



How to pre-pair chromosomes for Meiosis

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October 19th 2016 (Wed), 16:00 - 17:30

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Understanding how germ cells develop is not only of paramount medical interest for reproductive medicine, but is also crucial to comprehend how animal shapes and forms evolve through generations. Germ cells are the only cells which are transmitted from one generation to the next and can be considered immortal. Germ cells produce highly specialized cells, called gametes, which carry the genetic and cytoplasmic information defining a given species and which can initiate the formation of an entire organism. Germ cells can transmit at least three types of information: 1) genetic information, which is the sequence of DNA corresponding to the maternal or paternal genome ; 2) cytoplasmic components, which are mainly maternal mRNAs and cortical polarity ; and 3) epigenetic information, which is both nuclear and cytoplasmic. Here, I will focus on meiosis onset, when maternal and paternal chromosomes need to find each other and pair to ensure proper segregation. We showed that in *Drosophila*, pairing occurs during the mitotic cycles preceding meiosis. In addition, we demonstrated that germ cell nuclei undergo dramatic movements during this developmental window. Microtubules and Dynein are driving nuclear rotations and are required for centromere pairing and clustering. We further found that Klaroid (SUN) and Klarsicht (KASH) colocalize with centromeres at the nuclear envelope and are required for proper chromosome motions and pairing. We identified Mud (NuMA in vertebrates) as colocalizing with centromeres, Klarsicht and Klaroid. Mud is also required to maintain the integrity of the nuclear envelope and for the correct assembly of the synaptonemal complex. Our findings reveal a mechanism for chromosome pairing in *Drosophila*, and indicate that microtubules, centrosomes and associated proteins play a crucial role in the dynamic organization of chromosomes inside the nucleus.

reference

Christophorou et al., Microtubule-driven nuclear rotations promote meiotic chromosome dynamics. *Nature Cell Biology*, 17, 1388-1400, 2015.

Christophorou et al., Synaptonemal Complex Components Promote Centromeres Pairing in Pre-Meiotic Germ Cells. *PLoS Genetics*, 9:1-9, 2013.

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