Cells expressing a Tyrosine-1 mutant of RNA polymerase (Pol) II lose termination control and transcribe up to hundreds of kb after gene ends. Tyrosine-1 residues of the Pol II CTD are essential for both termination control and Pol II interaction with Mediator and Integrator complexes.

The carboxy-terminal domain (CTD) of RNA polymerase (Pol) II is composed of a repetition of YSPTSPS heptads and functions as a loading platform for protein complexes that regulate transcription, splicing and maturation of RNAs. Here, we studied CTD mutants to analyze the function of tyrosine1 residues in the transcription cycle. The results reveal a massive pervasive transcription phenotype associated with mutation of tyrosine residues. Our detailed investigations indicate that 5' antisense as well as 3' end termination is strongly impaired in the tyrosine mutant YFFF, resulting in a global pervasive transcription phenotype. The YFFF mutant further shows a loss of interaction with the Mediator and Integrator complexes. We conclude that tyrosine1 residues of the CTD control termination of transcription by Pol II (Shah et al., 2017).

In paper of Nemec et al. (2017) we showed that the transcription termination factor Rtt103 factor can recognize two different CTD isoforms of CTD, phosphorylated either at serine 2 or threonine 4, to terminate transcription.


Tyrosine-1 of RNA Polymerase II CTD controls global termination of gene transcription in mammals

Figure 1. The CTD of Pol II in mammals consists of 52 heptads with the consensus Y$_1$S$_2$P$_3$T$_4$S$_5$P$_6$S$_7$. In mutant YFFF, the tyrosine residues in heptads 14-52 were replaced by phenylalanine. Pol II in the mutant YFFF does no longer bind the Mediator and Integrator complexes, while the binding of splicing and 3'-processing factors is normal. Functionally, the YFFF mutant has a strong transcription termination defect and Pol II transcribes up to several 100 kb downstream of poly A sites.