Transcription profiling suggests that mitochondrial topoisomerase IB acts as a topological barrier and regulator of mitochondrial DNA transcription

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Résumé en anglais	Mitochondrial DNA (mtDNA) is essential for cell viability because it encodes subunits of the respiratory chain complexes. Mitochondrial topoisomerase IB (TOP1MT) facilitates mtDNA replication by removing DNA topological tensions produced during mtDNA transcription, but it appears to be dispensable. To test whether cells lacking TOP1MT have aberrant mtDNA transcription, we performed mitochondrial transcriptome profiling. To that end, we designed and implemented a customized tiling array, which enabled genome-wide, strand-specific, and simultaneous detection of all mitochondrial transcripts. Our technique revealed that KO mouse cells process the mitochondrial transcripts normally but that protein-coding mitochondrial transcripts are elevated. Moreover, we found discrete long noncoding RNAs produced by H-strand transcription and encompassing the noncoding regulatory region of mtDNA in human and murine cells and tissues. Of note, these noncoding RNAs were strongly up-regulated in the absence of TOP1MT. In contrast, 7S DNA, produced by mtDNA replication, was reduced in the KO cells. We propose that the long noncoding RNA species in the D-loop region are generated by the extension of H-strand transcripts beyond their canonical stop site and that TOP1MT acts as a topological barrier and regulator for mtDNA transcription and D-loop formation.
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