Video Article

Patch clamp techniques for studying ion channels expressed in Xenopus oocytes

Junqiu Yang[1], Kelli Delaloye[2], Urvi Lee[2], Jianmin Cui[3]

[1]Department of Energy, Environmental & Chemical Engineering, Washington University in St. Louis

[2]Department of Biomedical Engineering, Washington University in St. Louis

[3]Department of Biomedical Engineering and Cardiac Bioelectricity and Arrhythmia Center, Washington University in St. Louis

Correspondence to: Jianmin Cui at jcui@biomed.wustl.edu

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Abstract

The protocol presented here is designed to study the activation of the large conductance, voltage- and Ca2+-activated K+ (BK) channels. The protocol may also be used to study the structure-function relationship for other ion channels and neurotransmitter receptors. BK channels are widely expressed in different tissues and have been implicated in many physiological functions, including regulation of smooth muscle contraction, frequency tuning of inner hair cells and regulation of neurotransmitter release. BK channels are activated by membrane depolarization and by intracellular Ca2+ and Mg2+. Therefore, the protocol is designed to control both the membrane voltage and the intracellular solution. In this protocol, messenger RNA of BK channels is injected into Xenopus laevis oocytes (stage V-VI) followed by 2-5 days of incubation at 18 C. Membrane patches that contain single or multiple BK channels are excised with the inside-out configuration using patch clamp techniques. The intracellular side of the patch is perfused with desired solutions during recording so that the channel activation under different conditions can be examined. To summarize, the mRNA of BK channels is injected into Xenopus laevis oocytes to express channel proteins on the oocyte membrane; patch clamp techniques are used to record currents flowing through the channels under controlled voltage and intracellular solutions.

Disclosures

No conflicts of interest declared.