DNA & RNA

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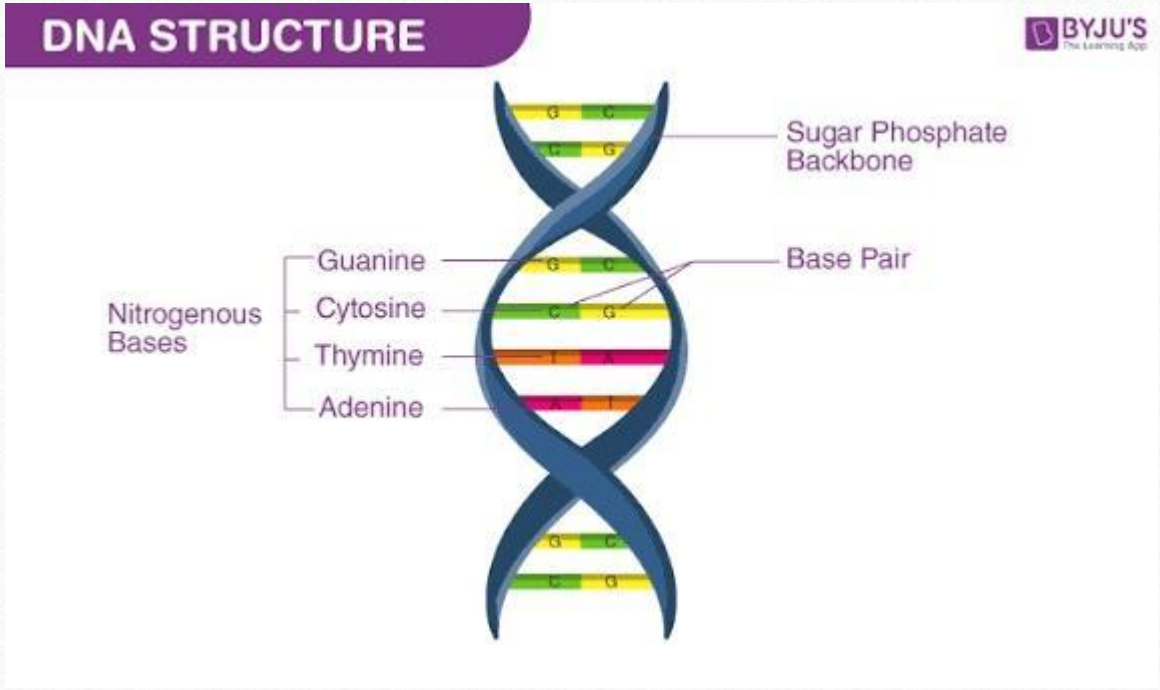
DNA Overview

- DNA = Deoxyribonucleic Acid
- Carries genetic instructions for growth, development, functioning, and reproduction of living organisms

DNA Structure

- Double Helix: twisted ladder / spiral staircase shape
- Built from nucleotides (monomers)
- Each nucleotide has 3 parts:
- Phosphate group → gives negative charge
- Deoxyribose sugar → forms backbone
- Nitrogenous base → four types: Adenine (A), Thymine (T), Cytosine (C), Guanine (G)
- Bases form "rungs" of ladder
- Base pairing: A–T and C–G (via hydrogen bonds)

DNA Structure



DNA Stand Orientation

- DNA has two antiparallel strands
- One runs 5′ → 3′, the other 3′ → 5′
- Antiparallel arrangement allows complementary base pairing

DNA Function

Genetic Information Storage

1-DNA stores genetic information in all living organisms.

2-Sequence of nucleotide bases encodes instructions for development, growth, functioning, and reproduction.

DNA Function

Transmission of Genetic Information

1-DNA is inherited from parents to offspring, creating variation.

2-Before cell division, DNA is replicated so each daughter cell receives a complete set.

Gene Expression

1-Gene = segment of DNA used to make messenger RNA (mRNA).

2-Transcription: DNA → mRNA (in nucleus).

3-Translation: mRNA → protein (at ribosomes in cytoplasm).

DNA Function

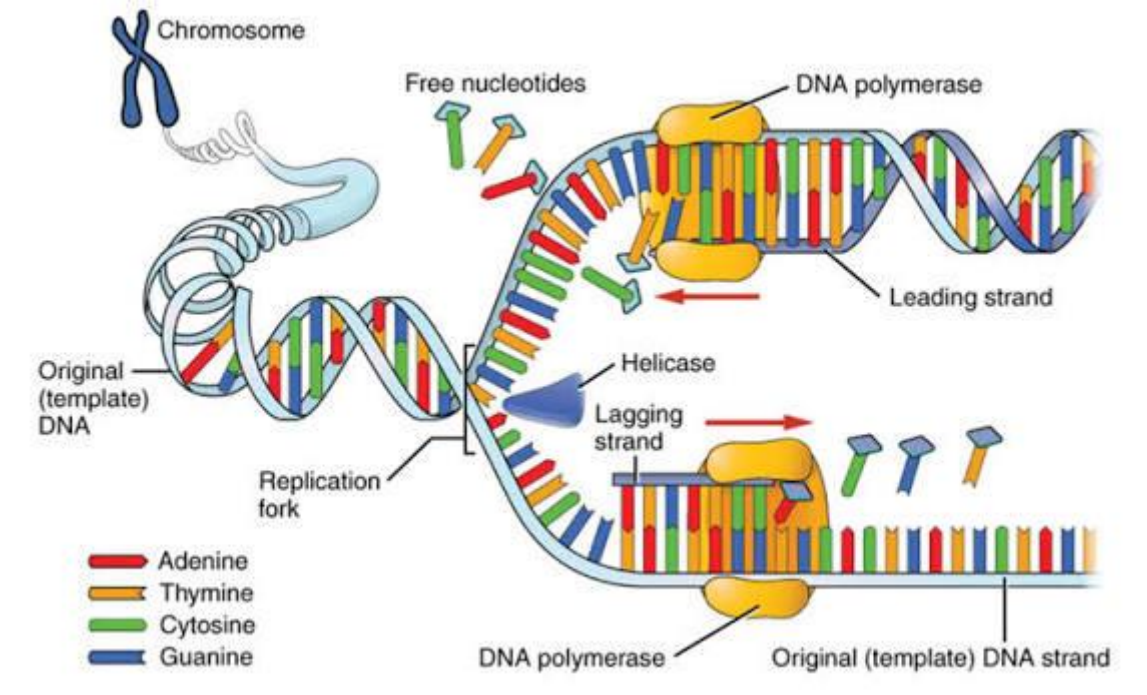
Mutation and Genetic Variation

1- Mutation = change in DNA nucleotide sequence.

2- Causes: mutagens (e.g., radiation, chemicals).

3-Effects: may alter phenotype, influence evolution, and affect population fitness.

DNA Function



RNA Overview

- Found in all living cells.
- Versatile molecule with multiple functions.
- Involved in:
- Protein synthesis
- Gene regulation
- Transmission of genetic information

Structure of RNA

- Single-stranded (unlike double-stranded DNA).
- Can form secondary structures (hairpins, loops).
- Made of nucleotides:
- Sugar (ribose)
- Phosphate group
- Nitrogenous base
- **Comparison with DNA**
- RNA: single-stranded | DNA: double-stranded.
- RNA: active role in protein synthesis and regulation.
- DNA: mainly stores genetic information.

RNA

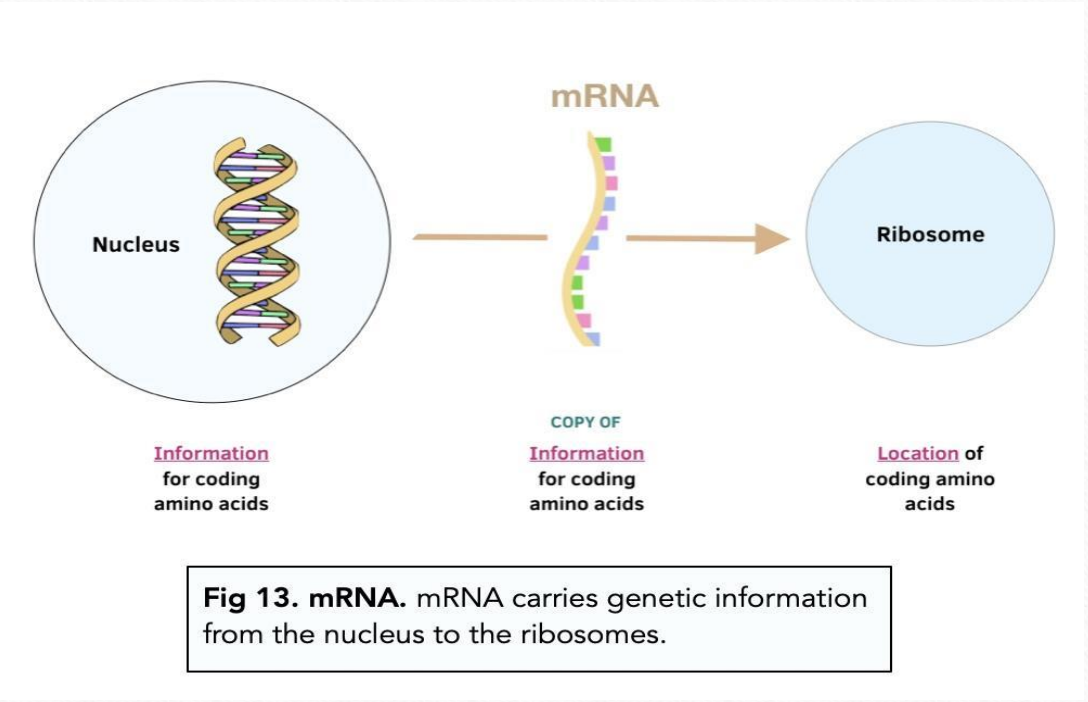


Fig 13. mRNA. mRNA carries genetic information from the nucleus to the ribosomes.

RNA Characteristics

- Contains ribose sugar (instead of deoxyribose in DNA).
- Has a phosphate group attached to ribose.
- Nitrogenous bases: Adenine (A), Uracil (U), Cytosine (C), Guanine (G).
- Uracil (U) replaces Thymine (T) of DNA.
- Base pairing: A–U, C–G.

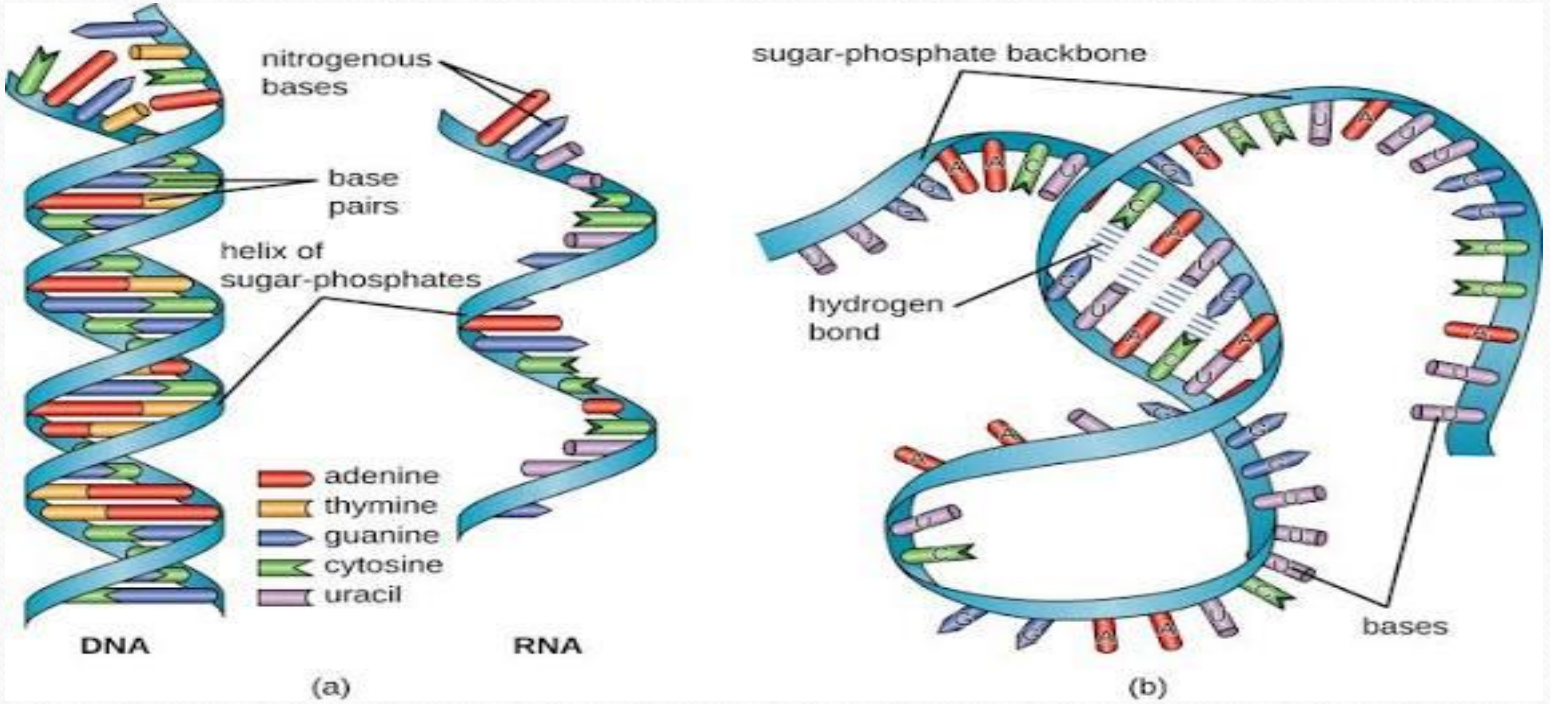
Types of RNA

- **mRNA (Messenger RNA):** Carries genetic information from DNA → ribosomes.
- **tRNA (Transfer RNA):** Brings amino acids; has anticodon complementary to mRNA codon.
- **rRNA (Ribosomal RNA):** Forms ribosomes; catalyzes peptide bond formation.
- miRNA & siRNA: Small RNAs regulating gene expression; degrade or block mRNA.

RNA Function

- **Protein synthesis (translation):** mRNA → protein.
- **Gene regulation:** miRNA & siRNA control expression.
- **RNA splicing**: Pre-mRNA → mature mRNA (introns removed, exons joined).
- **Genetic information transfer**: Some viruses use RNA as genetic material.

RNA Synthesise



Any Question


thank you