RNA Polymerase II Transcription Initiation

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Introduction

Reactome is open-source, open access, manually curated and peer-reviewed pathway database. Pathway annotations are authored by expert biologists, in collaboration with Reactome editorial staff and cross-referenced to many bioinformatics databases. A system of evidence tracking ensures that all assertions are backed up by the primary literature. Reactome is used by clinicians, geneticists, genomics researchers, and molecular biologists to interpret the results of high-throughput experimental studies, by bioinformatics seeking to develop novel algorithms for mining knowledge from genomic studies, and by systems biologists building predictive models of normal and disease variant pathways.

The development of Reactome is supported by grants from the US National Institutes of Health (P41 HG003751), University of Toronto (CFREF Medicine by Design), European Union (EU STRP, EMI-CD), and the European Molecular Biology Laboratory (EBI Industry program).

Literature references


Reactome database release: 76

This document contains 1 pathway and 3 reactions (see Table of Contents)
Formation of the open complex exposes the template strand to the catalytic center of the RNA polymerase II enzyme. This facilitates formation of the first phosphodiester bond, which marks transcription initiation. As a result of this, the TFIIB basal transcription factor dissociates from the initiation complex.

The open transcription initiation complex is unstable and can revert to the closed state. Initiation at this stage requires continued (d)ATP-hydrolysis by TFIIH. Dinucleotide transcripts are not stably associated with the transcription complex. Upon dissociation they form abortive products. The transcription complex is also sensitive to inhibition by small oligo-nucleotides.

Dinucleotides complementary to position -1 and +1 in the template can also direct first phosphodiester bond formation. This reaction is independent on the basal transcription factors TFIIE and TFIIH and does not involve open complex formation. This reaction is sensitive to inhibition by single-stranded oligonucleotides.

**Literature references**


**Editions**

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NTP Binds Active Site of RNA Polymerase II

Location: RNA Polymerase II Transcription Initiation

Stable identifier: R-HSA-75861

Type: binding

Compartments: nucleoplasm

At the beginning of this reaction, 1 molecule of 'pol II open pre-initiation complex', and 2 molecules of 'NTP' are present. At the end of this reaction, 1 molecule of 'Pol II initiation complex' is present.

This reaction takes place in the 'nucleus'.

Followed by: Nucleophillic Attack by 3'-hydroxyl Oxygen of nascent transcript on the Alpha Phosphate of NTP

Literature references

Nucleophillic Attack by 3'-hydroxyl Oxygen of nascent transcript on the Alpha Phosphate of NTP

Location: RNA Polymerase II Transcription Initiation

Stable identifier: R-HSA-75866

Type: transition

Compartments: nucleoplasm

At the beginning of this reaction, 1 molecule of 'Pol II initiation complex' is present. At the end of this reaction, 1 molecule of 'Pol II Initiation complex with phosphodiester-PPI intermediate' is present.

This reaction takes place in the 'nucleus'.

Preceded by: NTP Binds Active Site of RNA Polymerase II

Followed by: Newly Formed Phosphodiester Bond Stabilized and PPI Released

Literature references

**Newly Formed Phosphodiester Bond Stabilized and PPI Released**

**Location:** RNA Polymerase II Transcription Initiation

**Stable identifier:** R-HSA-75864

**Type:** dissociation

**Compartments:** nucleoplasm

At the beginning of this reaction, 1 molecule of 'Pol II Initiation complex with phosphodiester-PPI intermediate' is present. At the end of this reaction, 1 molecule of 'pyrophosphate', and 1 molecule of 'pol II transcription complex' are present.

This reaction takes place in the 'nucleus'.

**Preceded by:** Nucleophillic Attack by 3'-hydroxyl Oxygen of nascent transcript on the Alpha Phosphate of NTP

**Literature references**

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