Trpv channels in the Brain and Pituitary: Organization and possible role

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Transient receptor potential vanilloid (Trpv) subfamily of cation channels have emerged as novel regulators of neural and neuroendocrine regulation. Trpv ion channels are polymodal in nature and activated by a range of agents/stimuli. In recent years estradiol has emerged as a potential regulator of Trpv channels in the peripheral tissues and sensory neurons, however, its analogous role in the CNS is poorly understood. Trpv channels modulate Ca2+ signaling, neurotransmission and behavior, and expression of these ion channels and estrogen receptors show a great degree of overlap in different brain regions. The promoter of Trpv1-6 genes contain estrogen response element and we observed estrous cycle-related changes in their expression in different brain compartments. In view of the higher Ca2+-selectivity and estrogen responsiveness, we have demonstrated the neuroanatomical organization of Trpv5 and Trpv6-ir elements in the brain. We observed wide distribution of Trpv5- and Trpv6-equipped elements in the brain. Trpv5-ir was present in neurons as well as glial cells, whereas Trpv6-ir was observed in neuronal cell bodies and fibers. These ion channels expressing elements were observed in the hypothalamic cocaine-and amphetamine-regulated transcript (CART), neuropeptide Y (NPY), oxytocin and vasopressin neurons. Further, CART neurons expressing Trpv5 and Trpv6-ir neurons in the hypothalamus coexpressing ERα showed estrous cycle-dependent changes. Given the discretely organized Trpv1-6-ir elements in different lobes of the pituitary gland, we speculate that Trpv ion channels as novel endocrine regulators of pituitary gland. We found the presence of Trpv1 in growth hormone (GH) cells and treatment with Trpv1 agonist stimulated GH secretion in rat pituitary primary cultures. Interestingly, the CART-induced GH release seems independent of Trpv1. The findings are important since Trpv1 is thermosensitive, temperature is an important regulator of GH secretion, and GH release has been shown to increase with an increase in the core body temperature during exercise.

Speaker Biography

Santosh Kumar has completed his PhD in April 2018 from the National Institute of Science Education and Research, Bhubaneswar, India. He worked on the neural pathways that link energy balance and reproduction, and explored the role of Trpv channels in the brain and pituitary. He has 12 publications of which 4 are first author published in Neuroscience, Journal of Neuroendocrinology, and Brain Research. At present, he is working on the mechanisms of neurodevelopmental disorders at the University of California, Davis, USA as a postdoctoral scholar.

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