Subject: Thesis Defense - Benjamin Foster, MS Biology
Date: Thursday, April 3, 2025 at 12:30:10 PM Eastern Daylight Time
From: SSB Faculty List on behalf of Diane St. Germain
To: SSB-FACULTY-LIST-L@LISTSERV.GMU.EDU

Thesis Defense Announcement
To: The George Mason University Community

Candidate: Benjamin Foster

Program: M.S. in Biology

Date: Tuesday April 22, 2025

Time: 4:00 PM Eastern Time (US and Canada)

Join Zoom Meeting

https://gmu.zoom.us/j/96095318488?pwd=oOAHVdUAZWvCCghb6aHaEiSwSSaJlf.1

Meeting ID: 960 9531 8488

Passcode: 458736

Committee chair: Dr. Ancha Baranova

Committee members: Dr. Nadine Kabbani, Dr. Dougal "Gowan" Tervo

Title: Characterization of a Transgenic Rat Line Permitting Reversible Neuronal Region Inactivation

Abstract:
Perturbations of brain regions enable scientists to investigate these regions' contributions to behavior. To extend this indispensable method to allow rapid and robust inactivation of distributed brain regions in the rat, we developed a transgenic rat line expressing Red-Activatable Channelrhodopsin (ReaChR) in inhibitory neurons under the control of the vesicular GABA transporter (VGAT) promoter. This thesis details the generation of VGAT-ReaChR rat lines, selection of the best expressing line, and the validation of its use. We screened multiple candidate lines and demonstrated histologically the stable germline transmission of a useful brain-wide expression of ReaChR in inhibitory neurons. Using in-situ hybridization in the medial prefrontal cortex, we showed that ReaChR expression is exclusive to VGAT-positive neurons. Tissue clearing and conventional sectioning experiments demonstrated broad expression patterns across the brain. Electrophysiological recordings confirmed functional light-induced neural inactivation. We anticipate that this rat line will enable neuroscientists to investigate brain

region function in the rat through robust, rapid, and reversible inactivation of distributed brain regions.

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