Synthesis of DNA

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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 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.

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Literature references


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This document contains 4 pathways (see Table of Contents)
Synthesis of DNA ➔

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**Compartments:** nucleoplasm, cytosol

The actual synthesis of DNA occurs in the S phase of the cell cycle. This includes the initiation of DNA replication, when the first nucleotide of the new strand is laid down during the synthesis of the primer. The DNA replication preinitiation events begin in late M or early G1 phase.
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**


Switching of origins to a post-replicative state involves the removal of Orc1 from chromatin, CDK-mediated phosphorylation and removal of Cdc6, and the rearrangement and mobilization of Mcm2-7.
Accurate and efficient genome duplication requires coordinated processes to replicate two template strands at eucaryotic replication forks. Knowledge of the fundamental reactions involved in replication fork progression is derived largely from biochemical studies of the replication of simian virus and from yeast genetic studies. Since duplex DNA forms an anti-parallel structure, and DNA polymerases are unidirectional, one of the new strands is synthesized continuously in the direction of fork movement. This strand is designated as the leading strand. The other strand grows in the direction away from fork movement, and is called the lagging strand. Several specific interactions among the various proteins involved in DNA replication underlie the mechanism of DNA synthesis, on both the leading and lagging strands, at a DNA replication fork. These interactions allow the replication enzymes to cooperate in the replication process (Hurwitz et al 1990; Brush et al 1996; Ayyagari et al 1995; Budd & Campbell 1997; Bambara et al 1997).

**Literature references**


https://reactome.org


**Editions**

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