

Seminar

Thermo-gated TRP channels as regulators for maintaining subcellular organelle structure, function and temperature: Implications in diseases

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TRP channels are a family of non-selective cation channels that are present from single cell lower eukaryotes to human, but are absent in plant kingdom. These channels act as key molecules involved in sensory functions and induce diverse signalling events. Among all TRP sub-family, TRPV group of ion channels are very important as few members of this sub-family are thermo-sensitive in nature, i.e. regulated by warm, high or low temperature and show “thermo-gated behaviour”. Mutations in TRP channels induce several physiological disorders commonly known as “channelopathies”.

Notably, majority of the TRP channels are described as ion channels present in plasma membrane and relevant for cytosolic Ca^{2+} regulation. In last 15 years our lab explored the presence of TRPV4, TRPV4 (two important channels that are activated by warm temperature) and TRPM8 (a cold-activated ion channel) in sub-cellular organelles. We demonstrate that TRPV4 is present in a sub-set of mitochondria. Accordingly, TRPV4 regulates a number of mitochondrial parameters, such as morphology, fission-fusion, ER-mito contact points, mitochondrial metabolism, and mitochondrial temperature. In a parallel manner, TRPV3 is present in lysosome and regulates lysosomal pH. TRPM8, the cold temperature activated ion channel is also specifically present in certain sub-cellular organelle and largely regulates the cellular thermal homeostasis. Collectively our findings suggest the critical involvement of these thermogated TRP channels in maintaining of overall cellular Ca^{2+} and thermal homeostasis, mainly by “heating up and/or cooling down” of subcellular organelles. This understanding is critical for handling several diseases, such as obesity, bone disorders, *Charcot Marie Tooth*, different forms of *Skeletal Dysplasia*, and rare genetic disorders such as “*Olmsted Syndrome*”.

Wednesday, Aug 5th 2026

11:30 Hrs (Tea / Coffee 11:15 Hrs)

Seminar Hall, TIFRH