IMEG Seminar Series

The road to global science

Dr. Kathy Niakan Professor, the Francis Crick Institute and the University of Cambridge, Director of the Centre for Trophoblast Research, UK

October 12 th, 2021, 17:00~18:00

Genetic approaches to study early lineage specification in human embryos

This seminar series is for students, postdocs, and all researchers at Kumamoto University. Check your email box and find the Zoom ID and passcode.

During preimplantation development human embryos are comprised of pluripotent embryonic cells, which eventually form the fetus, and extra-embryonic cells, which contribute to the placenta and yolk sac. The central question we address is what are the molecular mechanisms that regulate these early cell fate choices in human embryos. We are using CRISPR/Cas9-mediated genome editing, TRIM-Away protein depletion, dominant negative mutations and small molecules to dissect the function of genes during human embryogenesis. These methods have enabled us to uncover that the first lineage specification event in human embryos is the initiation of a placental program. By integrating signaling insights from human blastocysts we have also defined human embryonic stem cell culture conditions that more closely recapitulate the embryonic niche. The molecular basis of these early cell lineage decisions are of fundamental importance and have wide-reaching clinical implications for infertility, miscarriages, developmental disorders and therapeutic applications of stem cells.

References:

1. Alanis-Lobato G. et al., and Niakan K.K. (2021) Frequent loss-of-heterozygosity in CRISRP-Cas9-edited early human embryos. PNAS, 118(22):e2004832117.
2. Gerri C. et al., and Niakan K.K. (2020) A conserved molecular cascade initiates trophectoderm differentiation in human, bovine and mouse embryos prior to blastocyst formation. Nature, 587: 443-447.
3. Wamaitha S.E. et al., and Niakan K.K. (2020) IGF1-mediated human embryonic stem cell self-renewal recapitulates the embryonic niche. Nature Communications, 11: 764.
4. Fogarty, N.M.E. et al., and Niakan K.K. (2017) Genome editing reveals a role for OCT4 in human embryogenesis. Nature, 550(7674): 67-73.
5. Wamaitha S.E. et al., and Niakan K.K. (2015) Gata6 potently initiates reprogramming of pluripotent and differentiated cells to extraembryonic endoderm stem cells. Genes and Development, 29(12): 1239-1255.

You will be fascinated by,

Human embryogenesis.

The Niakan lab is the first to receive permission from the Human Fertilization and Embryology Authority (HFEA, UK) to use CRISPR-Cas9 in human embryo.

Comparative embryology.

How can we be a human? The Niakan lab has shown the similarities and differences in early embryology among species, including human.

A novel reproductive technology.

The Niakan lab contributed to pre-clinical data that led to changes in UK law allowing for mitochondrial replacement therapy.

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