De novo generation of diverse organ buds from stem cells

Venue: Nye auditorium 13 (GA012015), Domus Medica, IMB.

Date and time: Wednesday, October 20th, at 12 noon

Abstract :

In vitro organogenesis is now becoming a realistic goal of stem cell biology; however, one practical challenge is to develop a four-dimensional (4-D) stem cell culture system whereby multiple progenitors communicate in a spatiotemporal manner, as observed in organogenesis **(*Clin Pharmacol Ther*, 2014)**. During early hepatogenesis, the multicellular communication that occurs among mesenchymal stem cells, undifferentiated vascular endothelial cells and anterior visceral endodermal cells are required to initiate the budding of the rudimentary liver in the foregut. To recapitulate early organogenesis, we recently showed that specified hepatic cells self-organized into 3-D iPSC-derived liver buds when co-cultivated on solidified Matrigel with multiple stromal cell populations. By transplanting *in vitro* grown organ bud, we have demonstrated the vascularized and functional liver tissues in an immunodeficient animal with therapeutic potential **(*Nature*, 2013 & *Nature Protocols*, 2014).** Furthermore, we also demonstrated the applicability of this approach to other systems by delineating the mechanisms guiding organ bud formation. Specifically, mesenchymal progenitors initiated organ bud formation within these heterotypic cell mixtures, which was dependent upon substrate matrix stiffness. Defining optimal mechanical properties of the substrate promoted formation of 3D, transplantable organ buds from tissues including kidney, pancreas and cartilage **(*J Clin Invest*, 2014 & *Cell Stem Cell*, 2015**). In this talk, I will summarize the state-of-art of these organ bud based approaches, and discuss their future potential applications.

Biography

Takanori Takebe received his M.D. in 2011 from Yokohama City University School of Medicine, Japan after a few years training as a research associate at the Scripps Research Institute and as an external medical student at Columbia University Medical Center in the US.

After receiving his M.D., he worked as a research associate at the same university. He became a project leader in 2012 at Yokohama City University Advanced Medical Research and later in 2013 appointed an associate professor position at Yokohama City University. He now has a joint position as an assistant professor at Cincinnati Children's Hospital Medical Center and a visiting associate professor at Stanford University in the US.

He has published a number of pioneering works on organ regeneration from iPS cells.