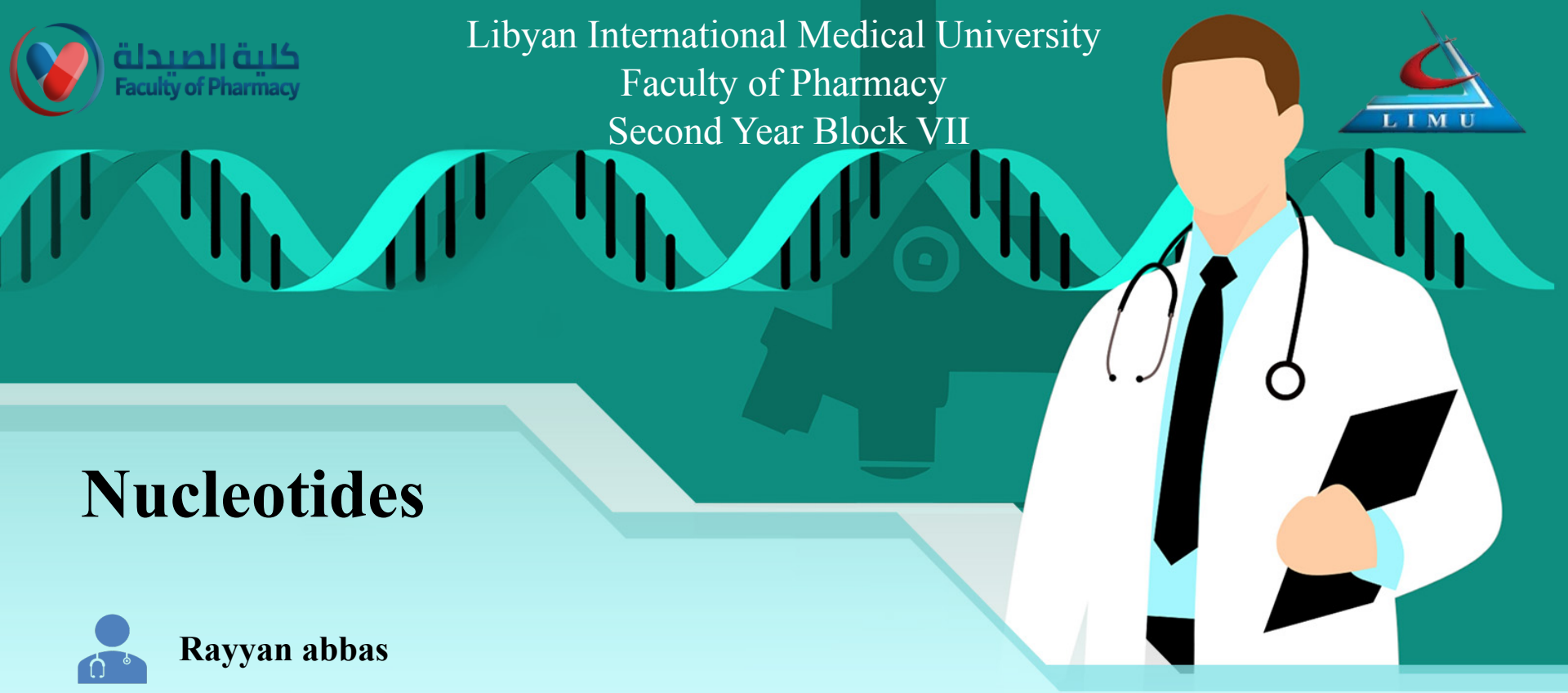
Libyan International Medical University
Faculty of Pharmacy
Second Year Block VII



Nucleotides

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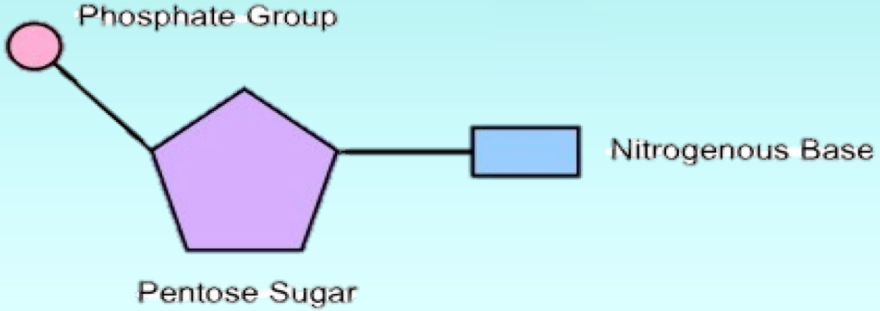
Objectives:

- Describe the structure of Nucleotides
- List function of Nucleotides
- Describe Nucleotide Synthesis
- Discuss degradation of purine nucleotides

Nucleotides

- Nucleotides are the basic building blocks of nucleic acids (both DNA & RNA) Structurally, nucleotides have 3 components.
- A nucleotide consists of a sugar molecule (either ribose in RNA or deoxyribose in DNA) attached to a phosphate group and a nitrogen-containing base. The bases used in DNA are adenine (A), cytosine (C), guanine (G), and thymine (T). In RNA, the base uracil (U) takes the place of thymine.
- The molecule without the phosphate group is called a nucleoside.



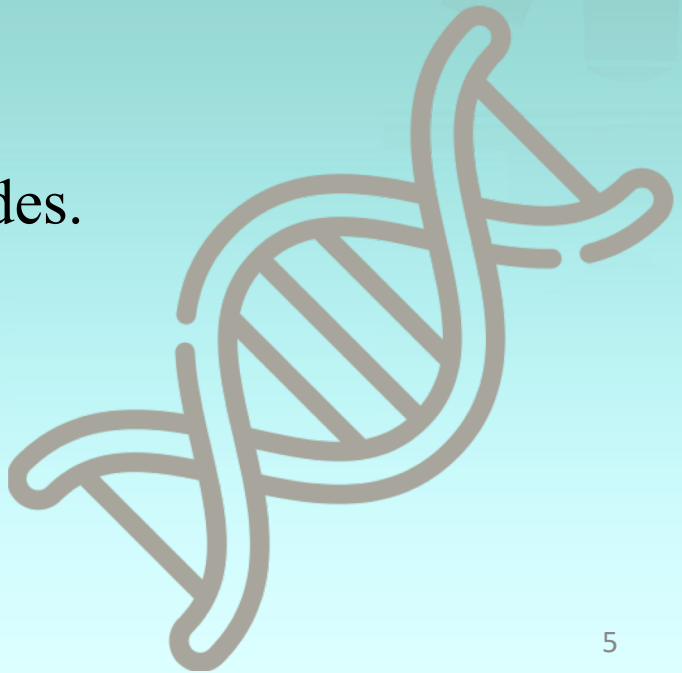
Function of Nucleotides

- Nucleotides are precursors of the nucleic acids, deoxyribonucleic acid (DNA) and ribonucleic acid (RNA).
- Besides being the basic unit of genetic material for all living things.
- Nucleotide can be a base in another molecule, such as adenosine triphosphate (ATP), which is the main energy molecule of the cell.
- They are also coenzymes like NAD and NADP these molecules are used in many chemical reactions that play roles in metabolism.

Nucleotide Synthesis

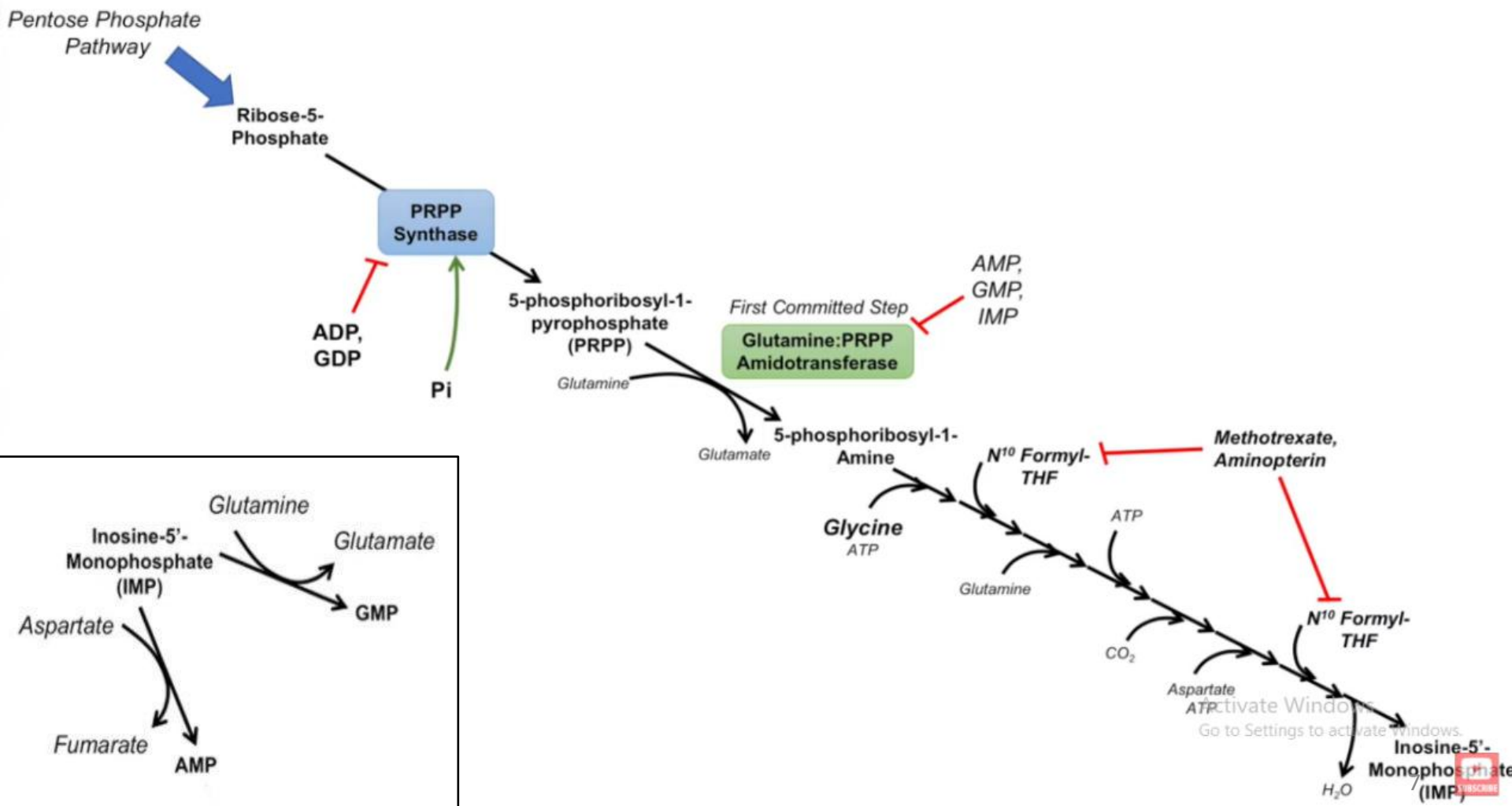
- There are two pathways for the synthesis of nucleotides:

1. De novo Synthesis of Purine Nucleotides.
2. Salvage Pathway.



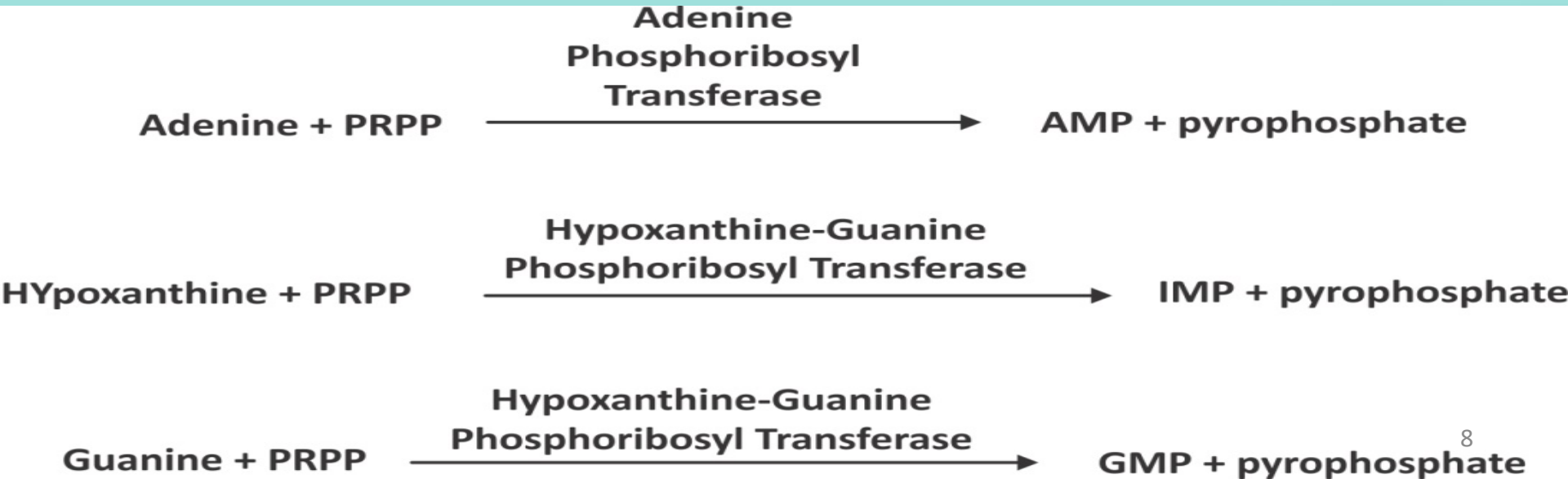
De novo Synthesis of Purine Nucleotides

- Amino acids(Glycine, Glutamine and Aspartate) , CO_2 and one carbon donors are required for synthesis of new molecule of purine nucleotide.
- Synthesis of purine nucleotide occurs in most of the tissue but Mainly in liver.
- Purine monophosphates (IMP, GMP, and AMP) are synthesized instead of free purine.


Pentose Phosphate Pathway
Ribose-5-Phosphate
PRPP Synthase
ADP, GDP
Pi
5-phosphoribosyl-1-pyrophosphate (PRPP)
First Committed Step
Glutamine:PRPP Amidotransferase
AMP, GMP, IMP
Glutamine
Glutamate
5-phosphoribosyl-1-Amine
Glycine
ATP
N10 Formyl-THF
Methotrexate, Aminopterin
Glutamine
ATP
CO2
Aspartate
ATP
N10 Formyl-THF
H2O
Inosine-5'-Monophosphate (IMP)
Glutamine
Inosine-5'-Monophosphate (IMP)
Glutamate
GMP
Aspartate
Fumarate
AMP

Salvage Pathway

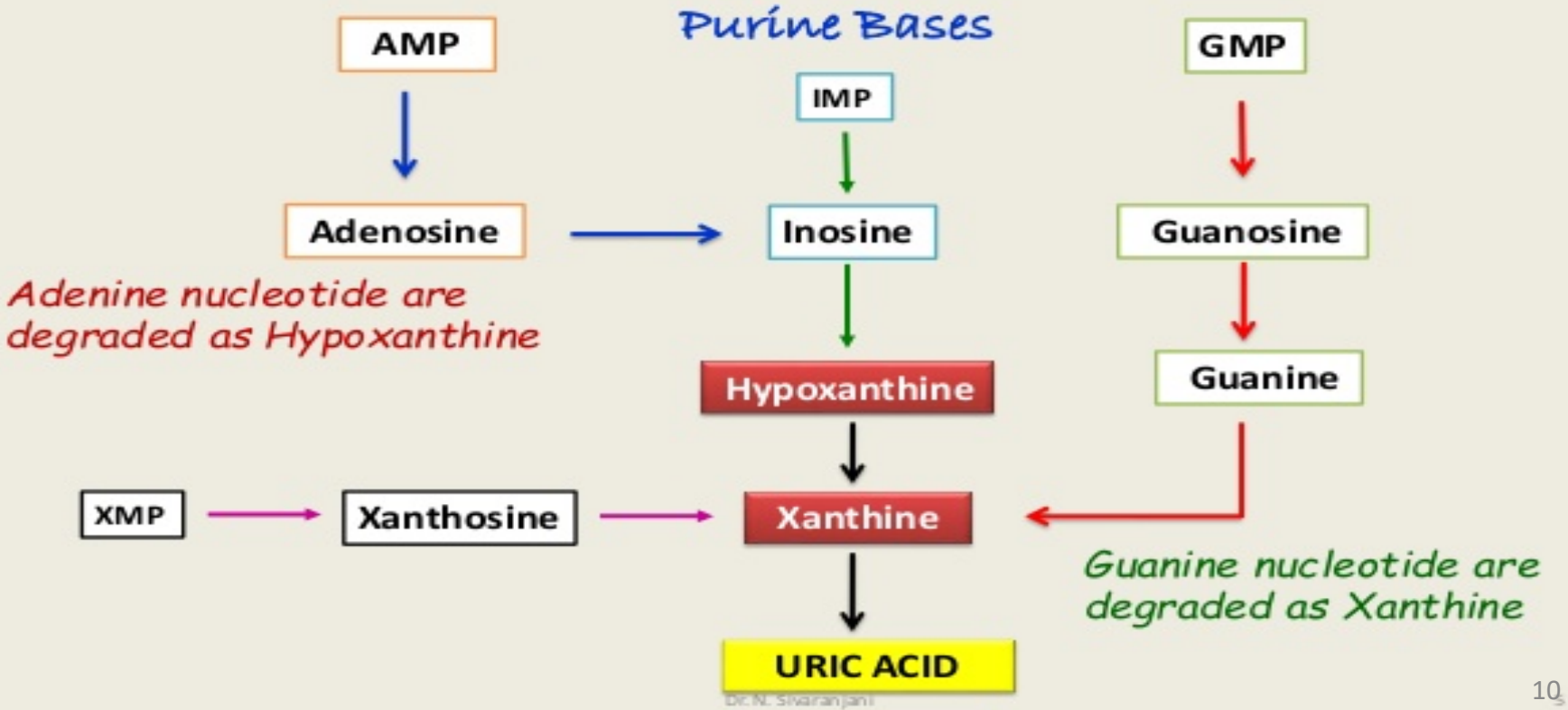
Salvage pathways recycle the free purines and purine nucleosides released from nucleic acid breakdown



Q & A

❖ What is the difference between De novo and Salvage pathway?

Degradation of purine nucleotides

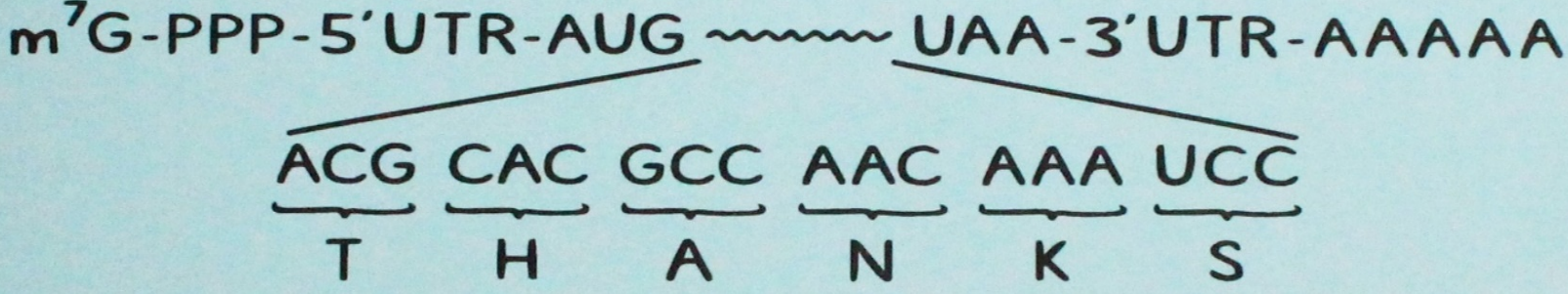


Summary

- Nucleotides are the basic building blocks of nucleic acids.
- There are two pathways De novo and salvage pathway.
- De novo pathway synthesis of purine nucleotide occurs in most of the tissue.
- Salvage pathways recycle the free purines and purine nucleosides.

References

- https://www.genome.gov/genetics-glossary/Nucleotide
- https://biologydictionary.net/nucleotide/#nucleotide-function
- Harper's Biochemistry
- Lippincott's Illustrated Reviews Biochemistry



a message of thanks