Scientists probe mechanism of asymmetry in meiotic cell division

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The Stowers Institute's Rong Li Lab has characterized a mechanism that allows for asymmetrical cell division during meiosis in oocytes. By tracking chromosome movement in live mouse oocytes, the team discovered that chromosomes can recruit to their vicinity a protein called formin-2. This protein allows the oocyte to retain the majority of the cytoplasm – a requirement for embryonic development after fertilization – while the other daughter cell (called a polar body) resulting from the asymmetric division gets only a minimal amount and subsequently dies.

The work was published this week in the advance online publication of *Nature Cell Biology*.

Formin-2 is an actin-nucleating protein that can promote the formation of actin filaments around the chromosomes. Actin filaments undergo dynamic elongation and shortening and, in the process, push the chromosomes towards the outer edge of the oocyte. After the chromosomes reach the periphery, the actin filaments orient the cell division plane so that most of the cytoplasm required to sustain the earliest stages of development stays with the daughter cell that retains the identy of the oocyte.

"This work revealed the general mechanism by which the actin cytoskeleton drives chromosome movement in mammalian meiotic oocytes," said Hongbin Li, Ph.D., Senior Research Associate and lead author on the publication. "Our findings will enable us to carry out even more detailed dissection of the molecular components and mechanisms."

"Infertility and birth defects are often related to problems during oocyte meiotic cell divisions," said Rong Li, Ph.D., Investigator and senior author on the paper. "Failure in the chromosome movement will lead to failed oocyte maturation and infertility. These findings provide an important step toward a better understanding of the process of meiotic divisions and how actin generates the force to power intra-cellular movements."

Source: Stowers Institute for Medical Research