Towards *in vitro* reconstruction of human and non-human primate early embryonic development

Recent research shows that pluripotent stem cell (PSC)-based *in vitro* models of early human development can replicate certain features of peri- and post-implantation stage embryos. However, due to technical and ethical constraints, these models are not able to fully capture the complexities of human peri-gastrulation or later developmental stages, necessitating the use of non-human primate (NHP) cells as a surrogate model system to navigate these challenges. Despite significant efforts, the establishment of efficient and stable naïve PSCs from a variety of NHP species remains difficult but is essential for advancing synthetic *in vitro* embryo models. To overcome this, first I aimed to create a universal naïve conversion protocol that efficiently reprograms primed PSCs into stable naïve PSCs from multiple primate species, focusing on modulating minimal but key factors involved in early embryonic development. So far, I have successfully developed stable naïve PSCs from both humans and NHPs, which have the capacity to differentiate into extra-embryonic lineages (e.g., trophectoderm and primitive endoderm and extraembryonic mesenchyme) and to form 3D *in vitro* embryo models that recapitulate certain aspects of early embryonic development. Utilizing this Stem cell-derived PRImate-embryo Model (SPRIM), I am now going to conduct comparative and multi-omics analysis (e.g., scRNA/scATAC-seq and spatial transcriptomics) to investigate the biological and structural similarities between *in vitro* models and *in vivo* embryos. I anticipate that SPRIM will deepen our understanding of early embryonic development in primates, enabling the discovery of novel species-specific features and contributing to evolutionary and developmental biology (Evo-Devo) research in humans and other primates.