

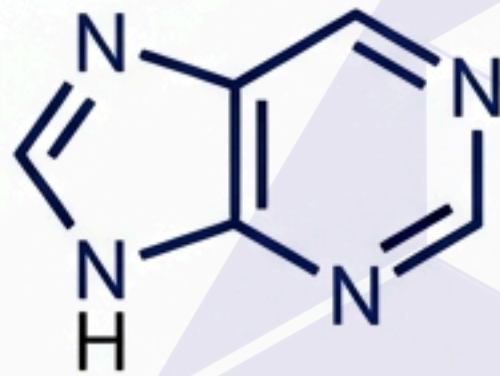
Polynucleotides That Carry Genetic Information

Unlocking the Chemical
Architecture of Nucleic Acids

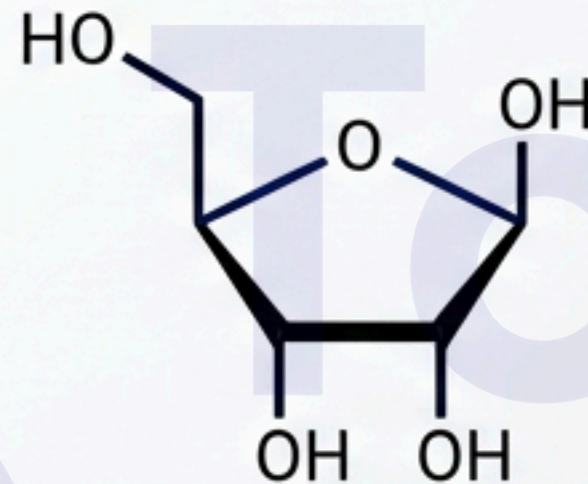


The Building Block: The Nucleotide

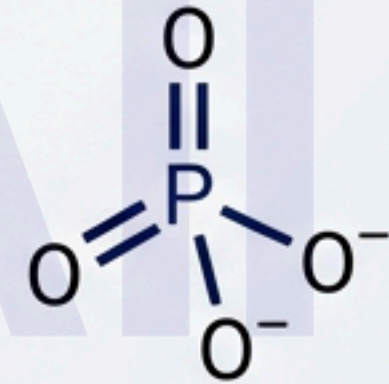
Nucleic acids are true biomacromolecules found in the acid-insoluble fraction of living tissues. They are polymers built entirely from repeating nucleotide monomers.



Heterocyclic Compound
(Base)



Monosaccharide
(Sugar)



Phosphoric Acid
(Phosphate)

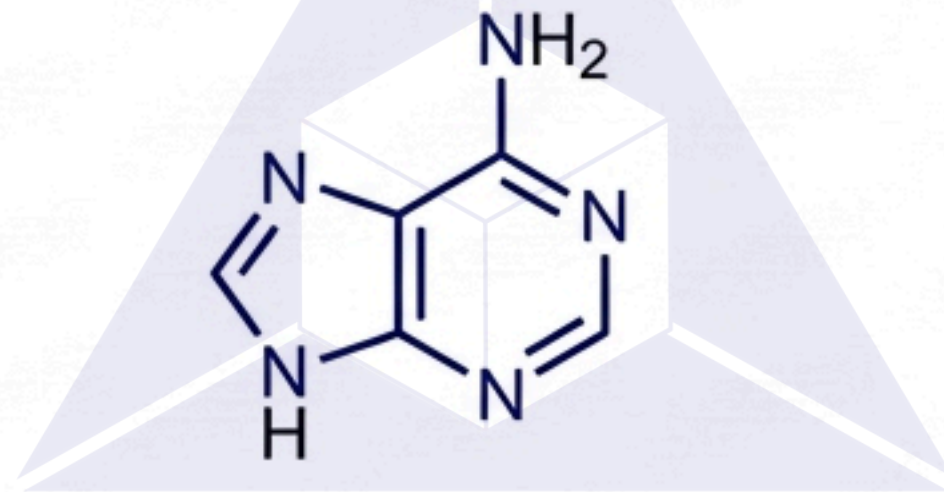
DO NOT CONFUSE

Nucleoside vs. **Nucleotide**. A nitrogenous base attached to a sugar is a **Nucleoside** (e.g., Adenosine). Only when a phosphate group is esterified to the sugar does it become a **Nucleotide** (e.g., Adenylic acid).

The Information Code: Nitrogenous Bases

The heterocyclic compounds in nucleic acids form the varying "letters" of the genetic code. They are divided into two distinct structural categories:

Purines

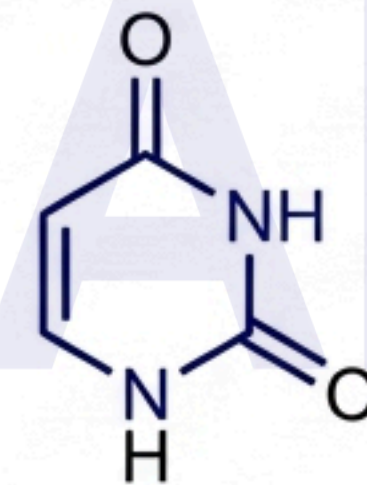


Substituted skeletal purine rings.

Adenine (A)

Guanine (G)

Pyrimidines



Substituted skeletal pyrimidine rings.

Cytosine (C)

Thymine (T)

Uracil (U)

Structural Insight: Purines are larger, double-ring structures, while pyrimidines are smaller, single-ring structures.



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Key Highlights

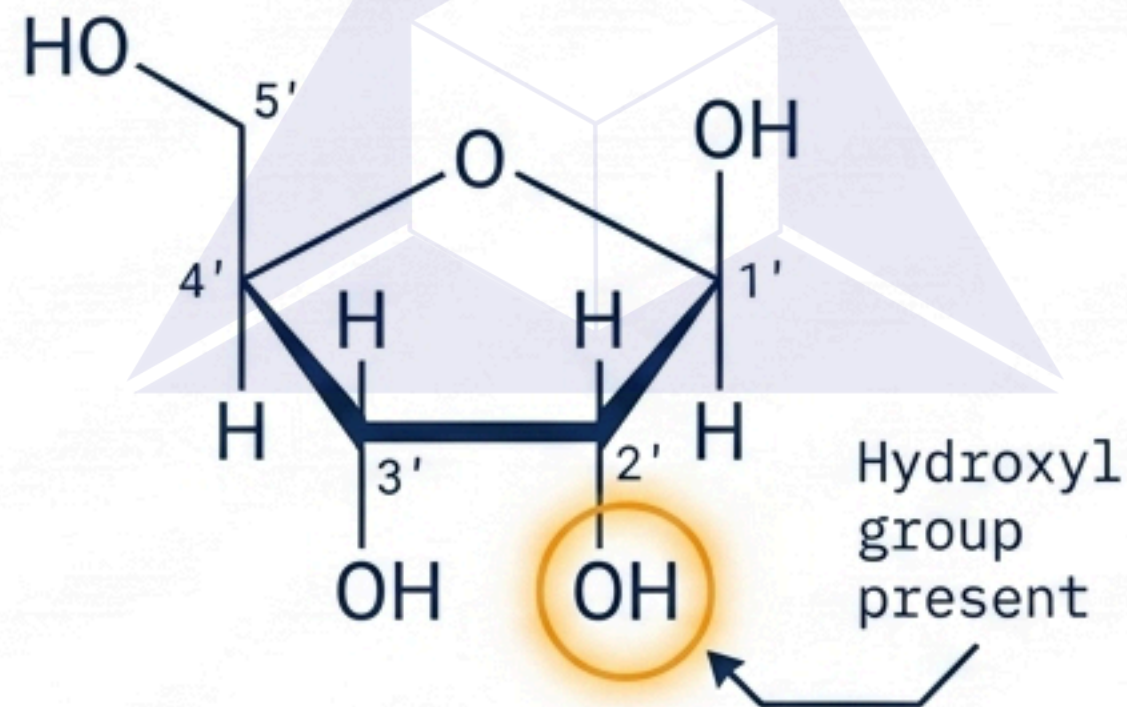
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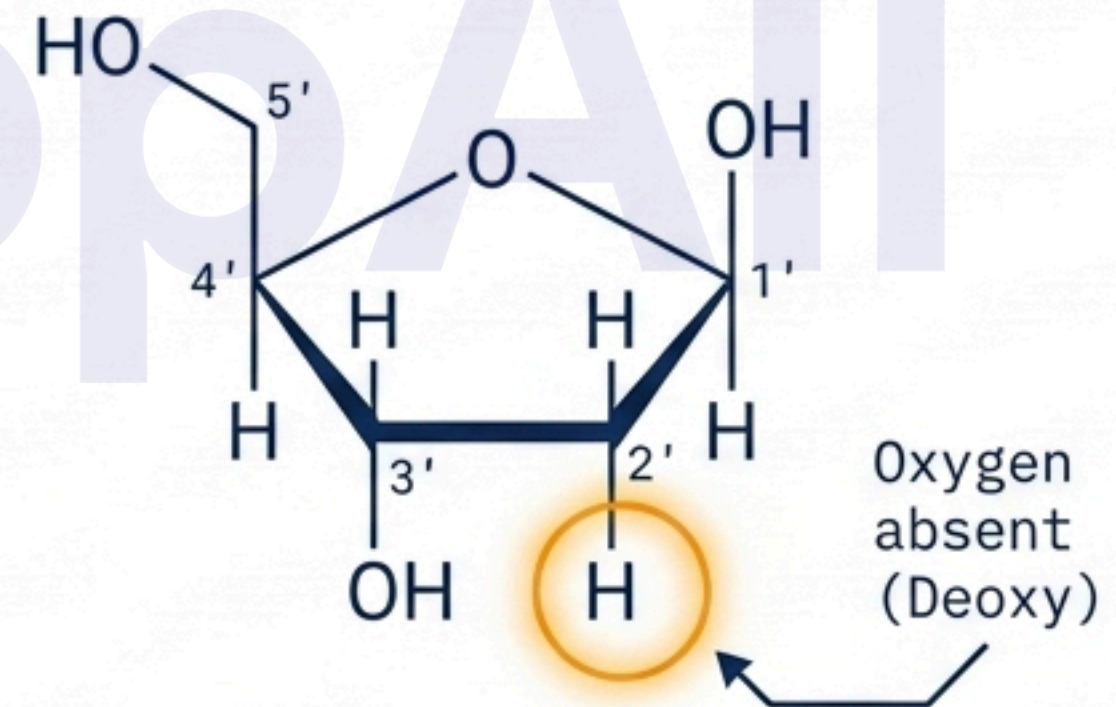
The Structural Backbone: Pentose Sugar

The monosaccharide component of a nucleotide is a 5-carbon (pentose) sugar. The specific type of sugar dictates the entire classification of the nucleic acid polymer.

Ribose (Found in RNA)



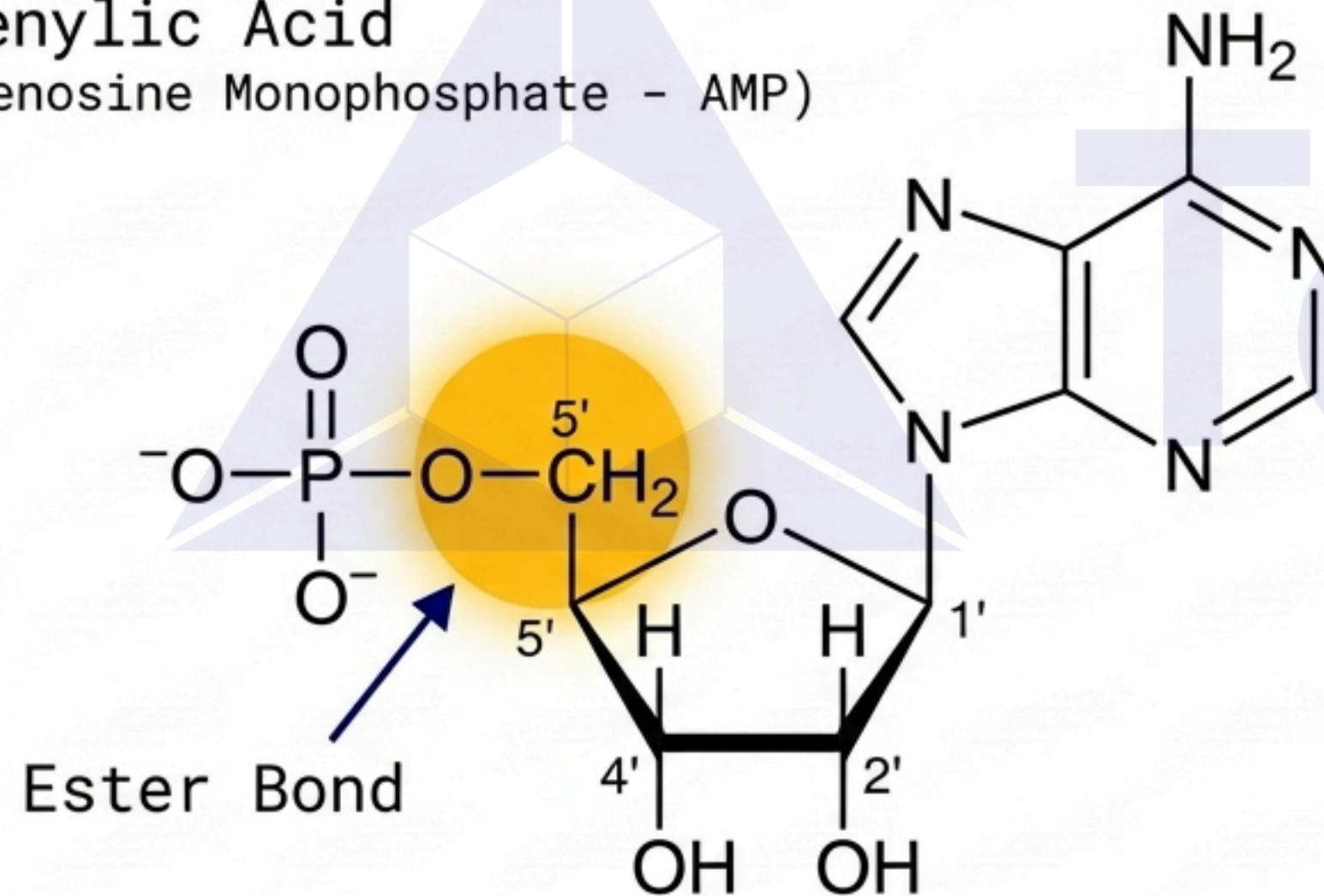
2' Deoxyribose (Found in DNA)



The Linking Mechanism: Phosphate Group

Phosphoric acid provides the critical link that transforms a single unit into a massive polynucleotide chain.

Adenylic Acid
(Adenosine Monophosphate - AMP)



- Binds to the pentose sugar via an ester bond.
- Converts a nucleoside into a functional nucleotide.
- Gives nucleic acids their characteristic acidic nature (forming the acid-insoluble fraction).

Macromolecular Polymers: DNA vs. RNA

How varying the micro-components creates two distinct master molecules.

Feature	DNA (Deoxyribonucleic Acid)	RNA (Ribonucleic Acid)
Sugar	2' Deoxyribose	Ribose
Purine Bases	2' Deoxyribose	2' Deoxyribose
Purine Bases	Adenine, Guanine	Adenine, Guanine
Pyrimidine Bases	Cytosine, Thymine	Cytosine, Uracil

Key Difference: RNA utilizes Uracil (U) in place of DNA's Thymine (T).

The Master Molecules of Heredity

Nucleic acids (DNA and RNA) are true macromolecular polynucleotides constructed from highly **specific nucleotide building blocks** (Base + Sugar + Phosphate). Their precise **sequence of nitrogenous bases allows them to encode, store, and transmit the hereditary information required for all living organisms, passing traits from parental generation to progeny.**



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