

Supplementary Table 4. Genes upregulated in ASIP overexpressing males of GO category Transmembrane Transport belonging to Biological Processes

Ensembl ID	UniProtKB ID	Gene name	Protein name	Function UniProtKB/Swiss-Prot	Link to human orthologue in GeneCards database	Associated keywords
AMINO ACID-RELATED TRANSPORT						
ENSDARG00000020212	D7RVR6_DANRE	slc1a1	Amino acid transporter	Sodium-dependent, high-affinity amino acid transporter that mediates the uptake of L-glutamate and also L-aspartate and D-aspartate	SLC1A1 Gene - GeneCards EAA3 Protein EAA3 Antibody	Membrane; Reference proteome; Symport; Transmembrane; Transmembrane helix; Transport
ENSDARG00000055226	F1R8V8_DANRE	slc7a7	Solute carrier family 7 member 7	Involved in the sodium-independent uptake of dibasic amino acids and sodium-dependent uptake of some neutral amino acids	SLC7A7 Gene - GeneCards YLAT1 Protein YLAT1 Antibody	Membrane; Reference proteome; Transmembrane; Transmembrane helix
ENSDARG00000010816	S7A14_DANRE	slc7a14a	Cationic amino acid transporter (Solute carrier family 7 member 14)	Involved in arginine transport	SLC7A14 Gene - GeneCards S7A14 Protein S7A14 Antibody	Lysosome; Membrane; Reference proteome; Transmembrane; Transmembrane helix
ENSDARG000000089974	A0A2R8RSM8_DANRE	si:ch211-190o6.3	Solute carrier family 15 member 5	Proton oligopeptide cotransporter	SLC15A5 Gene - GeneCards S15A5 Protein S15A5 Antibody	Membrane; Reference proteome; Symport; Transmembrane; Transmembrane helix; Transport
ENSDARG000000021573	F1QVM2_DANRE	slc16a7	Solute carrier family 16 member 7 (MCT2)	Proton-coupled monocarboxylate transporter. Catalyzes the rapid transport across the plasma	SLC16A7 Gene - GeneCards MOT2 Protein MOT2 Antibody	Membrane; Reference proteome; Transmembrane; Transmembrane helix

				membrane of many monocarboxylates such as lactate, pyruvate, branched-chain oxo acids derived from leucine, valine and isoleucine, and the ketone bodies acetoacetate, beta-hydroxybutyrate and acetate		
ENSDARG00000020984	MOT10_DANRE	slc16a10	Monocarboxylate transporter 10 (MCT 10) (Solute carrier family 16 member 10)	Sodium-independent transporter that mediates the uptake of aromatic acids	SLC16A10 Gene - GeneCards MOT10 Protein MOT10 Antibody	Cell membrane; Membrane; Reference proteome; Transmembrane; Transmembrane helix
ENSDARG00000089885	F1Q846_DANRE	slc16a12b	Monocarboxylate transporter 12-B	Proton-linked monocarboxylate transporter that mediates creatine transport across the plasma membrane	SLC16A12 Gene - GeneCards MOT12 Protein MOT12 Antibody	Membrane; Reference proteome; Transmembrane; Transmembrane helix
ENSDARG00000055342	A0A2R8QIL1_DANRE	slc16a13	Solute carrier family 16 member 13	Proton-linked monocarboxylate transporter. May catalyze the transport of monocarboxylates across the plasma membrane	SLC16A13 Gene - GeneCards MOT13 Protein MOT13 Antibody	Membrane; Reference proteome; Transmembrane; Transmembrane helix
ENSDARG00000027355	Q6NX10_DANRE	slc25a4	ADP/ATP translocase (ADP,ATP carrier protein)	Catalyzes the exchange of ADP and ATP across the membrane	SLC25A4 Gene - GeneCards ADT1 Protein ADT1 Antibody	Membrane; Proteomics identification; Reference proteome; Repeat; Transmembrane; Transmembrane helix; Transport
ENSDARG00000059805	S238A_DANRE	slc25a38a	Mitochondrial glycine transporter A (Solute carrier family 25 member 38-A)	Mitochondrial glycine transporter that imports glycine into the mitochondrial matrix. Plays an important role in providing glycine for the first enzymatic step in heme biosynthesis, the condensation of glycine with succinyl-CoA to produce 5-	SLC25A38 Gene - GeneCards S2538 Protein S2538 Antibody	Membrane; Mitochondrion; Mitochondrion inner membrane; Reference proteome; Repeat; Transmembrane; Transmembrane helix; Transport

				aminolevulinate (ALA) in the mitochondrial matrix. Required during erythropoiesis		
ENSDARG00000036848	A0A0R4IP58_DANRE	slc43a2a	L-type amino acid transporter 4 (Large neutral amino acids transporter small subunit 4) (Solute carrier family 43 member 2)	Sodium-, chloride-, and pH-independent high affinity transport of large neutral amino acids.	SLC43A2 Gene - GeneCards LAT4 Protein LAT4 Antibody	Membrane; Reference proteome; Transmembrane; Transmembrane helix
ENSDARG00000061120	A0A2R8QSV3_DANRE	slc43a2b	Solute carrier family 43 member 2b	Sodium-, chloride-, and pH-independent high affinity transport of large neutral amino acids	SLC43A2 Gene - GeneCards LAT4 Protein LAT4 Antibody	Membrane; Reference proteome; Transmembrane; Transmembrane helix
ION-RELATED TRANSPORT						
ENSDARG00000003269	A0A140LGR0_DANRE	clcn3	Chloride channel protein	Strongly outwardly rectifying, electrogenic H(+)/Cl(-)exchanger which mediates the exchange of chloride ions against protons	CLCN3 Gene - GeneCards CLCN3 Protein CLCN3 Antibody	CBS domain; Chloride; Glycoprotein; Ion transport; Lysosome; Membrane; Reference proteome; Repeat; Transmembrane; Transmembrane helix; Transport
ENSDARG000000032577	E7F798_DANRE	clcn6	Chloride channel protein	Voltage-gated chloride channel (CIC) family	CLCN6 Gene - GeneCards CLCN6 Protein CLCN6 Antibody	CBS domain; Chloride; Ion transport; Membrane; Proteomics identification; Reference proteome; Transmembrane; Transmembrane helix; Transport
ENSDARG000000011618	E7F9I7_DANRE	slc26a2	Sulfate transporter (Solute carrier family 26 member 2)	Sulfate transporter. May play a role in endochondral bone formation	SLC26A2 Gene - GeneCards S26A2 Protein S26A2 Antibody	Glycoprotein; Membrane; Phosphoprotein; Proteomics identification; Reference proteome; Transmembrane; Transmembrane helix; Transport
ENSDARG000000021735	A2BHF3_DANRE	cacna1ba	Voltage-dependent N-type calcium channel subunit alpha	Voltage-sensitive calcium channels (VSCC) mediate the entry of calcium ions into excitable cells and are also involved in a	CACNA1B Gene - GeneCards CAC1B Protein CAC1B Antibody	Calcium; Calcium channel; Calcium transport; Coiled coil; Glycoprotein; Ion channel; Ion transport; Membrane; Metal-binding; Phosphoprotein; Reference proteome; Repeat;

				variety of calcium-dependent processes, including muscle contraction, hormone or neurotransmitter release, gene expression, cell motility, cell division and cell death. The isoform alpha-1B gives rise to N-type calcium currents		Transmembrane; Transmembrane helix; Transport; Voltage-gated channel
NSDARG00000027192	F6NQL8_DANRE	hcn3	Hyperpolarization-activated cyclic nucleotide-gated potassium channel 3	Hyperpolarization-activated potassium channel. May also facilitate the permeation of sodium ions	HCN3 Gene - GeneCards HCN3 Protein HCN3 Antibody	Ion channel; Ion transport; Ligand-gated ion channel; Membrane; Reference proteome; Sodium; Sodium channel; Sodium transport; Transmembrane; Transmembrane helix; Transport
ENSDARG00000028173	B0S7B8_DANRE	slc4a2a	Anion exchange protein	Plasma membrane anion exchange protein of wide distribution	SLC4A2 Gene - GeneCards B3A2 Protein B3A2 Antibody	Anion exchange; Antiport; Ion transport; Membrane; Methylation; Reference proteome; Transmembrane; Transmembrane helix; Transport
ENSDARG00000044808	A0A0R4IUL4_DANRE	slc4a4b	Anion exchange protein	Sodium bicarbonate cotransporter (NBC) involved in the regulation of bicarbonate secretion and absorption and intracellular pH	SLC4A4 Gene - GeneCards S4A4 Protein S4A4 Antibody	Ion transport; Membrane; Reference proteome; Transmembrane; Transmembrane helix; Transport
ENSDARG00000055835	A0A2R8RSH7_DANRE	slc26a6	Solute carrier family 26 member 6	Anion transporter proteins. Encodes a protein involved in transporting chloride, oxalate, sulfate and bicarbonate	SLC26A6 Gene - GeneCards S26A6 Protein S26A6 Antibody	Coiled coil; Membrane; Reference proteome; Transmembrane; Transmembrane helix; Transport
ENSDARG00000061288	A5WUQ2_DANRE	kcnc4	Potassium voltage-gated channel, Shaw-related subfamily, member 4	Voltage-dependent potassium ion permeability of excitable membranes	KCNC4 Gene - GeneCards KCNC4 Protein KCNC4 Antibody	Ion channel; Ion transport; Membrane; Potassium; Potassium channel; Potassium transport; Reference proteome; Transmembrane; Transmembrane helix

						Transport; Voltage-gated channel;
ENSDARG00000031506	A0A2R8RI22_DANRE	flvcr2b	FLVCR heme transporter 2b	Acts as an importer of heme. Also acts as a transporter for a calcium-chelator complex, important for growth and calcium metabolism	FLVCR2 Gene - GeneCards FLVC2 Protein FLVC2 Antibody	Membrane; Reference proteome; Transmembrane; Transmembrane helix
ENSDARG00000031587	Q5RGT2_DANRE	flvcr1	FLVCR heme transporter 1	Heme transporter that exports cytoplasmic heme. It can also export coproporphyrin and protoporphyrin IX, which are both intermediate products in the heme biosynthetic pathway	FLVCR1 Gene - GeneCards FLVC1 Protein FLVC1 Antibody	Membrane; Reference proteome; Transmembrane; Transmembrane helix
ENSDARG00000053853	F1QZ08_DANRE	slc13a2	Solute carrier family 13 member 2	Cotransport of sodium ions and dicarboxylates such as succinate and citrate	SLC13A2 Gene - GeneCards S13A2 Protein S13A2 Antibody	Coiled coil; Ion transport Membrane; Reference proteome; Sodium; Sodium transport; Transmembrane; Transmembrane helix; Transport
ENSDARG00000055523	E9QE28_DANRE	slc22a6l oat	Solute carrier family 22 member 6,-like	Functions as organic anion exchanger when the uptake of one molecule of organic anion is coupled with an efflux of one molecule of endogenous dicarboxylic acid (glutarate, ketoglutarate, etc)	SLC22A6 Gene - GeneCards S22A6 Protein S22A6 Antibody	Membrane; Reference proteome; Transmembrane; Transmembrane helix
ENSDARG00000055835	A0A2R8RSH7_DANRE	slc26a6	Solute carrier family 26 member 6	Apical membrane anion-exchanger with wide epithelial distribution that plays a role as a component of the pH buffering system for maintaining acid-base homeostasis. Acts as a versatile DIDS-	SLC26A6 Gene - GeneCards S26A6 Protein S26A6 Antibody	Coiled coil; Membrane; Reference proteome; Transmembrane; Transmembrane helix; Transport

				sensitive inorganic and organic anion transporter that mediates the uptake of monovalent anions like chloride, bicarbonate, formate and hydroxyl ion and divalent anions like sulfate and oxalate		
ENSDARG00000062346	A0A0J9YIY1_DANRE	cacna1ea	Calcium channel, voltage-dependent, R type, alpha 1E subunit a	Pore-forming, alpha-1S subunit of the voltage-gated calcium channel that gives rise to L-type calcium currents in skeletal muscle	CACNA1S Gene - GeneCards CAC1S Protein CAC1S Antibody	Membrane; Reference proteome; Transmembrane; Transmembrane helix
ENSDARG00000069478	A0A2R8QG62_DANRE	slc13a3	Solute carrier family 13 member 3	High-affinity sodium-dicarboxylate cotransporter that accepts a range of substrates with 4-6 carbon atoms, including succinate, alpha-ketoglutarate and N-acetylaspartate	SLC13A3 Gene - GeneCards S13A3 Protein S13A3 Antibody	Ion transport; Membrane; Reference proteome; Sodium; Sodium transport; Transmembrane; Transmembrane helix; Transport
ENSDARG00000078800	A0A2R8RL03_DANRE	slc26a10	Solute carrier family 26 member 10	SLC26A10 (Solute Carrier Family 26 Member 10) is a Pseudogene. Predicted to enable anion transmembrane transporter activity	SLC26A10 Gene - GeneCards SLC26A10 Pseudogene	Membrane; Reference proteome; Transmembrane; Transmembrane helix; Transport
ENSDARG00000078959	C4IXV6_DANRE	tpcn3	Two pore channel 3 (Two pore segment channel 3)	Voltage-gated sodium channel activity. Sodium ion transmembrane transporter activity	ENSG00000184115 Gene - GeneCards ENSG00000184115 Pseudogene	3D-structure; Membrane; Reference proteome; Transmembrane; Transmembrane helix
ENSDARG00000099038	A0A0R4INQ7_DANRE	kcng1	Potassium voltage-gated channel, subfamily G, member 1	Potassium channel subunit that does not form functional channels by itself. Can form functional heterotetrameric channels with KCNB1; modulates the delayed rectifier voltage-gated	KCNG1 Gene - GeneCards KCNG1 Protein KCNG1 Antibody	Ion channel; Ion transport; Membrane; Potassium; Potassium channel; Potassium transport; Reference proteome; Transmembrane; Transmembrane helix; Transport; Voltage-gated channel

				potassium channel activation and deactivation rates of KCNB1		
ENSDARG00000104387	A0A0R4IJZ4_DANRE	slc4a5a	Anion exchange protein	Mediates sodium- and bicarbonate-dependent electrogenic sodium bicarbonate cotransport, with a Na(+):HCO3(-) stoichiometry of 2:1	SLC4A5 Gene - GeneCards S4A5 Protein S4A5 Antibody	Ion transport; Membrane; Reference proteome; Transmembrane; Transmembrane helix; Transport
ENSDARG00000101297	A0A0G2KRM1_DANRE	tmem266	Transmembrane protein 266	Voltage-sensor protein present on the post-synaptic side of glutamatergic mossy fibers and granule cells in the cerebellum	TMEM266 Gene - GeneCards TM266 Protein TM266 Antibody	Coiled coil; Membrane; Reference proteome; Transmembrane; Transmembrane helix
ENSDARG00000078733	A0A2R8QQ79_DANRE	cnm2b	Cyclin and CBS domain divalent metal cation transport mediator 2b	Divalent metal cation transporter. Mediates transport of divalent metal cations in an order of Mg(2+) > Co(2+) > Mn(2+) > Sr(2+) > Ba(2+) > Cu(2+) > Fe(2+)	CNNM2 Gene - GeneCards CNNM2 Protein CNNM2 Antibody	CBS domain; Membrane; Reference proteome; Repeat; Signal; Transmembrane; Transmembrane helix
ENSDARG00000076870	E7FD74_DANRE	piezo1	Piezo-type mechanosensitive ion channel component	Pore-forming subunit of a mechanosensitive non-specific cation channel	PIEZO1 Gene - GeneCards PIEZ1 Protein PIEZ1 Antibody	Ion channel; Ion transport; Membrane; Reference proteome; Transmembrane; Transmembrane helix; Transport
VITAMIN-RELATED TRANSPORT						
ENSDARG00000014599	A9JSZ5_DANRE	slc5a6b	Solute carrier family 5 member 6	NA(+)-dependent vitamin transporter (pantothenate, biotin and lipoate)	SLC5A6 Gene - GeneCards SC5A6 Protein SC5A6 Antibody	Membrane; Reference proteome; Transmembrane; Transmembrane helix
ENSDARG00000026149	F1QNN7_DANRE	slc46a1	Proton-coupled folate transporter	Transmembrane proton-coupled folate transporter protein	SLC46A1 Gene - GeneCards PCFT Protein PCFT Antibody	Membrane; Reference proteome; Transmembrane; Transmembrane helix
ENSDARG00000052497	B8JIT8_DANRE	zgc:110789	Solute carrier family 23 member 1	Sodium/ascorbate cotransporter. Mediates	SLC23A1 Gene - GeneCards S23A1	Membrane; Reference proteome; Transmembrane

				electrogenic uptake of vitamin C, with a stoichiometry of 2 Na(+) for each ascorbate	Protein S23A1 Antibody	Transmembrane helix; Transport
NEUROTRANSMITTER-RELATED TRANSPORT						
ENSDARG00000015110	F1QVV1_DANRE	slc18a2	Solute carrier family 18 member 2	ATP-dependent transporter of monoamines, such as dopamine, norepinephrine, serotonin, and histamine	SLC18A2 Gene - GeneCards VMAT2 Protein VMAT2 Antibody	Membrane; Neurotransmitter transport; Reference proteome; Transmembrane; Transmembrane helix; Transport
ENSDARG00000059945	E7F6Z2_DANRE	sv2a	Synaptic vesicle glycoprotein 2A	Control of regulated secretion in neural and endocrine cells, enhancing selectively low-frequency neurotransmission	SV2A Gene - GeneCards SV2A Protein SV2A Antibody	Cell junction; Cytoplasmic vesicle; Membrane; Neurotransmitter transport; Phosphoprotein; Proteomics identification; Reference proteome; Synapse; Transmembrane; Transmembrane helix; Transport
LIPID-RELATED TRANSPORT						

ENSDARG00000061017	SPNS2_DANRE	spns2 toh	Protein spinster homolog 2 (Protein two of hearts)	Transports sphingosine 1-phosphate (S1P), a secreted lipid mediator that plays critical roles in regulating heart development (PubMed:19062281, PubMed:19074308). Mediates the export of S1P from cells in the extraembryonic yolk syncytial layer (YSL), thereby regulating myocardial precursor migration (PubMed:19062281, PubMed:19074308)	SPNS2 Gene - GeneCards SPNS2 Protein SPNS2 Antibody	Cell membrane; Endosome; Lipid transport; Membrane; Reference proteome; Transmembrane; Transmembrane helix; Transport
ENSDARG00000061896	F1Q9B1_DANRE	slco2a1	Solute carrier organic anion transporter family member	Transports PGD2, as well as PGE1, PGE2 and PGF2A. Mediates the clearance of prostaglandins from the circulation through uptake across cell membrane which allows cytoplasmic oxidation and prostaglandin signal termination	SLCO2A1 Gene - GeneCards SO2A1 Protein SO2A1 Antibody	Cell membrane; Ion transport; Membrane; Reference proteome; Transmembrane; Transmembrane helix; Transport
ENSDARG00000075375	A9C4A0_DANRE	mfsd2a2	Major Facilitator Superfamily Domain-Containing Protein 2A	Sodium-dependent lysophosphatidylcholine (LPC) symporter. Transport of LPC is essential because it constitutes the major mechanism by which docosahexaenoic acid (DHA), an omega-3 fatty acid enters the brain.	MFSD2A Gene - GeneCards NLS1 Protein NLS1 Antibody	Membrane; Reference proteome; Transmembrane; Transmembrane helix
OTHER TRANSPORT-RELATED MOLECULES						

ENSDARG00000046012	A0A0R4ILJ3_DANRE	slc47a1	Multidrug and toxin extrusion protein	Solute transporter for tetraethylammonium (TEA), 1-methyl-4-phenylpyridinium (MPP), cimetidine, N-methylnicotinamide (NMN), metformin, creatinine, guanidine, procainamide, topotecan, estrone sulfate, acyclovir, ganciclovir and also the zwitterionic cephalosporin, cephalexin and cephradine	SLC47A1 Gene - GeneCards S47A1 Protein S47A1 Antibody	Membrane; Reference proteome; Transmembrane; Transmembrane helix
ENSDARG00000014031	F1RCV0_DANRE	abcc2	ATP-binding cassette, sub-family C (CFTR/MRP), member 2	ATP-binding cassette (ABC) family that binds and hydrolyzes ATP to enable active transport of various substrates including many drugs, toxicants and endogenous compound across cell membranes	ABCC2 Gene - GeneCards MRP2 Protein MRP2 Antibody	ATP-binding; Coiled coil; Membrane; Nucleotide-binding; Proteomics identification; Reference proteome; Transmembrane; Transmembrane helix; Transport
ENSDARG000000103220	A0A0R4IEF1_DANRE	slc10a3	Solute carrier family 10 member 3	Predicted to be involved in transmembrane transport. The ubiquitous expression and the conservation of the sequence in distant animal species suggest that the gene codes for a protein with housekeeping functions.	SLC10A3 Gene - GeneCards P3 Protein P3 Antibody	Reference proteome; Signal
ENSDARG000000104278	A0A0R4IIC8_DANRE	slc2a8	Solute carrier family 2 member 8	Insulin-regulated facilitative hexose transporter that mediates the transport of glucose and fructose	SLC2A8 Gene - GeneCards GTR8 Protein GTR8 Antibody	Membrane; Reference proteome; Transmembrane; Transmembrane helix; Transport
ENSDARG00000042521	A2CEZ0_DANRE	si:dkey-251i10.1	ADP/ATP translocase (ADP,ATP carrier protein)	Catalyzes the exchange of ADP and		Membrane; Proteomics identification; Reference proteome; Repeat;

				ATP across the membrane		Transmembrane; Transmembrane helix; Transport
ENSDARG00000102724	A0A0R4IRQ7_DANRE	zgc:153039	Solute carrier family 12 member 9	May be an inhibitor of SLC12A1. Seems to correspond to a subunit of a multimeric transport system and thus, additional subunits may be required for its function	SLC12A9 Gene - GeneCards S12A9 Protein S12A9 Antibody	Membrane; Reference proteome; Transmembrane; Transmembrane helix

Ensembl ID terms were retrieved with Uniprot ([Retrieve / ID mapping \(uniprot.org\)](#)) in order to gain potential functionality of upregulated genes. Links to the human gene database GeneCards ([GeneCards - Human Genes | Gene Database | Gene Search](#)) is also provided