Supplemental table 2. The reported roles of dysregulated genes in neurodevelopment, nervous system physiology, and neurodegeneration

Gene Symbol	Description of genes	Experimental Models	Role in neurodevelopment and/or neurodegeneration	Reference
ADAM21	ADAM metallopeptidase domain 21	rodent central nervous system (CNS)	ADAM21 is associated with neurogenesis and axonal growth in post-natal development	[1]
TBX1	T-box	mice	TBX1 encodes transcription factors specifically implicated in cardiac neural-crest-related developmental defects	[2]
PDGFC	platelet derived growth factor	mice	PDGFC is expressed in cerebellum and neurogenic derivatives of neural crest cells; palate formation, craniofacial structures, neural tube, and mesodermal organs	[3] [4]
KCNC1	potassium voltage-gated channel subfamily C member 1	whole-exome sequencing from diagnosed patients	KCNC1 mediates the voltage-dependent potassium ion permeability of excitable membranes, variants prevent neuronal inhibition, which is associated with epilepsy, ataxia, intellectual disability, and developmental delay	[5]
WNT7A	Wnt family member 7A	genetic mouse models, mouse embryos	WNT7A is crucial to the development of the cerebral cortex, synapse formation, and central nervous system vasculature formation and maintenance	[6]
MEF2C	myocyte enhancer factor 2C	mice	MEF2C is highly expressed in developing cortical excitatory neurons, variants linked to autism, intellectual	[7]

			disability, and schizophrenia	
TLE1	transducin like enhancer of split 1	mice	TLE1 inhibits differentiation of neural progenitor cells into neurons, necessary for the maintenance of neuronal survival	[8]
HSD11B2	hydroxysteroid 11-beta dehydrogenase 2	zebrafish	HSD11B2 is involved in stressor-mediated cortisol regulation and protecting glucocorticoid-sensitive tissues during stress	[9]
TUSC1	tumor suppressor candidate 1	Glioblastomas tissues and cell lines	TUSC1 inhibits malignant brain tumor proliferation and induces G1 phases arrest	[10]
KIRREL3	kirre like nephrin family adhesion molecule 3	mice	KIRREL3 is required for the formation of hippocampal mossy fiber synapses, which regulate inhibition of cornu ammonis 3 (CA3) neurons, variants associated with intellectual disabilities	[11]
SHPRH	SNF2 histone linker PHD RING helicase	diagnosed glioma samples and normal brain tissue	SHPRH found abundantly in the human brain, ubiquitinates proliferating cell nuclear antigen, leading to inhibited cell proliferation and tumorigenicity	[12]
AKAIN1	A-kinase anchor inhibitor 1	Neuro2a mouse neuronal cell line	AKAIN1 is expressed preferentially in neural tissues and serves as a disruptor peptide for PKA-AKAP interactions	[13]
PER2	period circadian regulator 2	UK biobank dataset	PER2 is centrally involved with generating and maintaining circadian daily rhythms	[14]
GABRG3	gamma-aminobutyric acid type A receptor gamma3 subunit	genetic mouse models	GABRB3 is important for neurodevelopment, mutations are associated with epilepsy, autism, and visual defects including	[15]

			ocular hypopigmentation	
CABYR	calcium binding tyrosine phosphorylation regulated	Yeast cloning and DNA sequencing	CABYR plays a primary role in the fibrous sheath but is also expressed more distinctly in fetal than the adult brain, providing a potential for a role in brain development	[16]
EP400	E1A binding protein p400	mice	EP400 is essential in the myelination of axons in the central and peripheral nervous systems	[17]
ALX3	ALX homeobox 3	mouse embryos	ALX3 encourages cell differentiation and is involved in cranial neural tube closure, a possible role of patterning the mesoderm during development	[18]
GGA3	golgi associated, gamma adaptin ear containing, ARF binding protein 3	Neuro2A cells	GGA3 regulates trafficking and degradation of enzymes from the Golgi, including some involved in Parkinson's disease and other age-related neurodegenerative disorders	[19]
ZBTB18	zinc finger and BTB domain containing 18	HeLa, HEK293, and P19 embryo-carcinoma cell lines	ZBTB18 encodes DNA-binding transcription factors essential for myogenesis and brain development, variants can lead to brain developmental disease	[20]
CHD5	chromodomain helicase DNA binding protein 5	rodent cerebral cortex	CHD5 plays a role in the development of the nervous system by activating the expression of genes promoting neuron terminal differentiation	[21]
SS18L1	SS18L1, nBAF chromatin remodeling	genetic mouse models	SS18L1 encodes calcium-responsive transactivator (CREST),	[22]

	complex subunit		which when deleted leads to neuroinflammation and ALS-like motor defects	
RIMKLA	ribosomal modification protein rimK like family member A	murine brain tissue and sciatic nerves	RIMKLA synthesizes N-acetyl-L-aspartyl-L-glutamate (NAAG), found in sciatic nerves, spinal, cord, and brainstem and predicted to act as a neurotransmitter	[23]
EPHA7	EPH receptor A7	adult rat and mouse brain	EPHA7 regulates brain development modulating cell-cell adhesion and repulsion and plays key roles in adult CNS synaptic maintenance, plasticity, and function	[24]
FAT4	FAT atypical cadherin 4	complete coding sequence of FAT4_human	FAT4 acts as a positive regulator of planar cell polarity and is expressed in fetal brain, infant brain, brain tumor, and colorectal cancer	[25]
NAB1	NGFI-A binding protein 1	C. elegans ventral nerve cord	NAB1 can interact with SYD1 in absence of Rac proteins to inhibit axon outgrowth and prohibit neurite development	[26]
DENND2A	DENN domain containing 2A	Ischemic stroke and Parkinson's Disease patient tissue and whole blood samples	DENND2A acts as a specific guanine nucleotide exchange factor (GEF) for Rab9, possible role in mitophagy-determined etiology of Parkinson's disease and ischemic stroke	[27]
PCED1B	PC-esterase domain containing 1B	Human astrocyte and glioma cells	PCED1B knockdown restricted cell proliferation and induced cell apoptosis in glioma cells	[28]
MEF2A	myocyte enhancer factor 2A	human and rat temporal neocortex tissue	MEF2A regulates synaptogenesis, dendritic morphogenesis, and neuronal survival, and is	[29]

			found to be downregulated in temporal lobe epilepsy	
SENP5	SUMO specific peptidase 5	murine brain tissue	SENP5 in cortical neurons is localized to presynaptic terminals, postsynaptic spines, and mitochondria in axon terminals, suggesting a role for SUMOylation in synaptic regulation	[30]
RASGEF1B	RasGEF domain family member 1B	mouse embryos	RASGEF1B is expressed primarily in cortical interneurons in the cortical subventricular zone and may play a role in tangential migration of interneurons	[31]
GABRA2	gamma-aminobutyric acid type A receptor alpha2 subunit	genetic and clinical data of diagnosed patients	GABRA2 variants are associated with early-onset epileptic encephalopathy and intellectual disability with seizures	[32]
HOXC13	homeobox C13	mice brain microvascular endothelial cells; sheep embryonic mRNA	HOXC13 is upregulated by vascular endothelial growth factor (VEGF) in vitro models of cerebral ischemia, aggravating the blood brain barrier; indicated in the development of hair, nail, and filiform papilla	[33]
USPL1	ubiquitin specific peptidase like 1	SMN2 mice embryos and neonates	USPL1 changes in alternative splicing found in phenotypic-stage severe spinal muscular atrophy embryo and neonate models and these changes became more pronounced with the severity of the disease	[34]
SPTB	spectrin beta, erythrocytic	patient with diagnosed autism and spherocytosis	SPTB encodes a cytoskeleton protein previously associated with spherocytosis, deleted in case studies with	[35]

			spherocytosis, severe learning disabilities, and mild mental retardation	
DISP2	dispatched RND transporter family member 2	zebrafish	DISP2 is expressed in the telencephalon and ventral hindbrain in zebrafish found to be essential for normal embryonic development	[36]
GAN	gigaxonin	diagnosed giant axonal neuropathy patients	GAN synonymous mutations and intragenic deletions are involved in giant axonal neuropathy, an age-related progressive neurodegenerative disease involving PNS and CNS	[37]
PCDHB8	protocadherin beta 8	Ms5Yah mouse model	PCDHB8 is disrupted in genetic mouse models of partial monosomy 21, characterized by intellectual disabilities involving spatial learning and memory impairments, craniofacial dysmorphology, short stature, and muscular and heart defects	[38]
SNRK	SNF related kinase	rat cerebellar granule neurons	SNRK is implicated in the regulation of low K+ induced apoptosis of cerebellar granule neurons	[39]
CCSER1	coiled-coil serine rich protein 1	Parkinson's patient	CCSER1 is disrupted at the genomic breakpoint in early-onset, sever parkinsonism-dementia syndrome	[40]
ARFGEF1	ADP ribosylation factor guanine nucleotide exchange factor 1	genetic mouse models	ARFGEF1 haploinsufficiency is associated with developmental delay and decreased threshold to spontaneous seizure activity suggested to impair neuronal inhibition	[41]

CSRNP3	cysteine and serine rich nuclear protein 3	unigene libraries of mouse tissues	CSRNP3 homologue is only expressed in the mouse brain and spinal cord during embryonic development but in all regions of the adult brain	[42]
MAPK8IP3	mitogen-activated protein kinase 8 interacting protein 3	MAPK8IP3 variant case studies, zebrafish embryos	MAPK8IP3 variants are associated with spastic diplegia, intellectual disability, cerebral atrophy, and corpus callosum hypoplasia; overexpression in zebrafish embryos had an adverse effect on developing axons	[43]
ALKBH8	alkB homolog 8, tRNA methyltransferase	tRNA of ALKBH8 mutated individuals	ALKBH8 truncations affect wobble modifications, which the brain is sensitive to and is associated with intellectual disability	[44]
PDXDC1	pyridoxal dependent decarboxylase domain containing 1	genetic mouse models	PDXDC1 suppression increases acoustic prepulse inhibition, a schizophrenia endophenotype, and is highly expressed in the hippocampus	[45]
ANK3	ankyrin 3	genetic mouse models	ANK3 suppression is linked to schizophrenia, bipolar disorder, intellectual disability, and autism spectrum disorders, and heterozygous knockouts in mice show smaller cingulate cortex, granular retrosplenial cortex, primary motor cortex, and fimbria of the hippocampus	[46]
KCNB2	potassium voltage-gated channel subfamily B	mouse dorsal root ganglion neurons	KCNB2 plays a role in the postnatal maturation of dorsal root ganglion neurons, expression gradually	[47]

	member 2		decreases between 1 and 4 weeks of age	
SLC16A14	solute carrier family 16 member 14	mouse brain tissue	SLC16A14 encodes a protein exclusively localized in the soma of neurons and highly expressed in excitatory and inhibitory neurons and epithelial cells in the mouse brain suggested to be a neuronal aromatic-amino-acid transporter	[48]
RORB	RAR related orphan receptor B	whole exome sequencing from diagnosed patients	RORB variants are associated with neurodevelopmental disorders, especially in generalized epilepsies with predominant absence seizures, and is hypothesized to control cytoarchitectural patterning of neocortical neurons during development	[49]
SEMA4C	semaphorin 4C	genetic mouse models	SEMA4C signaling knockout in mouse forebrain indicates a large role of this gene in the recent and remote recall of fear memory, specifically by enhancing dendritic ramifications and modulating synaptic density in the adult hippocampus	[50]
CNTN1	contactin 1	healthy adult corpus collosum tissue	CNTN1 gene variations are linked to impacted axon density in the corpus collosum, and is suggested to be an axon guidance gene	[51]
PCDHB11	protocadherin beta 11	K562 cells	PCDBH11 is a human-specific brain-expressed protein with homophilic cell adhesion	[52]

			functions	
AASDHPPT	aminoadipate-semialdehyde dehydrogenase-phosphopantetheinyl transferase	human glioma metabolomics	AASDHPPT is a sulfotransferase found up-regulated in malignant brain tumor	[53]
ZNF852	zinc finger protein 852	whole genome analysis of epileptic patients	ZNF852 downregulation was associated with seizure-free outcome of epileptic patients following anterior temporal lobectomy with amygdalohippocampectomy	[54]
MAPK8IP2	mitogen-activated protein kinase 8 interacting protein 2	RNA sequencing of human brain tissue	MAPK8IP2 expression is high throughout fetal life and infancy, and is suggested to enrich genes related to axonal growth and synaptic function during neurodevelopment; deleted in Phelan-McDermid syndrome, characterized by intellectual disability, severely delayed language development, and specific facial features	[55]
SLITRK1	SLIT and NTRK like family member 1	genomic screenings	SLITRK1 variants are associated with obsessive-compulsive disorder and Tourette disorder phenotypes	[56, 57]
PLXNC1	plexin C1	genetic mouse models	PLXNC1 directs axonal guidance of midbrain dopaminergic neurons and the segregation of mesolimbic and nigrostriatal dopaminergic pathways	[58]
ATP6V0A1	ATPase H^+ transporting V0 subunit a1	human microglial cells	ATP6V0A1 elevation attenuates rotenone-induced microglia inflammation, which is implicated in the	[59]

			chronic inflammation of Parkinson’s disease	
DPYSL2	dihydropyrimidinase like 2	genetic mouse models	DPYSL2 is identified as an alcohol-sensitive Alzheimer's Disease-related protein that regulates cytoskeleton development	[60]
CHRFAM7A	CHRNA7 (exons 5-10) and FAM7A (exons A-E) fusion	clinical data of diagnosed patients	CHRFAM7A variation is associated with pro-inflammatory responses, which is significantly linked to elevated pain experience following spinal cord injury	[61]
L1CAM	L1 cell adhesion molecule	genetic rat models	L1CAM gene mutations are associated with X-linked human congenital hydrocephalus and can accelerate early hydrocephalus phenotypes of Ccdc39 knockout rats showing impaired cortical development and glymphatic Cerebrospinal fluid (CSF) flow	[62]
GREM2	gremlin 2, DAN family BMP antagonist	SH-SY5Y neuronal cells	GREM2 effects neuroprotection via downregulation in neuronal cells exposed to cadmium, which is linked to neurotoxicity and neurodegenerative diseases, including Alzheimer's and Parkinson’s	[63]
KCNS2	potassium voltage-gated channel modifier subfamily S member 2	genetic and clinical data of a diagnosed patient	KCNS2, via a microdeletion, is a possible candidate for explaining a complex neurological phenotype involving developmental delay, microcephaly, seizures, and typical facial dysmorphism	[64]

ATP7A	ATPase copper transporting alpha	genetic and clinical data of diagnosed patients	ATP7A mutations have been associated with severe infantile neurodegenerative Menkes diseases and Occipital horn syndrome, a novel missense mutation was identified in the familial presentation of distal motor neuropathy and autonomic dysfunction	[65]
HDAC2	histone deacetylase 2	genetic mouse models	HDAC2 upregulation in dorsal hippocampal neurons resulted in neuroinflammation-induced memory impairment and reduced histone acetylation, and suppression was able to reverse microglial activation and memory deficits	[66]
DGKD	diacylglycerol kinase delta	diagnosed epileptic patient, array Comparative Genomic Hybridization (CGH)	DGKD encodes a cytoplasmic enzyme involved in the production of phosphatic acid, deletion and mutations are associated with epilepsy and other neurological diseases, though the mutation alone is not sufficient to cause epilepsy	[67]
CPNE5	copine 5	genetic mouse models	CPNE5 deficiency in mice does not affect rodent locomotor activity or memory, but significantly decreased anxiety level during stress-inducing tasks, indicating a role of this gene in regulating anxiety level	[68]
GPR88	G protein-coupled receptor 88	genetic rat models	GPR88 knockdown reduced acute amphetamine-induced and increased L-DOPA-induced turning	[69]

			behavior in a rat model of hemiparkinsonism and normalized the upregulated expression of striatal Gad67, and is identified as a possible new target for the management of Parkinson's disease	
RPS6KA3	ribosomal protein S6 kinase A3	genetic and clinical data of diagnosed patients	RPS6KA3 microduplication is identified in several cases of X-linked intellectual disabilities, with carriers displaying major depression and mild intellectual disability	[70]
SPHKAP	SPHK1 interactor, AKAP domain containing	genomic wide association studies of Japanese population	SPHKAP is identified as a susceptibility locus for schizophrenia in the Japanese and Psychiatric Genomic Consortium populations	[71]
DRD1	dopamine receptor D1	prenatally stressed bull calves	DRD1 is associated with behavior and stress response and was found to be differentially methylated in the white blood cells of bull calves who underwent prenatal stress	[72]
FAM234B	family with sequence similarity 234 member B	exome sequencing of diagnosed patients	FAM234B homozygous truncations were identified in 31.6% of families associated with intellectual disability	[73]
CXorf56	chromosome X open reading frame 56	genetic and clinical data of diagnosed patients	CXorf56 reduced expression was identified in one family associated with X-linked intellectual disability of behavioral problems, and is present and located in the nucleus, cell, soma, dendrites, and dendritic spines of the murine brain and primary hippocampal	[74]

			neuron cultures	
MYCBP2	MYC binding protein 2, E3 ubiquitin protein ligase	GWAS, SH-SY5Y cells, and primary neuronal cultures	MYCBP2 induces the ubiquitination of TSC2 and downstream decreases transcription of SYT11, which can induce lysosomal dysfunction and impair degradation of autophagosomes, which is likely to contribute to some forms of Parkinson's disease associated neurodegeneration	[75]
RASGRF1	Ras protein specific guanine nucleotide releasing factor 1	primary cultured cortical neurons	RASGRF1 is an intrinsic key mediator for BDNF-induced R-Rase activation and R-Ras mediated axonal morphological regulation, which is a key enabler of higher brain function in the central nervous system	[76]
COL25A1	collagen type XXV alpha 1 chain	mouse brain	COL25A1 was found to be expressed in mouse retina and specifically enriched in retin-recipient nuclei within the brain, suggesting a role in brain development and function	[77]
VSNL1	visinin like 1	RNAseq on genetic mouse model	VSNL1 increase was found in genetic mouse models of Helios-specific spatial memory deficits, and normalization of VSNL1 was able to reverse their CA30CA1 neuronal spine density loss phenotype	[78]
DOCK4	dedicator of cytokinesis 4	genetic mouse models	DOCK4 knockout mice displayed a series of autism spectrum disorder-like behaviors, and restoration corrected impaired social	[79]

			deficits and social novelty deficits, suggesting a mechanism in regulating hippocampal excitatory synaptic transmission and social behavior	
ERCC6	ERCC excision repair 6, chromatin remodeling factor	genetic and clinical data of diagnosed patients	ERCC6 variants are present in two thirds of individuals with Cackayne syndrome, a disease impacting a spectrum of phenotypes including impaired postnatal growth, progressive impairment of vision, central and peripheral nervous system function that leads to severe disability	[80]
EN2	engrailed homeobox 2	genetic mouse models	EN2 knockout in the excitatory cerebellar nuclei neurons (eCN) leads to reduced postnatal growth of the cerebellar cortex through the loss of the eCN and interactions with Purkinje cells, which regulate the production of granule cells and interneurons	[81]
PRKAA2	protein kinase AMP-activated catalytic subunit alpha 2	genetic mouse models	PRKAA2 disruption significantly decreased apoptosis of neural progenitor cells in mice after irradiation, suggesting a role of this gene in determining cell fate response following DNA damage in NPCs	[82]
GSG1L	GSG1 like	genetic mouse models	GSG1L is found to regulate the strength of AMPA receptor-mediated synaptic transmission in hippocampal dentate granule neurons, suggesting a neuronal-type	[83]

			specific role of this gene	
KIF5A	kinesin family member 5A	genetic and clinical data of diagnosed patients	KIF5A mediates the transport of VAPB, mutations of this function and in the KIF5A gene have been associated with late-onset spinal muscular atrophy	[84]
DRD5	dopamine receptor D5	prenatally stressed bull calves; SK-N-SH cell line	DRD5, much like DRD1, is associated with behavior and stress response, and was found to be differentially methylated in the white blood cells of bull calves who underwent prenatal stress; DRD5 was also found to be upregulated by overexpression of a lncRNA identified in peripheral blood of schizophrenic patients, and downregulated by its knockdown	[72] [85]
CACNG6	calcium voltage-gated channel auxiliary subunit gamma 6	WGAS of the Chinese Han population	CACNG6 contributes to the gamma subunit of voltage-gated L-type calcium channels, with polymorphisms in this gene found to potentially associate with increased risk of schizophrenia, and a strong interaction suggesting a possible biological interaction with CACNG5	[86]
B3GALT1	beta-1,3-galactosyltransferase 1	GWAS on Parkinson's patients	B3GALT1 is contained within a chromosomal region often affected by Parkinson's disease, and variants in this gene have been identified in PD patients but not yet associated with particular risk or phenotype	[87]
WASF1	WAS protein	WGAS of ID	WASF1 truncations have	[88]

	family member 1	patients, function studies of patient fibroblast cells	been identified in unrelated individuals with intellectual disability, autistic features, and seizures, and have been shown to affect the actin remodeling in fibroblasts from these patients	
KCNV1	potassium voltage-gated channel modifier subfamily V member 1	WES and blood cell transcriptome of male autism spectrum disorder (ASD) patients	KCNV1 mutations have been identified in male autism spectrum disorder patients and are associated with an ADHD phenotype, and defects in voltage-gated potassium channels have previously been noted in other neuropsychiatric disorders such as bipolar disorder, ASD, and schizophrenia	[89]
DNM1	dynamin 1	WES in diagnosed patients	DNM1 encodes a protein necessary in the process of neurotransmitter signaling and CNS development, variants have been associated with global developmental delay and severe intellectual disability, and most with epileptic encephalopathy	[90]
APCS	amyloid P component, serum	F57I fly variants	APCS encodes a protein that can prevent cell death in the CNS in diseased flies, and prevent the accumulation of insoluble forms of lysosomes in both WT and diseased flies, suggesting an ability of this protein to prevent cell death by preventing the accumulation of toxic F57I structures	[91]
FAIM	Fas apoptotic	neuronal PC12	FAIM encodes an	[92]

	inhibitory molecule	cells, MM cell lines, genetic data from diagnosed patients	anti-apoptotic protein upregulated in B cell receptor-activated V cells and provides resistance to Fas-mediated cell death, but has also been found to have a function in cell growth, metabolism, Alzheimer's disease, and tumorigenesis	
SOX14	SRY-box 14	mouse cerebellar culture, genetic mouse models	SOX14 has been found to be an exclusive marker of inhibitory projection neurons in the lateral and interposed cerebellar nuclei, targeted ablation of Sox14 positive cells leads to significantly impaired motor learning	[93]
C5orf63	chromosome 5 open reading frame 63	whole transcript expression profiling in meningiomas	C5orf63 was significantly upregulated in meningiomas, or primary brain tumors, classified as DCC (deleted in colorectal cancer) gene low expression compared to high expression	[94]
FCGR1B	Fc fragment of IgG receptor Ib	GIBHi001-A hIPSC line	FCGR1B mutations were found in human induced pluripotent stem cells derived from a patient with autism spectrum disorder and it has a suggested role in the humoral immune response	[95]
TMEM173	transmembrane protein 173	genetic mouse models	TMEM173 encodes a protein that plays a crucial role in modulating information, and knockout is shown to alleviate inflammatory response and facilitate recovery following spinal cord injury in mice	[96]
LRRN4	leucine rich repeat neuronal	mouse embryos	LRRN4 is expressed in dorsal root ganglion (DRG)	[97]

	4		cells of adult mice, expression patterns show increasing rates from embryo to postnatal, then decrease dramatically to adult levels, suggesting a contribution to synaptic formation or development of synaptic function in DRG neurons	
NUPL2	nucleoporin like 2	mouse and human cerebral cortex cells	NUPL2 expression shows regional variability in the brain, with the highest expression being in temporal cortex in normal brain tissue, and after introducing an SNP seen in Parkinson's disease, NUPL2 showed increased expression in cerebellum, temporal cortex, and frontal cortex	[98]
CDCP2	CUB domain containing protein 2	whole genome analysis of epileptic patients	CDCP2 downregulation, much like ZNF852, was associated with seizure-free outcome of epileptic patients following anterior temporal lobectomy with amygdalohippocampectomy	[54]
GAD1	glutamate decarboxylase 1	GAD1 interneurons	GAD1 expressing interneurons block the antidepressant actions of ketamine when GluN2B is knocked down, this prevents an increase in extracellular glutamate and synaptic formation in the prefrontal cortex	[99]
SPTBN2	spectrin beta, non-erythrocyti c 2	genetic data of diagnosed patients	SPTBN2 mutations are associated with infantile onset of spinocerebellar ataxia type 5, which presents with ataxic cerebral palsy	[100]

DYRK1A	dual specificity tyrosine phosphorylation regulated kinase 1A	transgenic mouse models	DYRK1A overexpression is associated with cognitive phenotypes of down syndrome and is shown to alter protein and phosphoprotein levels of key postsynaptic and plasticity-related pathways	[101]
NVL	nuclear VCP-like	genetic data of diagnosed patients	NVL is suggested to contain overlapping genetic risk factors for major depressive disorder and schizophrenia in the Han Chinese population	[102]
OLR1	oxidized low density lipoprotein receptor 1	neuroinflammatory mouse model	OLR1 overexpression is found in activated microglia, while silencing of the gene inhibited MAPK phosphorylation, some nuclear transport, and pro-inflammatory factor production in microglia, suggesting a role of OLR1 in aggravating neuroinflammation-induced neuronal apoptosis	[103]

Note: *CNS: central nervous system; PNS: peripheral nervous system; CSF: cerebrospinal fluid; GWAS: genome-wide association studies; NPC: neural progenitor cell; lncRNA: long non-coding RNA; PD: Parkinson's disease; ID: intellectual disability; WES: whole exome sequencing; ASD: Autism spectrum disorders; ADHD: attention deficit hyperactivity disorder; WT: wild type; MM: multiple myeloma; SNP: single nucleotide polymorphism; PKA: protein kinase A; AKAP: a-kinase anchoring protein; ALS: amyotrophic lateral sclerosis; BDNF: brain-derived neurotrophic factor; AMPA: α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid; GLUN2B: glutamate ionotropic receptor NMDA type subunit 2B; MAPK: mitogen-activated protein kinase*

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