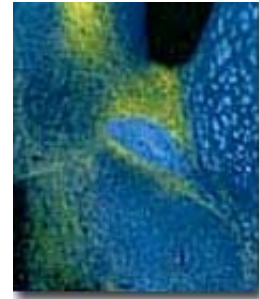




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Research Interests

Inwardly rectifying potassium, or Kir, channels are critical regulators of cellular excitability. They function like electronic diodes to stabilize cells resting potential and to regulate potassium balance. The mechanism of their unusual behavior to conduct ions readily only in one direction, a phenomenon called inward rectification, was largely unknown until it has been recently discovered that small ubiquitous molecules called polyamines (putrescine, spermidine and spermine) are the sole reason for this , anomalous, effect. One of the goals of our laboratory is to understand on the molecular level how polyamines interact with the channel protein to cause inward rectification. To approach this problem we utilize electrophysiological, molecular biological and computer modeling techniques. Besides attacking the biophysical part of the phenomenon of rectification we are also interested in the regulation of cellular excitability by genetic manipulation of both Kir channels and polyamines in experimental animals. The heart is one of the major organs where intracellular polyamines cause the strongest rectification of potassium channels. We are now producing and characterizing transgenic mice with genetically altered polyamine biosynthesis and Kir channels to understand in more detail the physiological role of these channels in the function of the heart. This approach includes molecular biological design of mutated enzymes of polyamine biosynthesis and potassium channels, their targeted expression in the heart and studying the effects of genetic manipulation on the single cell level using patch-clamp technology and on the level of isolated heart and whole animal.

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