UNIVERSITY of WASHINGTON
PSYCHIATRY & BEHAVIORAL SCIENCES
School of Medicine

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[Lab Website]

[Faculty Profile]

Summary of Research Program:

The Turner laboratory conducts research in two main areas, the role of transcription factors in neural and craniofacial development, and the function of neural pathways in the brainstem in the regulation of motivated behavior and mood states.

The first area of research focuses on homeodomain transcription factors that have been linked to numerous developmental syndromes affecting every organ system. Past work has addressed the role of the POU- and LIM-class transcription factors in brain and sensory neuron development. Currently Dr. Turner is exploring the role of the homeodomain factor Hmx1 in the development of the sensory innervation of the face and in craniofacial morphogenesis, in collaboration with the Cox laboratory. Our aim is to bridge the two fields of neural and craniofacial development and to identify unexpected molecular connections which may shed light on a number of human genetic disorders leading to birth defects and neurological deficits.

The Turner lab also studies the development and function of neural circuitry using transgenic and optogenetic mouse models. Specifically, we are working on the function of a poorly understood brain region called the habenula. New transgenic mice developed in collaboration with the Allen Brain Institute have allowed us to explore the function of the habenula using optogenetics, in which light-sensitive channels permit the manipulation of specific populations of neurons in this nucleus. One group of neurons in the ventral medial habenula form a circuit with midbrain neurons that express an unusual acetylcholine receptor that has been implicated in genetic studies nicotine addiction in humans. This circuit is likely to mediate some reinforcing properties of tobacco. Recently we have shown that another group of neurons in the dorsal medial habenula are required for mice to engage in normal levels of voluntary exercise. Optogenetic stimulation of these neurons is highly reinforcing, and these neurons appear to be closely linked to pathways regulating mood or hedonic state in the brainstem.