OIST SEMINAR

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Stem Cell and Regenerative Biology 6

Agency for Science, Technology and Research, Genome Institute of Singapore

DATE: **Monday, February 5th, 2018**

TIME: **10:00 – 11:00**

VENUE: ~~**D015 Seminar Room, Level D, Lab 1**~~

B503 Seminar Room, Level B, Lab 1

Human Mini-Midbrain in a dish: Parkinson's disease modeling

Abstract:

Pluripotent stem cells (PSCs) can be efficiently differentiate into functional homogenous cell types which are present in human brain. These in vitro generated functional neural cells enable downstream studies and have an availablilty to model human neurological disease as well as potential therapeutic applications. However, homogenous neural cells which are generated by conventional two-demenstional (2D) culture system have various limitation to understand the physiology of in vivo brain. Recent advances in three-dimensional (3D) culture systems have led to generate human brain organoids in vitro that recapitulate the function of brain. Due to restriction of accessment to functional human brain tissue, hPSCs have been great cell source to generate human brain organoids which mimic the tissue architecture and cellular interactions. In this talk, I introduce a method I developed to generate human midbrain-like organoids (hMLOs) containing midbrain dopaminergic (mDA) neurons which recapitulate features of human midbrain development. The hMLOs contained distinct multiple layers in developing neuroepithelia and showed global transcriptional profiling that resembles human prenatal midbrain. Strikingly, we detected functional midbrain dopaminergic neurons which are electrophysiologically active and produce dopamine in our 3D hMLOs as well as neuromelanin which is dark and insoluble human specific pigment exist in A9 subtype mDA neurons. Using hMLOs, we are applying for in vitro modeling of Parkinson's disease (PD) which is caused by the selective and progressive loss of mDA neurons particularly from the substantia nigra pars compacta (SNpc), and PD modeling system using hMLOs provides a new avenue to understand PD pathophysiological mechanism in vivo.