How do we select high-quality oocytes?

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In vitro maturation (IVM) is being increasingly used to treat human infertility, especially as rescue therapy for patients of polycystic ovarian syndrome and ovarian hyperstimulation syndrome. Quality control and the determination of optimal fertilization conditions—important to increase the use of IVM oocytes for embryo production and improve pregnancy success rates—require a detailed understanding of oocyte maturation mechanisms. Such an understanding would allow production of high-quality oocytes and selection based on predictive markers for successful oocyte maturation.

Oocyte maturation involves nuclear maturation, comprising chromosome alignment and spindle formation, and cytoplasmic maturation. The details of the molecular mechanism underlying these processes are unknown, despite chromosome segregation following spindle formation being an important oocyte maturation process.

Meiotic spindle formation differs considerably from that during mitosis, and oocyte mitotic spindle formation is better understood than the corresponding process in meiosis. Elucidating the molecular players in this process might inform oocyte marker identification for IVM.

Akt and mammalian target of rapamycin (mTOR), implicated in many cellular processes, are both localized at the spindle in mouse oocytes—this unique distribution contributes to meiotic resumption and completion [2, 3]. The occurrence rate of chromosomal abnormalities in oocytes increases with aging and is related to abnormalities in spindle checkpoints. Therefore, spindle formation, chromosome segregation, and their underlying mechanisms during meiosis must be accurately understood.

At this seminar, I will discuss morphological characterization of oocytes with high developmental competence and changes in the localization of proteins such as Akt and mTOR, which might be potential oocyte selection markers.

References

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