神経科学セミナー

日時　6 月 17 日（月）16:00~
場所　ナノ棟 3 階セミナー室
ゲストスピーカー　田中（原田）大介　（Institute of Interdisciplinary Research (IRIBHM) University of Brussels ULB Belgium)

演題
Cell transplantation and induced pluripotent stem cells (iPS cells) for studies of neocortical evolution

要旨
In the first part of my presentation I will introduce our previous work showing the usefulness of cell-transplantation approach to understand cellular mechanisms of neocortical evolution. During amniote development, most GABAergic interneurons are generated in the medial ganglionic eminence (MGE) and migrate tangentially to enter the dorsal pallium. It remained unclear whether and how the evolutionary change in the MGE-derived interneurons in the ancestor of mammals was involved in the establishment of the mammalian neocortex. We performed interspecies transplantation in which chicken, turtle, and marmoset MGE cells were transplanted into mouse MGE in utero and their migratory behaviors were compared *in vivo*. While marmoset MGE cells entered the neocortical gray matter, the same as mouse MGE cells did, chicken and turtle MGE cells failed to enter that region regardless of their birthdates and interneuron subtypes. We conclude that an evolutionary change in the migratory ability of GABAergic interneurons in the ancestor of mammals was crucial for the establishment of the mammalian neocortex by supplying inhibitory components to the network (Tanaka et al., *PNAS*, 2011).

In the second part I will introduce our current work trying to apply cellular reprogramming and genome editing to evolutionary research. It is often difficult to have enough number of cells from evolutionarily-interesting but invaluable organisms to perform cellular and molecular experiments, such as cell transplantation and functional experiment of certain genes. Recent development of reprogramming technology may enable us to induce pluripotent stem cells (iPS cells) from a piece of skin or a drop of blood followed by differentiation into many kinds of cells we are interested in. Also, recent development of tools for genome editing, such as zinc-finger nucleases and transcription activator-like effecter nucleases, may enable us to make knock-out and knock-in cell line from cells in which it had been difficult to induce homologous recombination by conventional ways, to examine role of a specific gene or genomic sequence of interest. I will show our efforts to make iPS cells from human fibroblasts carrying a specific mutation in a microcephaly-related gene and to correct that mutation through homologous recombination stimulated by zinc-finger nucleases. Also we show successful differentiation of neocortical progenitors and neurons from those iPS cells *in vitro*.

Reference:
Changes in cortical interneuron migration contribute to the evolution of the neocortex
Tanaka DH, Oiwa R, Sasaki E and Nakajima K
Proc. Natl. Acad. Sci. USA 108(19) 8015-8020 (2011)

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