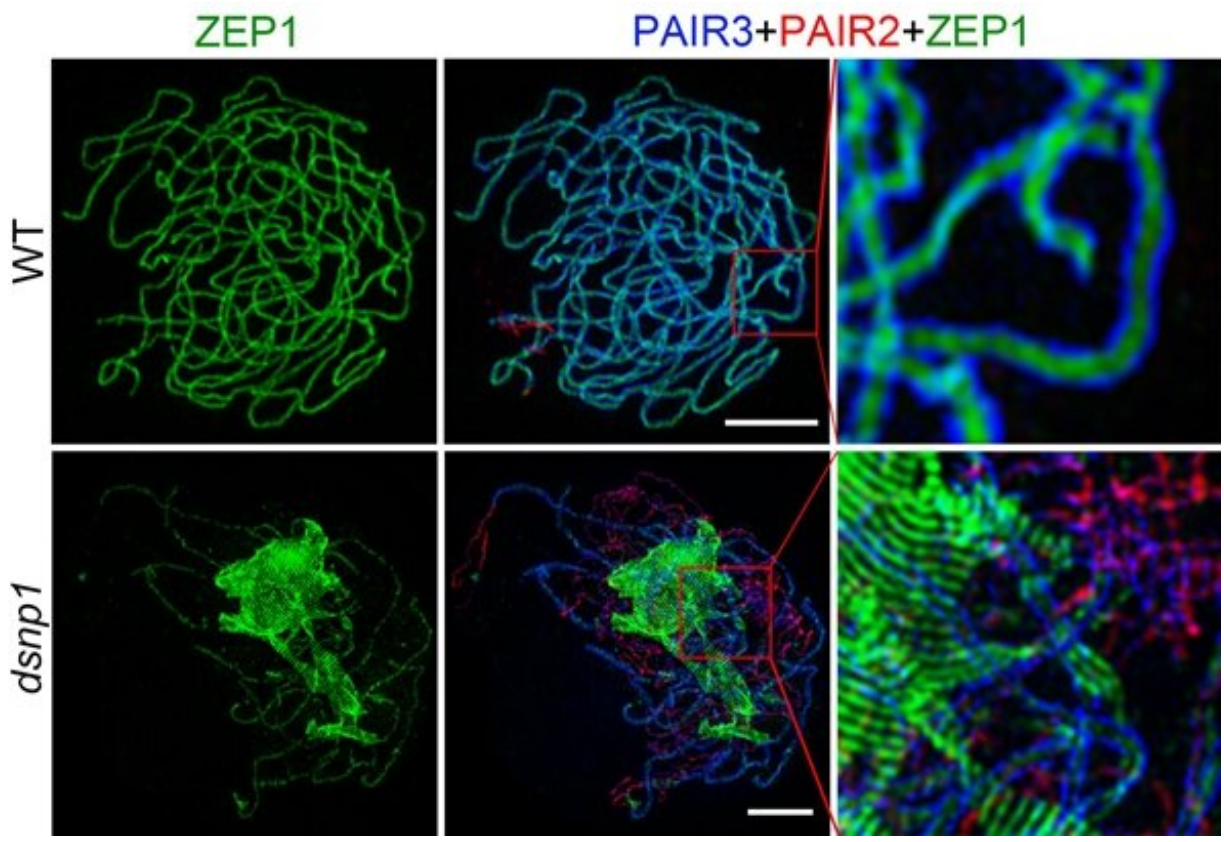
# E3 ubiquitin ligase plays essential role during rice meiosis

November 10 2021, by Zhang Nannan




Super-resolution structured illumination microscopy analysis of SC assembly. Credit: IGDB

Synaptonemal complex (SC) assembly between paired homologous chromosomes plays a vital role in ensuring correct homologous

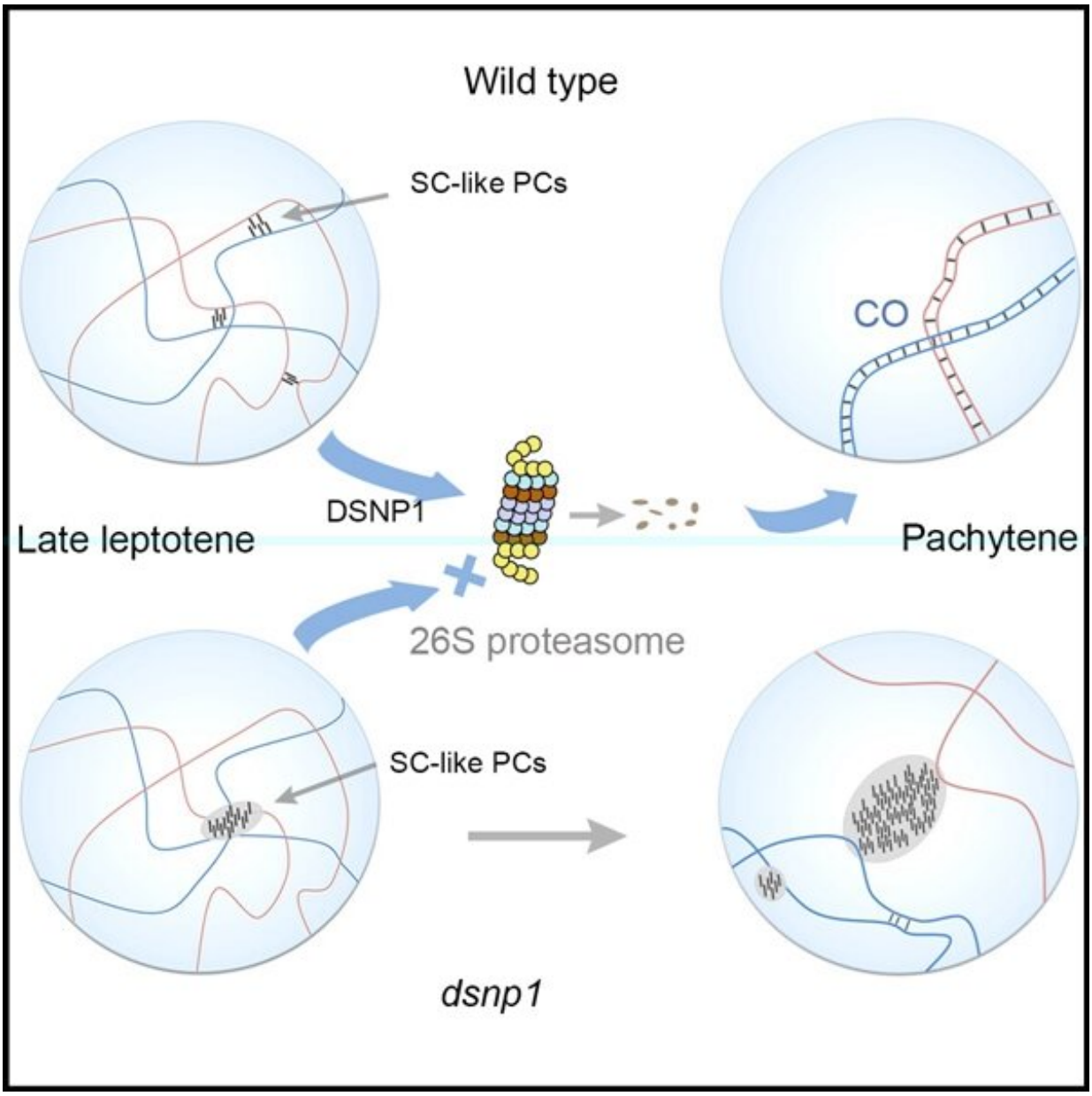
recombination during meiosis. However, the mechanisms underlying the genetic regulation of SC assembly remain unclear.

In a study published in *Cell Reports*, a research group led by Prof. Cheng Zhukuan from the Institute of Genetics and Developmental Biology of the Chinese Academy of Sciences identified a novel RING finger E3 ubiquitin ligase encoding gene DESYNAPSIS1 (DSNP1) participating in synapsis and homologous recombination using a map-based cloning strategy.

In the dsnp1 mutant, aberrant SC-like polycomplexes with ZEP1 as skeleton resembling those in wild-type late leptotene meiocytes formed independent of homologous chromosomes at prophase I. And MG132 treated wild-type meiocytes showed aggregation of ZEP1 proteins similar to that observed in dsnp1, suggesting a significant role of DSNPI-mediated proteasome pathway in degrading aberrant SC-like polycomplexes.

Moreover, recombination factors including HEI10, MER3, and ZIP43 were trapped in ZEP1 polycomplexes, leading to the decreased foci of these recombination factors on meiotic chromosomes and a dramatic reduction in the number of crossovers (COs) in dsnp1.

Interestingly, the introduction of ZEP1 mutation in dsnp1 background could restore the localization of ZMM proteins on meiotic chromosomes and the formation of COs to a great extent.




An E3 ubiquitin ligase DSNP1 plays an essential role during rice meiosis. Credit: IGDB

These findings indicate that the stabilization of canonical tripartite SC structure along paired homologous chromosomes and further formation of COs are regulated by the component of the Ubiquitin-proteasome

pathway, DSNP1. This study provides new insights into the accurate guarantee mechanisms of meiotic process.

**More information:** Lijun Ren et al, The E3 ubiquitin ligase DESYNAPSIS1 regulates synapsis and recombination in rice meiosis, *Cell Reports* (2021). DOI: 10.1016/j.celrep.2021.109941

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