HCN Channels: New therapeutic targets for pain treatment

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Hyperpolarization-activated cyclic nucleotide-gated (HCN) channels are highly regulated proteins which respond to different cellular stimuli. The HCN currents (Ih) mediated by HCN1 and HCN2 drive the repetitive firing in nociceptive neurons. The role of HCN channels in pain has been widely investigated as targets for the development of new therapeutic drugs, but the comprehensive design of HCN channel modulators has been restricted due to the lack of crystallographic data. The three-dimensional structure of the human HCN1 channel was recently reported, opening new possibilities for the rational design of highly-selective HCN modulators. In this review, we discuss the structural and functional properties of HCN channels, their pharmacological inhibitors, and the potential strategies for designing new drugs to block the HCN channel function associated with pain perception.

HCN blockers

HCN channels

HCN channels expression

HCN structure

Pain condition

hyperpolarization activated cyclic nucleotide gated channel

analgesia

animal

antagonists and inhibitors

central nervous system

chemistry

drug design

drug development

gene expression regulation

genetics

human

metabolism

molecularly targeted therapy

nociception

pain

signal transduction

structure activity relation

Animals

Central Nervous System

Drug Design

Drug Discovery

Gene Expression Regulation

Humans

Hyperpolarization-Activated Cyclic Nucleotide-Gated Channels

Molecular Targeted Therapy

Pain

Pain Management

Pain Perception

Signal Transduction

Structure-Activity Relationship