Weekly Colloquium
Tuesday, 12/08/2015, 12:30 pm
Billings Building,
Rosedale Conference Room

“Of Neurons and Pericytes: Neurovascular Approach to Brain Health and Disease”

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Abstract: In classical view, brain physiology is mainly considered from perspective of neurons. Consequently, many neurological deficits are viewed as neuronal impairments. Recently, a more nuanced approach has emerged in which glial and vascular cells, the other two building blocks of the brain have moved into a spotlight. While our general understanding of molecular and synaptic mechanisms of normal physiology and pathophysiology of each of these individual components has been increasing exponentially, our ability to translate these finding into clinical applications in human disease has been limited. The success of applying basic findings to treatments may hinge on comprehensive analysis in which not only neuron-to-neuron or glia-to-glia connections are considered but rather how interactions among diverse brain components emerge and change during disease. It has become clear that proper brain and, as a result, entire body function depends on a precise and dynamic balance within so-called neurovascular unit. Neurovascular unit comprised of neurons, capillary cells and glia, has become lately a subject of numerous studies and reviews. Indeed, only comprehensive analysis of all neurovascular components can provide the most complete picture of wide range of neurological disease that were initially thought to have either neuronal, vascular or glial origins. Therefore, identification of common and well-defined neurovascular units in which to study these interactions has emerged as a long-standing goal of neuroscience research. Blood flow control and neuronal health serve as valuable models for dissecting neurovascular interactions. In our body, brain has the highest metabolic demand. To meet this demand oxygen and nutrients have to be delivered to the active neurons and end products removed in timely and balanced manner, a phenomenon termed functional hyperemia. The cellular and molecular mechanisms responsible for blood flow regulation remain largely unclear. In this work we would like to describe a new model of using optogenetic techniques in studies of neurovascular interaction in the retinal model of central nervous system and how this approach can be potentially applied to treat neurological dysfunctions.

List of recent publications:
Disruption in dopaminergic innervation during photoreceptor degeneration. Ivanova E, Yee CW, Sagdullaev BT. J Comp Neurol. 2015

Intersublaminar vascular plexus: the correlation of retinal blood vessels with functional sublaminae of the inner plexiform layer. Ivanova E, Toychiev AH, Yee CW, Sagdullaev BT. Invest Ophthalmol Vis Sci. 2014

Block of gap junctions eliminates aberrant activity and restores light responses during retinal degeneration. Toychiev AH, Ivanova E, Yee CW, Sagdullaev BT. J Neurosci. 20

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