

SLC7 – Cationic amino acid transporter/glycoprotein-associated family

| Human gene name | Protein name | Aliases [assoc. with] | Predominant substrates | Transport type / coupling ions ^{*)} | Tissue distribution and cellular / subcellular expression | Link to disease | Human gene locus | Sequence accession ID | Splice variants and their features |
|--------------------------|---------------------|---|---|--|--|---|------------------|---|---|
| SLC7A1 | CAT-1 | ATRC1, system y ⁺ | cationic L-amino acids | F [#] (non-obligatory E) | ubiquitous except for liver, basolateral and intracellular membranes in epithelial cells | (hypertension) | 13q12-q14 | NM_003045 | |
| SLC7A2 | CAT-2 (A or B) | ATRC2, system y ⁺ | cationic L-amino acids | F [†] | CAT-2A: liver, skeletal muscle, pancreas CAT-2B: inducible in many cell types | | 8p22-21.3 | NM_003046 NM_001008539 | CAT-2A: low affinity CAT-2B: high affinity |
| SLC7A3 | CAT-3 | ATRC3, system y ⁺ | cationic L-amino acids | F [†] | thymus, ovary, testis, brain (neurons) | | Xq13.1 | NM_032803 NM_001048164 | 2 splice variants |
| SLC7A4 | CAT-4 | | | O | brain, testis, placenta. plasma and intracellular membranes | | 22q11.21 | NM_004173 | |
| SLC7A5 | LAT1 | [4F2hc], CD98, 4F2lc, system L | large neutral L-amino acids, T ₃ , T ₄ , L-dopa, BCH | E (similar intra- and extracellular selectivities, low intracellular apparent affinity) | brain, ovary, testis, placenta, blood-brain barrier, fetal liver, activated lymphocytes, tumor cells | (cancer) | 16q24.3 | NM_003486 | |
| SLC7A5P1 | (pseudogene) | LAT1-3TM, MLAS | | | | | 16p11.2 | NR_002593 | |
| SLC7A6 | y ⁺ LAT2 | [4F2hc], system y ⁺ L | Na ⁺ indep.: cationic amino acids; Na ⁺ /: large neutral amino acids | E (preferentially intracellular cationic amino acid against extracellular neutral amino acid / Na ⁺) | brain, small intestine, testis, parotis, heart, kidney, lung, thymus/ basolateral in epithelial cells | (etoposide-induced cytotoxicity) | 16q22.1 | NM_003983 NM_001076785 | |
| SLC7A7 | y ⁺ LAT1 | [4F2hc], system y ⁺ L | Na ⁺ indep.: cationic amino acids; Na ⁺ /: large neutral L-amino acids | E (preferentially intracellular cationic amino acid against extracellular neutral amino acid / Na ⁺) | small intestine, kidney, leucocytes, placenta, lung / basolateral in epithelial cells | lysinuric protein intolerance (LPI) | 14q11.2 | NM_003982 | 3 splice variants |
| SLC7A8 | LAT2 | [4F2hc], system L | Neutral L-amino acids, BCH | E (similar intra- and extracellular selectivities, lower intracellular apparent affinity) | small intestine, kidney, brain, placenta, ovary, testis, skeletal muscle / basolateral in epithelial cells | | 14q11.2 | NM_012244 NM_182728 | 2 splice variants |
| SLC7A9 | b ^{0,+} AT | [rBAT], system b ^{0,+} | cationic amino acids, large neutral amino acids | E (preferentially extracellular cationic amino acid against intracellular neutral amino acid) | small intestine, kidney, lung, placenta, brain, liver / apical in epithelial cells | cystinuria type II, cystinuria type III | 19q13.1 | NM_014270 | 2 splice variants |
| SLC7A10 | Asc-1 | [4F2hc], system asc | small neutral amino acids | preferentially E | (human) brain, heart, placenta, skeletal muscle and kidney | - | 19q13.1 | NM_019849 | |
| SLC7A11 | xCT | [4F2hc], system X _c ⁻ | cystine (anionic form), L-glutamate | E (preferentially extracellular cystine against intracellular glutamate) | macrophages, brain, retinal pigment cells, liver, kidney / basolateral in epithelial cells | - | 4q28-q32 | NM_014331 | |
| SLC7A13 | AGT-1 | XAT2 | L-aspartate and L-glutamate | E | proximal straight tubules and distal convoluted tubules (basolateral) | | 8q21.3 | NM_138817 | |
| SLC7A14 | | | | O | | | 3q26.2 | NM_020949 | |

*) C: Cotransporter; E: Exchanger; F: Facilitated transporter; O: Orphan transporter

F CAT-1 is strongly trans-stimulated and works better in the exchange mode, CAT-2B and CAT-3 are moderately trans-stimulated, and CAT-2A is completely independent of the presence of trans-substrate.

References:

Original version of the SLC table:

[Verrey F, Closs EI, Wagner CA, Palacin M, Endou H, Kanai Y.](#) CATs and HATs: the SLC7 family of amino acid transporters. *Pflugers Arch.* 2004 Feb;447(5):532-42.

Questions & Comments