

SLC12 – Electroneutral cation-coupled Cl cotransporter family

Human gene name	Protein name	Aliases	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
SLC12A1	NKCC2	BSC1	sodium, potassium (or ammonium), chloride	C / Na ⁺ / K ⁺ (or NH ₄ ⁺) / 2Cl ⁻	kidney-specific: apical membrane of the thick ascending limb	Bartter's syndrome type I	15q21.1	NM_000338	isoforms A, B, F differ in ion affinities and exhibit axial expression along TAL; shorter C-terminal isoform encodes a Na ⁺ :Cl ⁻ cotransporter
SLC12A2	NKCC1	BSC2	sodium, potassium (or ammonium), chloride	C / Na ⁺ / K ⁺ (or NH ₄ ⁺) / 2Cl ⁻	ubiquitous: basolateral membrane of epithelial cells; also in non-epithelial cells	seizures, epilepsy, neuropathic pain	5q23.3	NM_001046	shorter C-terminal isoform due to absence of exon 21
SLC12A3	NCC	TSC	sodium, chloride	C / Na ⁺ / Cl ⁻	kidney-specific: apical membrane of the distal convoluted tubule; (bone)	Gitelman's syndrome	16q13	NM_000339	
SLC12A4	KCC1		potassium (or ammonium), chloride	C / K ⁺ (or NH ₄ ⁺) / Cl ⁻	ubiquitous	none	16q22	NM_005072	
SLC12A5	KCC2		potassium (or ammonium), chloride	C / K ⁺ (or NH ₄ ⁺) / Cl ⁻	neuron-specific	seizures, epilepsy and neuropathic pain	20q13	NM_020708	
SLC12A6	KCC3		potassium (or ammonium), chloride	C / K ⁺ (or NH ₄ ⁺) / Cl ⁻	widespread, KCC3a and KCC3b predominantly expressed in CNS and kidney, respectively	Anderman's syndrome	15q14	NM_005135	two N-terminal variants, KCC3a and KCC3b, generated by transcriptional initiation 5' of two distinct first coding exons
SLC12A7	KCC4		potassium (or ammonium), chloride	C / K ⁺ (or NH ₄ ⁺) / Cl ⁻	widespread	deafness and distal renal tubular acidosis (KO mice)	5p15	NM_006598	
SLC12A8	CCC9		polyamines (spermidine, spermine putrescine), amino acids	C / polyamines / amino acids	widespread	psoriasis vulgaris susceptibility	3q21	NM_024628	seven splice variants identified, CCC9a-g, only CCC9a has been functionally characterized
SLC12A9	CCC8	CIP	unknown	unknown	widespread		7q22	NM_020246	

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

References:

Original version of the SLC table:

[Hebert SC, Mount DB, Gamba G.](#) Molecular physiology of cation-coupled Cl(-) cotransport: the SLC12 family. Pflugers Arch. 2004 Feb;447(5):580-93.

Questions & Comments