Cyclic nucleotide-gated channels

Overview: Cyclic nucleotide-gated (CNG) channels are responsible for signalling in the primary sensory cells of the vertebrate visual and olfactory systems. A standardized nomenclature for CNG channels has been proposed by the NC-IUPHAR subcommittee on voltage-gated ion channels (see Hofmann *et al.*, 2005).

CNG channels are voltage-independent cation channels formed as tetramers. Each subunit has 6TM, with the pore-forming domain between TM5 and TM6. CNG channels were first found in rod photoreceptors (Fesenko *et al.*, 1985; Kaupp *et al.*, 1989), where light signals through rhodopsin and transducin to stimulate phosphodiesterase and reduce intracellular cGMP level. This results in a closure of CNG channels and a reduced 'dark current'. Similar channels were found in the cilia of olfactory neurons (Nakamura and Gold, 1987) and the pineal gland (Dryer and Henderson, 1991). The cyclic nucleotides bind to a domain in the C-terminus of the subunit protein: other channels directly binding cyclic nucleotides include HCN, eag and certain plant potassium channels.

Nomenclature	CNGA1	CNGA2	CNGA3
Other names	CNG1, CNGα1, RCNC1	CNG2, CNGα3, OCNC1	CNG3, CNGα2, CCNC1
Ensembl ID	ENSG00000198515	ENSG00000183862	ENSG00000144191
Activators	Intracellular cyclic nucleotides: cGMP (EC_{50} ~ 30 μM)>>cAMP	Intracellular cyclic nucleotides: cGMP ~ cAMP (EC_{50} ~ 1 μM)	Intracellular cyclic nucleotides: cGMP (EC_{50} ~ 30 μM)>>cAMP
Inhibitors	L-*cis* diltiazem	–	L-*cis* diltiazem
Functional characteristics	γ = 25–30 pS P_{Ca}/P_{Na}=3.1	γ = 35 pS P_{Ca}/P_{Na} = 6.8	γ = 40 pS P_{Ca}/P_{Na} = 10.9

CNGA1, CNGA2 and CNGA3 express functional channels as homomers. Three additional subunits CNGA4 (Genbank protein AAH40277), CNGB1 (Q14028) and CNGB3 (NP_061971) do not, and are referred to as auxiliary subunits. The subunit composition of the native channels is believed to be as follows. Rod: $CNGA1_3$/CNGB1a; Cone: $CNGA3_2$/$CNGB3_2$; Olfactory neurons: $CNGA2_2$/CNGA4/CNGB1b (Weitz *et al.*, 2002; Zheng *et al.*, 2002; Zhong *et al.*, 2002; Peng *et al.*, 2004; Zheng and Zagotta, 2004).

Further Reading

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