Colloquium

The Institute Colloquium: Signaling from synapse to nucleus for synaptic and behavior

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Host:

The primary language of excitable cells (action potential firing) is converted into the primary language of intracellular activity (biochemical signaling) by voltage-gated Ca2+ channels (CaVs). Such signaling is exemplified by excitation-contraction (E-C) coupling and excitation-secretion (E-S) coupling. Excitation-transcription (E-T) coupling is a more general event in excitable cells yet is less understood. A subfamily of Ca2+ channels, CaV1 (L-type) channels, fulfills a privileged role in excitation-transcription coupling to nuclear CREB, a transcription factor critical in learning and memory. However, even the earliest step in this signaling pathway is not fully understood: local Ca2+ elevations near CaV1 channels are thought to be the main trigger in the signaling cascade, but CaV1 channels could also convey a voltage-dependent conformational signal (VCS) to nearby signaling intermediates, like the conformational signal in E-C coupling. We have devised an approach whereby conformational changes required to open the CaV pore are experimentally decoupled from Ca2+ influx into the channel nanodomain. This dissection uncovered a remarkable requirement for the CaV1 VCS in excitation-transcription coupling. CaV1 signaling to CREB behaves as an AND gate, whereby both Ca2+ and voltage-dependent movements are necessary. The key local signaling intermediates include a-and bCaMKII.

Monday, April 11, 2016 12:45pm - 01:45pm
Raiffeisen Lecture Hall, Central Building

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