S1-5 *[2000 Oct. 19 (Thur), 12:05~12:40/Hall A]*

Molecular Physiology and Pharmacology of a New Family of K^+ Channels

Donghee Kim

Finch Univ. Health Sciences/Chicago Medical School, Department of Physiology & Biophysics, 3333 Green Bay Road, North Chicago, IL 60064-3095, USA

K^+ channels are ubiquitous membrane proteins that are involved in many cellular functions in both excitable and non-excitable cells. They are highly diverse in their conductance, gating, pharmacology and molecular structure. Molecular cloning has helped to identify and characterize many members of different subfamilies within the K^+ channel superfamily. Three main families of K+ channels are now known to exist. (1) Voltage-gated K^+ channels have six transmembrane segments and are involved in neuronal integration, hormone secretion and cardiac repolarization. (2) Inward rectifier K^+ channels have two transmembrane segments and are involved in maintenance of resting membrane potential, and regulation of cell excitability and signal transduction (G-proteins). (3) A new structural family of K^+ channels containing four transmembrane segments has recently been identified by searching in the GenBank for K^+ channel signature sequence (TIGYG). The physiological roles of these K^+ channels are now beginning to be elucidated. Some may contribute to the resting conductance in a variety of cells and others may be involved in synaptic transmission.

Here, we describe the molecular cloning and expression of several new members of the 4TM K^+ channel family and discuss their potential roles in physiology and pharmacology. One of the most interesting properties of some of these channels are that they are activated by mechanical stress, unsaturated free fatty acids, acid/base changes, volatile anesthetics and heat. These interesting properties of the 4TM K^+ channels suggest that they are likely to be involved in various normal physiological processes as well as in certain pathophysiological states such as ischemia, seizure and metabolic imbalance.