Modulation of transcription affects mRNP quality

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Processing of mRNA and proper formation of messenger ribonucleoprotein particles (mRNPs) require co-transcriptional loading of proteins onto nascent transcripts, which is critically dependent on the function of the THO/TREX complex, and proper 3’-end formation of the transcript.

Mutations in several genes involved in mRNA export and in mRNP assembly lead to retention of mRNPs in transcription site-foci and to partial degradation of the mRNA by the nuclear exosome. Here, we demonstrate a prominent role of the rate of transcription in the constitution of an export-competent mRNP. We show that two transcription-defective alleles of the Rad3p helicase, a component of the TFIIH transcription initiation factor, suppress several export-related phenotypes linked to mutation of Rip1p, Rna14p and members of the THO/TREX complex. Biochemical and genetic data indicate that mutation of Rad3p in the context of THO/TREX and rna14-3 mutants improves mRNP quality by acting upstream or at the critical step that determines transcription-site retention and nuclear degradation of the transcripts.

As the Rad3p mutant effects can be phenocopied by other mutations known to affect transcription and by the addition of transcription elongation drugs, it is unlikely that the suppression phenotypes are related to a specific role of Rad3p/TFIIH. Rather, our data suggest that modulation of transcription rates kinetically favors proper mRNP formation against competing non-productive events that predominate in export mutants.