

## **Pain Research Panel**

The Beckman Coulter Genomics Pain Research Panel targets genes involved in acute and chronic pain conditions. The panel utilizes the Affymetrix MegAllele™ platform and contains over 3,000 SNPs in 317 genes whose protein products are linked to biological pathways that influence pain sensitivity and/or psychological state. These SNPs are arranged into 3 clusters:

Cluster 1: genes that produce proteins that mediate the transmission of pain signals by sensory nerve fibers and by CNS neural pathways that mediate the perception of pain.





Cluster 2: genes that produce proteins that mediate peripheral and central inflammatory responses to tissue injury or psychological stress. Many of these genes are expressed in monocytes, microglia, and astrocytes.

Cluster 3: genes that produce proteins that influence mood and affect, which are psychological states that are associated with acute and chronic pain conditions

## **SNP Selection**

Within the locus of each gene, SNPs were selected which cover the allelic diversity, including potentially functional variations. The TAG SNPs were selected using the HapMap (1) and/or Tamal (2) databases.

The SNPs were further narrowed down based on the following criteria:

-  Selection was restricted to SNPs with a minimum allele frequency of >0.05 because relatively abundant SNPs rather than rare mutations are more likely to contribute to complex traits like pain responsiveness, complex pain disorders, and drug responsiveness (3). The Caucasian population was chosen as a reference population for frequency because of the lower allelic diversity in Caucasian population compared to African-American population.
-  Selection was focused on SNPs that were most likely to impact gene function, which are SNPs in the coding region, exon-intron junctions, 5' promoter regions, putative transcription factor binding sites (TFBS), 3' and 5' untranslated regions (UTRs) and other highly evolutionary conserved genomic regions. Evidence based approaches using information from published and unpublished studies were also used to select functional genetic variants that have been associated with pain sensitivity, chronic pain conditions, and related traits.
-  Within intronic regions, equally spaced SNPs were elected at an interval of ~ 4kb to cover the haplotypic structure of the loci, with the exception of very large genes that exceed 200kb.
-  Ancestry-informative markers (AIM) were included to control for population stratification (4)

## Gene List

317 Genes represented on the Pain Panel

ACCN1	ATP1B3	CHRM5	ELOVL3	GALR3	HTR2A	MAO-B	NTSR2	PTGER3	SLC6A2
ACCN2	ATP2B1	CHRNA4	EPHB1	GBP1	HTR2B	MAP2K1IP1	OBLR	PTGER4	SLC6A3
ACCN3	ATP6V1A	CHRN2	EPHB2	GBP2	HTR2C	MAP3K1	OLR1	PTGS1	SLC6A4
ACCN4	ATP6V1B2	CIAS1	EPHB3	GDNF	HTR3A	MAPK1	OPRD1	PTGS2	SOD2
ACE	BDKRB1	CNR1	EPHB4	GLRA1	HTR3B	MAPK11	OPRK1	RAB20	TAC1
ACE2	BDKRB2	CNR2	EPHB5	GLRA2	IFI30	MAPK13	OPRM1	RAB5A	TACR1
ADCY7	BDNF	COMT	EPHB6	GLRB	IFNG	MAPK14	OXT	RAB8B	TCIRG1
ADORA1	BTG2	CREB1	EPO	GNB2L1	IFRD1	MAPK3	P2RX2	RBMX	TH
ADORA2A	CACNA1A	CRH	EPOR	GNG5	IKBKB	MPDZ	P2RX3	RGS2	THBS1
ADORA2B	CACNA2D1	CRHBP	EREG	GPX4	IL-2	MPO	P2RX4	RGS4	TIMP1
ADORA3	CACNA2D2	CRHR1	ESR1	GRIA1	IL-4	MSN	P2RX7	S100A12	TLR4
ADRA1A	CALCA	CRHR2	ESR2	GRIA2	IL-6	MTMR6	P2RY1	S100A2	TMSB10
ADRA1B	CALCRL	CSEN	FAAH	GRIA3	IL-8	NAB1	P2RY12	S100B	TMSB4X
ADRA1D	CALM2	CSNK1A1	FACL2	GRIA4	IL10	NFKBIA	P2RY13	SAMSN1	TNF
ADRA2A	CAMK4	CSNK1E	FOS	GRIK1	IL13	NFKBIZ	P2RY2	SC5DL	TNFAIP3
ADRA2B	CAT	CX3CL1	FPR1	GRIN1	IL1A	NGFB	P2RY4	SCD	TPH2
ADRA2C	CCK	CX3CR1	FPRL1	GRIN2A	IL1B	NOS1	P2RY6	SCN10A	TRPM8
ADRB2	CCKAR	CXCR4	GABARAPL1	GRIN2B	IL1RN	NOS2A	PACSN1	SCN11A	TRPV1
ADRB3	CCKBR	CYBB	GABRA2	GRM1	INADL	NOS3	PDYN	SCN1A	TRPV2
AGT1	CCL2	DARPP32	GABRA4	GSTM1	INSIG1	NPY	PENK	SCN2A1	TRPV3
AGTR1	CCL3	DBH	GABRA6	GSTT1	ITGAM	NPY1R	PLA2G4A	SCN3A	UBE2G2
AGTR2	CCL4	DBI	GABRB1	HCRT	KCNJ11	NPY2R	PLA2G4B	SCN5A	VIL2
AIM	CCL5	DDC	GABRB2	HIF1A	KCNJ3	NPY5R	PLAUR	SCN8A	VPS4A
ANXA1	CCR1	DDX24	GABRB3	HN1	KCNJ5	NQO1	PNOC	SCN9A	VPS4B
ANXA2	CCR2	DRD1	GABRD	HNRPD	KCNJ6	NR3C1	POMC	SET	XDH
AP1G1	CCRL2	DRD2	GABRG2	HNRPU	KCNJ8	NR4A1	PRKACA	SGK	YWHAZ
ARL5B	CDK5	DRD3	GABRG3	HSPA8	KCNJ9	NR4A2	PRKACB	SGKL	ZA20D2
ARRB1	CDKN1A	DRD4	GAD1	HSPA9B	KCNK2	NR4A3	PRKCABP	SLC18A2	ZA20D3
ARRB2	CHRM1	DRD5	GAD2	HSPCA	KCTD17	NRG1	PRKCE	SLC29A1	
ATF3	CHRM2	EFNB1	GAL	HSPCB	KLF10	NTRK1	PRKD3	SLC32A1	
ATP1A1	CHRM3	EFNB2	GALR1	HTR1A	KPNB1	NTRK2	PTGER1	SLC6A11	
ATP1A2	CHRM4	EGR3	GALR2	HTR1B	LIPL3	NTSR1	PTGER2	SLC6A13	
					MAO-A				

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Appendix: Gene Symbols and Name

ACCN1 amiloride-sensitive cation channel 1, neuronal (degenerin)	ESR1	estrogen receptor 1 (alpha)	NPY1R	neuropeptide Y receptor Y1
ACCN2 amiloride-sensitive cation channel 2, neuronal	ESR2	estrogen receptor 2 (beta)	NPY2R	neuropeptide Y receptor Y2
ACCN3 amiloride-sensitive cation channel 3	FAAH	fatty acid amide hydrolase	NPY5R	neuropeptide Y receptor Y5
ACCN4 amiloride-sensitive cation channel 4, pituitary	FACL2	fatty-acid-Coenzyme A ligase, long-chain 2	NQO1	NAD(P)H dehydrogenase, quinone 1
ACE angiotensin I converting enzyme (peptidyl-dipeptidase A) 1	FOS	v-fos FBJ murine osteosarcoma viral oncogene homolog	NR3C1	nuclear receptor subfamily 3, group C, member 1
ACE2 angiotensin I converting enzyme (peptidyl-dipeptidase A) 2		formyl peptide receptor 1	NR4A1	TR3 orphan receptor NR4A1
ADCY7 adenylate cyclase 7	FPRL1	FPRL1 formyl peptide receptor-like 1	NR4A2	NGFI-B/nur77 beta homolog
ADORA1 adenosine A1 receptor	GABARAPL1	GABA(A) receptor-associated protein like 1/early estrogen-regulated protein (GEC1)	NR4A3	mitogen induced nuclear orphan receptor (MINOR)
ADORA2A adenosine A2a receptor	GABRA2	gamma-aminobutyric acid (GABA) A receptor, alpha 2	NRG1	neuregulin 1
ADORA2B adenosine A2b receptor	GABRA4	gamma-aminobutyric acid (GABA) A receptor, alpha 4	NTRK1	neurotrophic tyrosine kinase, receptor, type 1
ADORA3 adenosine A3 receptor	GABRA6	gamma-aminobutyric acid (GABA) A receptor, alpha 6	NTRK2	neurotrophic tyrosine kinase, receptor, type 2
ADRA1A adrenergic, alpha-1A-, receptor	GABRB1	gamma-aminobutyric acid (GABA) A receptor, beta 1	NTSR1	neurotensin receptor 1
ADRA1B adrenergic, alpha-1B-, receptor	GABRB2	gamma-aminobutyric acid (GABA) A receptor, beta 2	NTSR2	neurotensin receptor 2
ADRA1D adrenergic, alpha-1D-, receptor	GABRB3	gamma-aminobutyric acid (GABA) A receptor, beta 3	OBLR	opiate receptor-like 1
ADRA2A adrenergic, alpha-2A-, receptor	GABRD	gamma-aminobutyric acid (GABA) A receptor, delta	OLR1	oxidised low density lipoprotein receptor 1
ADRA2B adrenergic, alpha-2B-, receptor	GABRG2	gamma-aminobutyric acid (GABA) A receptor, gamma 2	OPRD1	opioid receptor, delta 1
ADRA2C adrenergic, alpha-2C-, receptor	GABRG3	gamma-aminobutyric acid (GABA) A receptor, gamma 3	OPRK1	opioid receptor, kappa 1
ADRB2 adrenergic, beta-2-, receptor, surface	GAD1	glutamate decarboxylase 1 (brain, 67kDa)	OPRM1	opioid receptor, mu 1
ADRB3 adrenergic, beta-3-, receptor, surface	GAD2	glutamate decarboxylase 2 (pancreatic islets and brain, 65kDa)	OXT	oxytocin, prepro- (neurophysin I)
AGT1 angiotensinogen (serpin peptidase inhibitor, clade A, member 8)	GAL	galanin	P2RX2	purinergic receptor P2X, ligand-gated ion channel, 2
AGTR1 angiotensin II receptor, type 1	GALR1	galanin receptor 1	P2RX3	purinergic receptor P2X, ligand-gated ion channel, 3
AGTR2 angiotensin II receptor, type 2	GALR2	galanin receptor 2	P2RX4	purinergic receptor P2X, ligand-gated ion channel, 4
AIM Ancestry-informative markers	GALR3	galanin receptor 3	P2RX7	purinergic receptor P2X, ligand-gated ion channel, 7
ANXA1 annexin A1	GBP1	guanylate binding protein 1, interferon-inducible, 67kD	P2RY1	purinergic receptor P2Y, G-protein coupled, 1
ANXA2 annexin A2	GBP2	guanylate binding protein 2, interferon-inducible	P2RY12	purinergic receptor P2Y, G-protein coupled, 12

AP1G1	adaptor-related protein complex 1, gamma 1 subunit	GDNF	glial cell derived neurotrophic factor	P2RY13	purinergic receptor P2Y, G-protein coupled, 13
ARL5B	ADP-ribosylation factor-like 5B	GLRA1	glycine receptor, alpha 1 (startle disease/hyperekplexia, stiff man syndrome)	P2RY2	purinergic receptor P2Y, G-protein coupled, 2
ARRB1	arrestin, beta 1	GLRA2	glycine receptor, alpha 2	P2RY4	purinergic receptor P2Y, G-protein coupled, 4
ARRB2	arrestin, beta 2	GLRB	glycine receptor, beta	P2RY6	purinergic receptor P2Y, G-protein coupled, 6
ATF3	activating transcription factor 3	GNB2L1	guanine nucleotide binding protein (G protein), beta polypeptide 2-like 1	PACSIN1	Protein kinase C and casein kinase substrate in neurons 1
ATP1A1	ATPase, Na <sup>+</sup> /K <sup>+</sup> transporting, alpha 1 polypeptide	GNG5	guanine nucleotide binding protein (G protein), gamma 5	PENK	proenkephalin
ATP1A2	ATPase, Na <sup>+</sup> /K <sup>+</sup> transporting, alpha 2 (+) polypeptide	GPX4	glutathione peroxidase 4 (phospholipid hydroperoxidase)	PLA2G4A	phospholipase A2, group IVA (cytosolic, calcium-dependent)
ATP1B3	ATPase, Na <sup>+</sup> /K <sup>+</sup> transporting, beta 3 polypeptide	GRIA1	glutamate receptor, ionotropic, AMPA 1	PLA2G4B	phospholipase A2, group IVB (cytosolic)
ATP2B1	ATPase, Ca <sup>++</sup> transporting, plasma membrane 1	GRIA2	glutamate receptor, ionotropic, AMPA 2	PLAUR	plasminogen activator, urokinase receptor
ATP6V1A	ATPase, H <sup>+</sup> transporting, lysosomal, alpha polypeptide, 70kD, isoform 1	GRIA3	glutamate receptor, ionotropic, AMPA 3	PNOC	prepronociceptin
ATP6V1B2	ATPase, H <sup>+</sup> transporting, lysosomal, beta polypeptide, 56/58kD, isoform 2	GRIA4	glutamate receptor, ionotropic, AMPA 4	PDYN	prodynorphin
BDKRB1	bradykinin receptor B1	GRIK1	glutamate receptor, ionotropic, kainate 1	POMC	proopiomelanocortin (adrenocorticotropin/ beta-lipotropin/ alpha-melanocyte stimulating hormone/ beta-melanocyte stimulating hormone/ beta-endorphin)
BDKRB2	bradykinin receptor B2	GRIN1	glutamate receptor, ionotropic, N-methyl D-aspartate 1	PRKACA	protein kinase, cAMPdependent, catalytic, alpha
BDNF	brain-derived neurotrophic factor	GRIN2A	glutamate receptor, ionotropic, N-methyl D-aspartate 2A	PRKACB	protein kinase, cAMPdependent, catalytic, beta
BTG2	BTG family, member 2, translocation gene 2, anti-proliferative secreted protein	GRIN2B	glutamate receptor, ionotropic, N-methyl D-aspartate 2B	PRKCABP	protein kinase C, alpha binding protein
CACNA1A	calcium channel, voltage-dependent, P/Q type, alpha 1A subunit	GRM1	glutamate receptor, metabotropic 1	PRKCE	protein kinase C, epsilon
CACNA2D1	calcium channel, voltage-dependent, alpha 2/delta subunit 1	GSTM1	glutathione S-transferase M1	PRKD3	protein kinase C, D3
CACNA2D2	calcium channel, voltage-dependent, alpha 2/delta subunit 2	GSTT1	glutathione S-transferase theta 1	PTGER1	prostaglandin E receptor 1 (subtype EP1)
CALCA	Calcitonin/calcitonin-related polypeptide, alpha		hypocretin (orexin) neuropeptide precursor	PTGER2	prostaglandin E receptor 2 (subtype EP2)
CALCRL	Calcitonin/calcitonin-related polypeptide receptor	HIF1A	HIF1A, alpha subunit	PTGER3	prostaglandin E receptor 3 (subtype EP3)
CALM2	calmodulin 2 (phosphorylase kinase, delta)	HN1	Humanin (HN1), mitochondrial	PTGER4	prostaglandin E receptor 4 (subtype EP4)
CAMK4	calcium/calmodulin-dependent protein kinase IV	HNRPD	heterogeneous nuclear ribonucleoprotein D (AU-rich element RNA binding protein 1, 37kD)	PTGS1	prostaglandin-endoperoxide synthase 1 (prostaglandin G/H synthase and cyclooxygenase)

CAT	catalase	HNRPU	heterogeneous nuclear ribonucleoprotein U (scaffold attachment factor A)	PTGS2	prostaglandin-endoperoxide synthase 2 (prostaglandin G/H synthase and cyclooxygenase)
CCK	cholecystokinin	HSPA8	heat shock 70kD protein 8 (HSPA8)	RAB20	RAB20, member RAS oncogene family
CCKAR	cholecystokinin A receptor	HSPA9B	heat shock 70kD protein 9B (mortalin-2) (HSPA9B)	RAB8B	RAB8B, member RAS oncogene family
CCKBR	cholecystokinin B receptor	HSPCA	heat shock 90kD protein 1, alpha )	RBMX	RNA binding motif protein (RBMX, hnRNP-G), Heterogeneous nuclear ribonucleoprotein G
CCL2	chemokine (C-C motif) ligand 2	HSPCB	heat shock 90kD protein 1, beta	RGS2	regulator of G-protein signalling 2
CCL3	chemokine (C-C motif) ligand 3	HTR1A	5-hydroxytryptamine (serotonin) receptor 1A	RGS4	regulator of G-protein signalling 4
CCL4	chemokine (C-C motif) ligand 4	HTR1B	5-hydroxytryptamine (serotonin) receptor 1B	RAB5A	Rab5 GDP/GTP exchange factor homologue
CCL5	chemokine (C-C motif) ligand 5	HTR2A	5-hydroxytryptamine (serotonin) receptor 2A	S100A12	S100 calcium binding protein A12 (calgranulin C)
CCR1	chemokine (C-C motif) receptor 1	HTR2B	5-hydroxytryptamine (serotonin) receptor 2B		S100 calcium binding protein A3
CCR2	chemokine (C-C motif) receptor 2	HTR2C	5-hydroxytryptamine (serotonin) receptor 2C	S100B	S100 calcium binding protein, beta (neural)
CCRL2	chemokine receptor-like 2	HTR3A	5-hydroxytryptamine (serotonin) receptor 3A	SAMSN1	SAM domain, SH3 domain and nuclear localisation signals, 1
CDK5	cyclin-dependent kinase 5, regulatory subunit 1 (p35)	HTR3B	5-hydroxytryptamine (serotonin) receptor 3B	SC5DL	sterol-C5-desaturase (ERG3 delta-5-desaturase homolog, fungal)-like
CDKN1A	and Name: cyclin-dependent kinase inhibitor 1A	IFI30	interferon, gamma-inducible protein 30	SCD	stearoyl-CoA desaturase (delta9-desaturase)
CHRM1	cholinergic receptor, muscarinic 1	IFNG	interferon, gamma	SCN10A	sodium channel, voltage-gated, type X, alpha
CHRM2	cholinergic receptor, muscarinic 2	IFRD1	interferon-related developmental regulator 1	SCN11A	sodium channel, voltage-gated, type XI, alpha
CHRM3	cholinergic receptor, muscarinic 3	IKBKB	inhibitor of kappa light polypeptide gene enhancer in B-cells, kinase beta	SCN1A	sodium channel, voltage-gated, type I, alpha
CHRM4	cholinergic receptor, muscarinic 4	IL-2	interleukine 2	SCN2A1	sodium channel, voltage-gated, type II, alpha 1
CHRM5	cholinergic receptor, muscarinic 5	IL-4	interleukine 4	SCN3A	sodium channel, voltage-gated, type III, alpha
CHRNA4	cholinergic receptor, nicotinic, alpha polypeptide 4	IL-6	interleukine 6	SCN5A	sodium channel, voltage-gated, type V, alpha (long QT syndrome 3)
CHRN2	cholinergic receptor, nicotinic, beta polypeptide 2 (neuronal)	IL-8	interleukine 8	SCN8A	sodium channel, voltage gated, type VIII, alpha
CIAS1	cold autoinflammatory syndrome 1	IL10	interleukine 10	SCN9A	sodium channel, voltage-gated, type IX, alpha
CNR1	cannabinoid receptor 1 (brain)	IL13	interleukine 13	SET	SET translocation (myeloid leukemia-associated)
CNR2	cannabinoid receptor 2 (peripheral)	IL1A	interleukine 1 alpha	SGK	serum/glucocorticoid regulated kinase
COMT	catechol-O-methyltransferase	IL1B	interleukine 1 beta	SGKL	serum/glucocorticoid regulated kinase-like
CREB1	cAMP responsive element binding protein 1	IL1RN	interleukin 1 receptor antagonist	SLC18A2	solute carrier family 18 (vesicular monoamine), member 2

CRH	corticotropin releasing hormone	INADL	InaD-like (Drosophila)	SLC29A1	solute carrier family 29 (nucleoside transporters), member 1
CRHBP	corticotropin releasing hormone binding protein	INSIG1	insulin induced protein 1	SLC32A1	vesicular inhibitory amino acid transporter (solute carrier family 32 (GABA vesicular transporter)
CRHR1	corticotropin releasing hormone receptor 1	ITGAM	integrin, alpha M (complement component receptor 3, alpha; also known as CD11b (p170), macrophage antigen alpha polypeptide)	SLC6A11	solute carrier family 6 (neurotransmitter transporter, GABA), member 11
CRHR2	corticotropin releasing hormone receptor 2	KCNJ11	potassium inwardly-rectifying channel, subfamily J, member 11	SLC6A13	solute carrier family 6 (neurotransmitter transporter, GABA), member 13
CSEN	calsenilin, presenilin binding protein, EF-hand transcription factor	KCNJ3	potassium inwardly-rectifying channel, subfamily J, member 3	SLC6A2	solute carrier family 6 (neurotransmitter transporter, noradrenalin), member 2
CSNK1A1	casein kinase 1, alpha 1	KCNJ5	potassium inwardly-rectifying channel, subfamily J, member 5	SLC6A3	solute carrier family 6 (neurotransmitter transporter, dopamine), member 3
CSNK1E	casein kinase 1, epsilon	KCNJ6	potassium inwardly-rectifying channel, subfamily J, member 6	SLC6A4	solute carrier family 6 (neurotransmitter transporter, serotonin), member 4
CX3CL1	chemokine (C-X3-C motif) ligand 1	KCNJ8	potassium inwardly-rectifying channel, subfamily J, member 8	SOD2	superoxide dismutase 2, mitochondrial
CX3CR1	chemokine (C-X3-C motif) receptor 1	KCNJ9	potassium inwardly-rectifying channel, subfamily J, member 9	TAC1	tachykinin, precursor 1 (substance K, substance P, neurokinin 1, neurokinin 2, neuromedin L, neurokinin alpha, neuropeptide K, neuropeptide gamma)
CXCR4	chemokine (C-X-C motif), receptor 4 (fusin)	KCNK2	potassium channel, subfamily K, member 2	TACR1	tachykinin receptor 1 (substance P receptor; neurokinin-1 receptor)
CYBB	cytochrome b-245, beta polypeptide (chronic granulomatous disease)	KCTD17	potassium channel tetramerisation domain containing 17	TCIRG1	ATPase, H+ transporting, lysosomal V0 protein a isoform 3, T-cell, immune regulator 1
DARPP32	protein phosphatase 1, regulatory (inhibitor) subunit 1B (dopamine and cAMP regulated phosphoprotein, DARPP-32)	KPNB1	karyopherin (importin) beta 1	TH	tyrosine hydroxylase ( is involved in the conversion of phenylalanine to dopamine)
DBH	dopamine beta-hydroxylase (dopamine beta-monoxygenase)	LIPL3	lipase-like, ab-hydrolase domain containing 3	THBS1	thrombospondin
DBI	diazepam binding inhibitor (GABA receptor modulator, acyl-Coenzyme A binding protein)	MAO-A	monoamine oxidase A	KLF10	TGFB inducible early growth response
DDC	dopa decarboxylase (aromatic L-amino acid decarboxylase)	MAO-B	monoamine oxidase B	TIMP1	tissue inhibitor of metalloproteinase 1
DDX24	DEAD/H box polypeptide 24, ATP-dependent RNA helicase	MAP2K1IP1	mitogen-activated protein kinase kinase 1 interacting protein 1 (MAP2K1IP1)	TLR4	toll-like receptor 4
DRD1	dopamine receptor D1		MAP kinase kinase kinase 1 (Mekk1)	TMSB10	thymosin, beta 10
DRD2	dopamine receptor D2	MAPK1	mitogen-activated protein kinase 1	TMSB4X	thymosin, beta 4, X chromosome
DRD3	dopamine receptor D3	MAPK11	p38beta	TNF	tumor necrosis factor (TNF superfamily, member 2)
DRD4	dopamine receptor D4	MAPK13	p38delta	TNFAIP3	tumor necrosis factor, alpha-induced protein 3

DRD5	dopamine receptor D5	MAPK14	p38 alpha	TPH2	tryptophan hydroxylase 2 ( is the rate-limiting enzyme in the synthesis of serotonin)
EFNB1	ephrin-B1	MAPK3	mitogen-activated protein kinase 3	TRPM8	transient receptor potential cation channel, subfamily M, member 8
EFNB2	ephrin-B2	MPDZ	multiple PDZ domain protein	TRPV1	transient receptor potential cation channel, subfamily V, member 1
EGR3	early growth response 3	MPO	myeloperoxidase	TRPV2	transient receptor potential cation channel, subfamily V, member 2
ELOVL3	elongation of very long chain fatty acids (FEN1/Elo2, SUR4/Elo3, yeast)-like 3	MSN	moesin	TRPV3	transient receptor potential cation channel, subfamily V, member 3
EPHB1	ephrin EPH receptor B1		myotubularin related protein 6	UBE2G2	ubiquitin-conjugating enzyme E2G 2 (UBC7 homolog, yeast) (UBE2G2)
EPHB2	ephrin EPH receptor B2	NAB1	NGFI-A binding protein 1 (EGR1 binding protein)	VIL2	villin 2
EPHB3	ephrin EPH receptor B3	NFKBIA	nuclear factor of kappa light polypeptide gene enhancer in B-cells inhibitor	VPS4A	vacuolar protein sorting 4A (yeast)
EPHB4	ephrin EPH receptor B4	NFKBIZ	nuclear factor of kappa light polypeptide gene enhancer in B-cells inhibitor	VPS4B	vacuolar protein sorting 4B (yeast)
	ephrin EPH receptor B5	NGFB	nerve growth factor, beta polypeptide	XDH	xanthine dehydrogenase
EPHB6	ephrin EPH receptor B6	NOS1	nitric oxide synthase 1 (neuronal)	YWHAZ	tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein, zeta polypeptide
EPO	erythropoietin	NOS2A	nitric oxide synthase 2A (inducible, hepatocytes)	ZA20D2	zinc finger, A20 domain containing 2
EPOR	erythropoietin receptor	NOS3	nitric oxide synthase 3 (endothelial cell)	ZA20D3	zinc finger, A20 domain containing 3
EREG	epiregulin	NPY	neuropeptide Y		