Assembly and Maintenance of the Centromeric Histone CENP-A in the Male Germ Line.

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The control of cell division in germ cells that give rise to gametes (eggs and sperm) is important as errors can lead to aneuploidy or infertility. The centromere is the essential chromosomal locus that directs accurate chromosome segregation at cell division. Rather than DNA sequence, it is the incorporation of the histone H3 variant CENP-A that epigenetically specifies centromere identity and function. During the cell cycle, DNA replication in S phase results in the dilution of CENP-A at centromeres. To offset this dilution, newly synthesised CENP-A must be assembled and maintained at centromeric chromatin each cell cycle to ensure continued centromere function. Compared to somatic cells, germ cells display distinct properties with respect to CENP-A assembly and maintenance. For example, in germ line stem cells or in spermatocytes undergoing meiosis, CENP-A is assembled at unique cell cycle times or in unexpected amounts. An additional conserved property of CENP-A is that it is retained on mature sperm nuclei despite the removal of most other histones and replacement by protamines. In the fruit fly *Drosophila melanogaster*, the transgenerational inheritance of paternal CENP-A on sperm is critical for early embryonic development. Here I will present our latest investigations into the molecular mechanisms controlling CENP-A assembly, maintenance and function in the male germ line, using the both the fruit fly and bovine model systems.