

P038 Co-ordinate control of chromosome morphogenesis and Holliday junction resolution during meiosis

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During prophase of meiosis I, homologous chromosomes undergo a series of structural changes, culminating in the formation of the synaptonemal complex (SC), a universally conserved structure that connects homologs during the pachytene stage. In parallel, recombination is initiated on the DNA level via double strand breaks (DSBs) that get processed via several intermediates into crossovers. Crossovers provide physical linkage between homologous chromosomes thereby ensuring their faithful segregation during meiosis I. The widely conserved protein Pch2 was initially identified as part of the meiotic recombination checkpoint. We now report a role of Pch2 in wild-type meiosis. First, Pch2 controls the domainal organization of meiotic chromosomes. Two SC components, Hop1 and Zip1, normally localize preferentially to different chromosome regions in a given nucleus. Elimination of Pch2 results in loss of this domainal chromosome organization, with Hop1 and Zip1 co-spreading along chromosomes from an early stage of synapsis. Aberrant SC formed in this way fails to disassemble in a timely manner. Second, Pch2 mediates the timely formation of meiotic crossovers, with a key recombination intermediate (the double Holliday junction) accumulating transiently in the absence of Pch2. Our findings support a model in which exchange on the DNA level is controlled by chromosome architecture, with Pch2 as a key regulator of chromosome morphogenesis.