

Mechanism and Reconstitution In Vitro of Germ Cell Development in Mice, Monkeys, and Humans

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The germ cell lineage ensures the creation of new individuals, perpetuating/diversifying the genetic and epigenetic information across the generations. We have been investigating the mechanism for germ cell development, and have shown that mouse embryonic stem cells (mESCs)/induced pluripotent stem cells (miPSCs) are induced into primordial germ cell-like cells (mPGCLCs) with a robust capacity both for spermatogenesis and oogenesis and for contributing to offspring. These works have served as a basis for exploring the mechanism of key events during germ cell development such as epigenetic reprogramming and sex determination/meiotic entry. We have also shown that human iPSCs (hiPSCs) with a primed pluripotency robustly generates human PGCLCs (hPGCLCs) with a property of human early PGCs. Moreover, by investigating the development of cynomolgus monkeys, we have defined a developmental coordinate of the spectrum of pluripotency among mice, monkeys, and humans, and have made an unexpected finding that the germ cell lineage in primates is specified in the amnion. I would here discuss our efforts towards understanding the mechanism of and reconstituting in vitro of germ cell development in mice, monkeys, and humans.