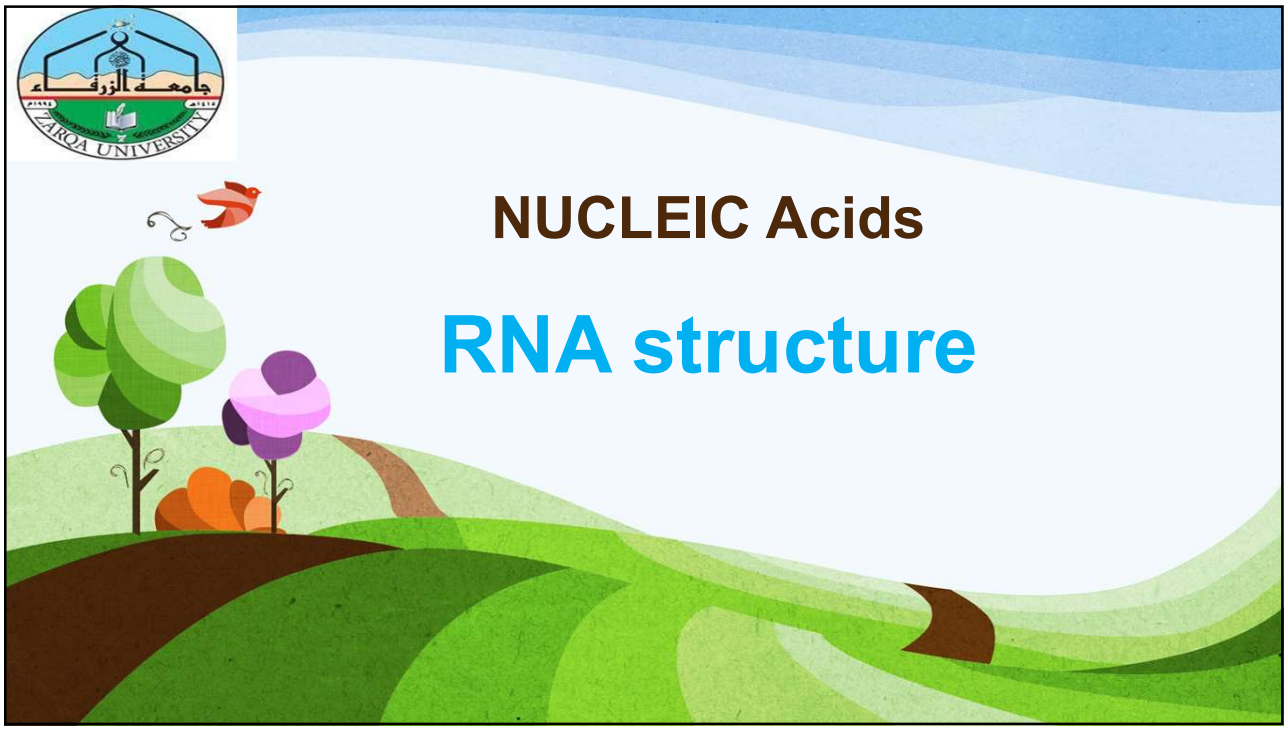


1

RNA Structure

- The polynucleotide structure of RNA is similar to DNA ***except*** that RNA contains the sugar **ribose** rather than **deoxyribose** and **uracil** rather than **thymine**

- **RNA** is generally **single-stranded** (but sometimes form **base pairing** and even **supercoiling**)

رغم انه RNA single الا انه بعض الاحيان يكون عامل double helix A form DNA,supercoiling

Differ from DNA

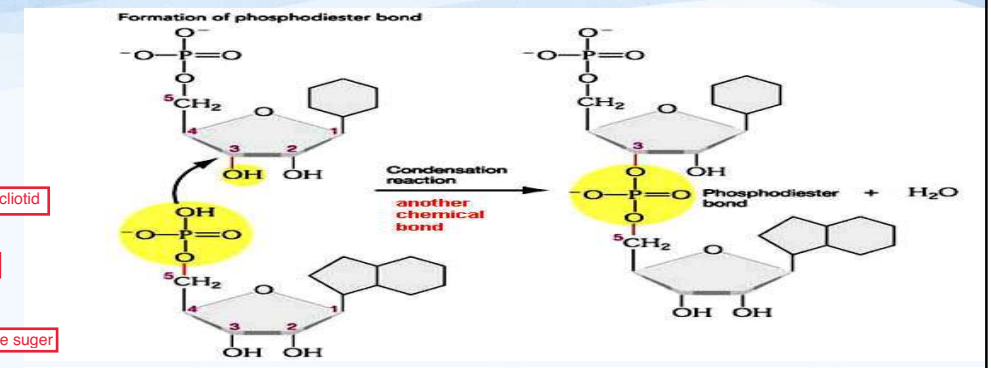
- Smaller
- Ribose
- Uracil
- Single strands (**Usually**)

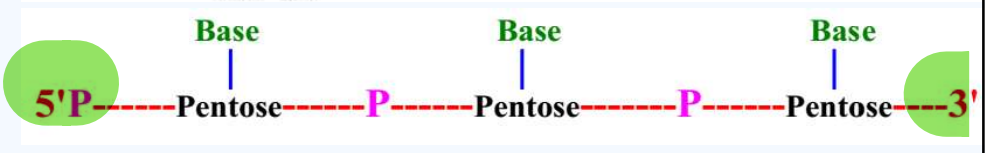
2

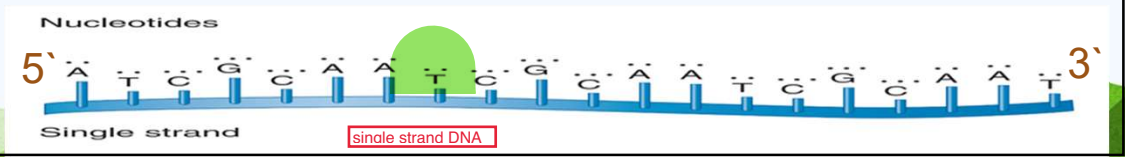
RNA Structure

RNA structure

- Building units (nucliotid)
- Bonds (phosphodiestar)
- Backbone (phosphate suger)
- Genetic code
- Ends (5 prime end, 3 prime end)







3

RNA Structure

بعض انواع ال RNA ممكن تشتغل ك enzyme

- Some **RNA molecules** act as **catalysts** of reactions; thus, RNA, as well as protein, can have **Enzymatic Activity**.

  - **Ribozymes**, usually precursors of rRNA, remove internal segments of themselves, **splicing** the ends together.

بقطع وبعدل نفسه بنفسه

  - RNAs also act as **ribonucleases**, cleaving other RNA molecules (e.g., RNase P cleaves tRNA precursors).

RNA Types

- **3 major types** of RNA (major; linked to protein synthesis)

  ribosomal (rRNA), **transfer** (tRNA), and **messenger** (mRNA)

- **Other Types** of RNA (**Noncoding** RNA) (non coding;non linked to protein)

4

A- Transfer RNA (tRNA)

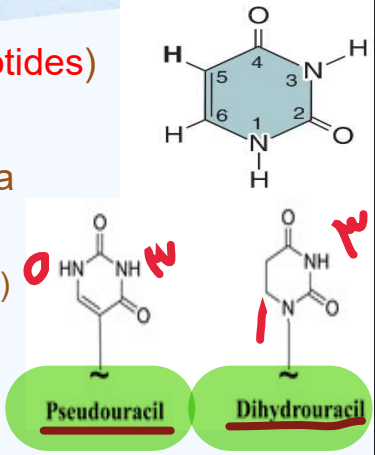
بشتغل ك carrier amino acid

- **Smallest** of the three major of RNA (about 80 nucleotides)
- About **15%** of the total RNA
- **At least one type** of tRNA for each of 20 standard aa
- Contains **unusual** bases يعني ممكن الاقي فيه اشياء uncommon

(**Dihydrouracil (D)**, **pseudouracil (ψ)**, and **thymine (T)**)

psedouracil ال على N 3,5

uracil ال العادي بكون ال ع N 1,3



- Have extensive intrachain base-pairing ⇨ **2ry** structure
- Characteristic **tertiary** (**supercoiling**) structure (**clover leaf** appearance)
- AA **carrier** in ptn synthesis (**Adaptor**)

5

tRNA structure

Five main arms:

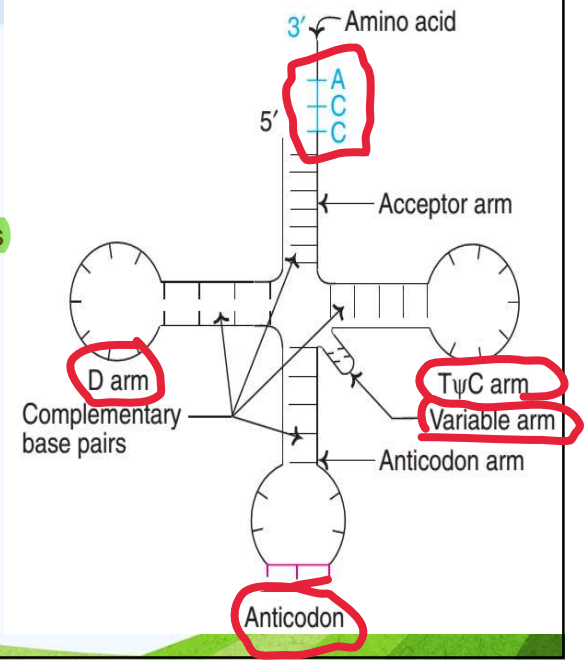
1- **Acceptor arm**: terminates at its **3`** end by a **CCA** sequence and it carries the amino acids

2- **D- arm**: contains dihydrouracil.

3- **Anticodon arm**: contains three specific bases (**anticodon**). It plays a key role in translation by **pairing** with the complementary codon of mRNA

4- **Extra arm** ايضا يسمى variable arm

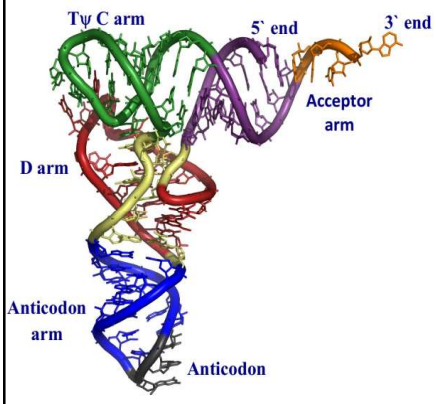
5- **TψC arm**: contains (thymine - pseudouridine - cytosine).



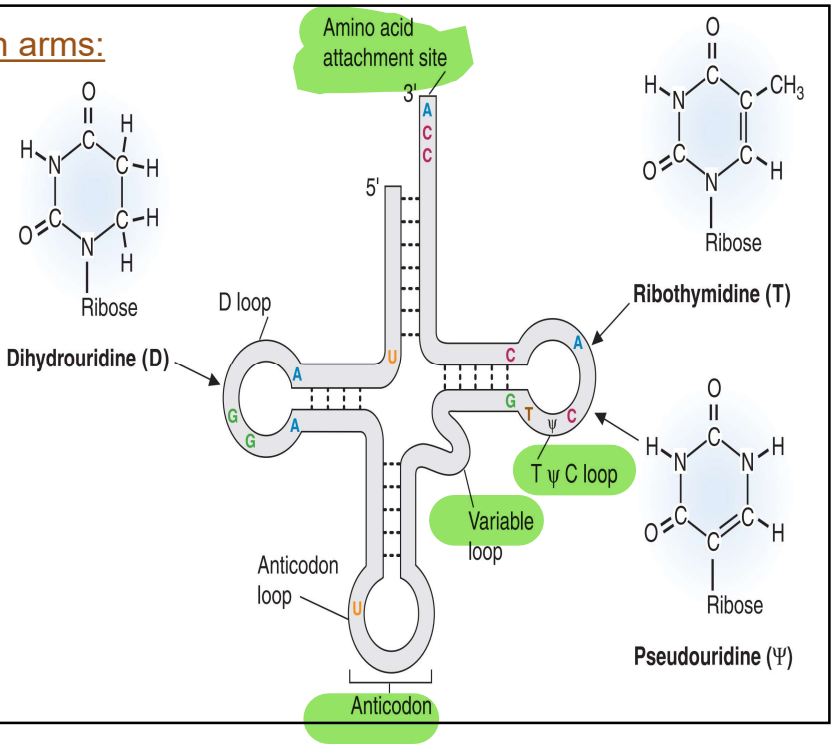
6

tRNA Structure

Five main arms:



(clover leaf appearance)



7

B- Messenger RNAs (mRNAs)

- About **5%** of the total RNA
- Carries **information** from **DNA** (**Nucleus**) for **protein synthesis** (**Cytosol**)

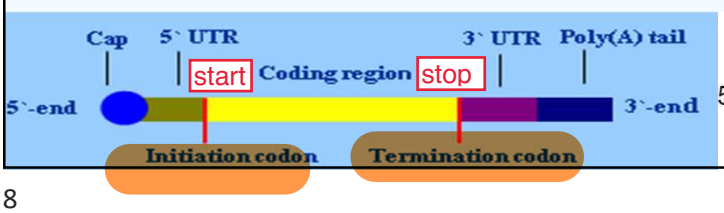
Structure of **Mature** eukaryotic mRNA

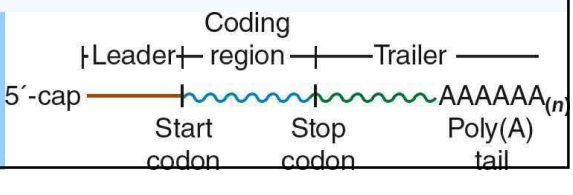
- Cap at 5' end
  (**methylated guanine triphosphate**)
- Poly A tail at 3' end
  (up to **200 adenine** (A))
- The coding region
- Untranslated regions (UTRs)

بعد

Posttranscriptional modification

cap , tail
بصيروا بعد ما نعمل transcription



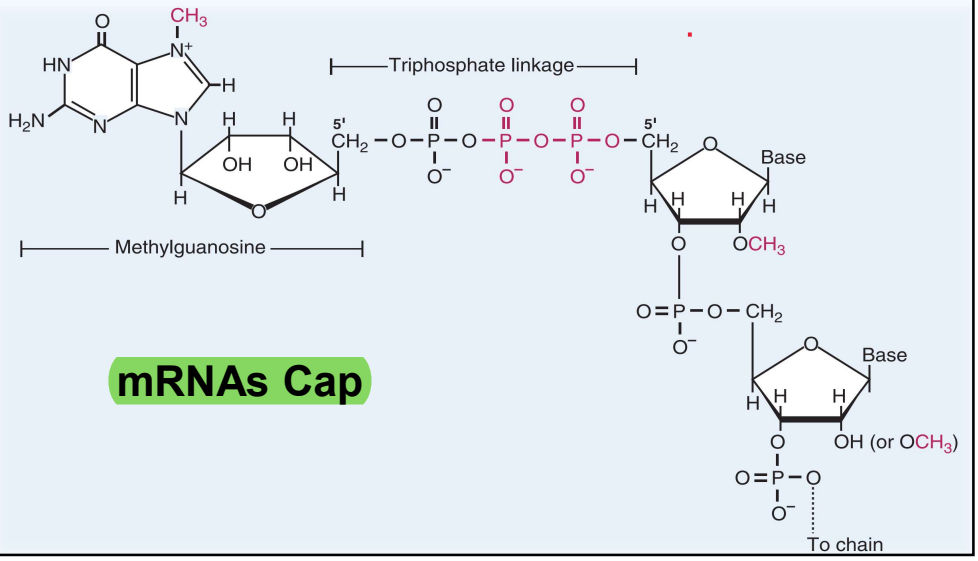


8

The **cap** consists of **methylated guanine triphosphate** attached to the hydroxyl group on the ribose at the 5′ end of the mRNA.

this cap protect strand RNA from exonuclease

*N.B. The 2'-hydroxyl groups of the **first** and **second** ribose moieties of the mRNA also may be methylated*



mRNAs Cap

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B- Messenger RNAs (mRNAs)

N.B.

-coding for one protein
-one initation/termination codon
-site in eukaryote

-coding for more one protein
-more one initation/ termination codon
-site in prokaryote

Monocistronic mRNA & Polycistronic mRNA

10

C- Ribosomal RNA (rRNA)

rRNA more stable
بضل فترة طويلة وما بتكسر بسرعة
زى ال mRNA

- **Associated** with several proteins → **ribosomes**
- Serve as the site for protein **synthesis**
- About **80%** of the total RNA

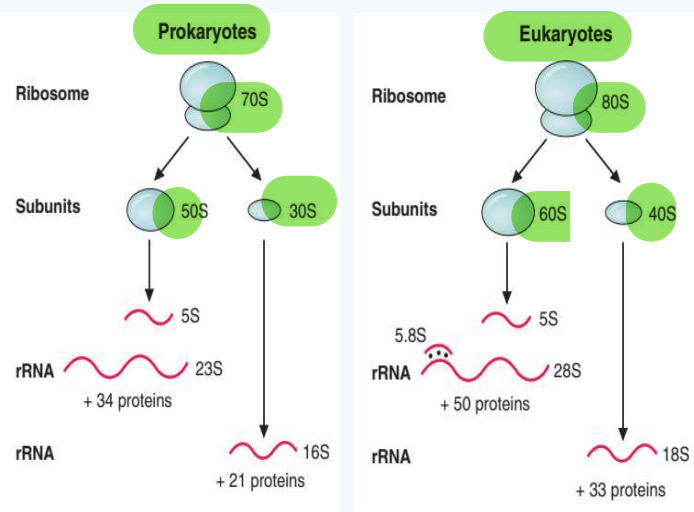
- Structure of ribosomes

- In prokaryotic cells

The fully active **70S** ribosomes
(**50S** subunit and the **30S** subunit)

- In Eukaryotic cells

The fully active **80S** ribosomes
(**60S** subunit and the **40S** subunit)



The Svedberg unit (S) offers a measure of a particle's size based on its **sedimentation rate.**

بدنا نعرف انه ال
sedmentation velocity
هي سرعة الترسيب
وحدة قياس اجزاء الرايبوسوم- S

11

Other Forms of RNA (Noncoding RNA)

non coding
حكينا انه ما بشتركوا بال
protein synthesis

Include;

- The **oligonucleotides** that serve as **primers** for DNA replication

nuclear موجودين بال

- **Small nuclear RNAs** (**snRNAs**) as a part of **Small nuclear ribonucleoproteins** (**snRNPs** or **snurps**) that are involved in the **splicing** and **processing** of RNA precursors

small nuclear RNA/protein

- **Micro RNAs** (**miRNAs**): important role in **regulation of gene expression**

JI

12

Comparison between DNA and RNA

	DNA	RNA
Nitrogenous Bases:		
a- Purines	Adenine & Guanine	Adenine & Guanine
b- Pyrimidines	Cytosine Thymine No uracil	Cytosine Thymine as minor base in tRNA Uracil
Sugar:	2-Deoxyribose	Ribose
Shape of strand:	Double helix	Single strand
Types:	Circular or linear (A, B & Z forms)	mRNAs tRNAs rRNAs
Site:	Nucleus and Mitochondria	Mainly in cytosol, less commonly in nucleus and mitochondria
Functions:	Genetic information and synthesis of RNAs	Protein synthesis

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