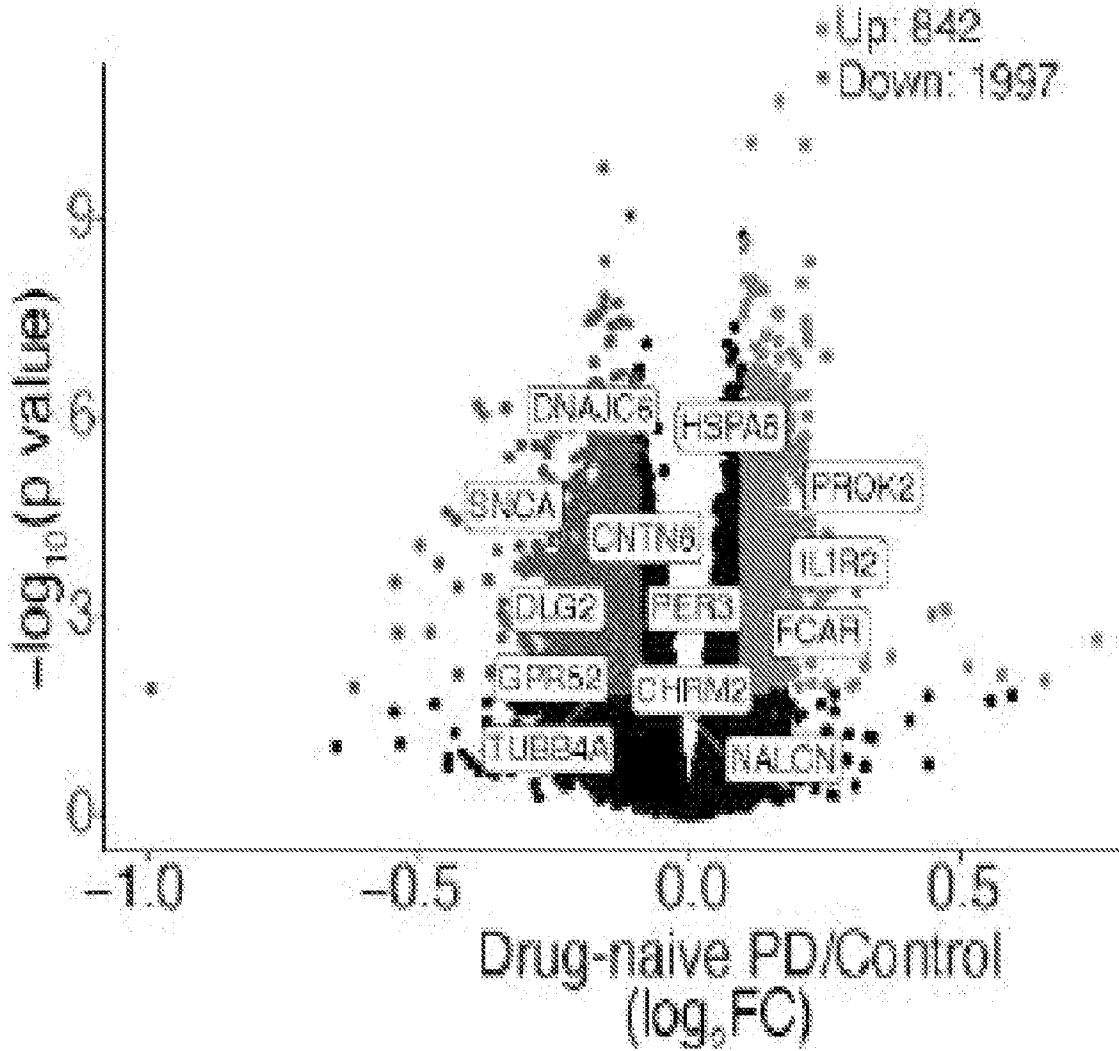


FIG. 6G

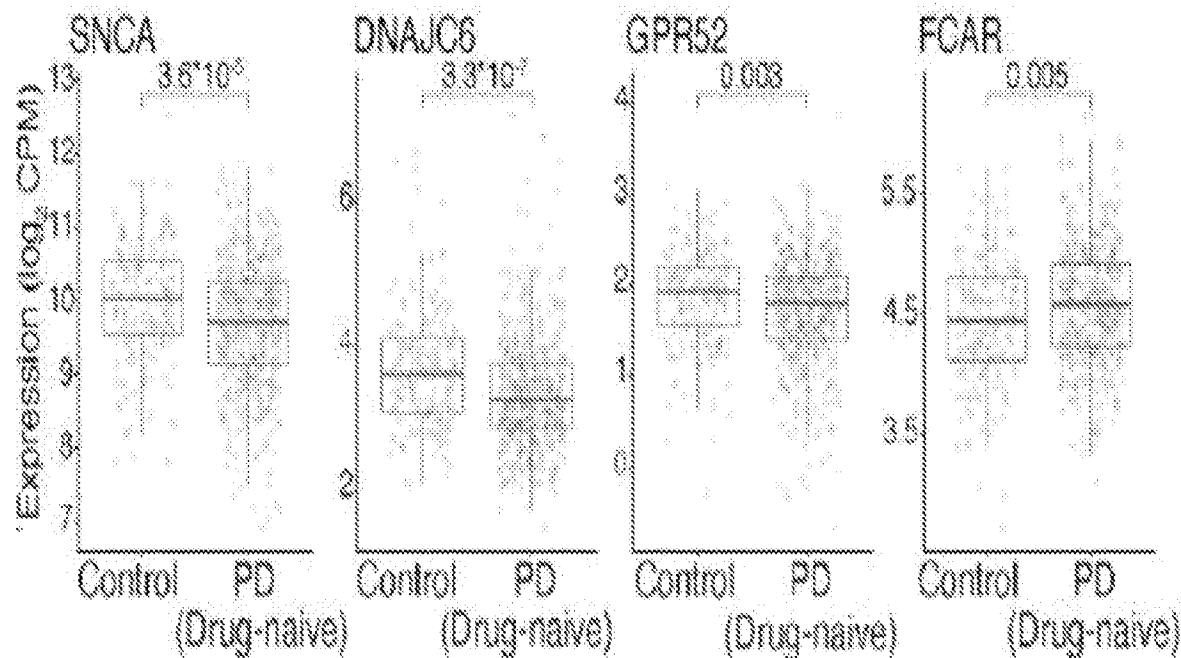


FIG. 6H

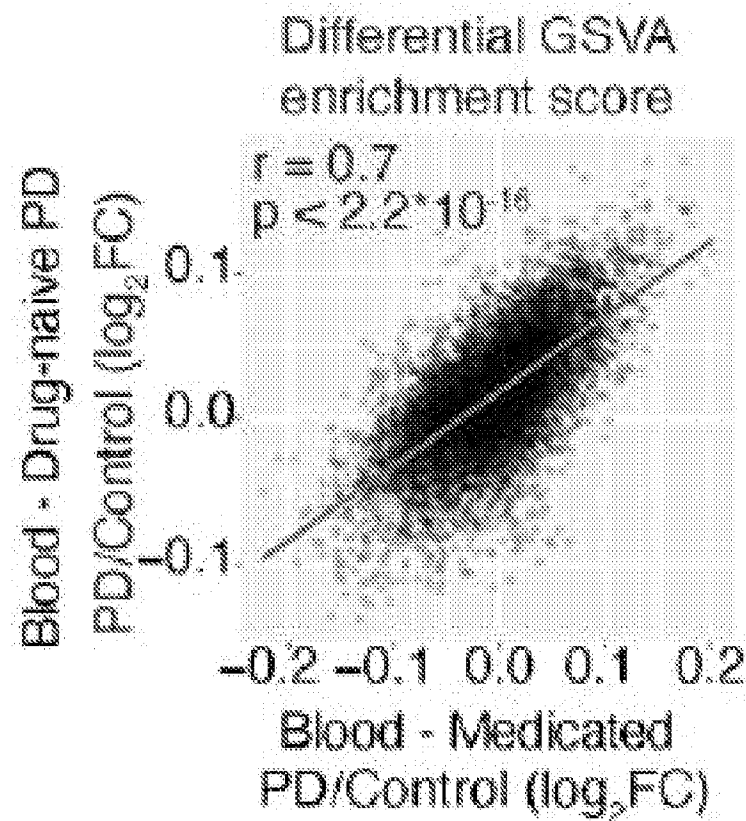


FIG. 6I

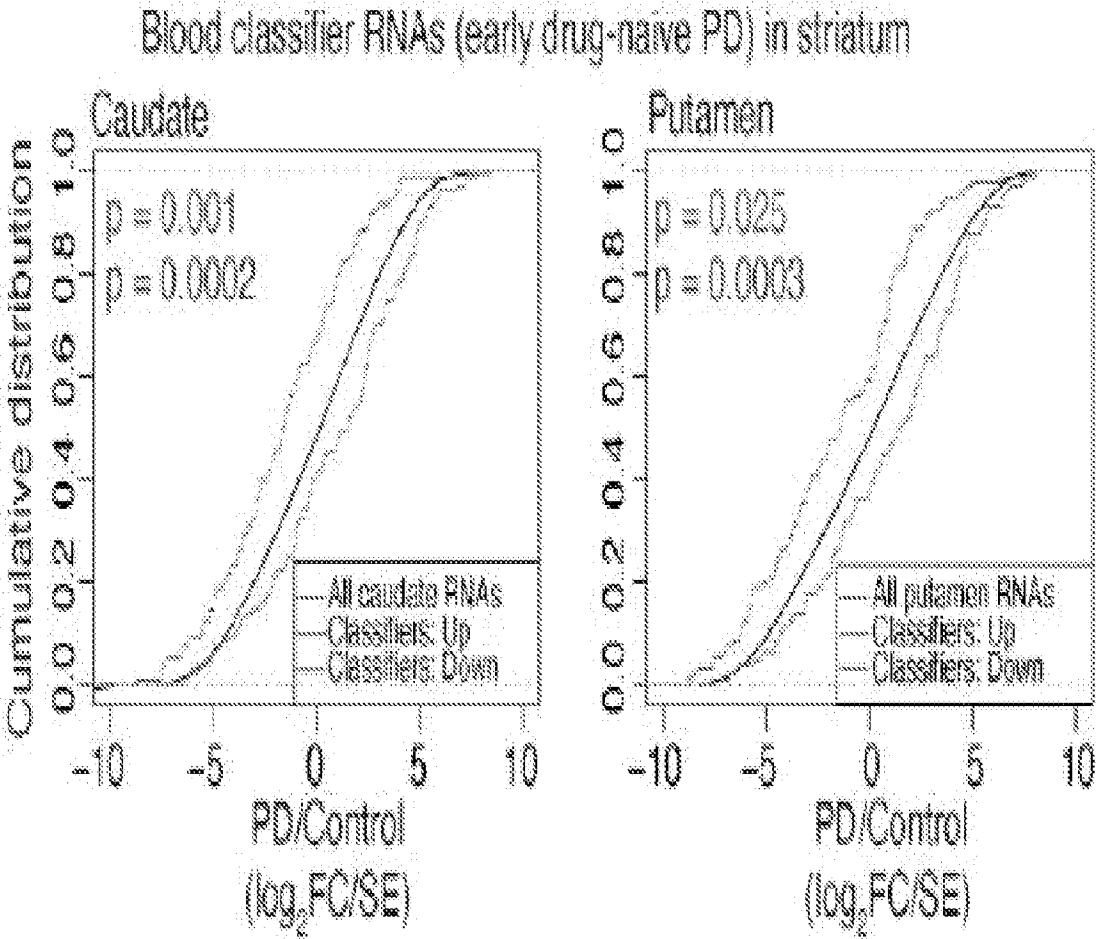


FIG. 7A

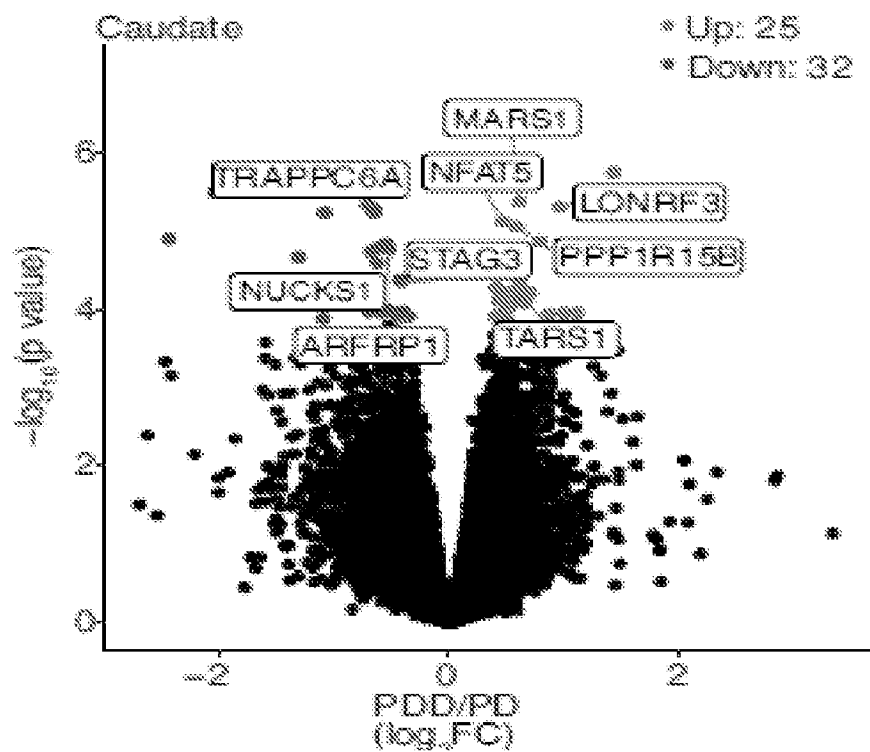


FIG. 7B

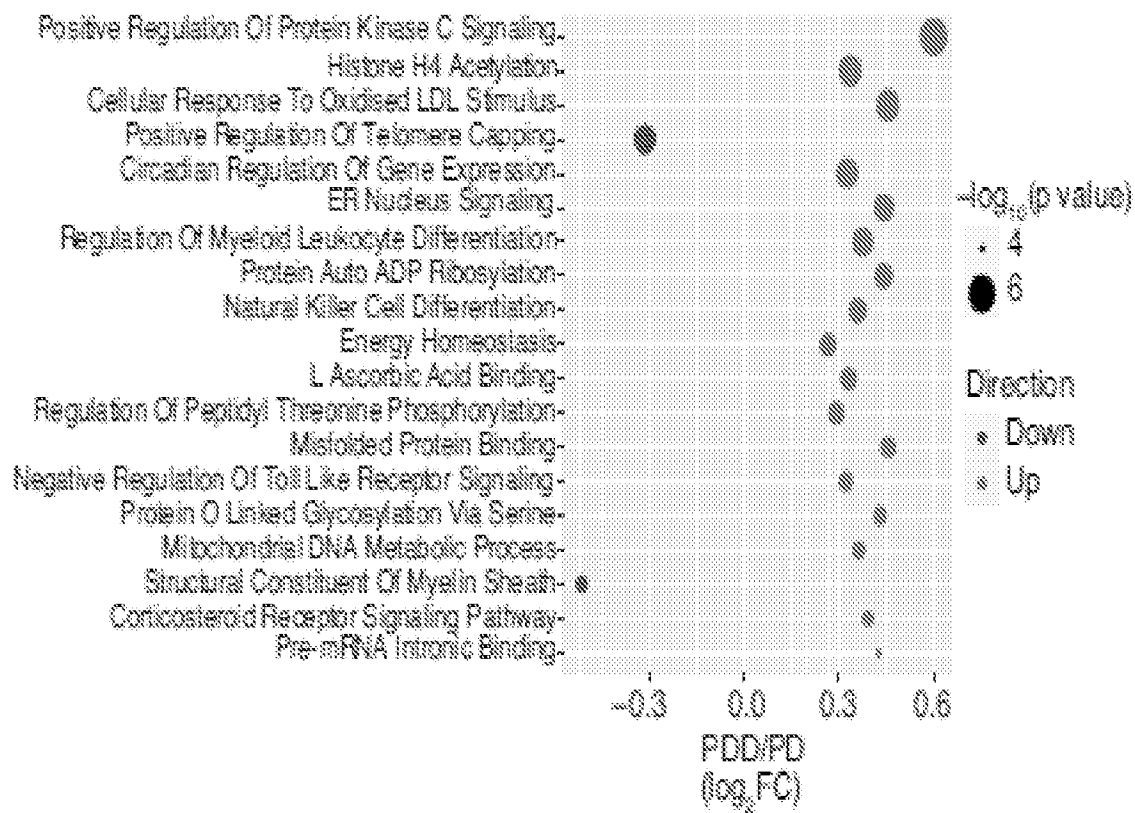


FIG. 7C

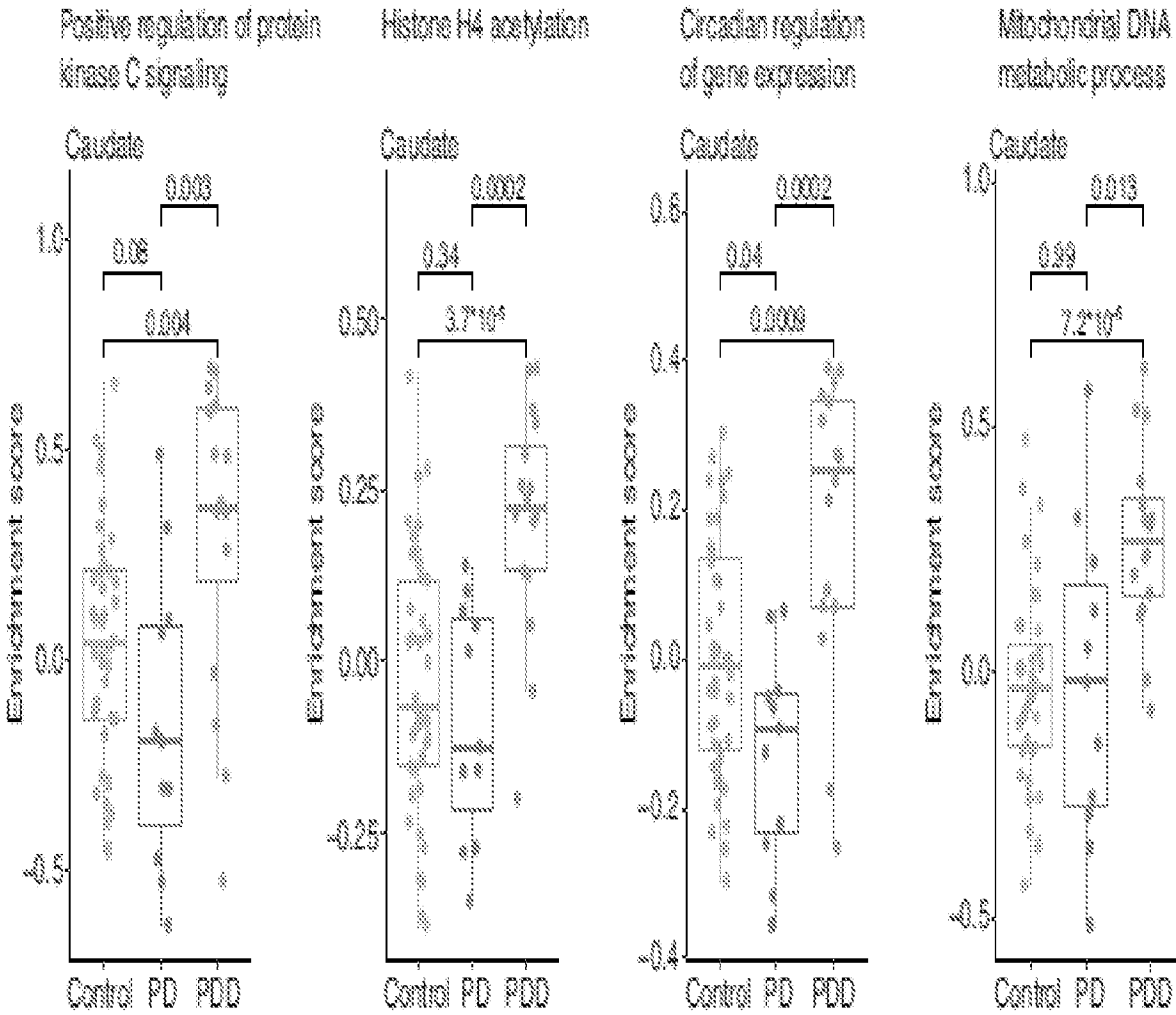


FIG. 7D

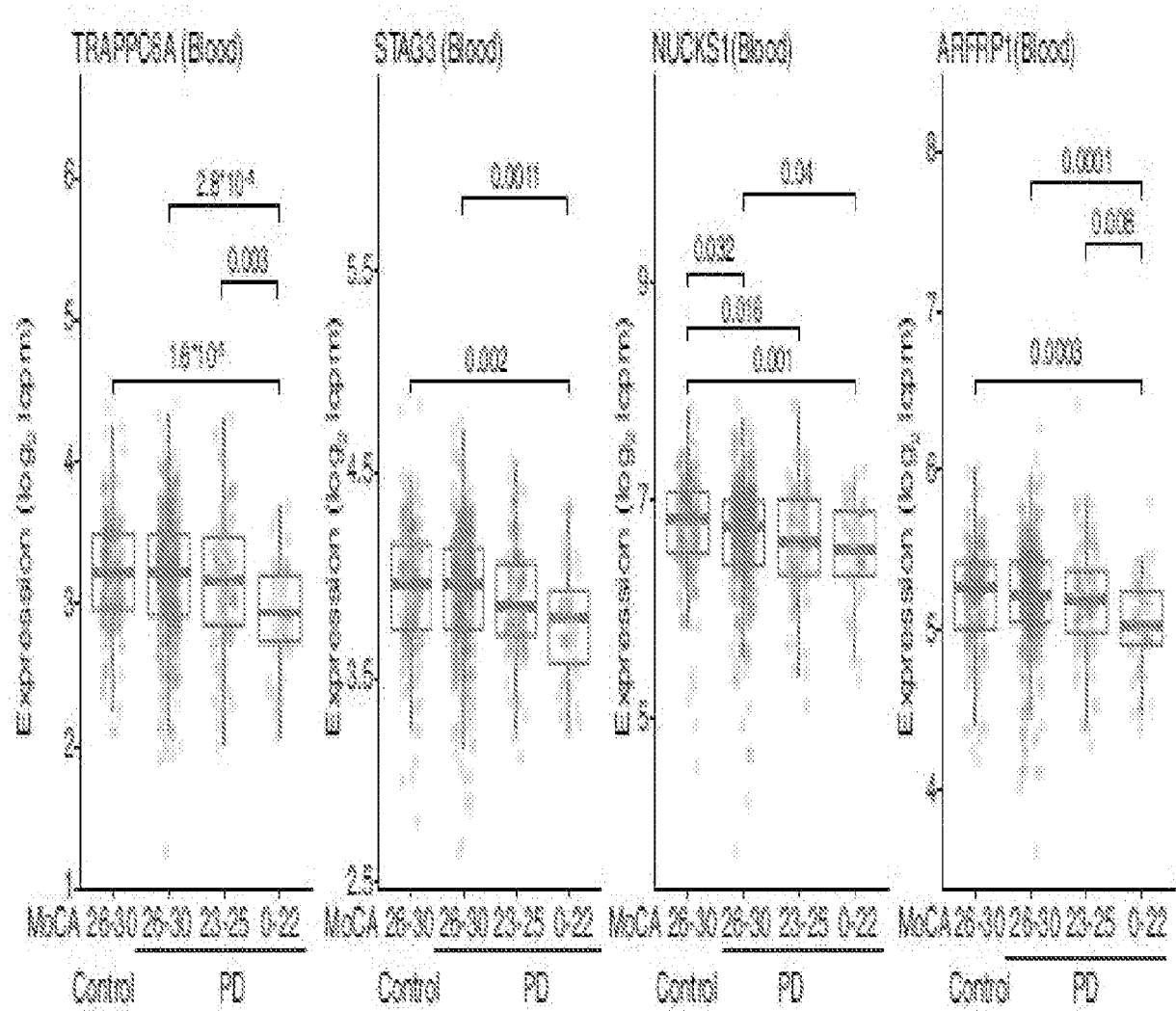


FIG. 8A

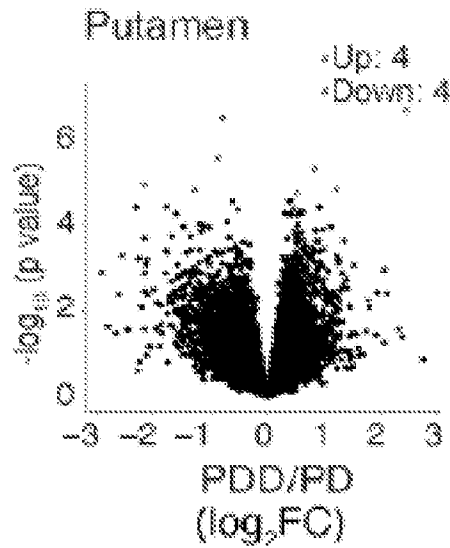


FIG. 8B

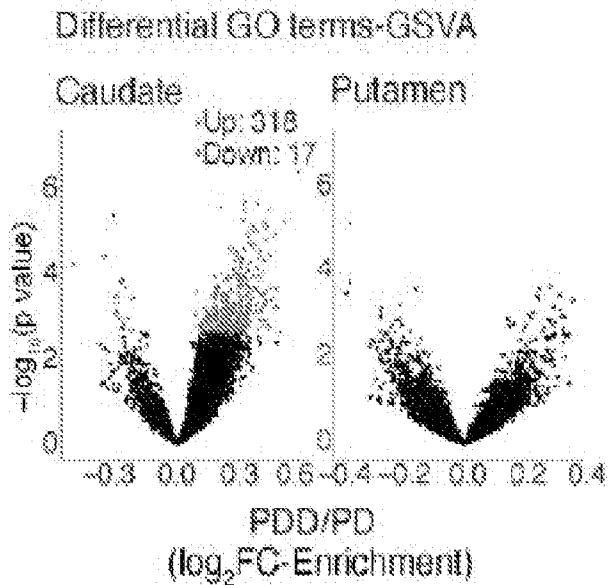


FIG. 8C

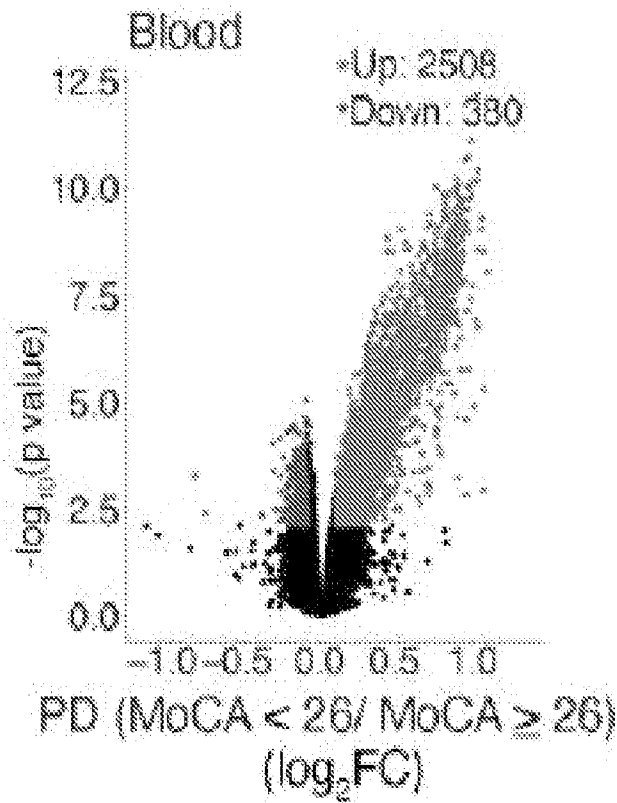


FIG. 8D

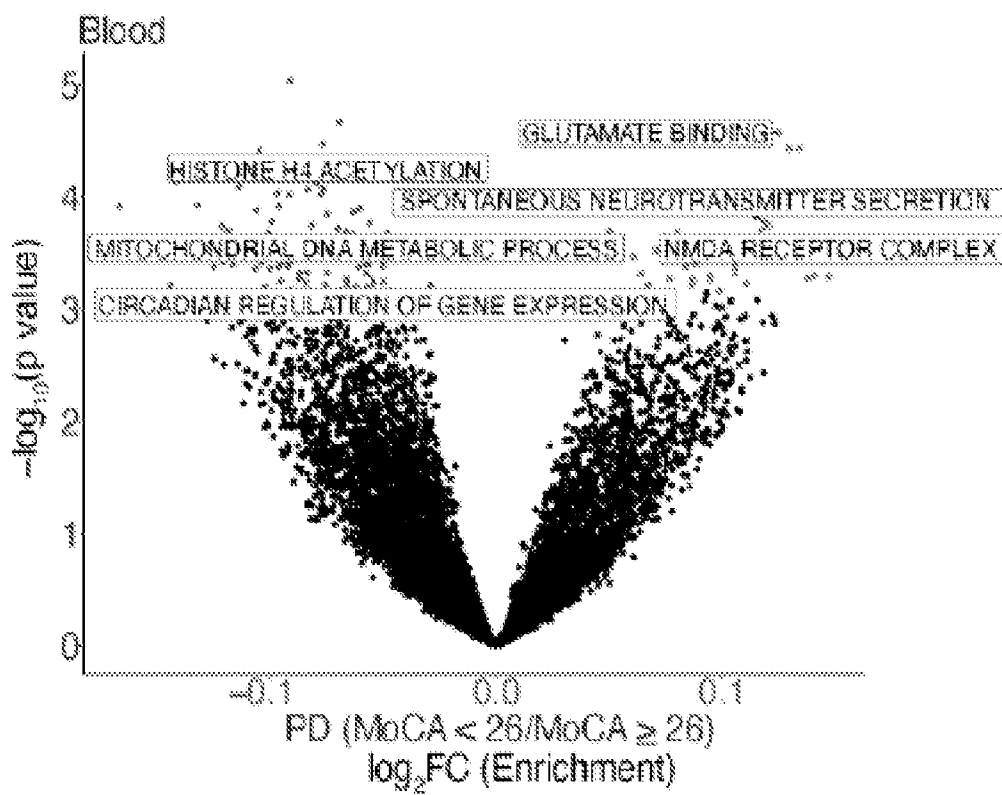


FIG. 8E

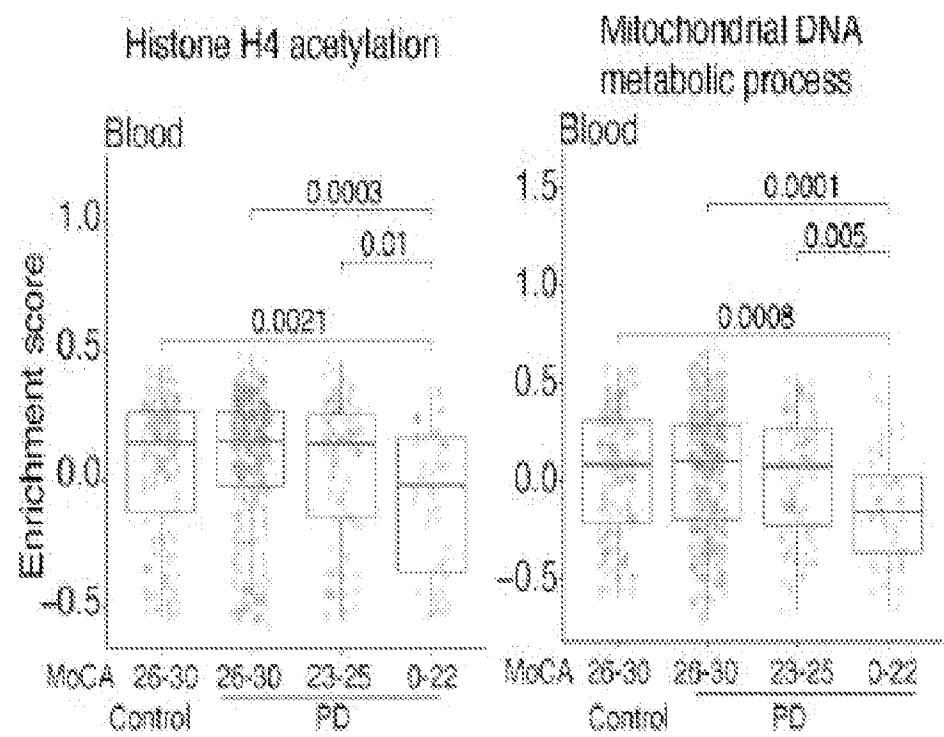


FIG. 8F

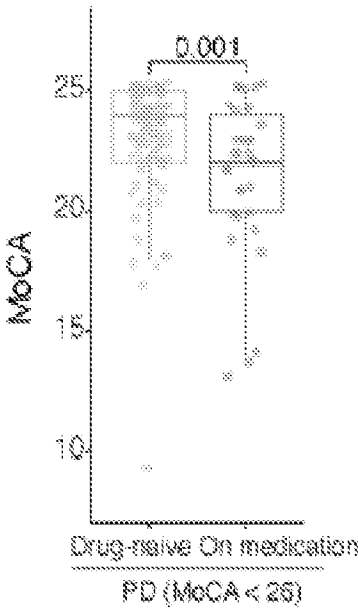


FIG. 8G

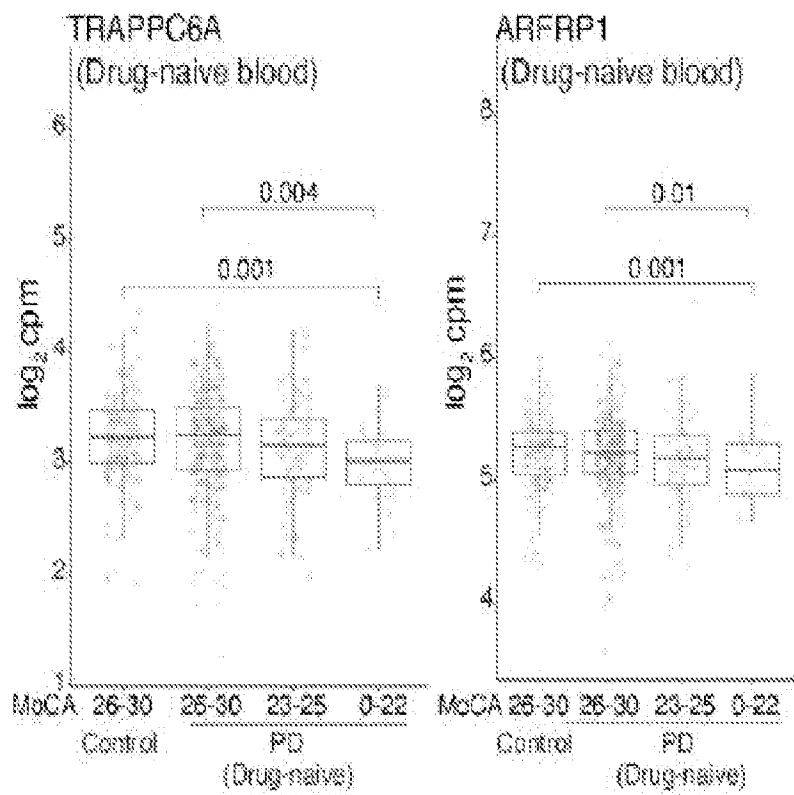


FIG. 8H

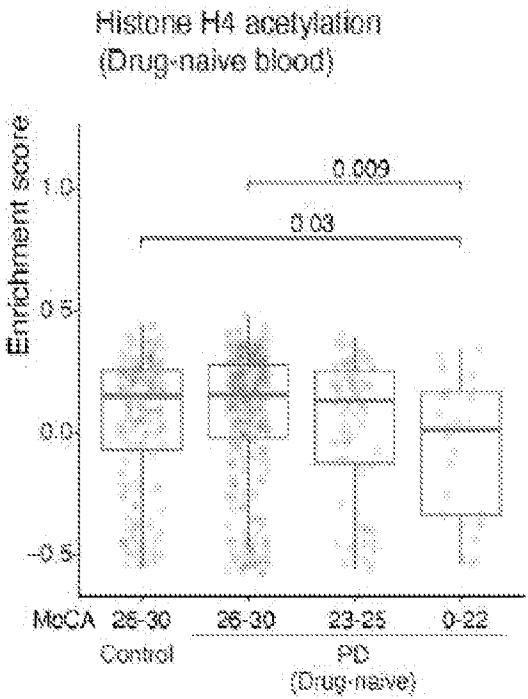


FIG. 9A

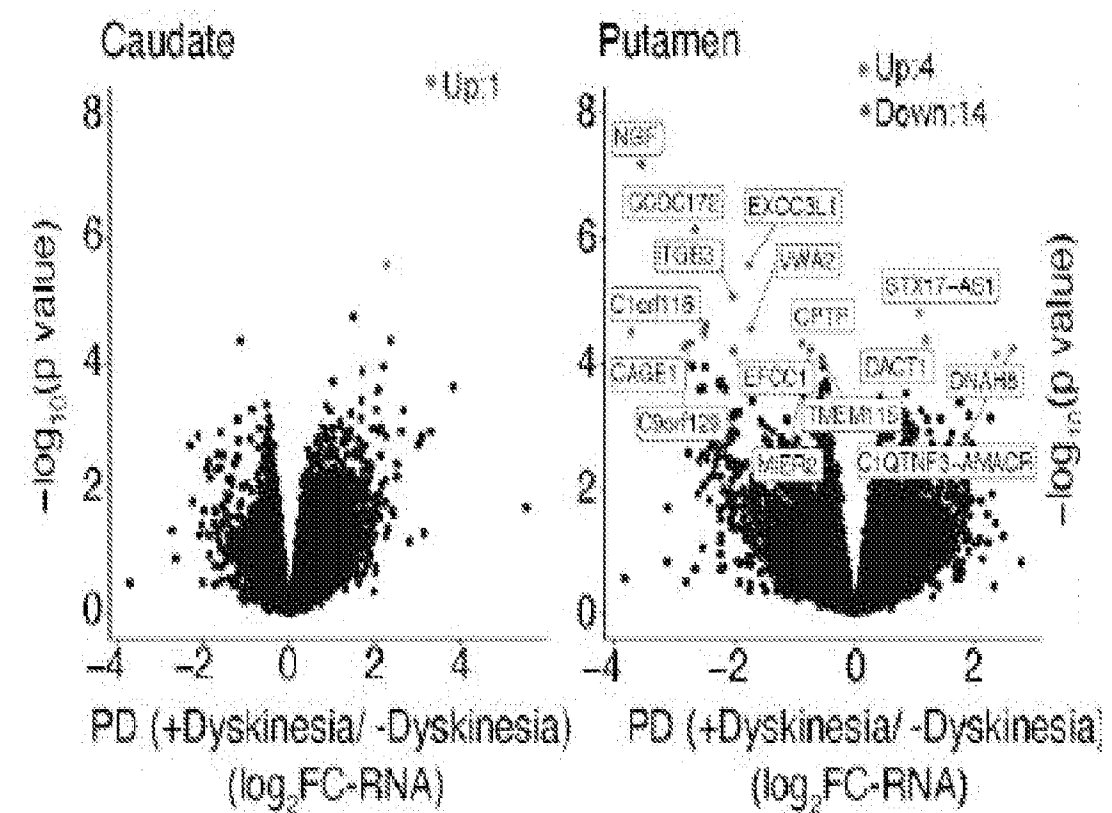


FIG. 9B

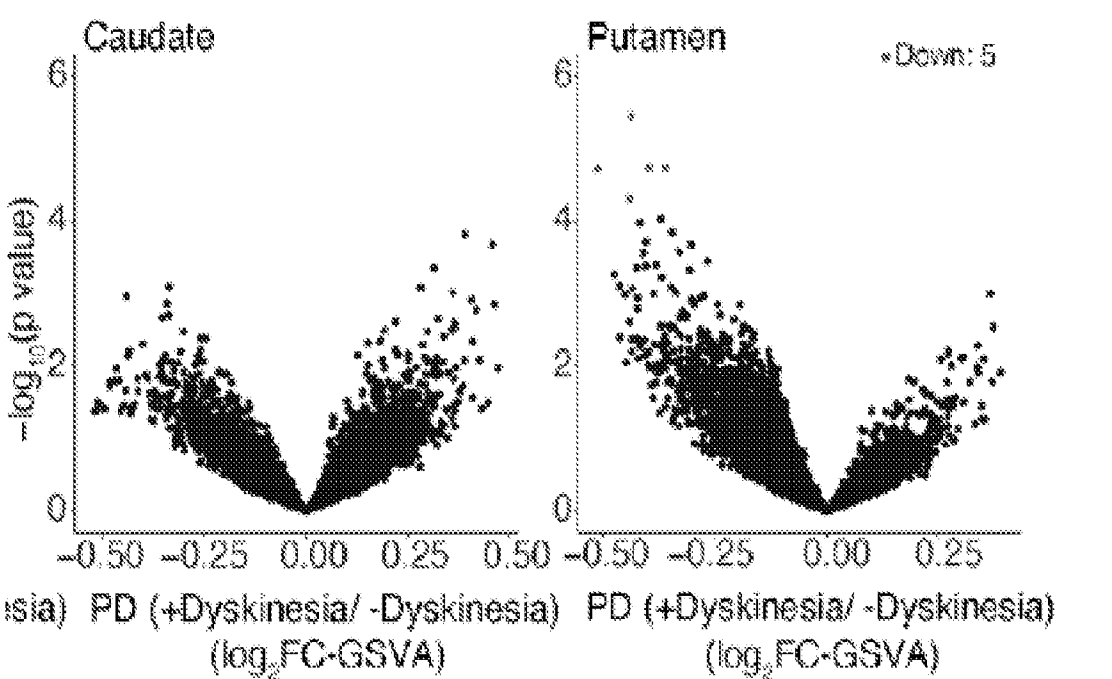


FIG. 9C

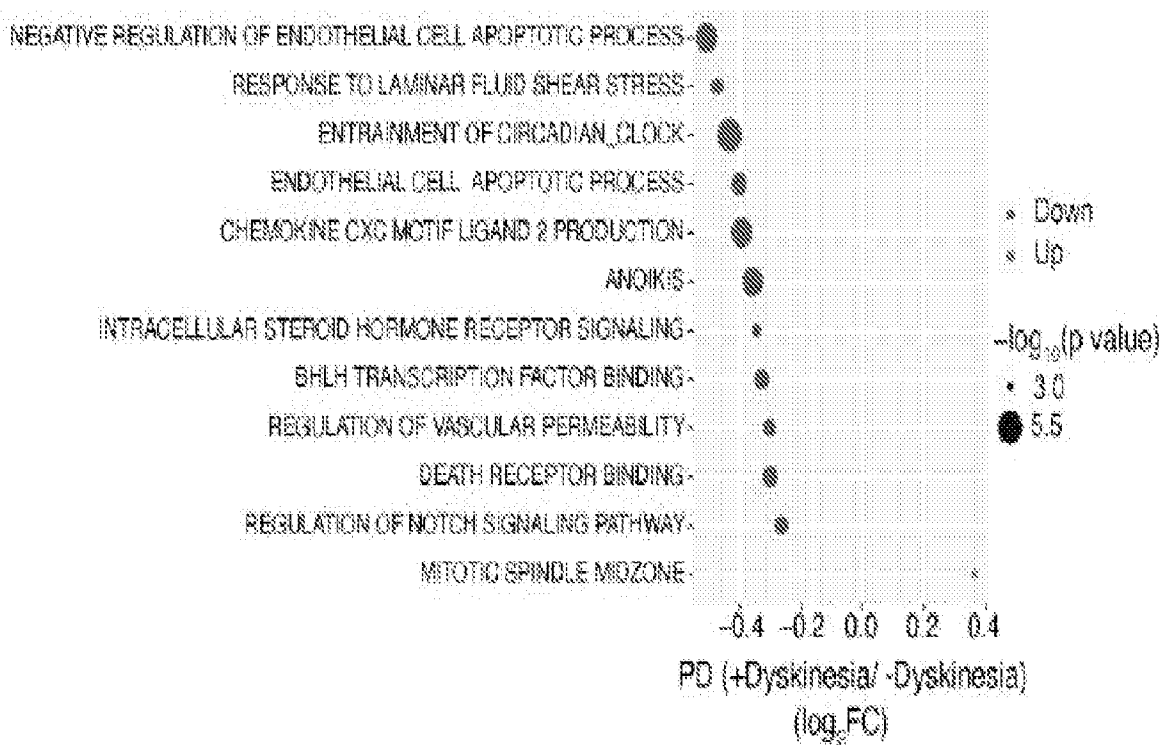


FIG. 9D

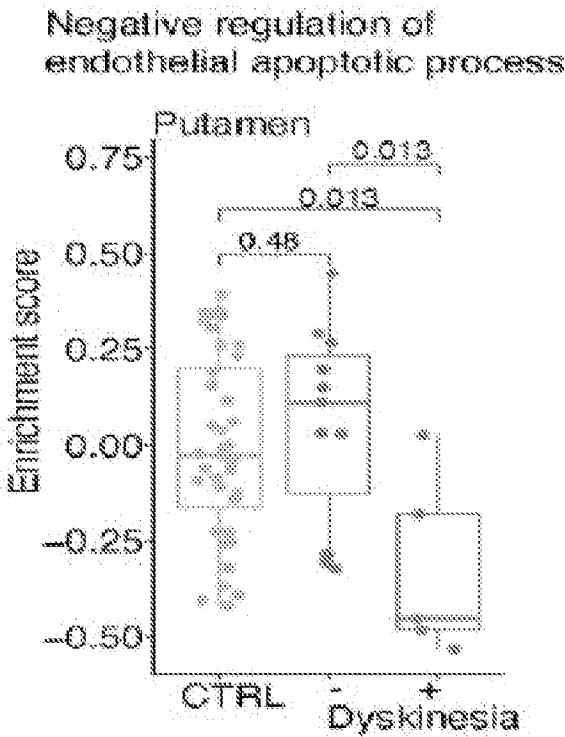


FIG. 10A

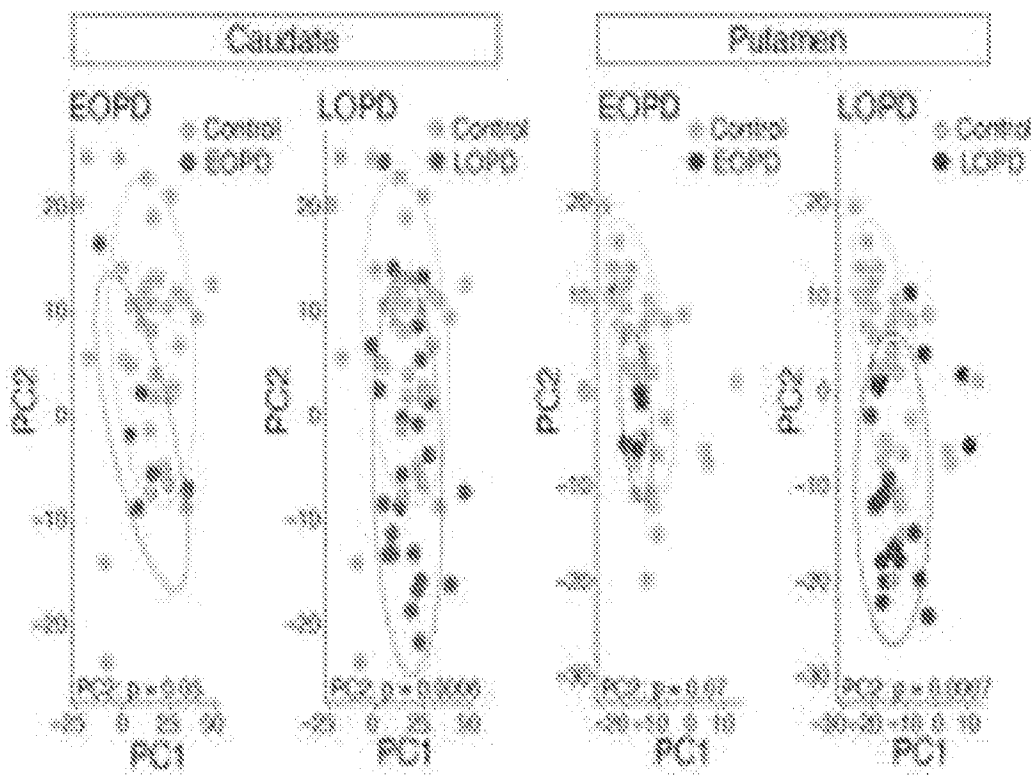


FIG. 10B

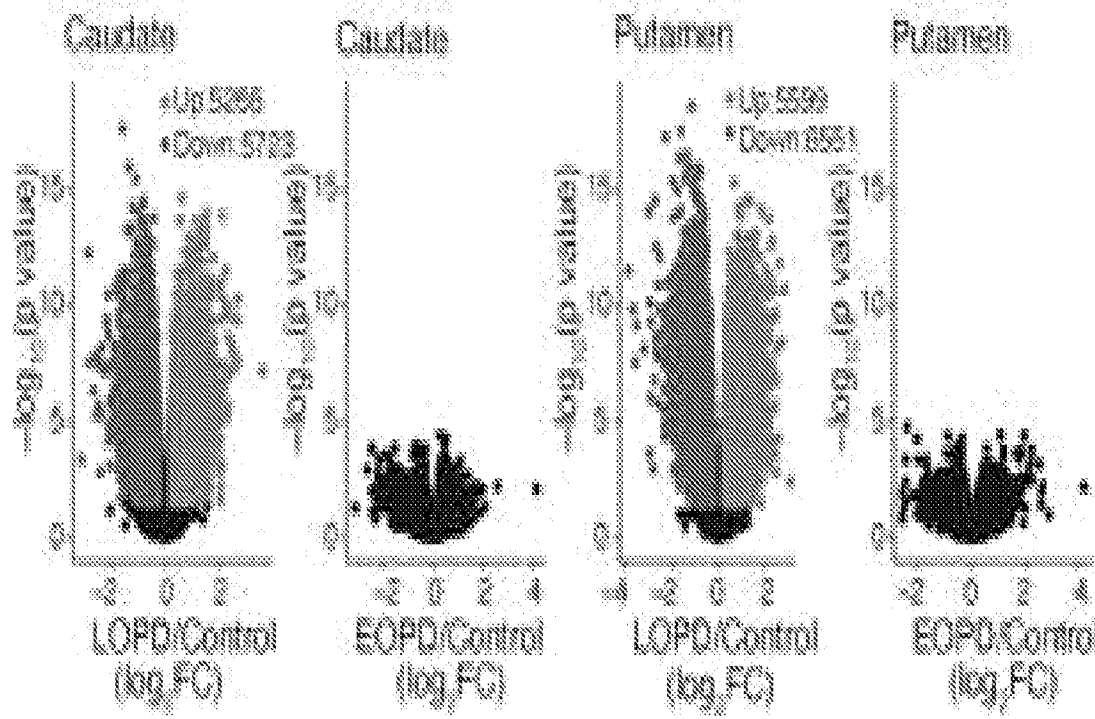


FIG. 10C

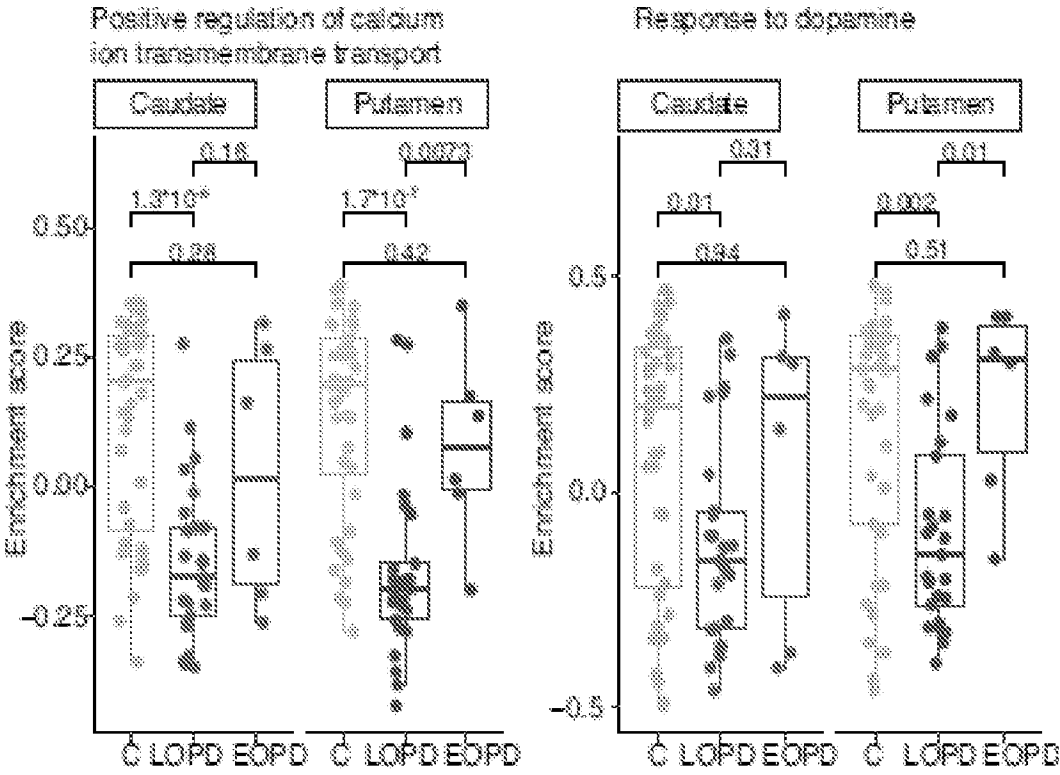


FIG. 10D

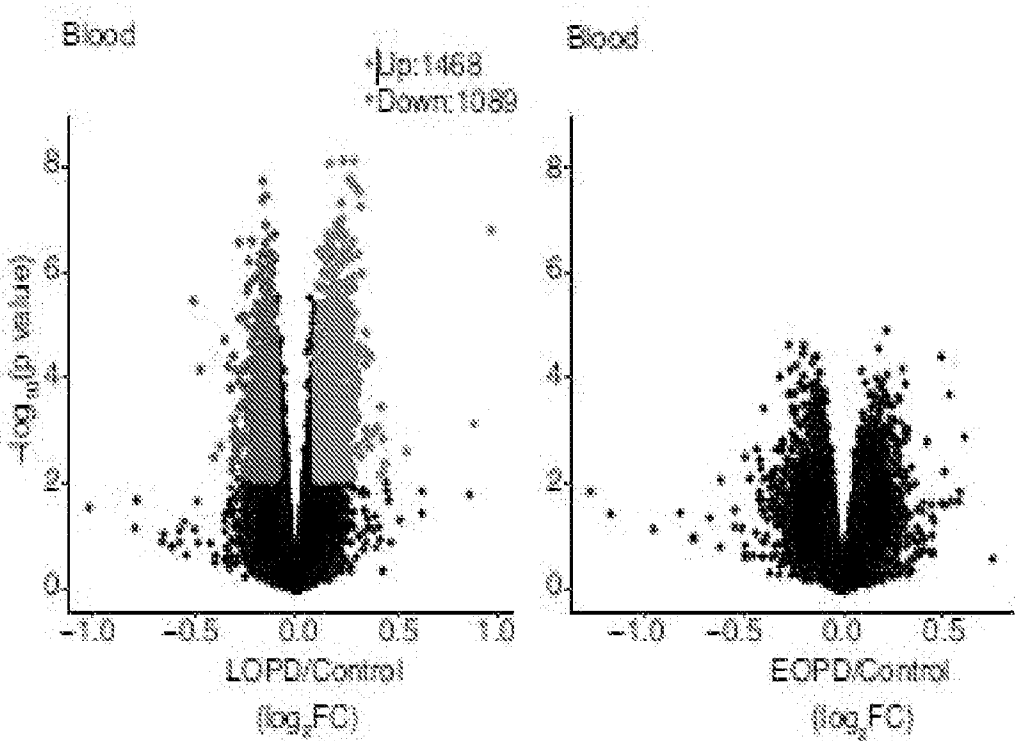


FIG. 11A

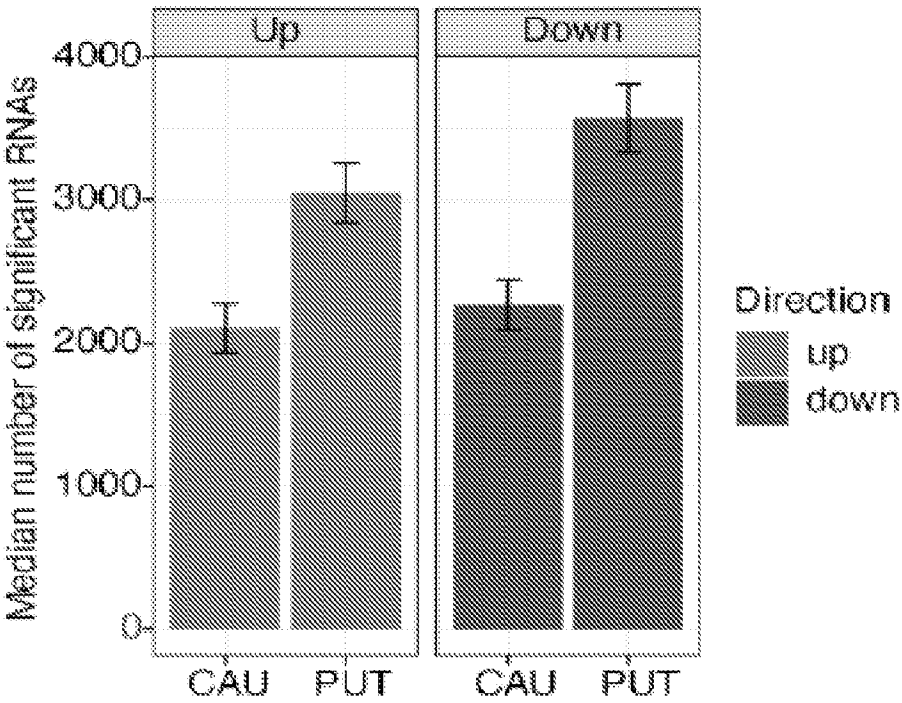


FIG. 11B

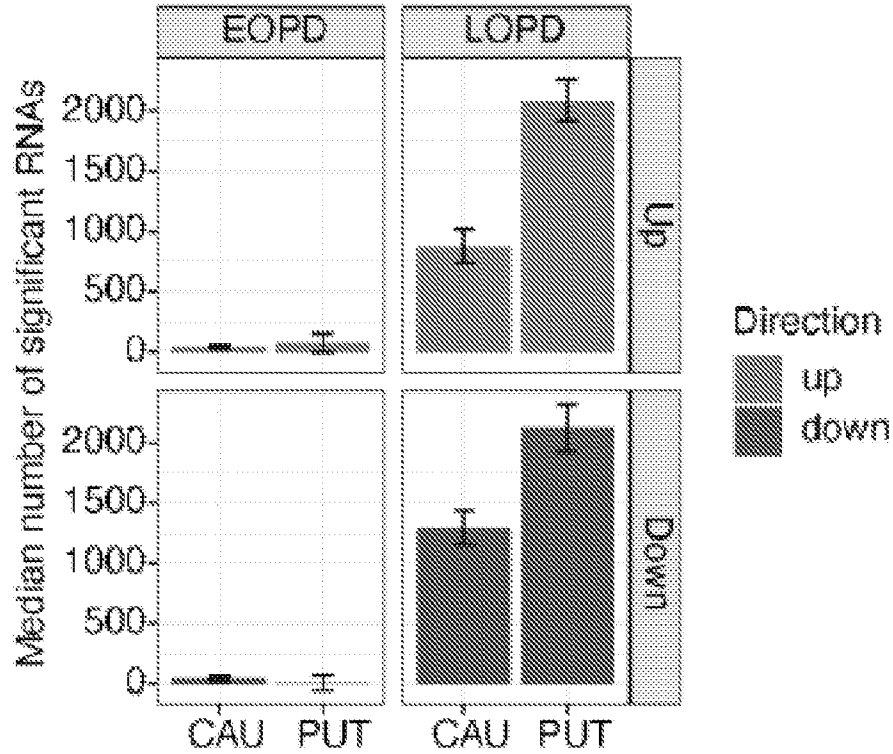


FIG. 11C

Caudate

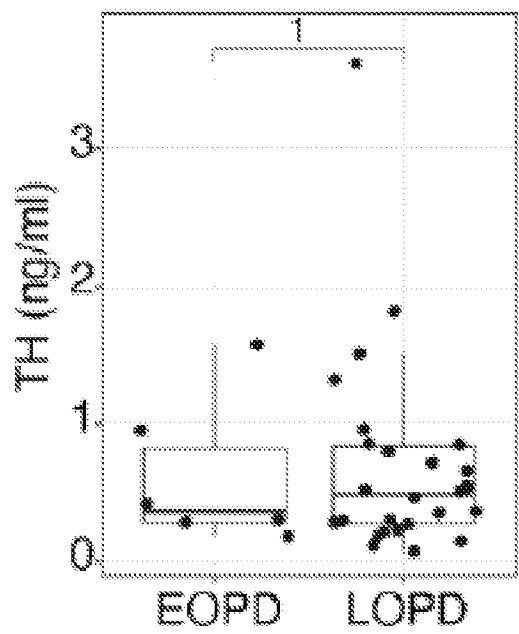


FIG. 11D

Putamen

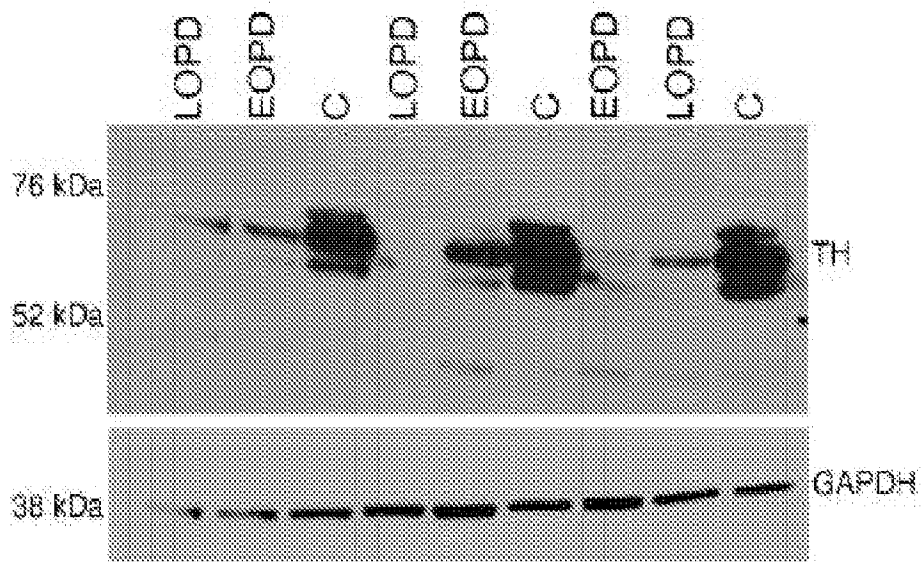


FIG. 11E

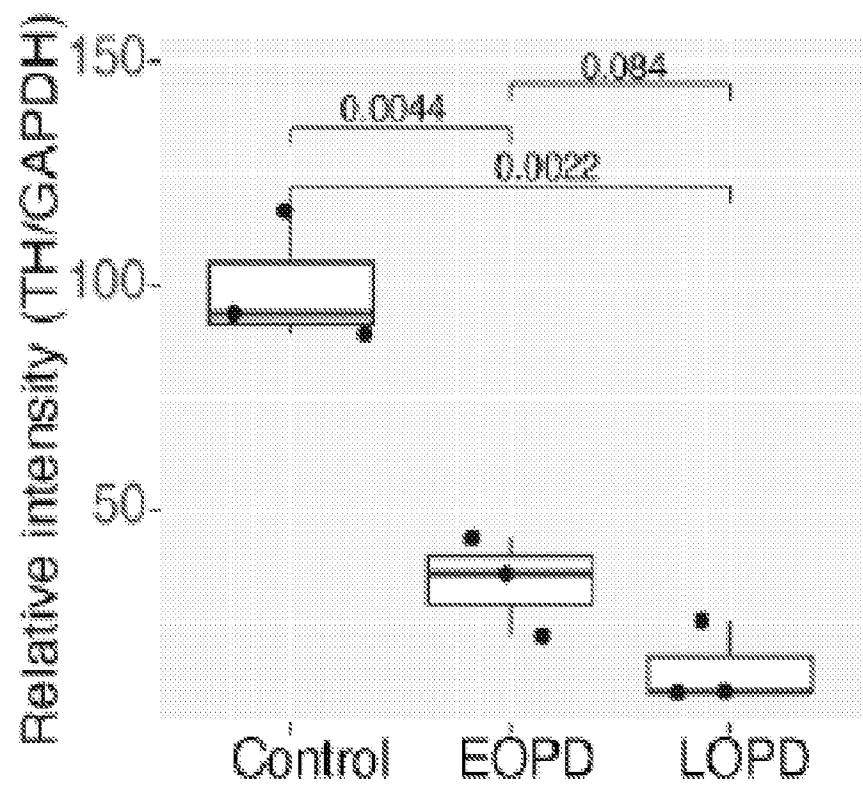


FIG. 12A

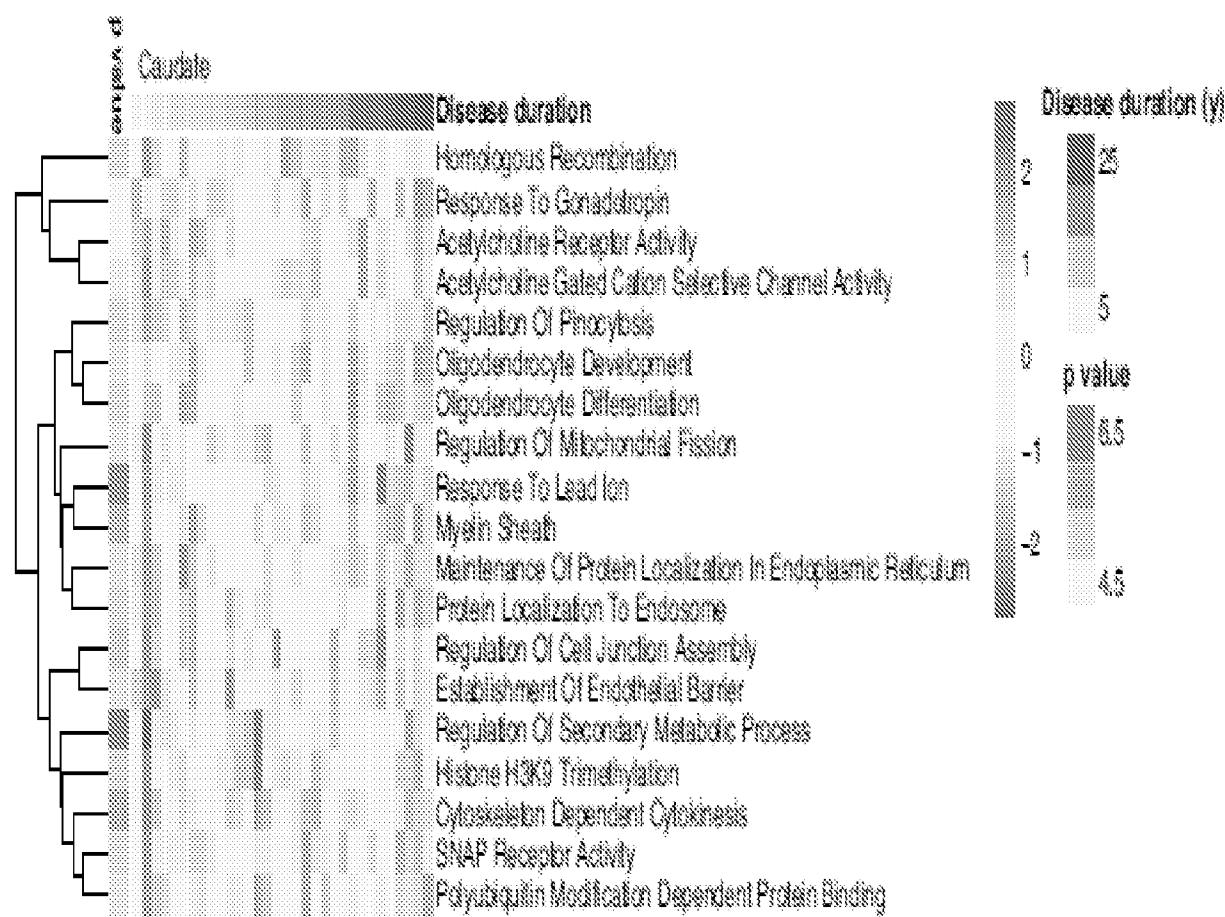


FIG. 12B

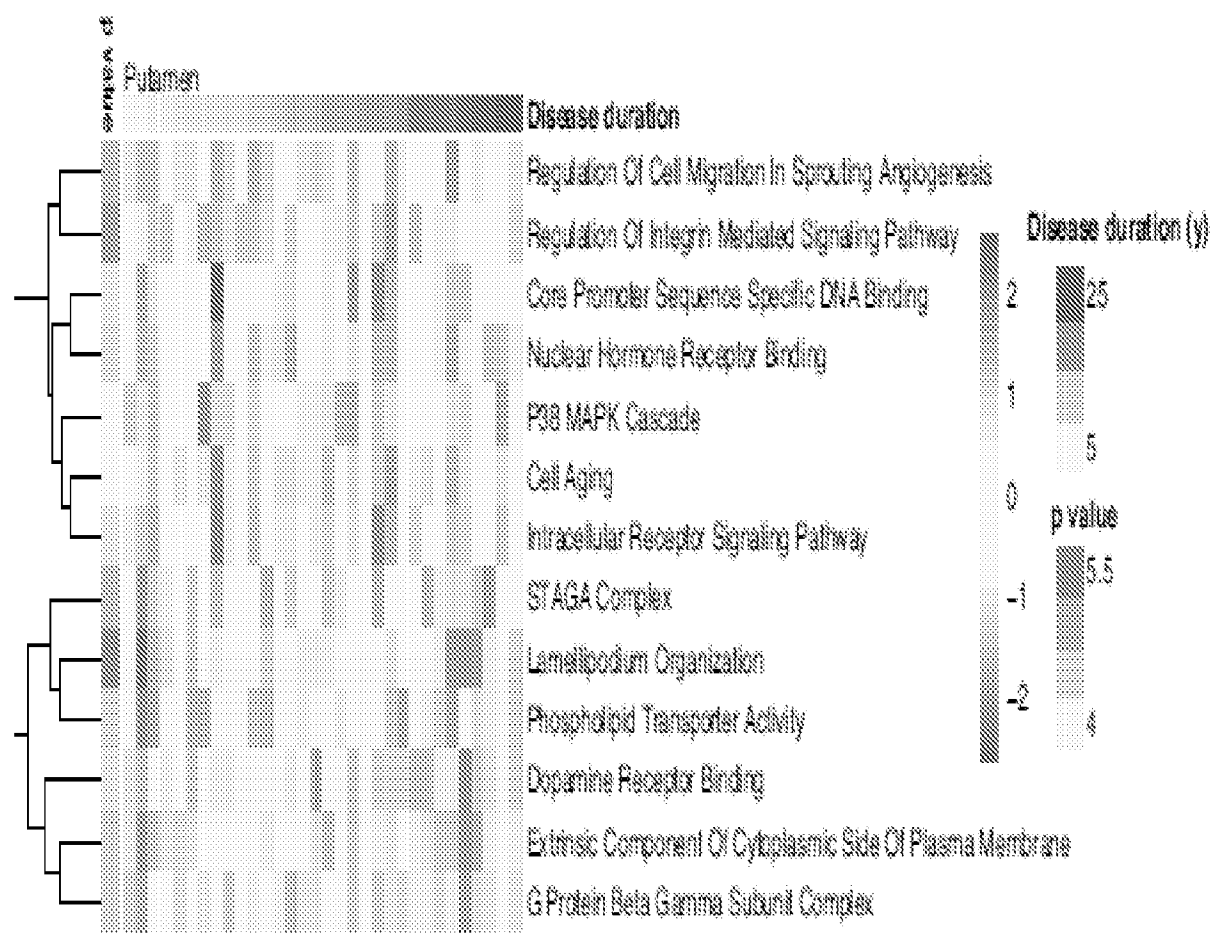


FIG. 12C

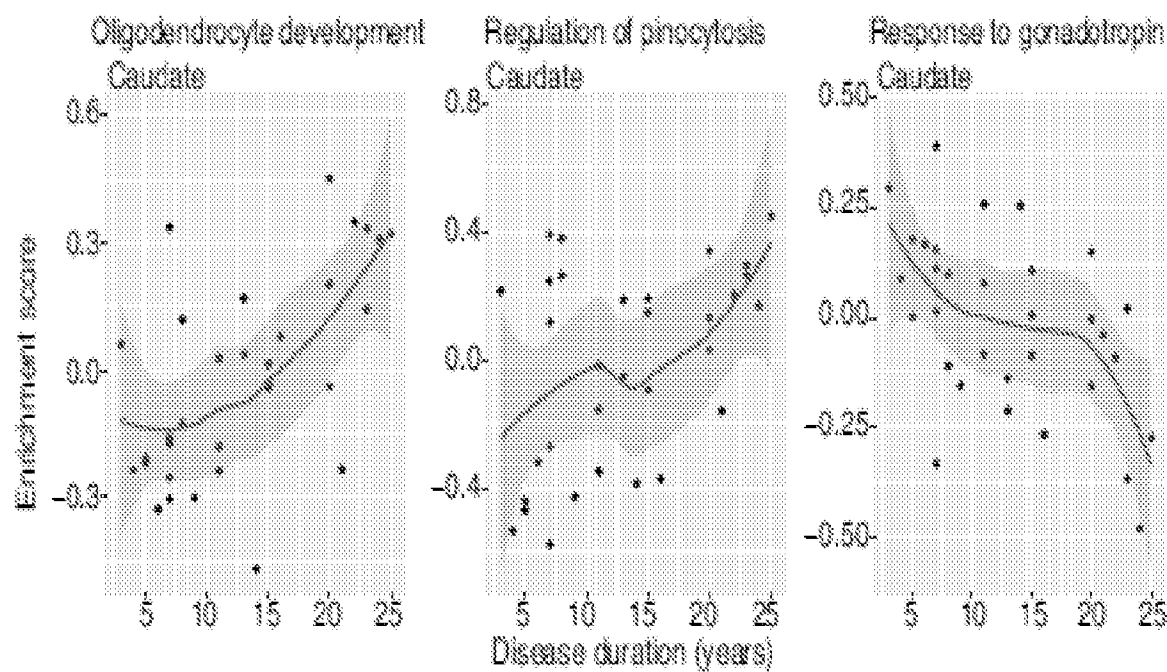


FIG. 12D

