NEW INSIGHTS INTO THE XY BODY FUNCTIONS

A key stage in meiosis is the synapsis of homologous chromosomes followed by exchange of genetic material to generate crossovers. In mammals, when chromosomes fail to synapse, the unsynapsed segments are transcriptionally inactivated by a process directed by the DNA Damage Response pathway (DDR). In heteromorphic sex chromosome systems, this process leads to the formation of a riveting nuclear structure, the XY body, which is the cytological manifestation of the meiotic sex chromosomes inactivation (MSCI).

A recent paper in Current Biology delves into the molecular events leading to the formation of this structure and its functionality. Using a defective MSCI mouse model, the authors demonstrate that, besides the well-known ATR induced H2AX phosphorylation at Ser139, phosphorylation at Tyr142 is also required for the initiation of meiotic sex chromosome inactivation and the formation of the XY body. More intriguingly, the observation of persistent DDR foci on autosome axes from defective MSCI mice has led the authors to propose that in the early pachytene stage, XY chromatin sequesters the DDR signaling from the autosomes to the sex chromosomes, a process essential to the progression of germ cells through meiotic prophase I.

As Mary Ann Handel states in her comment about this article "… the authors propose a novel role for MSCI, positing that by attracting and sequestering DDR proteins, it serves a checkpoint or licensing function. … The idea that MSCI and XY body formation together form an essential pacing mechanism for progress through meiosis is novel and exciting, and the finding that the XY body specifically sequesters proteins builds on merging views of the physical nature of heterochromatin". Without a doubt, Namekawa's article opens new and exciting scenarios for future research in this field.