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Activation of Mechanosensitive BK_{Ca} Channel in Cardiovascular

School of Pharmaceutical Sciences, Tsinghua-Peking Joint Center for Life Sciences, IDG/McGovern Brain Research Institute, Tsinghua University, Haidian District, and Beijing, China

*Correspondence to: Shaopeng Chi, School of Pharmaceutical Sciences, Tsinghua-Peking Joint Center for Life Sciences, IDG/McGovern Brain Research Institute, Tsinghua University, Haidian District, Beijing, China, E-mail: zkychisp.student@sina.com

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Abstract

Previous published study have demonstrated that stress in the plasma membrane can contribute to the mechanical activation of mechanosensitive channels (e.g. BK_{Ca}), though the possibility for the involvement of ancillary proteins in the activation cannot be ruled out. However, the activation of BK_{Ca} channel is unclear. The reviews have provided an important mechanism.

Keywords: Mechanosensitive ion channels, BK_{Ca} channel, STREX.

Editorial

Mechanosensitive channels have been identified in cardiovascular from bacteria to humans, and are believed to play an important role in the process of transducing mechanical stimuli into intracellular signals. Notwithstanding little is known on the molecular mechanisms in Mechanosensitive channels. The cells mechanosensing are channel-mediated, discussing its requirements and steps, and studying how a cell can use such an elegant process to sense and respond to the mechanical environment. In the past the researches have made major breakthroughs in demystifying mechanosensitive channels.

In the first research, the present study shows that both cationic amphipath chlorpromazine and anionic amphipathtrinitrophenol could activate the BK_{Ca} channel. Further results suggest that the stress-regulated (STREX) sequences acts as an important domain that can indirectly convey stress in the membrane to the gate of the BK_{Ca} channel via an unidentified membrane associated protein that can detect or transmit stress in the membrane [1].

In the second research, the present study shows that regulatory effect of sulphatides on BK_{Ca} channels. Sulphatides aresulphated glycosphingolipids in thecentral and the peripheral nervous systems. BK_{Ca} channels chemical activators (Sulphatides) appear to activate and modulate BK_{Ca} channels via actingon STREX domain. As changes of sulphatide content are associated with neuronal dysfunction. The data suggest that these effects of sulphatides may play important pathophysiological roles in regulation of BK_{Ca} channels [2].

In the third research, the present study shows that Baifuzi reduces transient ischemic brain damage through an interaction with the STREX domain of BK_{Ca} channels. The cardiovascular diseases such as stroke are the number one world-wide killer. However, no successful therapeutic intervention is available for the majority of stroke patients. The research is well-noticed in the field of ion channels, especially pertaining to mechanosensitive ion channels. The results suggest that the mechanical force activation of BK_{Ca} channels. Notably, mechanosensitive channels have been known to be involved in several specialized cell functions, such as touch sensation and in pathology including cardiac arrhythmias. The study has discovered that the ethanol extract of Baifuzi, a traditional Chinese medicine, exerts neuroprotective effects against brain damage induced by transient global or focal cerebral ischemia. The study also found the specific target of stroke by observing the effects of activate a specific ion channel which can be further explored for the discovery of anti-stroke drugs [3-4].

Conclusion and Perspective

These results indicate that some compounds (include cationic amphipath chlorpromazine, anionic amphipathtrinitrophenol, sulphatides and Baifuzi) activated the mechanosensitive BK_{Ca} channels through its direct interaction with the STREX domain of the channel and suggests that the compounds merits exploration as a potential therapeutic agent for treating cardiovascular. Recently, the newly established mechanosensing Piezo channels have been demonstrated to play critical roles in various mechanotransduction processes. Piezo channels, including Piezo1 and Piezo2, have been established as the mechanosensitive cation channels in mammals. They play a critical

role in various physiological and pathophysiological processes. The groundbreaking research has identified Piezos as ion channels that sense light touch sensation, proprioception, neuron growth, skeleton homeostasis and vascular blood flow, ruled out roles for Piezos in several other mechanotransduction processes, and revealed the basic structural and functional properties of the channel. However, their molecular mechanisms remain unclear. By focusing on Piezo channels,the researcher has found that knockout of Piezo1 channel in osteoblast disrupted the osteogenesis of osteoblasts and severely impaired bone structure and strength. In addition, the researcher also found interaction protein and new chemical activators, providing novel tools and insights for investigating of Piezo channels. Then, using a combination of these novel tools and high-resolution Cyro-EM structure approaches, the researcher has identified the molecular basis underlying its mechanotransduction properties [5-10]. In the future, there searcher wants to examine mechanosensitive Piezo channels in heart.

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