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Placental contribution to human neocortex development and evolution

NEUROSCIENCE GRAND ROUNDS

SPEAKER

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DATE

Friday, October 27th, 2023

9:00 AM - 10:00 AM

LOCATION

Psychiatry Bldg. 2nd Floor Rm PX236/238

BIO

Dr. Lei Xing completed his undergraduate and masters studies at the medical school of Jilin University, China. His strong interest in neuroscience led him to University of Ottawa, where he studied neuroestrogen regulation by neurotransmitters in the adult brain under the supervision of Dr. Vance Trudeau. To further understand the role of hormones and neurotransmitters in the developing brain, Dr. Xing joined the Max Planck Institute of Molecular Cell Biology and Genetics (MPI-CBG) in Dresden, Germany in 2016. In Dr. Wieland Huttner's lab, his work using mouse, ferret and human organoid has identified a novel role of serotonin as an extrinsic factor to promote basal progenitor proliferation in the developing human neocortex and also linked the enhanced memory flexibility to the expanded neocortex induced by the human-specific gene ARHGAP11B. In September 2023, Dr. Xing joined the Department of Biological Sciences at University of Manitoba as an Assistant Professor, his research is focused on understanding the cellular and molecular mechanisms underlying the impact of placental factors on brain development, evolution and neurodevelopmental disorders.

ABSTRACT

The neocortex is the evolutionarily youngest part of the mammalian brain, which establishes a structural foundation for the higher cognitive abilities in humans. During mammalian brain development, the formation of the central nervous system results from a series of events, which begins with the neural induction and the proliferation and differentiation of the neural progenitor cells (NPCs). Precise temporal and spatial control of NPC proliferation and differentiation by a concert of cell intrinsic and cell extrinsic factors is essential for the correct formation and proper function of the neocortex. Understanding the contribution of placental factors to mammalian brain development and evolution, via regulating the proliferation and differentiation of NPCs, is the main goal of my research. Serving as the exchange centre between mother and conceptus, the placenta provides the fetal brain with diverse cell extrinsic signals, including growth factors, hormones, neurotransmitters, microRNAs and even microbiome derived metabolites, all of which could exert essential functions in the development of the mammalian neocortex. Plancetal serotonin (5-HT), via its receptor HTR2A, promotes NPC proliferation in an evolutionarily relevant manner. HTR2A is not expressed in embryonic mouse neocortex, but in embryonic ferret and fetal human neocortex. However, ectopic HTR2A expression can increase mouse NPC proliferation. Conversely, CRISPR/Cas9-mediated knockout of endogenous HTR2A in embryonic ferret neocortex reduces NPC proliferation. Pharmacological activation of endogenous HTR2A in fetal human neocortex ex vivo increases NPC proliferation via HER2/ERK signaling. Hence, 5-HT emerges as an important extrinsic pro-proliferative signal for NPCs, which may have contributed to evolutionary neocortex expansion.

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Zoom Link: https://us06web.zoom.us/j/83267302150

Meeting ID: 832 6730 2150

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