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mRNA quality control at the 5' end

Key words: mRNA capping, mRNA capping quality control, Rai1, Dxo1, DXO

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- All eukaryotic mRNAs are capped at their 5’ end, and the mature cap is essential for the stability, export and translation of the mRNA.

- Capping of mRNAs takes place co-transcriptionally and involves three steps. The intermediates and the uncapped 5’ tri-phosphate RNA are resistant to decapping by decapping enzymes Dcp2/Nudt16, and degradation by the 5’-3’ exoribonuclease Xrn1.

- Recently, a novel family of enzymes have been identified, which catalyze the conversion of the improperly capped mRNAs to 5’ mono-phosphate RNA, allowing them to be degraded by 5’-3’ exoribonucleases. Several of these enzymes also possess 5’-3’ exoribonuclease activities themselves, and can singlehandedly clear the improperly capped mRNAs. Such discoveries lead to the identification of a mRNA capping quality control mechanism in eukaryotes.

- Structural studies of these enzymes provided molecular insights into their function.