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The cell cycle-dependent oscillation of histone methyltransferase TXR1 is implicated in regulating replication-transcription conflicts

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With replication origins and transcription cis-regulatory elements frequently in juxtaposition, eukaryotic cells need to coordinate replication and transcription. TXR1 (*Tetrahymena Trithorax*-related 1), the histone H3 lysine 27 monomethyltransferase in *Tetrahymena thermophila*, was reported to cause replication stress in mutation strains. In this study, we analyzed TXR1's role in regulating replication-transcription conflicts. 1) The protein level of TXR1 oscillates during cell cycle and cell cycle was a prerequisite to this oscillation. The active degradation of TXR1 in S-phase is mediated by its interaction with PCNA. 2) Precise regulation of TXR1 level is required for normal DNA replication. Under- and over-expression of *TXR1* lead to DNA damage, but the underlying triggers may be different. 3) Transcription profile was dramatically changed in both Δ*TXR1* and over-expression (TXR1 OE) cells, manifest as transcripts in non-transcribed regions. We propose that TXR1 functions as a switch between replication and transcription.

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