SPINDLE FORMATION AND ASYMMETRIC CELL IN MAMMALIAN OOCYTES

Nam-Hyung Kim
Department of Animal Sciences, Chungbuk National University, Chungbuk, Republic of Korea

Before fertilization mammalian oocytes generate a meiotic spindle and undergo chromosome segregation to yield an egg that is ready for fertilization. Herein, I review the recent advances in understanding the mechanisms controlling formation of the meiotic spindle in metaphase I (MI) and metaphase II (MII) in mammalian oocytes, and focus on the differences between mouse and human oocytes. Unlike mitotic cells, mammalian oocytes lack typical centrosomes that consist of two centrioles and the surrounding pericentriolar matrix proteins, which serve as microtubule-organizing centers (MTOCs) in most somatic cells. Instead, oocytes rely on different mechanisms for the formation of microtubules in MI spindles. Two different mechanisms have been described for MI spindle formation in mammalian oocytes. Chromosome-mediated microtubule formation, including RAN-mediated spindle formation and chromosomal passenger complex-mediated spindle elongation, controls the growth of microtubules from chromatin, while acentriolar MTOC-mediated microtubule formation contributes to spindle formation. Understanding the mechanisms of MI/MII spindle formation, spindle assembly checkpoint, and chromosome segregation, in mammalian oocytes, will provide valuable insights into the molecular mechanisms of human infertility