DNA REPLICATION

DNA replication, also known as **semi-conservative replication**, is the process by which DNA is doubled. This is an important process taking place within the dividing cell.

In this article, we shall discuss the **structure** of DNA, the precise steps involved in **replicating** DNA (initiation, elongation and termination) and the **clinical consequences** that can occur when this process goes wrong.

DNA Structure

DNA is made up of millions of **nucleotides.** These are molecules composed of a deoxyribose sugar, with a phosphate and a base (or nucleobase) attached to it. These nucleotides are attached to each other in strands via **phosphodiester bonds** to form a 'sugar-phosphate backbone'. The bond formed is between the third carbon atom on the deoxyribose sugar of one nucleotide (known as the 3') and the fifth carbon atom of another sugar on the next nucleotide (known as the 5').

N.B: 3' is pronounced 'three prime' and 5' is pronounced 'five prime'.

There are two strands of DNA, which run in opposite or **antiparallel** directions to each other. These strands are attached to each other throughout their lengths via the bases on each nucleotide. There are 4 different bases associated with DNA: **C**ytosine, **G**uanine, **A**denine, and **T**hymine. In normal DNA strands, cytosine binds to guanine, and adenine binds to thymine. When bound together, the two strands form a **double helix** structure.

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Fig 1 – The Structure of RNA and DNA

Stages of DNA replication

DNA replication can be thought of in three stages: **initiation, elongation** and **termination**

Initiation

DNA synthesis is initiated at particular points within the DNA strand known as '**origins**', which have specific coding regions. These origins are targeted by initiator proteins, which go on to recruit more proteins that help aid the replication process, forming a replication