Doctoral College
Metabolic & Cardiovascular Disease

Modeling ion transport in vascular smooth muscle nanospaces

GUEST LECTURE by

Nicola Fameli, PhD
Dept. of Anaesthesiology, Pharmacology & Therapeutics
The University of British Columbia
Vancouver / Canada

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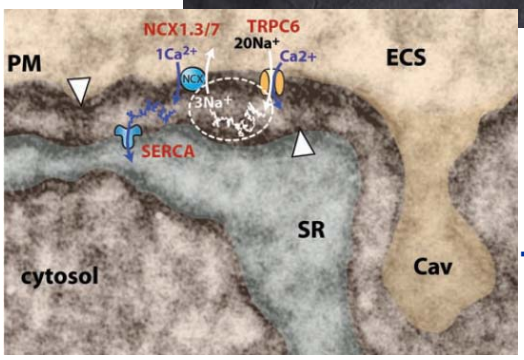
HS 02.01, Dept. of Pharmacology & Toxicology, KFUG (Universitätsplatz 2)



Channels (Austin). 2008 Jan-Feb;2(1):10-2.
Poburko D, Fameli N, Kuo KH, van Breemen C

Abstract

Increasingly more convincing evidence supports the view that cytoplasmic nanospaces - nanometre scale spaces between organellar membranes, hosting cell signalling machinery - are key to Ca^{2+} signalling as much as Ca^{2+} transporters and Ca^{2+} storing organelles. I will address the important role of diffusional ion transport in cytoplasmic nanospaces for Ca^{2+} signalling in smooth muscle cells and how quantitative modeling can shed significant light on the understanding of signalling mechanisms.

I will first overview experimental results in the study of smooth muscle cell plasma membrane (PM)-sarcoplasmic reticulum (SR) nanospaces, including evidence of their role in the generation of asynchronous Ca^{2+} waves.

I will then illustrate how stochastic modeling approaches have aided and guided our understanding of two basic functional steps responsible for smooth muscle cell contractile activation via asynchronous Ca^{2+} waves.

Lastly, I will outline how more sophisticated and realistic quantitative stochastic modeling needs to be employed not only to deepen our understanding, but also to aid in the hypothesis generation for further experimental investigation.