

Supplementary Table 2. ESNP- and ECNP-related genes list

ESNP-related genes	Description	Location
<i>PCCA</i>	Propionyl CoA carboxylase, alpha polypeptide	Cytoplasm
<i>IGHMBP2</i>	Immunoglobulin mu binding protein 2	Nucleus
<i>RNF43</i>	Ring finger protein 43	Plasma membrane
<i>ALAD</i>	Aminolevulinate dehydratase	Cytoplasm
<i>CS</i>	Citrate synthase	Cytoplasm
<i>CARS2</i>	Cysteinyl-tRNA synthetase 2, mitochondrial (putative)	Cytoplasm
<i>TPO</i>	Thyroid peroxidase	Plasma membrane
<i>RGS7</i>	Regulator of G-protein signaling 7	Cytoplasm
<i>PLA2G4C</i>	Phospholipase A2, group IVC (cytosolic, calcium-independent)	Plasma membrane
<i>LYPLA1</i>	Lysophospholipase I	Cytoplasm
<i>BRIP1</i>	BRCA1 interacting protein C-terminal helicase 1	Nucleus
<i>PJA2</i>	Praja ring finger 2, E3 ubiquitin protein ligase	Cytoplasm
<i>*SEP9</i>	Septin 9	Cytoplasm
<i>GBE1</i>	Glucan (1,4-alpha-), branching enzyme 1	Cytoplasm
<i>ZNRF1</i>	Zinc and ring finger 1, E3 ubiquitin protein ligase	Cytoplasm
<i>TP53I3</i>	Tumor protein p53 inducible protein 3	Other
<i>UBR2</i>	Ubiquitin protein ligase E3 component n-recognin 2	Nucleus
<i>TDP1</i>	Tyrosyl-DNA phosphodiesterase 1	Nucleus
<i>EMR3</i>	Egf-like module containing, mucin-like, hormone receptor-like 3	Plasma membrane
<i>LPHN3</i>	Latrophilin 3	Plasma membrane
<i>LTBP4</i>	Latent transforming growth factor beta binding protein 4	Extracellular space
<i>KCNMA1</i>	Potassium large conductance calcium-activated channel, subfamily M, alpha member 1	Plasma membrane
<i>PRKCE</i>	Protein kinase C, epsilon	Cytoplasm
<i>GOLGA5</i>	Golgin A5	Cytoplasm
<i>ITPK1</i>	Inositol-tetrakisphosphate 1-kinase	Cytoplasm
<i>ITPKB</i>	Inositol-trisphosphate 3-kinase B	Cytoplasm
<i>MYLK3</i>	Myosin light chain kinase 3	Cytoplasm
<i>GRK5</i>	G protein-coupled receptor kinase 5	Plasma membrane
<i>IPPK</i>	Inositol 1,3,4,5,6-pentakisphosphate 2-kinase	Cytoplasm
<i>PRKD2</i>	Protein kinase D2	Cytoplasm
<i>GALK2</i>	Galactokinase 2	Cytoplasm
<i>PKIA</i>	Protein kinase (cAMP-dependent, catalytic) inhibitor alpha	Cytoplasm
<i>GRAP2</i>	GRB2-related adaptor protein 2	Cytoplasm

Supplementary Table 2. Continued.

ESNP-related genes	Description	Location
<i>FAM107B</i>	Family with sequence similarity 107, member B	Other
<i>LRRC20</i>	Leucine rich repeat containing 20	Other
<i>SMEK1</i>	SMEK homolog 1, suppressor of mek1 (Dictyostelium)	Plasma membrane
<i>FBXW4</i>	F-box and WD repeat domain containing 4	Other
<i>RALGPS1</i>	Ral GEF with PH domain and SH3 binding motif 1	Cytoplasm
<i>AHRR</i>	Aryl-hydrocarbon receptor repressor	Nucleus
<i>SLC17A9</i>	Solute carrier family 17, member 9	Other
<i>TMEM143</i>	Transmembrane protein 143	Cytoplasm
<i>CAMTA1</i>	Calmodulin binding transcription activator 1	Other
<i>CUL9</i>	Cullin 9	Cytoplasm
<i>MSL1</i>	Male-specific lethal 1 homolog (Drosophila)	Nucleus
<i>FAM118A</i>	Family with sequence similarity 118, member A	Other
<i>TMEM170A</i>	Transmembrane protein 170A	Other
<i>TUBGCP3</i>	Tubulin, gamma complex associated protein 3	Cytoplasm
<i>NIPSNAP3A</i>	Nipsnap homolog 3A (C. elegans)	Cytoplasm
<i>CARD8</i>	Caspase recruitment domain family, member 8	Nucleus
<i>LOC100506325</i>	Uncharacterized LOC100506325	Other
<i>PROS1</i>	Protein S (alpha)	Extracellular space
<i>SETBP1</i>	SET binding protein 1	Nucleus
<i>ECM2</i>	Extracellular matrix protein 2, female organ and adipocyte specific	Extracellular space
<i>FAT4</i>	FAT atypical cadherin 4	Other
<i>DCUN1D2</i>	DCN1, defective in cullin neddylation 1, domain containing 2	Other
<i>COL23A1</i>	Collagen, type XXIII, alpha 1	Plasma membrane
<i>C17orf67</i>	Chromosome 17 open reading frame 67	Other
<i>COL26A1</i>	Collagen, type XXVI, alpha 1	Extracellular space
<i>FAM196A</i>	Family with sequence similarity 196, member A	Other
<i>URGCP</i>	Upregulator of cell proliferation	Cytoplasm
<i>SPON1</i>	Spondin 1, extracellular matrix protein	Extracellular space
<i>ANK2</i>	Ankyrin 2, neuronal	Plasma membrane
<i>RFC2</i>	Replication factor C (activator 1) 2, 40kDa	Nucleus
<i>ABLIM2</i>	Actin binding LIM protein family, member 2	Cytoplasm
<i>KIAA0930</i>	KIAA0930	Other

Supplementary Table 2. Continued.

ESNP-related genes	Description	Location
<i>ELN</i>	Elastin	Extracellular space
<i>SUMO3</i>	Small ubiquitin-like modifier 3	Nucleus
<i>ARFGEF1</i>	ADP-ribosylation factor guanine nucleotide-exchange factor 1 (brefeldin A-inhibited)	Cytoplasm
<i>FAM13B</i>	Family with sequence similarity 13, member B	Cytoplasm
<i>SPACA7</i>	Sperm acrosome associated 7	Cytoplasm
<i>MEI1</i>	Meiosis inhibitor 1	Other
<i>ZC3H4</i>	Zinc finger CCCH-type containing 4	Other
<i>FBXL20</i>	F-box and leucine-rich repeat protein 20	Cytoplasm
<i>MBP</i>	Myelin basic protein	Extracellular space
<i>KIAA1244</i>	KIAA1244	Cytoplasm
<i>COLGALT1</i>	Collagen beta(1-O)galactosyltransferase 1	Cytoplasm
<i>ZBTB46</i>	Zinc finger and BTB domain containing 46	Nucleus
<i>KDM4B</i>	Lysine (K)-specific demethylase 4B	Other
<i>WDR89</i>	WD repeat domain 89	Other
<i>SH3BP2</i>	SH3-domain binding protein 2	Cytoplasm
<i>GTDC1</i>	Glycosyltransferase-like domain containing 1	Other
<i>MTMR11</i>	Myotubularin related protein 11	Other
<i>HCG18</i>	HLA complex group 18 (non-protein coding)	Other
<i>CHGA</i>	Chromogranin A (parathyroid secretory protein 1)	Cytoplasm
<i>GLG1</i>	Golgi glycoprotein 1	Cytoplasm
<i>LOC285972</i>	Uncharacterized LOC285972	Other
<i>EVI5</i>	Ecotropic viral integration site 5	Other
<i>LOC100130172</i>	Uncharacterized LOC100130172	Other
<i>DIDO1</i>	Death inducer-obliterator 1	Nucleus
<i>PHF20</i>	PHD finger protein 20	Nucleus
<i>PDZD2</i>	PDZ domain containing 2	Plasma membrane
<i>CEP192</i>	Centrosomal protein 192kDa	Cytoplasm
<i>TRMT44</i>	tRNA methyltransferase 44 homolog (<i>S. cerevisiae</i>)	Other
<i>RIN3</i>	Ras and Rab interactor 3	Cytoplasm

Supplementary Table 2. Continued.

ESNP-related genes	Description	Location
<i>NF1</i>	Neurofibromin 1	Cytoplasm
<i>CENPM</i>	Centromere protein M	Cytoplasm
<i>CPLX2</i>	Complexin 2	Cytoplasm
<i>ERC1</i>	ELKS/RAB6-interacting/CAST family member 1	Cytoplasm
<i>VWA3B</i>	Von Willebrand factor A domain containing 3B	Other
<i>LRRC36</i>	Leucine rich repeat containing 36	Other
<i>UTS2</i>	Urotensin 2	Extracellular space
<i>COL28A1</i>	Collagen, type XXVIII, alpha 1	Extracellular space
<i>TNRC6C</i>	Trinucleotide repeat containing 6C	Cytoplasm
<i>EFCAB11</i>	EF-hand calcium binding domain 11	Other
<i>CCNY</i>	Cyclin Y	Nucleus
<i>VOPP1</i>	Vesicular, overexpressed in cancer, prosurvival protein 1	Nucleus
<i>NLRC3</i>	NLR family, CARD domain containing 3	Cytoplasm
<i>FCHO1</i>	FCH domain only 1	Plasma membrane
<i>LOC100506172</i>	Uncharacterized LOC100506172	Other
<i>TUBGCP6</i>	Tubulin, gamma complex associated protein 6	Cytoplasm
<i>C1orf54</i>	Chromosome 1 open reading frame 54	Other
<i>RASGRF1</i>	Ras protein-specific guanine nucleotide-releasing factor 1	Cytoplasm
<i>MADD</i>	MAP-kinase activating death domain	Cytoplasm
<i>ZNF484</i>	Zinc finger protein 484	Nucleus
<i>ACTR3C</i>	ARP3 actin-related protein 3 homolog C (yeast)	Other
<i>PRC1</i>	Protein regulator of cytokinesis 1	Nucleus
<i>TBC1D22A</i>	TBC1 domain family, member 22A	Other
<i>OTUD7B</i>	OTU domain containing 7B	Cytoplasm
<i>CASP9</i>	Caspase 9, apoptosis-related cysteine peptidase	Cytoplasm
<i>AEBP1</i>	AE binding protein 1	Nucleus
<i>PTPRA</i>	Protein tyrosine phosphatase, receptor type, A	Plasma membrane
<i>HOXD3</i>	Homeobox D3	Nucleus
<i>NPAS2</i>	Neuronal PAS domain protein 2	Nucleus

Supplementary Table 2. Continued.

ESNP-related genes	Description	Location
<i>ZNF236</i>	Zinc finger protein 236	Nucleus
<i>TRERF1</i>	Transcriptional regulating factor 1	Nucleus
<i>VAV2</i>	Vav 2 guanine nucleotide exchange factor	Cytoplasm
<i>ZNF174</i>	Zinc finger protein 174	Nucleus
<i>GATAD2B</i>	GATA zinc finger domain containing 2B	Nucleus
<i>UBN1</i>	Ubinuclein 1	Nucleus
<i>RUNX3</i>	Runt-related transcription factor 3	Nucleus
<i>PRRX2</i>	Paired related homeobox 2	Nucleus
<i>ELF1</i>	E74-like factor 1 (ets domain transcription factor)	Nucleus
<i>MXI1</i>	MAX interactor 1, dimerization protein	Nucleus
<i>CERS4</i>	Ceramide synthase 4	Cytoplasm
<i>KLF12</i>	Kruppel-like factor 12	Nucleus
<i>EIF4E2</i>	Eukaryotic translation initiation factor 4E family member 2	Cytoplasm
<i>EIF4H</i>	Eukaryotic translation initiation factor 4H	Cytoplasm
<i>UTRN</i>	Utrophin	Plasma membrane
<i>ROBO1</i>	Roundabout, axon guidance receptor, homolog 1 (Drosophila)	Plasma membrane
<i>ITGB3</i>	Integrin, beta 3 (platelet glycoprotein IIIa, antigen CD61)	Plasma membrane
<i>TNFRSF9</i>	Tumor necrosis factor receptor superfamily, member 9	Plasma membrane
<i>ABCA1</i>	ATP-binding cassette, sub-family A (ABC1), member 1	Plasma membrane
<i>SMC1B</i>	Structural maintenance of chromosomes 1B	Nucleus
<i>XPO6</i>	Exportin 6	Cytoplasm
<i>NUP50</i>	Nucleoporin 50kDa	Nucleus
<i>MIP</i>	Major intrinsic protein of lens fiber	Plasma membrane
<i>STX11</i>	Syntaxin 11	Plasma membrane
<i>TMCO3</i>	Transmembrane and coiled-coil domains 3	Other
<i>VPS45</i>	Vacuolar protein sorting 45 homolog (<i>S. cerevisiae</i>)	Cytoplasm
<i>EXOC3</i>	Exocyst complex component 3	Plasma membrane
ECNP-related genes	Description	Location
<i>APOBEC2</i>	Apolipoprotein B mRNA editing enzyme, catalytic polypeptide-like 2	Other
<i>NDUFA9</i>	NADH dehydrogenase (ubiquinone) 1 alpha subcomplex, 9, 39kDa	Cytoplasm
<i>OARD1</i>	O-acyl-ADP-ribose deacylase 1	Other
<i>TOP1</i>	Topoisomerase (DNA) I	Nucleus

Supplementary Table 2. Continued.

ECNP-related genes	Description	Location
<i>UAP1</i>	UDP-N-acetylglucosamine pyrophosphorylase 1	Nucleus
<i>GABRA5</i>	Gamma-aminobutyric acid (GABA) A receptor, alpha 5	Plasma membrane
<i>GABRG3</i>	Gamma-aminobutyric acid (GABA) A receptor, gamma 3	Plasma membrane
<i>DDR2</i>	Discoidin domain receptor tyrosine kinase 2	Plasma membrane
<i>ALCAM</i>	Activated leukocyte cell adhesion molecule	Plasma membrane
<i>ASTN2</i>	Astrotactin 2	Cytoplasm
<i>C12orf4</i>	Chromosome 12 open reading frame 4	Other
<i>C1QTNF7</i>	C1q and tumor necrosis factor related protein 7	Extracellular space
<i>C3orf20</i>	Chromosome 3 open reading frame 20	Cytoplasm
<i>CCDC174</i>	Coiled-coil domain containing 174	Other
<i>COL6A4P1</i>	Collagen, type VI, alpha 4 pseudogene 1	Other
<i>CPEB2</i>	Cytoplasmic polyadenylation element binding protein 2	Cytoplasm
<i>DAB1</i>	Dab, reelin signal transducer, homolog 1 (Drosophila)	Cytoplasm
<i>DLGAP3</i>	Discs, large (Drosophila) homolog-associated protein 3	Cytoplasm
<i>FGD5</i>	FYVE, RhoGEF and PH domain containing 5	Cytoplasm
<i>FLJ43663</i>	Uncharacterized LOC378805	Other
<i>FNDC1</i>	Fibronectin type III domain containing 1	Plasma membrane
<i>GTF2H5</i>	General transcription factor IIH, polypeptide 5	Nucleus
<i>KIAA0319L</i>	KIAA0319-like	Cytoplasm
<i>LINC00111</i>	Long intergenic non-protein coding RNA 111	Other
<i>LOC152742</i>	Uncharacterized LOC152742	Other
<i>LOC441009</i>	Uncharacterized LOC441009	Other
<i>MAG</i>	Myelin associated glycoprotein	Plasma membrane
<i>NUF2</i>	NUF2, NDC80 kinetochore complex component	Nucleus
<i>RAD51AP1</i>	RAD51 associated protein 1	Nucleus
<i>RBFOX1</i>	RNA binding protein, fox-1 homolog (C. elegans) 1	Cytoplasm
<i>RGS5</i>	Regulator of G-protein signaling 5	Plasma membrane
<i>SERAC1</i>	Serine active site containing 1	Extracellular space
<i>TAGAP</i>	T-cell activation RhoGTPase activating protein	Cytoplasm
<i>TCERG1L</i>	Transcription elongation regulator 1-like	Other
<i>TREML4</i>	Triggering receptor expressed on myeloid cells-like 4	Other
<i>TRMT44</i>	tRNA methyltransferase 44 homolog (S. cerevisiae)	Other
<i>ZFYVE20</i>	Zinc finger, FYVE domain containing 20	Cytoplasm
<i>ZMYM4</i>	Zinc finger, MYM-type 4	Other

Supplementary Table 2. Continued.

ECNP-related genes	Description	Location
<i>CAPN7</i>	Calpain 7	Cytoplasm
<i>PSMB2</i>	Proteasome (prosome, macropain) subunit, beta type, 2	Cytoplasm
<i>SYNJ2</i>	Synaptojanin 2	Cytoplasm
<i>ARID1B</i>	AT rich interactive domain 1B (SWI1-like)	Nucleus
<i>MYT1L</i>	Myelin transcription factor 1-like	Nucleus
<i>NFYA</i>	Nuclear transcription factor Y, alpha	Nucleus
<i>SPEN</i>	Spn homolog, transcriptional regulator (<i>Drosophila</i>)	Nucleus
<i>TULP4</i>	Tubby like protein 4	Cytoplasm
<i>NCR2</i>	Natural cytotoxicity triggering receptor 2	Plasma membrane
<i>TLR4</i>	Toll-like receptor 4	Plasma membrane
<i>OCA2</i>	Oculocutaneous albinism II	Plasma membrane
<i>SLC22A1</i>	Solute carrier family 22 (organic cation transporter), member 1	Plasma membrane
<i>SLC22A3</i>	Solute carrier family 22 (extraneuronal monoamine transporter), member 3	Plasma membrane
<i>SNX9</i>	Sorting nexin 9	Cytoplasm

ESNP, ethnic variant single-nucleotide polymorphism; ECNP, ethnic variant copy number polymorphism.