Mitochondrial Dynamics and Ca^{2+} Transport in the Regulation of Susceptibility to Epilepsy and Stroke

October 12

Tuesday, 12:30pm

Online Webinar

For Researchers

Speaker:

Yuriy M. Usachev, Ph.D.

John P. Long Endowed Professor
Professor of Neuroscience, Pharmacology and Anesthesia
Carver College of Medicine
University of Iowa

Host: Rajiv R. Ratan, M.D., Ph.D.

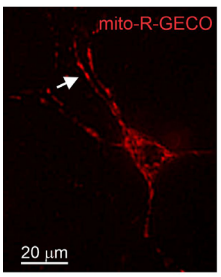
For more information contact

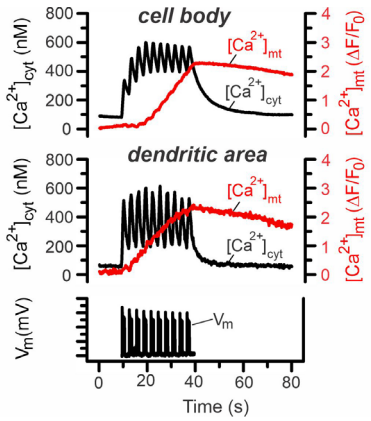
Darlene White

daw9085@med.cornell.edu

Abstract

Mitochondria play a central role in cell bioenergetics and control multiple aspects of neuronal life and death. Neurons are particularly dependent on proper mitochondrial function, because of the high energy demands as-sociated with maintenance of ionic gradients and synaptic vesicle recycling. Mitochondria are highly dynamic organelles shaped by fission and fusion, which affects mitochondrial transport, synaptic plasticity and survival. Mitochondria also play a prominent role in Ca^{2+} signaling and Ca^{2+}-dependent functions in neurons including ex-citability, synaptic plasticity, ATP synthesis, and neurotoxicity. In the first part of his talk, Dr. Usachev will focus on the roles of the mitochondrial Ca^{2+} uniporters MCU and MCUb in shaping neuronal Ca^{2+} signaling, regulating synaptic transmission and controlling neural network excitability and susceptibility to seizures and epilepsy. In the second half of his presentation, Dr. Usachev will describe the role of phosphorylation-dependent regulation of mitochondrial fission and fusion (MFF) and the role of protein kinase A/AKAP1 and protein phosphatase PP2A/Bβ2 signaling complexes in regulating mitochondrial dynamics and bioenergetics as well as controlling resistance to neuronal toxicity in ischemic stroke. How the MFF machinery and mitochondrial Ca^{2+} transport interact and how both processes could be therapeutically targeted for treating stroke and epilepsy will be also discussed.





1. Medvedeva Y.V., Kim M.-S. and Usachev Y.M.: **Mechanisms of prolonged presynaptic Ca^{2+} signaling and glutamate release induced by TRPV1 activation in rat sensory neurons.** Journal of Neuroscience 28:5295-5311, 2008. PMCID: PMC2694046**This article was featured in the "This week in the journal" section, and was highlighted in EurekAlert, an online global news service operated by AAAS, and selected for Faculty of 1000 Biology.

2. Kim M.-S. and Usachev Y.M.: **Mitochondrial Ca^{2+} cycling facilitates activation of the transcription factor NFAT in sensory neurons.** Journal of Neuroscience 29:12101-12114, 2009. PMCID: PMC2805078.

3. Flippo K.H., Zhihong Lin, Audrey Dickey, Xinchang Zhou, Nirav Dhanesha, Ronald Merrill, Robert Meller, Roger Simon, Anil Chauhan, *Usachev Y.M. and *Strack S.: **Deletion of a neuronal Drp1 activator protects against cerebral ischemia.** Journal of Neuroscience 40:3119-3129, 2020. PMCID: PMC7141887 *Corresponding authors

4. Rysted J.E., Lin Z., Walters G.C., Rauckhorst A.J., Noterman M., Liu G., Taylor E.B., Strack S. and Usachev Y.M. (2021) **Distinct Properties of Ca^{2+} Efflux from Brain, Heart and Liver Mitochondria: The Effects of Na^{+}, Li^{+} and the Mitochondrial Na^{+}/Ca^{2+} Exchange Inhibitor CGP37157.** Cell Calcium 96: doi: 10.1016/j.ceca.2021.102382. PMID: 33684833.

Burke Neurological Institute
Academic Affiliate of Weill Cornell Medicine
785 Mamaroneck Avenue, White Plains, NY 10605
burke.weill.cornell.edu/events

Burke Neurological Institute
The science hope demands

Weill Cornell Medicine