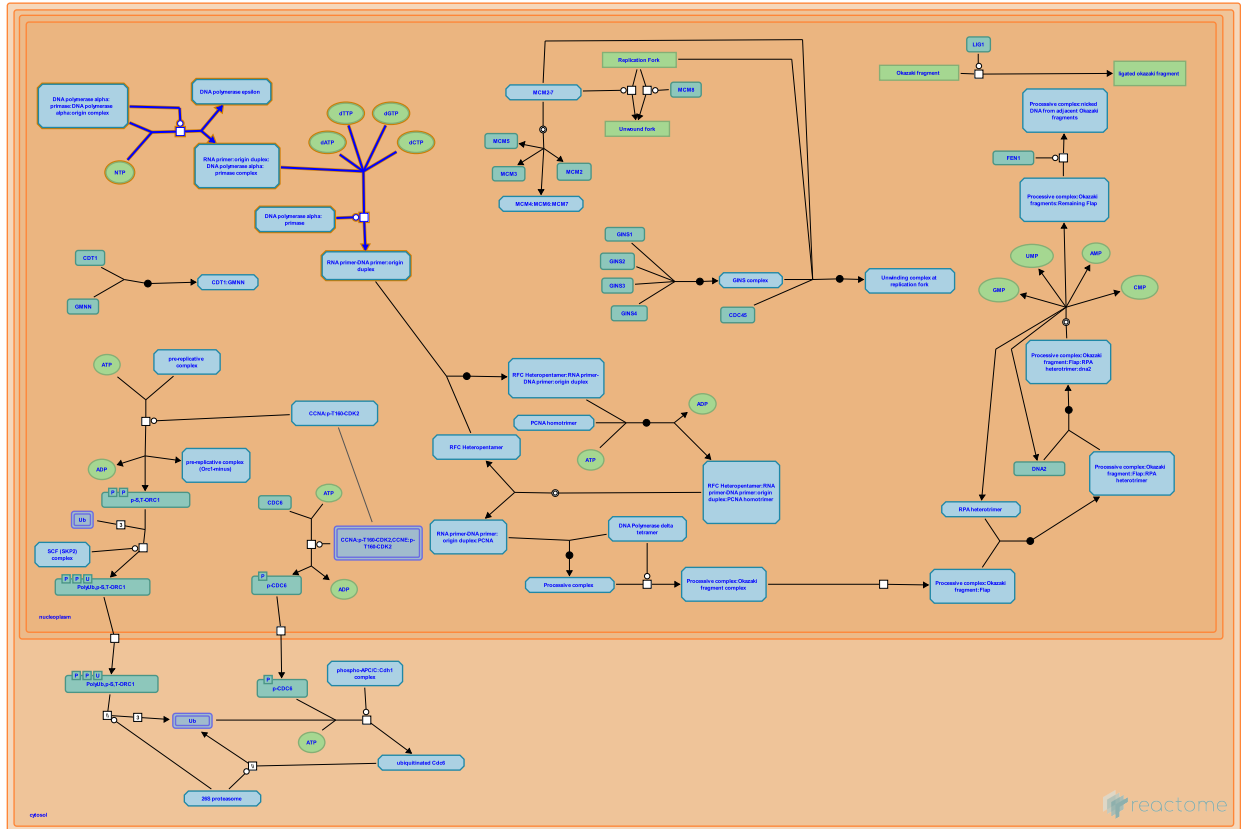


# DNA replication initiation



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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/).

26/04/2024

## 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

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- 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. [↗](#)

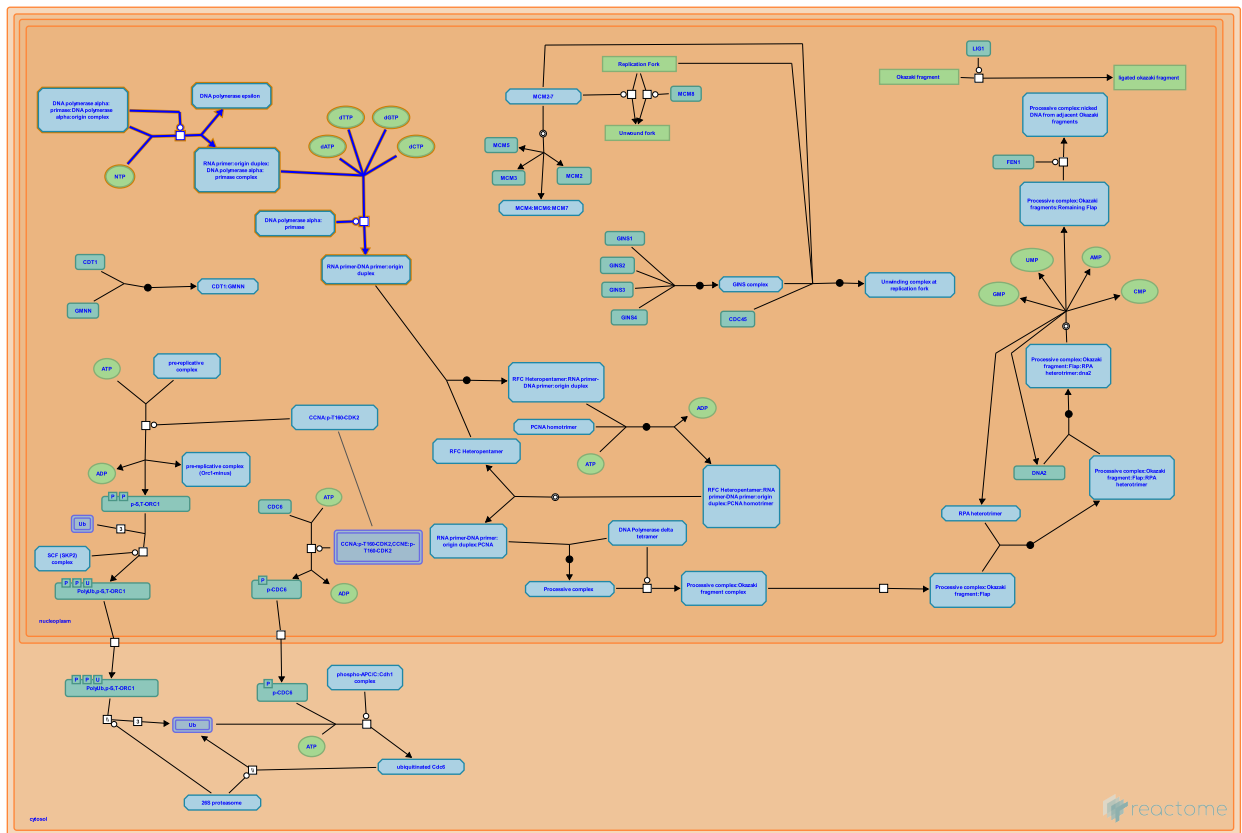
Reactome database release: 88

This document contains 1 pathway and 2 reactions ([see Table of Contents](#))

# DNA replication initiation ↗

Stable identifier: R-HSA-68952

Compartments: nucleoplasm



DNA polymerases are not capable of de novo DNA synthesis and require synthesis of a primer, usually by a DNA-dependent RNA polymerase (primase) to begin DNA synthesis. In eukaryotic cells, the primer is synthesized by DNA polymerase alpha:primase. First, the DNA primase portion of this complex synthesizes approximately 6-10 nucleotides of RNA primer and then the DNA polymerase portion synthesizes an additional 20 nucleotides of DNA (Frick & Richardson 2002; Wang et al 1984).

## Literature references

Frick, DN., Richardson, CC. (2002). DNA primases. *Annu Rev Biochem*, 70, 39-80. ↗

Hu, SZ., Korn, D., Wang, TS. (1984). DNA primase from KB cells. Characterization of a primase activity tightly associated with immunoaffinity-purified DNA polymerase-alpha. *J Biol Chem*, 259, 1854-65. ↗

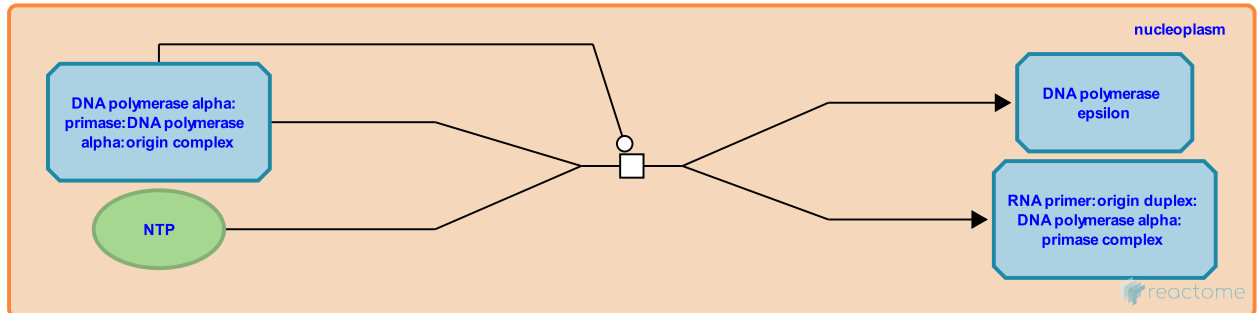
## The primase component of DNA polymerase:primase synthesizes a 6-10 nucleotide RNA primer at the origin ↗

**Location:** [DNA replication initiation](#)

**Stable identifier:** R-HSA-68913

**Type:** transition

**Compartments:** nucleoplasm



At the beginning of this reaction, 1 molecule of 'DNA polymerase alpha:primase:DNA polymerase alpha:origin complex', and 1 molecule of 'NTP' are present. At the end of this reaction, 1 molecule of 'DNA polymerase epsilon', and 1 molecule of 'RNA primer:origin duplex:DNA polymerase alpha:primase complex' are present.

This reaction takes place in the 'nucleus' and is mediated by the 'DNA-directed RNA polymerase activity' of 'DNA polymerase alpha:primase'.

**Followed by:** [The polymerase component of DNA polymerase alpha:primase synthesizes a 20-nucleotide primer at the origin](#)

### Literature references

Hu, SZ., Korn, D., Wang, TS. (1984). DNA primase from KB cells. Characterization of a primase activity tightly associated with immunoaffinity-purified DNA polymerase-alpha. *J Biol Chem*, 259, 1854-65. ↗

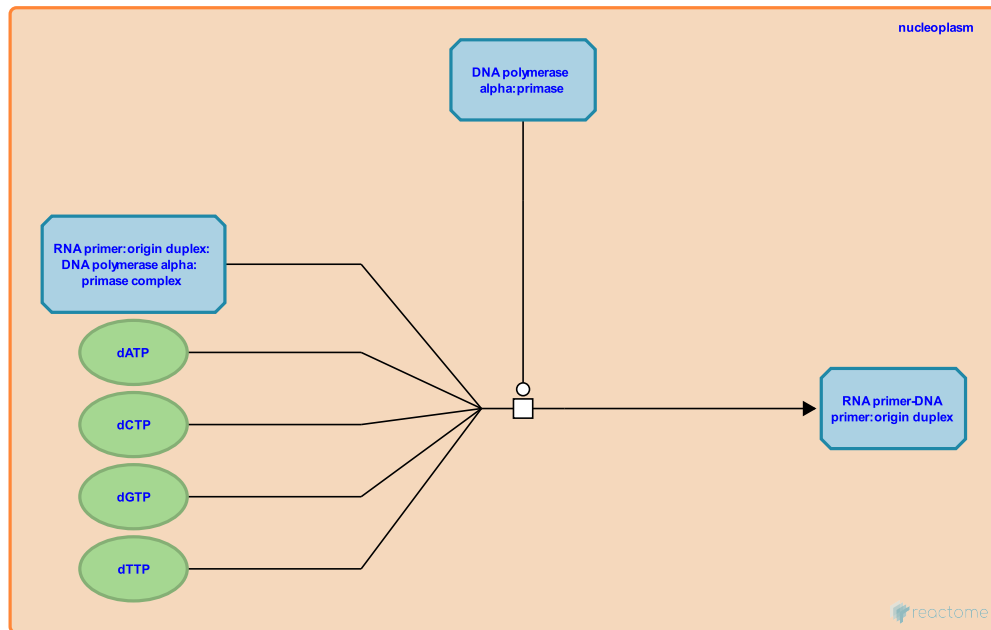
## The polymerase component of DNA polymerase alpha:primase synthesizes a 20-nucleotide primer at the origin ↗

**Location:** [DNA replication initiation](#)

**Stable identifier:** R-HSA-68950

**Type:** transition

**Compartments:** nucleoplasm



At the beginning of this reaction, 1 molecule of 'dTTP', 1 molecule of 'dGTP', 1 molecule of 'dATP', 1 molecule of 'RNA primer:origin duplex:DNA polymerase alpha:primase complex', and 1 molecule of 'dCTP' are present. At the end of this reaction, 1 molecule of 'RNA primer-DNA primer:origin duplex' is present.

This reaction takes place in the 'nucleus' and is mediated by the 'DNA-directed DNA polymerase activity' of 'DNA polymerase alpha:primase'.

**Preceded by:** [The primase component of DNA polymerase:primase synthesizes a 6-10 nucleotide RNA primer at the origin](#)

### Literature references

Rafter, E., Bollum, FJ., Chang, LM., Augl, C. (1984). Purification of a DNA polymerase-DNA primase complex from calf thymus glands. *J. Biol. Chem.*, 259, 14679-87. ↗

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