Joual of Molecular Pathophysiology, 2022
VOL 11, NO. 4, PAGE 01

COMMENTARY

Open Access

Involvement of DNA Polymerases to Carryout DNA Replication

Jordi Marino*
Department of Neurosurgery, Medical University of Gdansk, Gdansk, Poland

ARTICLE HISTORY
Received: 21-Mar-2022, Manuscript No. JMOLPAT-22-62849;
Editor assigned: 24-Mar-2022, PreQC No: JMOLPAT-22-62849 (PQ);
Reviewed: 11-Apr-2022, QC No: JMOLPAT-22-62849;
Revised: 18-Apr-2022, Manuscript No: JMOLPAT-22-62849 (R).
Published: 25-Apr-2022

Description

DNA replication is the biological process of making two identical replicas of DNA from a single original DNA molecule in molecular biology. All living organisms have DNA replication, which is the most important aspect of biological heredity. This is required for cell division during tissue growth and repair, as well as ensuring that each new cell receives its own copy of the DNA. The cell's ability to divide is unique, and this demands DNA replication. A double helix is formed by two complementary strands of DNA. A double-stranded DNA molecule has the shape of a double helix, which is made up of two linear strands that run in opposite directions and twist together to form a molecule. These strands are split during replication. Semiconservative replication is the process of using each strand of the original DNA molecule as a template for the creation of its counterpart. The new helix will be made up of an original DNA strand as well as a newly synthesized strand as a result of semi-conservative replication. Cellular error-checking and proofreading systems ensure near-perfect DNA replication fidelity. DNA replication begins in a cell at specified sites, or origins of replication, in the genome, which includes an organism's genetic material. The replication fork is connected with a variety of proteins that aid in the commencement and continuation of DNA synthesis. DNA polymerase is most notable for synthesizing new strands by adding nucleotides that complement each strand. During the S-stage of interphase, DNA replication takes place.

DNA polymerases are an enzyme family that performs all types of DNA replication. DNA polymerases can only stretch an existing DNA or RNA strand linked with a template strand, not initiate new strand synthesis. Before synthesis can begin, a short RNA fragment known as a primer must be created and attached to the template DNA strand. DNA polymerase generates a new strand of DNA by expanding the 3′ end of an existing nucleotide chain and adding extra nucleotides matched to the template strand one at a time *via* the production of phosphodiester linkages. The high-energy phosphate linkages between the three phosphates connected to each unincorporated base provide the energy for this DNA polymerization process. Nucleotides are free bases with phosphate groups attached; in particular, nucleoside triphosphates are bases with three attached phosphate groups. When a nucleotide is introduced to a growing DNA strand, a phosphodiester link is formed between the nucleotide's proximal phosphate and the expanding chain, followed by the hydrolysis of a high-energy phosphate bond, releasing the two distal phosphate groups as pyrophosphate. Enzymatic hydrolysis of the pyrophosphate that results into inorganic phosphate destroys a second high-energy phosphate bond, thereby making the reaction irreversible. DNA polymerases, in general, are extremely precise, with an intrinsic error rate of less than one mistake per 107 nucleotides added. Furthermore, some DNA polymerases have the ability to proofread by removing nucleotides from the end of a developing strand to repair mismatched bases. Finally, post-replication mismatch repair mechanisms look for faults in the DNA and can tell the difference between mismatches in the newly synthesized DNA strand and the original strand sequence.

Contact: Marino J, E-mail: jordi12345@gmail.com