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Diploma in Pharmacy 2nd Year
Biochemistry & Clinical Pathology
Chapter 5 : Nucleic acids

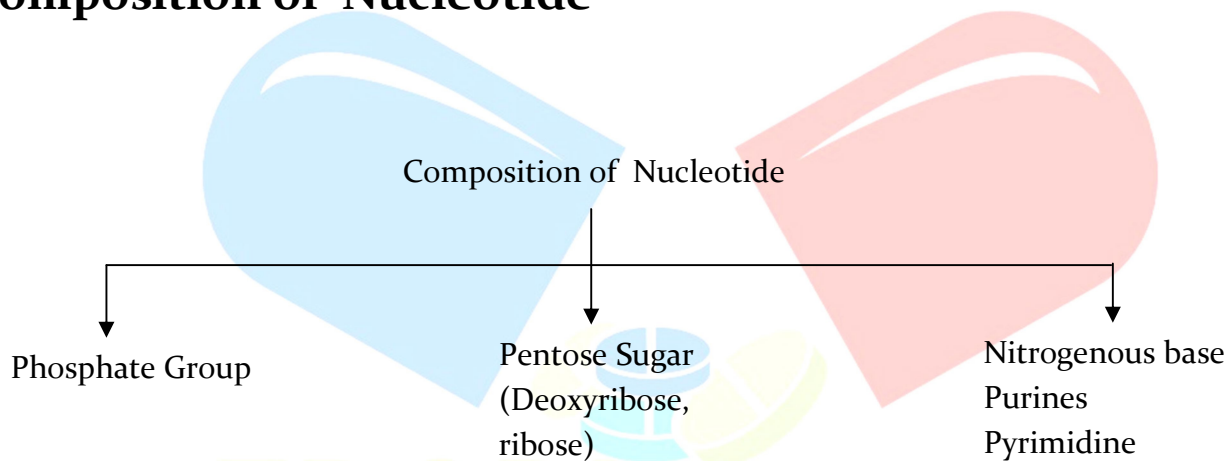
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Chapter 5 Nucleic acids

- Nucleic Acids (DNA & RNA) are formed by the polymerization of Nucleotide Subunits.
- Nucleic Acids are made up of a ribose sugar, nitrogenous base & Phosphate group.
- Deoxyribonucleic Acid (DNA) & Ribonucleic Acid (RNA) are two types of nucleic acids that act as sources and carriers of genetic Information.

Composition of Nucleotide



- **Purine** : They Contain two carbon nitrogen rings one of them is 6 membered and other is 5 membered
 - **Example** : Adenine, Guanine.
- **Pyrimidine** : It is 6 membered carbon nitrogen ring at the 1st & 3rd position it contain N(Nitrogen) instead of carbon
 - **Example** : Cytosine, Thymine, Uracil.

Component of Nucleoside & Nucleotide

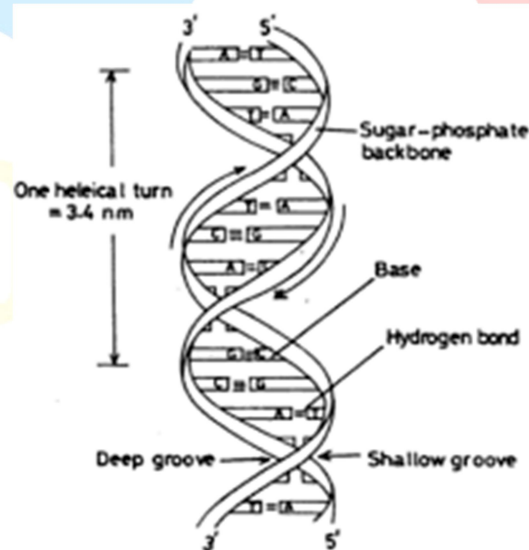
- Nucleoside : It is made up with the combination of Pentose sugar and nitrogenous base by glycosidic bond.
 - Nucleotide : Are Organic Substance made up of nucleoside and phosphate.
- Or
- Nucleotide are organic substance made up of pentose sugar, Nitrogenous base, phosphate group.

DNA (Deoxyribonucleic Acid)

- DNA (a polymer molecule) is made up of monomeric units called nucleotides.
- Polymer is known as polynucleotide.
- A 5-Carbon sugar (deoxyribose), nitrogenous base attach to the sugar and a phosphate group.

Watson and Crick model of DNA

- DNA as an acidic substance present in the nucleus was first identified by Frederick Meischer in 1869. He named it as 'nucleon'. Due to technical limitations in isolating such a long polymer intact the elucidation of structure of DNA remained elusive for a long period of time.
- It was only in 1953 that James Watson and Francis Crick proposed the very simple but famous double helix model for the structure of DNA.
- The main opposition was base pairing between the two strands of polynucleotide chains



The salient features of double helix structure of DNA are as follows :

- ▲ It is made up of two polynucleotide chains.
- ▲ The two chains have antiparallel polarity if one has polarities and the second chain must have polarity.
- ▲ The base into strands is paired through hydrogen bond forming base pairs. Adenine forms to hydrogen bonds with thymine from opposite strands and vice versa.
- ▲ Similarly guanine forms three H bonds with cytosine. As a result, purine comes opposite to pyrimidine.
- ▲ Because of this approximate a uniform distance between the two strengths of The Helix occurs.

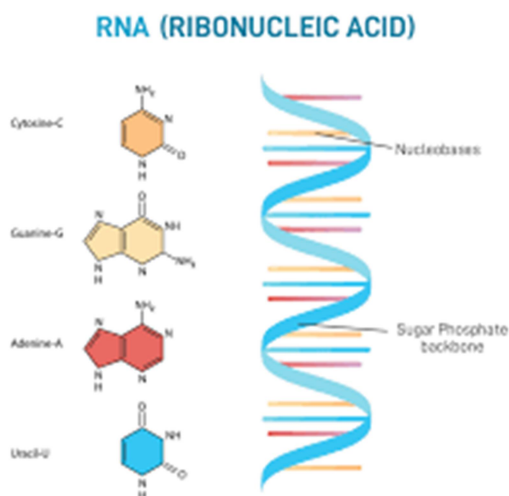
- ▲ The two chains are called in a right-handed fashion. Pitch of the helix is and there are roughly 10bp in each turn.
- ▲ The plane of one base pair is stacked over the other in a double helix. This confirms stability of the helical structure.

Function of DNA

1. **Genetic Information** : It transfer genetic information from mother to the child.
2. **Replication** : It makes its copy during cell division.
3. **Transcription** : When RNA is formed from DNA it is called transcription.
4. **DNA finger print** : It help to determine the identity of suspected person on the basis of nucleotide sequences

Structure of RNA

- Ribonucleic Acid RNA is a long unbranched macromolecule consisting of nucleotides joined by 3' to 5' Phosphodiester bonds.
- RNA is a single strand does not contain regions of double helical structure.
- RNA contain ribose sugar instead of 2-deoxyribose that present in DNA.
- The Structure of RNA Molecule was described by Robert William Holley in 1965.
- It contain four major bases such as
 - Purine base : Adenine & Guanine
 - Pyrimidine base : Cytosine & Uracil
- RNA Pairs
 - Adenine with Uracil
 - Cytosine with Guanine



Types of RNA / Function

- ✓ **mRNA** : It takes genetic messages from DNA and help in protein synthesis.
- ✓ **t-RNA** : It transfer amino acids to the codes information of mRNA.
- ✓ **r-RNA (ribose RNA)** : It play an important role in protein synthesis.

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