VT School of Neuroscience
Faculty Recruitment Seminar

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"In vivo cellular calcium imaging to study chronic pain"

November 2, 2017
11:00am – 12:00pm
Biocomplexity Institute Conference Room

Pain is mediated primarily by a subset of primary sensory neurons known as nociceptors in Dorsal Root Ganglia (DRG) and Trigeminal Ganglia (TG). How these neurons function at a populational level as ensemble under physiological and pathological conditions is not known. My group has developed tools to visualize the peripheral neuronal hypersensitivity corresponding to pain through the advantages in simple tissue preparation and imaging procedures, excellent special resolution, high-efficiency simultaneous imaging of multiple neurons, and finally a stable expression of GCaMP as genetically-encoded Ca2+ sensitive indicator. My group also developed an imaging technique which allows simultaneous monitoring of the activation of >1,800 neurons in the DRG and >2.800 neurons in the TG. By combining the powerful techniques of in vivo high resolution confocal microscopic imaging, in vivo small miniscope & micro-imaging sensor imaging, and electrophysiological recordings in live and freely behaving animals, my group has brought cutting edge technology into the pain research field. We have also acquired a number of transgenic mouse lines in collaboration with Dr. Ginty's group to visualize specific types of primary sensory neurons. These transgenic mice include: peptidergic neurons by CGRP, non-peptidergic neurons by MrgprD and Pirt2, itch neurons by MrgprA3 & C, C-lowthreshold mechanoreceptors (LTMRs) by TH, Aδ-LTMRs by TrkB, Aβ RA-LTMRs by Npy2r, Aβ SA-LTMRs by TrkC.

Using these powerful tools and cutting edge technologies such as in vivo multi-photon imaging, imaging from neural activities and networks from freely moving animals combined with whole-cell patch recordings and in vivo single cell recordings, we can now focus our study on the fundamental unresolved questions related to mechanisms of allodynia (pain resulting from a stimulus which would not normally induce pain), hyperalgesia (increased sensitivity to pain), and referred pain (pain localized in one area due to pain in another area).

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