IMBA Press Release

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Molecular Glue controls Chromosome Segregation in Oocytes

Most trisomic pregnancies arise as a consequence of chromosome missegregation in egg precursor cells called oocytes. Austrian researchers at the Institute of Molecular Biotechnology (IMBA) of the Austrian Academy of Sciences (ÖAW) aim to understand the molecular causes of female age-dependent chromosome missegregation in oocytes. They have now discovered that a "molecular glue" called cohesin plays an important role in proper functioning of checkpoint control, ensuring correct chromosome segregation and production of euploid eggs.

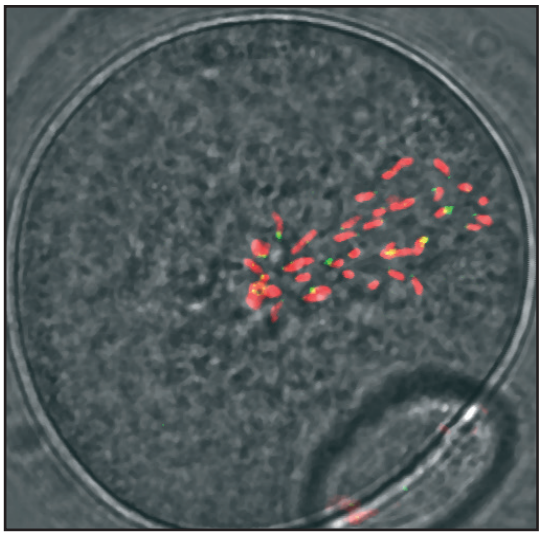
The spindle assembly checkpoint (SAC) is a surveillance mechanism that delays cell division until all chromosomes have attached to the spindle poles. If this mechanism is impaired in oocytes, it can result in chromosome missegregation and production of aneuploid fetuses, leading to abnormalities like Down's syndrome (trisomy 21), Edward's syndrome (trisomy 18) or Klinefelter's syndrome (XXY). The IMBA researcher Kikue Tachibana-Konwalski and her team together with collaborators from the University of Oxford have now discovered that the proper functioning of the SAC in mammalian oocytes depends on the "molecular glue" called cohesin.

Cohesin is essential to hold replicated chromosomes together. Using molecular "scissors" in the form of TEV protease, the researchers inactivated cohesin to generate chromosomes that cannot bi-orient on the spindle and therefore would be expected to activate a checkpoint response and trigger a cell cycle arrest. Instead, they found that oocytes in which cohesin has been destroyed still divide and produce highly aneuploid eggs. Therefore, cohesin is required for a robust SAC in oocytes. This has important implications for ageing oocytes, where cohesin deterioration will compromise the SAC, leading to chromosome segregation errors.

Original publication in "Current Biology": "Spindle Assembly Checkpoint of Oocytes Depends on a Kinetochore Structure Determined by Cohesin in Meiosis I"

Kikue Tachibana-Konwalski

Kikue Tachibana-Konwalski was educated in Austria, Japan and the UK. She obtained a BA Hons in Natural Sciences with specialization in Genetics and a PhD in cell cycle and cancer research from Cambridge University. For her postdoctoral research in Kim Nasmyth's lab in Oxford, she pioneered the use of TEV protease technology in the mouse to study cohesin in female germ cells. Kikue is a group leader at IMBA since November 2011. Her research focuses on the molecular control of the oocyte-to-zygote transition with the goal of understanding female age-related aneuploidy and infertility.



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IMBA Institute of Molecular Biotechnology of the Austrian Academy of Sciences

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IMBA:

The Institute of Molecular Biotechnology (IMBA) combines fundamental and applied research in the field of biomedicine. Interdisciplinary research groups address functional genetic questions, particularly those related to the origin of disease. IMBA is a subsidiary of the Austrian Academy of Sciences, the leading organization promoting non-university academic basic research in Austria. IMBA was voted as second to top international workplace for postdoctoral researchers, by readers of the US based and online life sciences magazine, The Scientist. imba.oeaw.ac.at

Austrian Academy of Sciences (ÖAW):

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