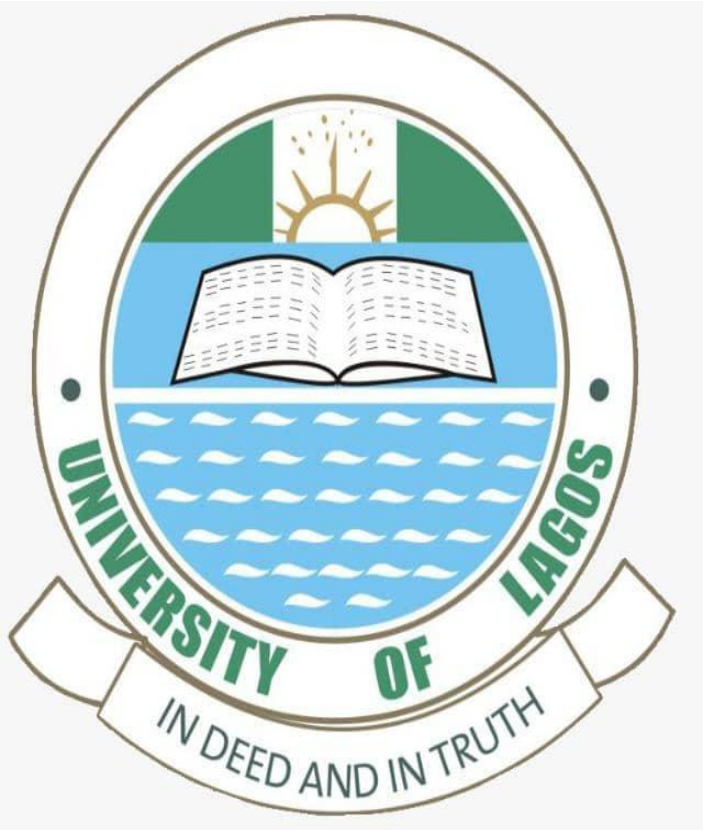
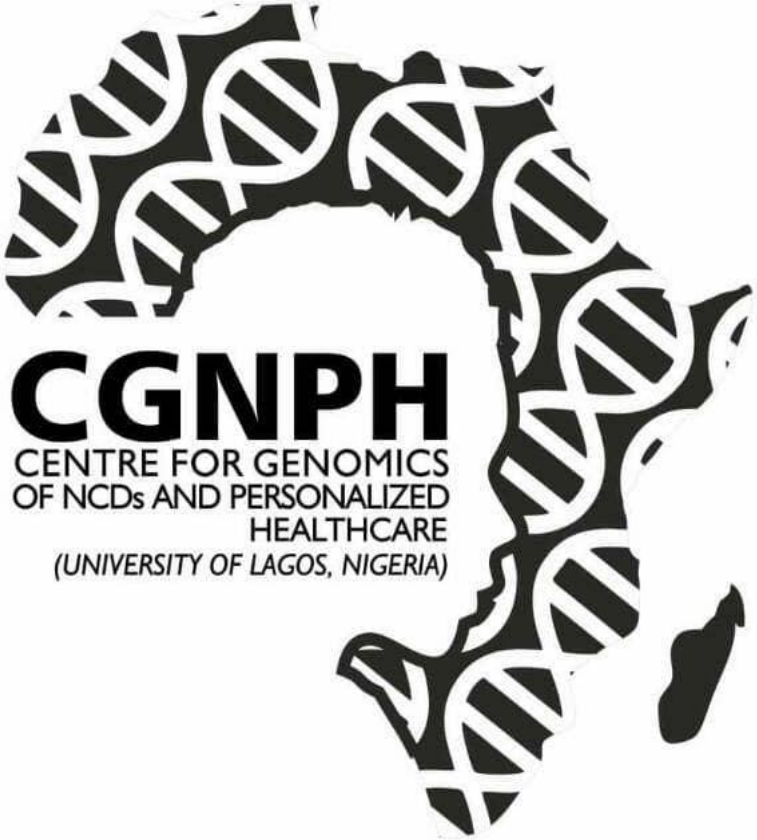
Nucleic Acid Structure and Function

July 2025





Prof Aderonke Samuel

Nucleic Acid Structure and Function

2025 dry &wet lab summer school

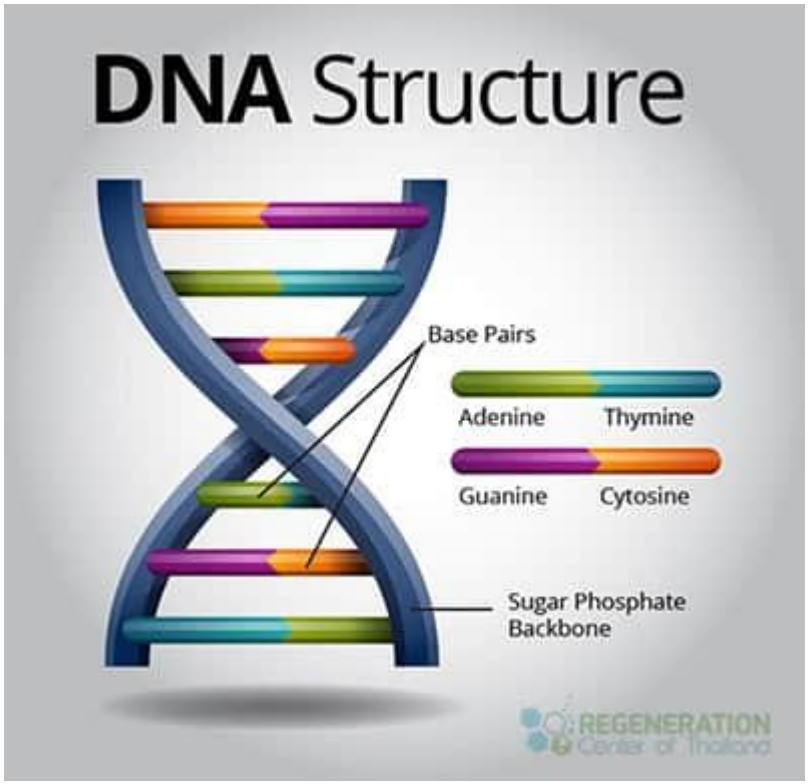
Learning Objectives

- - Understand DNA and RNA structures
- - Compare DNA and RNA
- - Explore base pairing and double helix
- - Describe nucleic acid functions

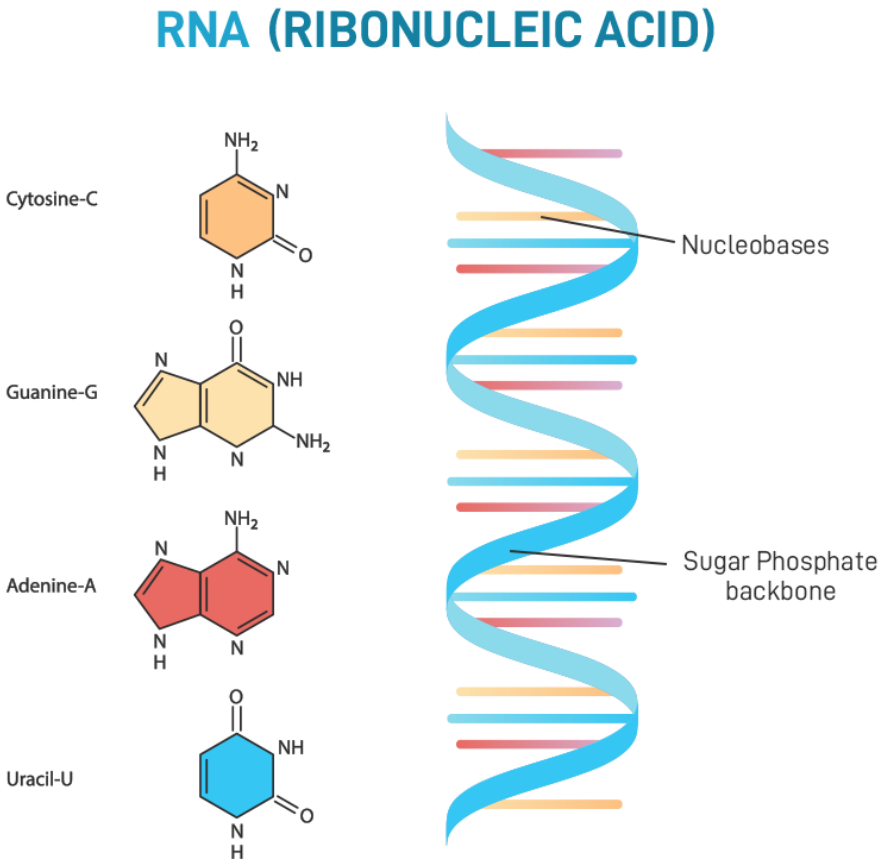
Nucleic Acids Overview

- DNA and RNA are nucleic acids composed of nucleotides.
- They store and transmit genetic information.

Deoxyribonucleic acid structure (DNA)



Ribonucleic acid (RNA)

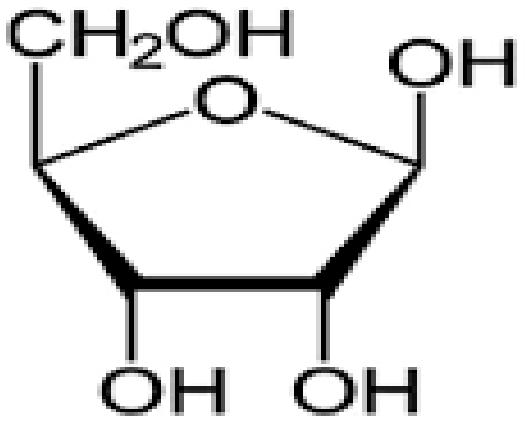


Nucleotide Components

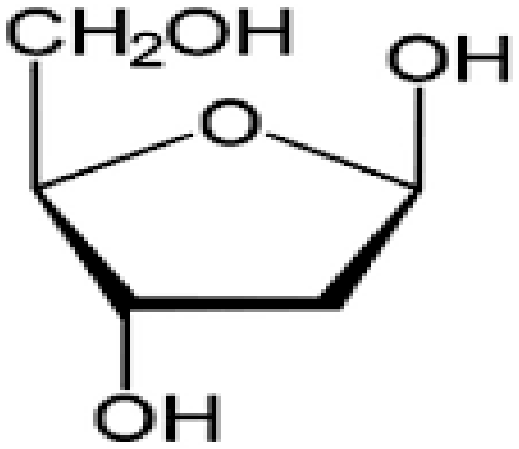
- - Phosphate group
- - Pentose sugar (ribose or deoxyribose)
- - Nitrogenous base (A, T, G, C, U)

- Purine = A -Adenine G- Guanine
- Pyrimidine =T- thymine C- Cytosine U- Uracil
- Uracil is found only in RNA – Ribonucleic acid

Ribose and Deoxyribose sugar

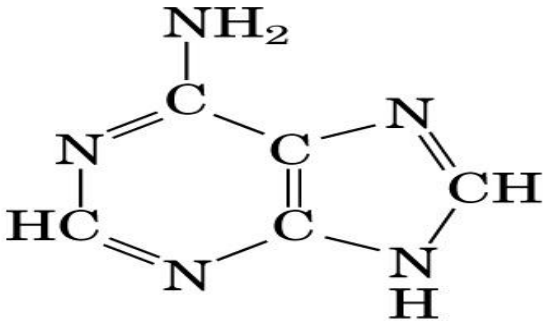


ribose

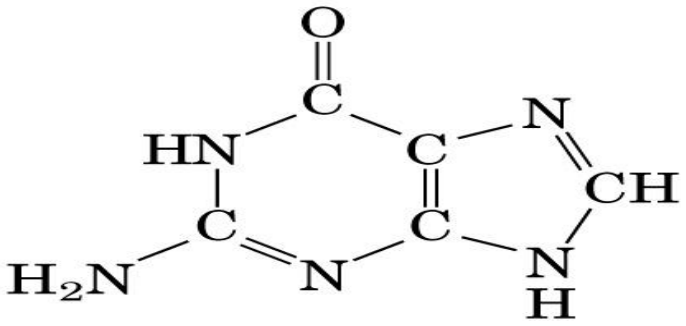


deoxyribose

Purines And Pyrimidines

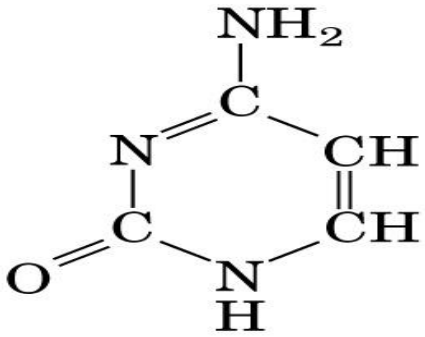


Adenine

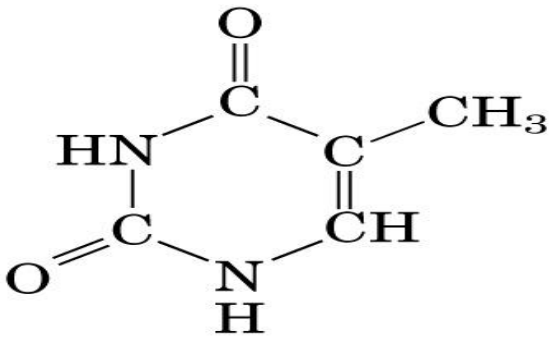


Guanine

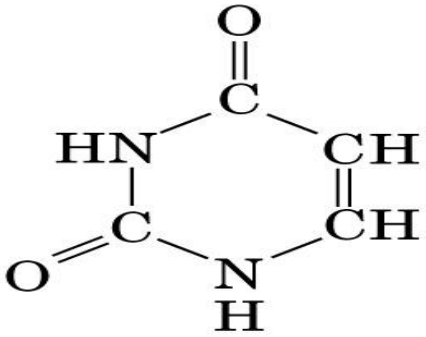
Purines



Cytosine



Thymine
(DNA)



Uracil
(RNA)

Pyrimidines

DNA vs RNA

- Comparison of DNA and RNA:
- - Sugar: deoxyribose vs ribose
- - Bases: A, T, G, C vs A, U, G, C
- - Structure: double vs single strand

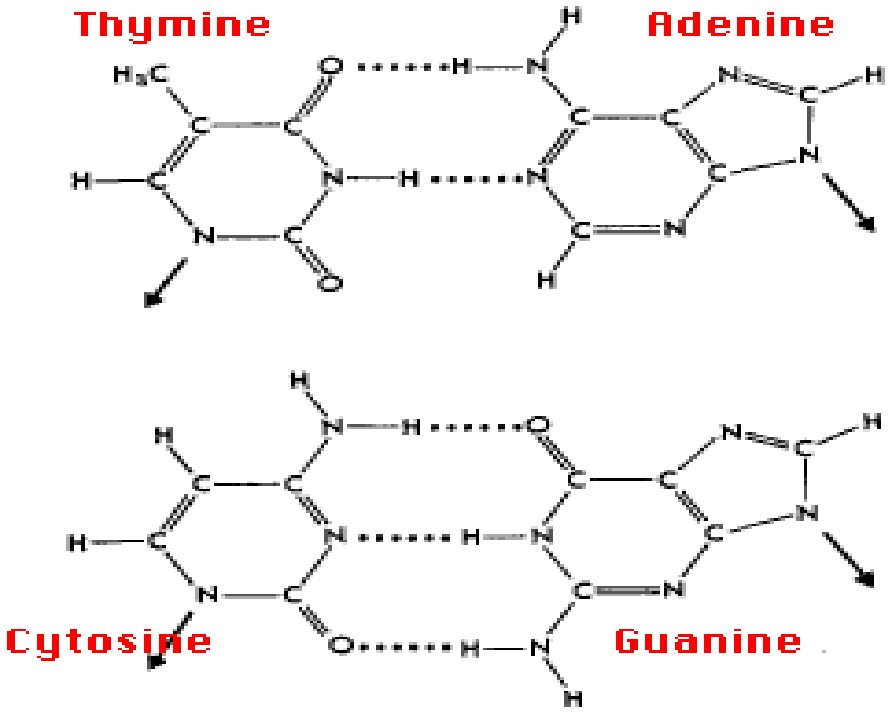
DNA Double Helix

- Watson-Crick model with antiparallel strands and complementary base pairing (A-T, G-C).

Base Pairing Rules

- A-T and G-C in DNA; A-U and G-C in RNA.
- Purines pair with pyrimidines.

Base pairing in DNA



Types of RNA

- - mRNA: messenger
- - tRNA: transfer
- - rRNA: ribosomal
- - miRNA/siRNA: regulatory roles

Functions of Nucleic Acids

- DNA stores genetic information.
- RNA is involved in protein synthesis and regulation.
- Some RNA molecules have catalytic activity.

Central Dogma

- Flow of genetic information:
- DNA → RNA → Protein
- Processes: replication, transcription, translation

Applications

- Nucleic acids in biotechnology:
- - PCR
- - DNA sequencing
- - Gene therapy
- - CRISPR
- - Forensic analysis

Summary

- - Structures and functions of DNA and RNA
- - Base pairing and central dogma
- - Importance in modern science


Thank you