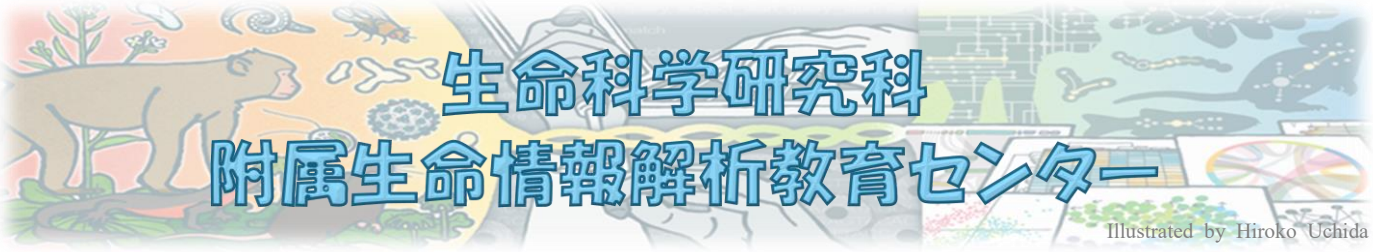
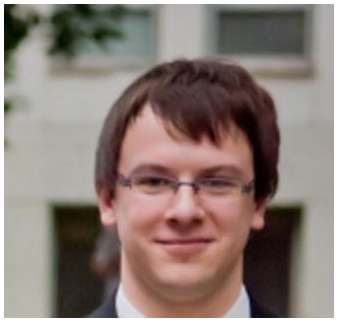


Recent insight into understanding chromosome segregation in mammalian oocytes

16:00-17:30, October 31 (Thu)2024
Seminar Room A, Building G, Faculty of Medicine Campus



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Accurate segregation of all chromosomes is essential to form an egg capable of being fertilized and supporting development to term. However, in human female meiosis, especially during the first meiotic division, chromosomes frequently segregate incorrectly, resulting in aneuploidy. Some aneuploid embryos can implant but fail to develop to term, whereas others develop to term and result in syndromes, such as Down's syndrome. Although loss of cohesion between chromosomes is a significant age-related cause of aneuploidy, meiotic spindle disruption is a major age-independent factor. Examples include spindle instability and transient multipolar spindles, promoting erroneous merotelic kinetochore-microtubule attachments. The formation of mammalian oocytes in mice and humans is associated with eliminating centrioles. Mammalian oocytes thus employ alternative strategies to generate spindle microtubules, such as chromatin-dependent pathways and acentriolar microtubule organizing centers. Two pathways activate microtubule nucleation in the vicinity of chromatin. One depends on the chromosomal passenger complex, a complex of Aurora kinases (AURKs), and three protein subunits. The other depends on the local activation of small GTP binding protein RAN around chromatin. In recent years, by using transgenic mouse models, light-sheet live-cell imaging, neural networks, and Förster resonance energy transfer (FRET) biosensors, we revealed how RAN and AURKs regulate functional bipolar spindle formation in mouse oocytes. The lecture will explore how mouse and human oocytes depend on RAN activity and how the spatiotemporal activity of three Aurora kinases regulates correct chromosome segregation in oocytes.

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