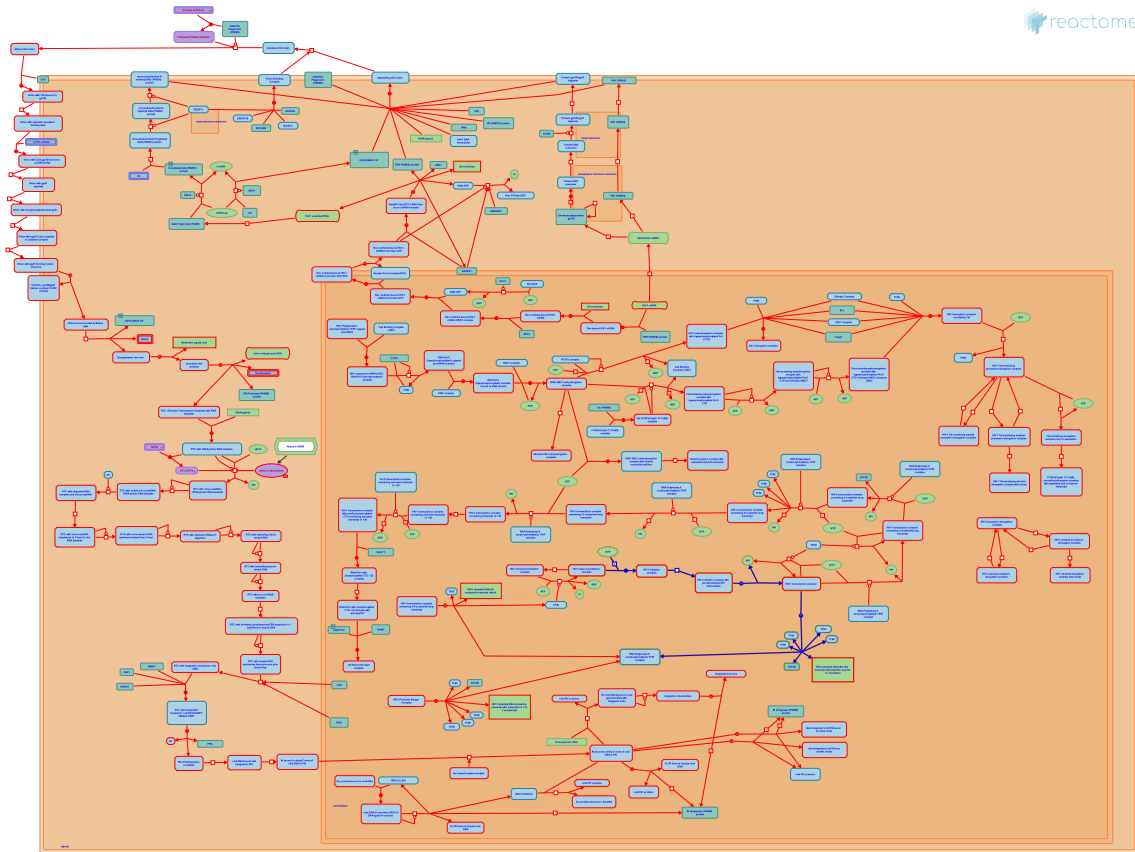


# HIV Transcription Initiation



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This is just an excerpt of a full-length report for this pathway. To access the complete report, please download it at the [Reactome Textbook](https://reactome.org/textbook).

06/05/2024

## 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 bioinformaticians 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

- Fabregat, A., Sidiropoulos, K., Viteri, G., Forner, O., Marin-Garcia, P., Arnau, V. et al. (2017). Reactome pathway analysis: a high-performance in-memory approach. *BMC bioinformatics*, 18, 142. [↗](#)
- Sidiropoulos, K., Viteri, G., Sevilla, C., Jupe, S., Webber, M., Orlic-Milacic, M. et al. (2017). Reactome enhanced pathway visualization. *Bioinformatics*, 33, 3461-3467. [↗](#)
- Fabregat, A., Jupe, S., Matthews, L., Sidiropoulos, K., Gillespie, M., Garapati, P. et al. (2018). The Reactome Pathway Knowledgebase. *Nucleic Acids Res*, 46, D649-D655. [↗](#)
- Fabregat, A., Korninger, F., Viteri, G., Sidiropoulos, K., Marin-Garcia, P., Ping, P. et al. (2018). Reactome graph database: Efficient access to complex pathway data. *PLoS computational biology*, 14, e1005968. [↗](#)

Reactome database release: 88

This document contains 1 pathway and 4 reactions ([see Table of Contents](#))

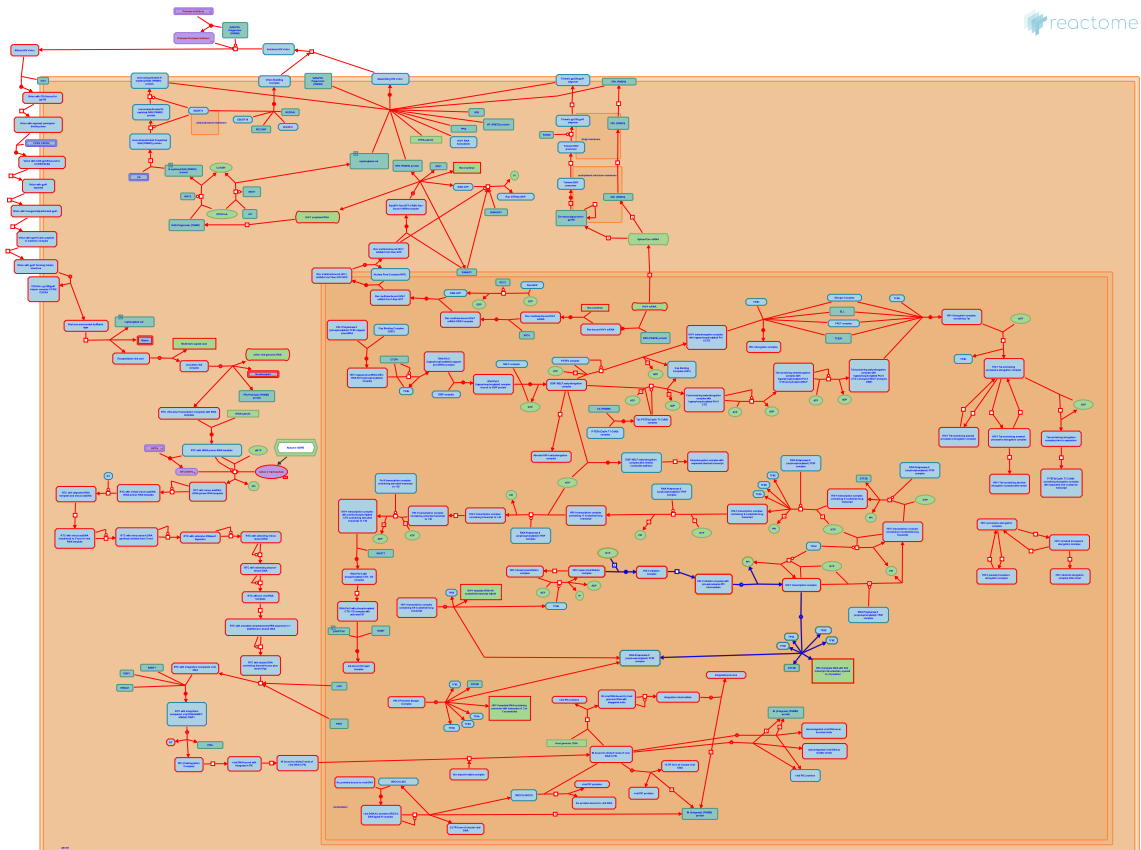
## HIV Transcription Initiation ↗

**Stable identifier:** R-HSA-167161

**Compartments:** nucleoplasm

**Diseases:** Human immunodeficiency virus infectious disease

**Inferred from:** RNA Polymerase II Transcription Initiation (Homo sapiens)



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 TFIIF. 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 TFIIF and does not involve open complex formation. This reaction is sensitive to inhibition by single-stranded oligonucleotides.

### Editions

2005-07-27

Authored

Matthews, L., Rice, AP.

2005-07-27

Edited

Matthews, L.

## NTP binds active site of RNA Polymerase II in HIV-1 open pre-initiation complex ↗

**Location:** [HIV Transcription Initiation](#)

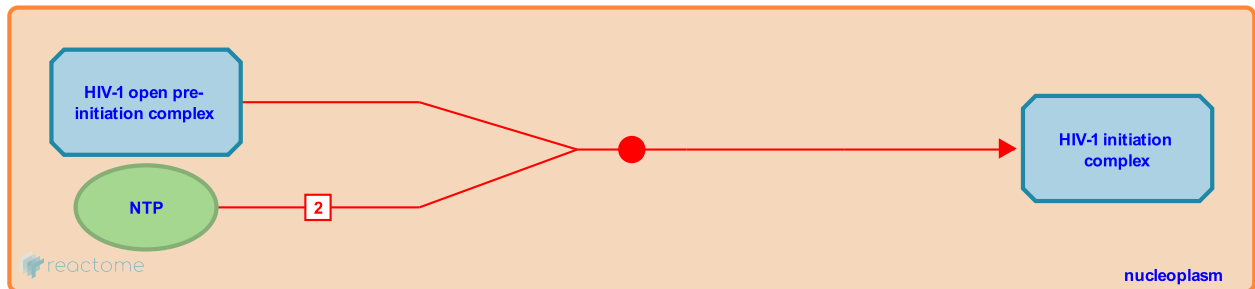
**Stable identifier:** R-HSA-167118

**Type:** binding

**Compartments:** nucleoplasm

**Diseases:** Human immunodeficiency virus infectious disease

**Inferred from:** [NTP Binds Active Site of RNA Polymerase II \(Homo sapiens\)](#)



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

This reaction takes place in the 'nucleus'.

**Followed by:** [Nucleophilic attack by 3'-hydroxyl oxygen of nascent HIV-1 transcript on the Alpha phosphate of NTP](#)

### Literature references

Fiedler, U., Timmers, HT., Holstege, FC. (1998). Three transitions in the RNA polymerase II transcription complex during initiation. *EMBO J*, 16, 7468-80. ↗

### Editions

2005-07-27	Authored	Matthews, L., Rice, AP.
2005-07-27	Edited	Matthews, L.

# Nucleophilic attack by 3'-hydroxyl oxygen of nascent HIV-1 transcript on the Alpha phosphate of NTP ↗

**Location:** [HIV Transcription Initiation](#)

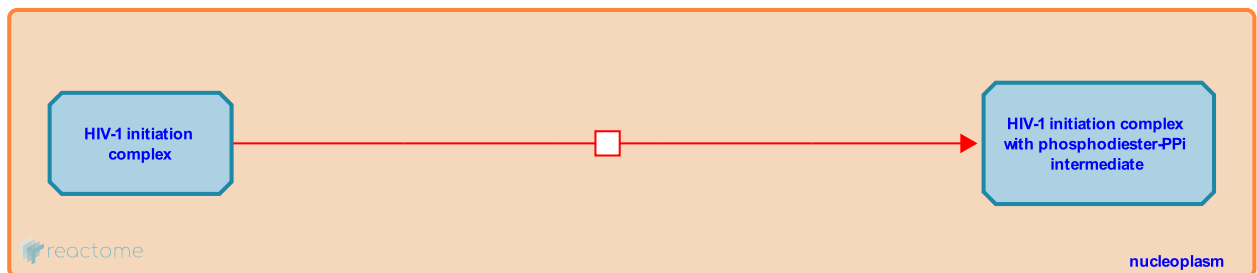
**Stable identifier:** R-HSA-167130

**Type:** transition

**Compartments:** nucleoplasm

**Diseases:** Human immunodeficiency virus infectious disease

**Inferred from:** [Nucleophilic Attack by 3'-hydroxyl Oxygen of nascent transcript on the Alpha Phosphate of NTP \(Homo sapiens\)](#)



At the beginning of this reaction, 1 molecule of 'HIV-1 initiation complex' is present. At the end of this reaction, 1 molecule of 'HIV-1 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 in HIV-1 open pre-initiation complex](#)

**Followed by:** [Newly formed phosphodiester bond stabilized and PPi released](#)

## Literature references

Fiedler, U., Timmers, HT., Holstege, FC. (1998). Three transitions in the RNA polymerase II transcription complex during initiation. *EMBO J*, 16, 7468-80. ↗

## Editions

2005-07-27	Authored	Matthews, L., Rice, AP.
2005-07-27	Edited	Matthews, L.

## Newly formed phosphodiester bond stabilized and PPi released ↗

**Location:** [HIV Transcription Initiation](#)

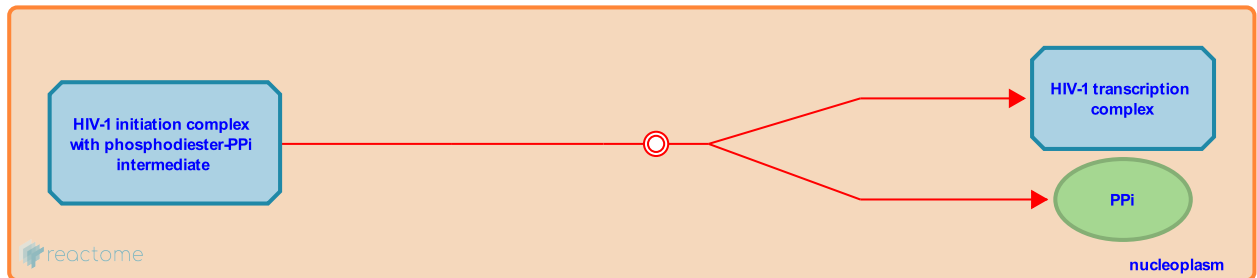
**Stable identifier:** R-HSA-167134

**Type:** dissociation

**Compartments:** nucleoplasm

**Diseases:** Human immunodeficiency virus infectious disease

**Inferred from:** [Newly Formed Phosphodiester Bond Stabilized and PPi Released \(Homo sapiens\)](#)



At the beginning of this reaction, 1 molecule of 'HIV-1 initiation complex with phosphodiester-PPi intermediate' is present. At the end of this reaction, 1 molecule of 'HIV-1 transcription complex', and 1 molecule of 'pyrophosphate' are present.

This reaction takes place in the 'nucleus'.

**Preceded by:** [Nucleophilic attack by 3'-hydroxyl oxygen of nascent HIV-1 transcript on the Alpha phosphate of NTP](#)

**Followed by:** [Abortive HIV-1 initiation after formation of the first phosphodiester bond](#)

### Literature references

Fiedler, U., Timmers, HT., Holstege, FC. (1998). Three transitions in the RNA polymerase II transcription complex during initiation. *EMBO J*, 16, 7468-80. ↗

### Editions

2005-07-27	Authored	Matthews, L., Rice, AP.
2005-07-27	Edited	Matthews, L.

## Abortive HIV-1 initiation after formation of the first phosphodiester bond ↗

**Location:** [HIV Transcription Initiation](#)

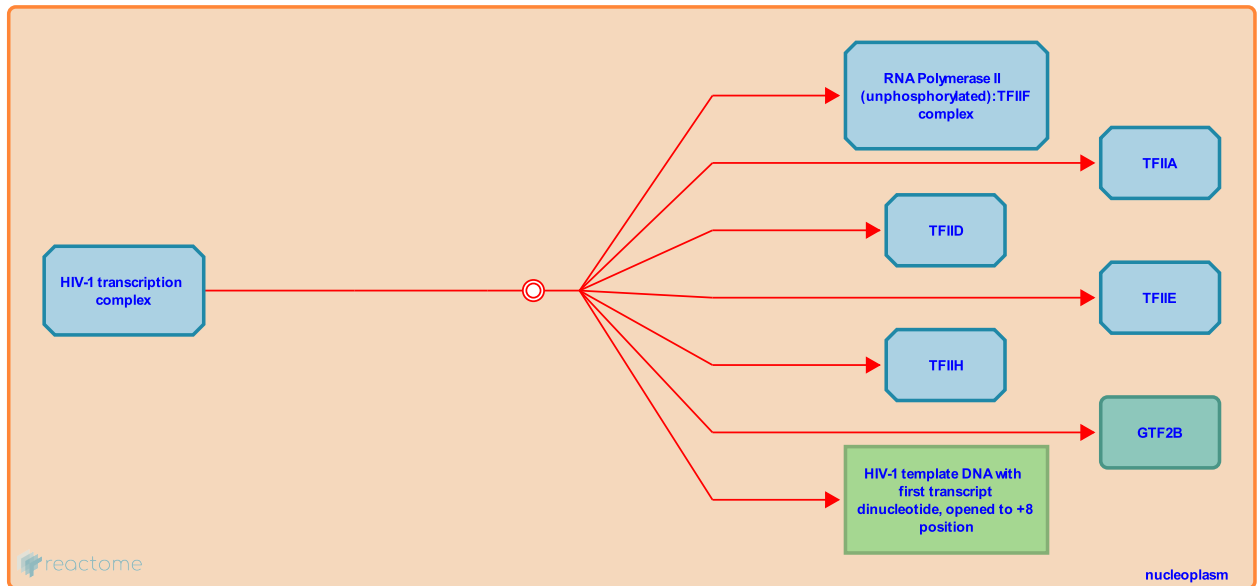
**Stable identifier:** R-HSA-167477

**Type:** dissociation

**Compartments:** nucleoplasm

**Diseases:** Human immunodeficiency virus infectious disease

**Inferred from:** [Abortive initiation after formation of the first phosphodiester bond \(Homo sapiens\)](#)



At the beginning of this reaction, 1 molecule of 'HIV-1 transcription complex' is present. At the end of this reaction, 1 molecule of 'TFIIA', 1 molecule of 'TFIIH', 1 molecule of 'TFIIE', 1 molecule of 'TFIID', 1 molecule of 'TFIIB', 1 molecule of 'RNA Polymerase II (unphosphorylated):TFIIF complex', and 1 molecule of 'HIV-1 template DNA with first transcript dinucleotide, opened to +8 position' are present.

This reaction takes place in the 'nucleus'.

**Preceded by:** [Newly formed phosphodiester bond stabilized and PPi released](#)

### Literature references

Luse, SW., Jacob, GA., Luse, DS. (1991). Abortive initiation is increased only for the weakest members of a set of down mutants of the adenovirus 2 major late promoter. *J Biol Chem*, 266, 22537-44. ↗

### Editions

2005-07-27	Authored	Matthews, L., Rice, AP.
2005-10-16	Edited	Matthews, L.

# Table of Contents

Introduction	1
⚡ HIV Transcription Initiation	2
➤ NTP binds active site of RNA Polymerase II in HIV-1 open pre-initiation complex	3
➤ Nucleophilic attack by 3'-hydroxyl oxygen of nascent HIV-1 transcript on the Alpha phosphate of NTP	4
➤ Newly formed phosphodiester bond stabilized and PPi released	5
➤ Abortive HIV-1 initiation after formation of the first phosphodiester bond	6
Table of Contents	7