Doctoral Dissertation Defense Announcement

"Investigation of the necessity, sufficiency, and specificity of the dmPFC cocaine seeking ensemble"

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Committee in Charge:
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John Mantsch, PhD
Qing-song Liu, PhD
Kajana Satkunendrarajah, PhD

Date: Monday, April 8, 2024
Time: 9:00 AM (CST)
Defense Location: HUB A5520/5628
Graduate Studies:

Biochemistry of the cell
Techniques of molecular and cell biology
Molecular and cellular biology
Mechanism of cellular signaling
Classical and molecular genetics
Ethics and integrity in science
Modern Drug Discovery & Development
Research Ethics Discussion Series
Fundamental of Neuroscience
Survey or Principle of Drug Action
Ion Channels & Signal Transduction
Seminars
Reading and Research
Doctoral Dissertation
Dissertation

“Investigation of necessity, sufficiency, and specificity of the dmPFC cocaine seeking ensemble”

Cocaine use disorder is a chronic and relapsing neuropsychiatric disorder characterized by a strong propensity for relapse upon re-exposure to a previously drug-associated environment. The dorsal medial prefrontal cortex (dmPFC) is a critical node in the mesocorticolimbic system related to cocaine seeking. There is evidence that learned associations between drug cues and drug seeking behavior are encoded by a specific ensemble of neurons sparsely scattered throughout the dmPFC. We hypothesized that inhibition of dmPFC cocaine seeking ensembles inhibits cocaine seeking memory retrieval, and these ensembles are not involved in fear conditioning memory retrieval, which is also mediated by the dmPFC. We tested this hypothesis by co-injection of viruses expressing TRE-Cre and a cre-dependent inhibitory PSAM-GlyR into the dmPFC of male and female cfos-tTA mice to enable “tagging” of ensemble neurons with an inhibitory chemogenetic receptor. Mice then underwent cocaine self-administration (0.5 mg/kg, 14 days) and fear conditioning. In Experiment 1, a dmPFC cocaine seeking ensemble was tagged, while in Experiment 2, a dmPFC ensemble for fear recall was tagged. In both experiments, subsequent cocaine seeking and fear recall were tested during inhibition of the tagged dmPFC ensemble (0.3 mg/kg uPSEM792s, 30 min prior to sessions). In both sexes, inhibition of the cocaine seeking ensemble suppressed cocaine seeking, but not recall of fear memory, while inhibition of the fear ensemble reduced conditioned freezing but not cocaine seeking. These data demonstrate that cocaine and fear recall ensembles in the dmPFC are stable, but mutually exclusive from one another.
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Curriculum Vitae  
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EDUCATION

Medical College of Wisconsin Graduate School 2018- present  
Interdisciplinary Doctoral Program in Biomedical Sciences  
Department of Pharmacology and Toxicology  
Neuroscience Research center

Beijing Institute of Basic Medical Science 2013- 2016  
Master of Science, May 2016  
Major: Pharmacology

Wuhan Institute of Technology  
Bachelor of Science, May 2012  
School of Chemistry Engineering & Pharmacy  
Major: Applied Chemistry

RESEARCH EXPERIENCE

Ph.D candidate, August 2018- Present  
Medical College of Wisconsin  
Dr. Christopher Olsen Lab, Department of Pharmacology and Toxicology  
- Investigation of the neuronal ensemble mechanisms underlying cocaine seeking in the medial prefrontal cortex (mPFC)

Visiting scholar, August 2017- May 2018  
Medical College of Wisconsin  
Dr. Qing-song Liu Lab, Department of Pharmacology and Toxicology  
- Investigation of the roles of Zona Incerta (ZI) and medial habenula (MHb) in drug addiction

Master, August 2013 - May 2016  
Beijing Institute of Basic Medical Science  
Dr. Zheng Yang Lab
Pharmacokinetics studies of Chinese herbs – Tetrahydroprotoberberines (THPBs) and their metabolites L-Corydalmine (L-CDL) and L-Tetrahydroberberrubine (L-THR)

SKILLS

Electrophysiology patch-clamp; Stereotaxic surgery; Jugular catheterization surgery; Optogenetics; Chemogenetics; Western blot; RNAscope; Immunohistochemistry, CLARITY.

PUBLICATIONS


CONFERENCES AND PRESENTATIONS

Winter Conference on Brain Research — Poster presentation, January 2023
MCW GSA 6th Annual symposium — Poster presentation, May 2023
Society for Neuroscience — Poster presentation, November 2022
MCW GSA 5th Annual symposium — Poster presentation, August 2022
Pavlovian Society — Poster presentation, January 2022
Society for Neuroscience — Poster presentation, November 2021
MCW GSA 4th Annual Symposium, April 2020
Society for Neuroscience, October 2020
MCW GSA 3rd Annual Symposium, March 2019