

## EPIGENETICS

## A silent inheritance

Polycomb repressor complex 1 (PRC1) proteins remain bound to chromatin during DNA replication, reports a new study in *Cell*. This finding suggests that the retention of chromatin regulatory proteins throughout DNA replication might be an important mechanism of epigenetic inheritance.

Chromatin templates that are bound by the PRC1 core complex (PCC) prior to DNA replication are completely replicated *in vitro*. Notably, the known inhibitory effect of PCC on chromatin remodelling persists through chromatin replication. So, PCC binds to, and affects, chromatin through DNA replication *in vitro*.

Using a modified chromatin immunoprecipitation assay, Francis *et al.* found that PCC is bound to both replicated and unreplicated DNA. Further experiments suggest that PCC is not released from templates during replication.

Given that PRC1 can bind to the repressive mark trimethylated

histone H3 Lys27 (H3K27me3), it has been proposed that the transfer of H3K27me3 to daughter DNA during DNA replication might recruit PRC1 if this complex is disrupted by the passage of the replication fork. However, Francis *et al.* found that H3K27me3 is not required for maintaining the association of PCC with chromatin during DNA replication.

Using chromatin immunoprecipitation, the authors observed that PCC components colocalize with bromodeoxyuridine (BrdU, a nucleotide analogue that incorporates into newly synthesized DNA) at Polycomb response elements (PREs) in *Drosophila melanogaster* S2 cells undergoing S phase. Interestingly, the amount of a PCC component — posterior sex comb (PSC) — that is bound to BrdU-labelled PRE increases after DNA replication.

These data support a model in which PCC bound to DNA before DNA replication is maintained on



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the daughter DNA template, and additional PCC is added to the daughter DNA template after DNA replication is completed to restore the full amount of PCC required for silencing.

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Nature Reviews Molecular Cell Biology

**ORIGINAL RESEARCH PAPER** Francis, N.J. *et al.* Polycomb proteins remain bound to chromatin and DNA during DNA replication *in vitro*. *Cell* **137**, 1–13 (2009)

**FURTHER READING** Probst, A. V. *et al.* Epigenetic inheritance during the cell cycle. *Nature Rev. Mol. Cell Biol.* **10**, 192–206 (2009) | Schwartz, Y.B. & Pirrotta, V. Polycomb silencing mechanisms and the management of genomic programmes. *Nat. Rev. Genet.* **8**, 9–22 (2007)