2015

Regulation of Sister Chromatid Cohesion by ECO-1 and WAPL-1 during meiosis and mitosis

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Regulation of Meiotic Sister Chromatid Cohesion by ECO-1 and WAPL-1

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Abstract

Cohesin is a widely conserved, tetrameric protein complex that tethers replicated sister chromatids during meiosis and mitosis. Two cohesin subunits, SMC-1 and SMC-3, and a third subunit, the α-kleisin, form a ring proposed to encircle sister chromatids. Different kleisins associate with cohesin during mitosis and meiosis. SCC-1 is the mitotic kleisin. Meiotic cohesin can associate with either REC-8 or COH-3/4. REC-8 and COH-3/4 cohesins differ greatly in their functional properties, indicating that the kleisin determines meiotic cohesin function. Early in meiosis, REC-8 and COH-3/4 cohesins are triggered to become cohesive at different times and by different mechanisms. Later in meiosis, REC-8 and COH-3/4 cohesins are removed from chromosomes at different times and places and by different mechanisms. Studies of sister chromatid cohesion (SCC) establishment and release by SCC-1 cohesin in mitotically proliferating yeast and vertebrate cells showed that a protein called WAPL can open the cohesin ring, allowing cohesin to dissociate from chromosomes and preventing SCC establishment. The Eco1 acetyltransferase establishes SCC by acetylating Smc3, which prevents WAPL binding. In mitotic prophase, WAPL again promotes cohesin removal. The aim of our study is to determine whether ECO-1 and WAPL-1 function similarly to regulate the two functionally specialized meiotic cohesin complexes.