BDR SEMINAR (Kobe & online hybrid)

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16:00 - 17:00

1F Auditorium, DB Building C, Kobe / Broadcast online via Zoom

What We Build, We Start to Understand: Modeling Human Embryos with Stem Cells

Summary

Human development remains poorly understood due to limited access to natural embryos. Stem cell-based embryo models (SCBEMs) provide a scalable and tractable platform for studying human embryogenesis and represent a constructive experimental approach to understanding human developmental processes by rebuilding them. In this context, we have previously developed integrated pre-implantation models (blastoids) and non-integrated post-implantation models (peri-gastruloids).

More recently, we established inducible SCBEMs (iSCBEMs), an integrated model of early post-implantation human development, by combining primed human pluripotent stem cells (hPSCs) with transgene-induced hypoblast- and trophectoderm-like cells derived from naive hPSCs. iSCBEMs recapitulate multiple key features of early post-implantation development, including the formation of amniotic-, yolk sac-, and chorionic-like cavities, syncytiotrophoblast-like cell differentiation with lacunae formation, bilaminar disk organization, anterior-posterior axis establishment, and early gastrulation events. Single-cell RNA sequencing revealed that iSCBEMs capture key cell types and developmental transitions characteristic of Carnegie Stage 5-6 (CS5-CS6) embryos. We further traced the origins of amnion-, yolk sac endoderm-, and extraembryonic mesoderm-like cells, providing insights into their lineage trajectories. While not without limitations, human iSCBEMs offer a robust and informative platform for dissecting early post-implantation development and addressing the inaccessibility of natural embryos.

I would like to present the above findings while discussing the future directions of embryo models and highlighting the conceptual significance of constructing them as a means to understand the logic of human development.

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