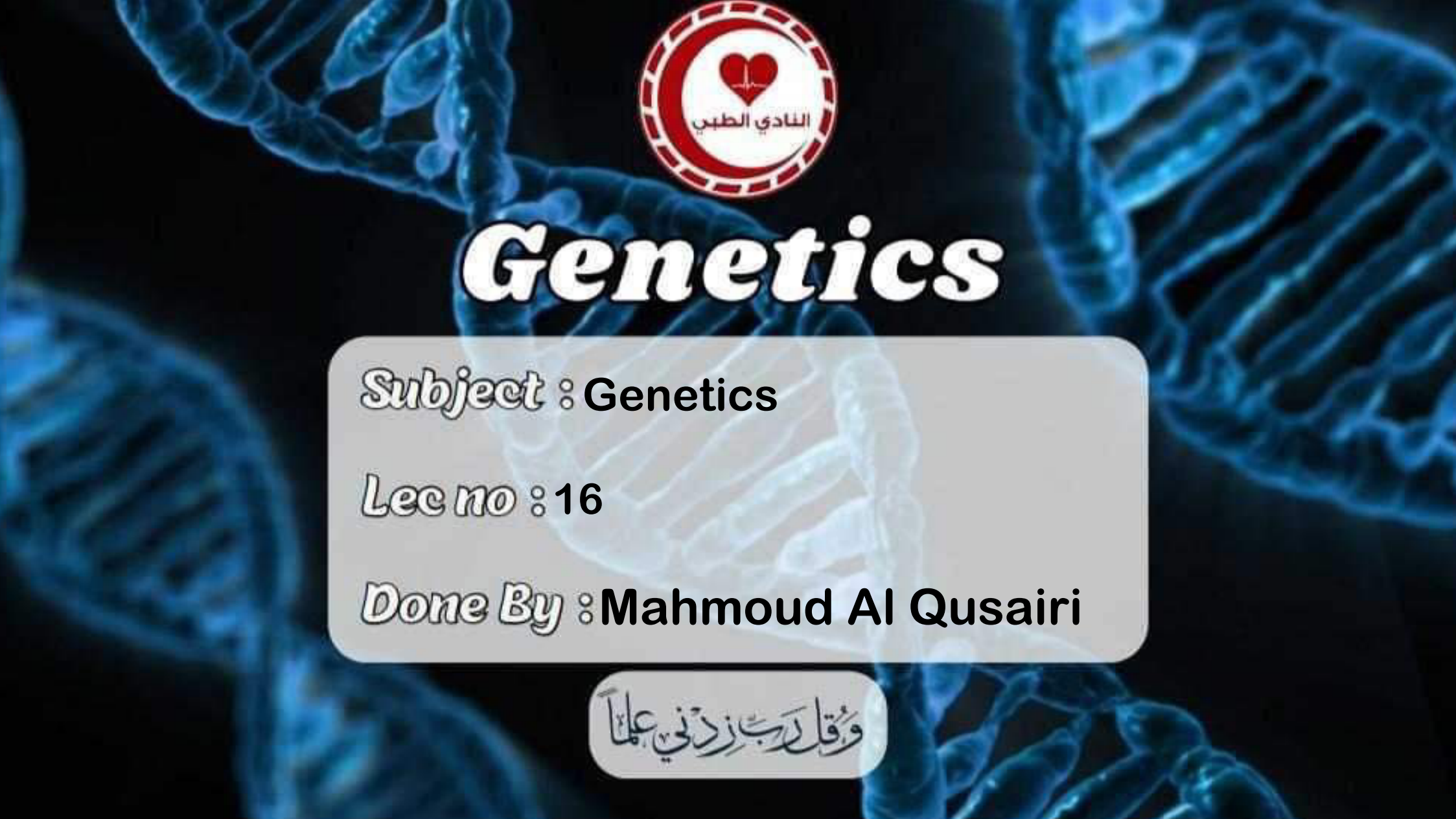

النادي الطبي
Genetics
Subject : Genetics
Lec no : 16
Done By : Mahmoud Al Qusairi
وقل رب زدني علماً


لا إله إلا الله
كتائب

Post-translational processing of polypeptide chains

*في بعض الأحيان يكون البروتين الناتج inactive
مثل: Insulin
* Insulin عندما يتصنع من translation يكون inactive polypeptide chain (inactive) ← مكونة من (109 a.a) long chain كـ يتكون
* insulin يحتاج لكي يتحول ← (active) post-translational modifications
* مثال على modifications اللي بتغير Trimming (قصقصة) ← active insulin ← Trimming ← inactive insulin

قصقصة

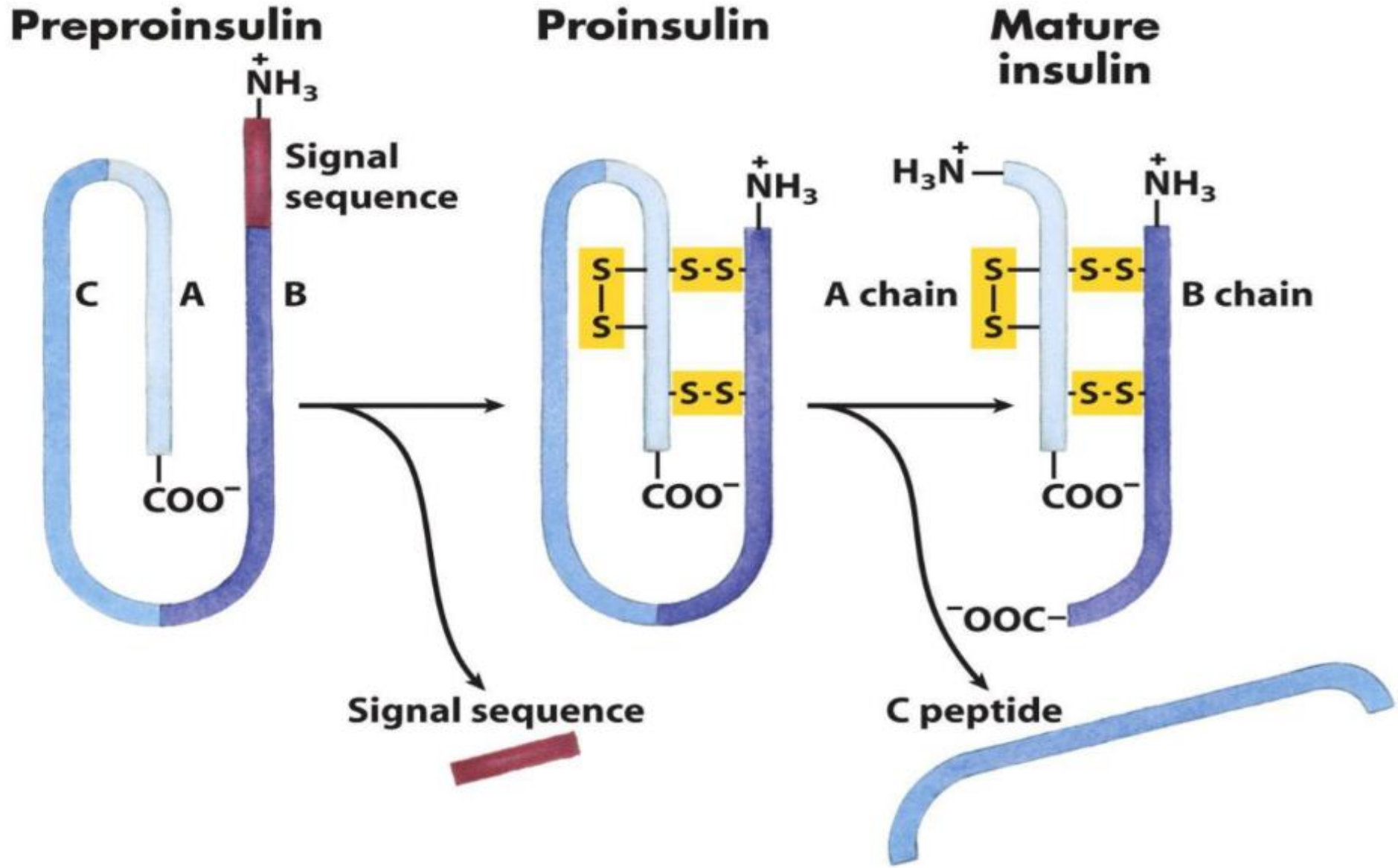
Trimming: many proteins are formed as large **precursor molecules** that are functionally inactive, and part of their chains must be removed to release the active molecules.

- Trimming means removal of part of the peptide chain.

- **Insulin** is translated as a protein containing 109 amino acids known as **preproinsulin**.

Trimming عملية بيتم قطعها في piece أول

A signal peptide of 23 aa is removed, forming **proinsulin**.
A further 35 aa are removed, forming insulin that contains only 51 aa


Preproinsulin
Proinsulin
Mature insulin
NH3
Signal sequence
C
A
B
COO−
S
S
S-S
S-S
H3N
A chain
B chain
−OOC−
Signal sequence
C peptide

Covalent modification of the polypeptide chains

chemical group عملية إضافة أو إزالة
active or inactive فيتحول البروتين إلى

- It means addition of chemical groups which may activate or inactivate the proteins. These chemical groups are:

عملية إضافة phosphate group وهذا يجعل البروتين inactive / active إما

phosphorylation يقوم بـ
phosphate group إضافة ← Kinase
phosphate group إزالة ← phosphatase
activation إما يعملوا inactivation أو

1. **Phosphorylation**: It means the addition of phosphate group to the enzyme which may activate or inactivate this enzyme.

* عملية إضافة phosphate group تكون على (hydroxyl of serine, threonin or tyrasin)

occurs on hydroxyl groups of **serine**, **threonine** or **tyrosine** residues of proteins. This Phosphorylation is catalyzed by **protein kinases** & reversed by **protein phosphatases** e.g. phosphorylation of enzymes & receptors.

Covalent modification of the polypeptide chains

عملية إضافة carbohydrate chain تكون على hydroxyl of serine or threonin و amide group of asparagin

carbohydrate chain (group) عملية إضافة على البروتين. ← هذا يجعل protein إما inactive أو active

2. **Glycosylation:** It means **addition** of carbohydrates chain to the protein to form glycoproteins. The carbohydrates chains may be attached to the hydroxyl group of serine or threonine (O-linked) or the amide group of asparagine (N-linked).

عملية إضافة hydroxl group إلى البروتين

Important for the structure of callagen: hydroxyproline ← proline, hydroxylysine ← lysine ← تكون عملية إضافة hydroxl group على *

3. **Hydroxylation:** It means **addition** of hydroxyl group to the protein. e.g. in collagen fibers

مثال على Hydroxylation

Proline and lysine amino acids are hydroxylated to form hydroxyproline and hydroxylysine. Important for formation of strong collagen.

Covalent modification of the polypeptide chains

إضافة carboxyl group إلى البروتين

* عملية إضافة carboxyl group تكون إلى glutamic acid
لـ وهذا يساعد protein على الارتباط مع calcium لتكوين blood clots

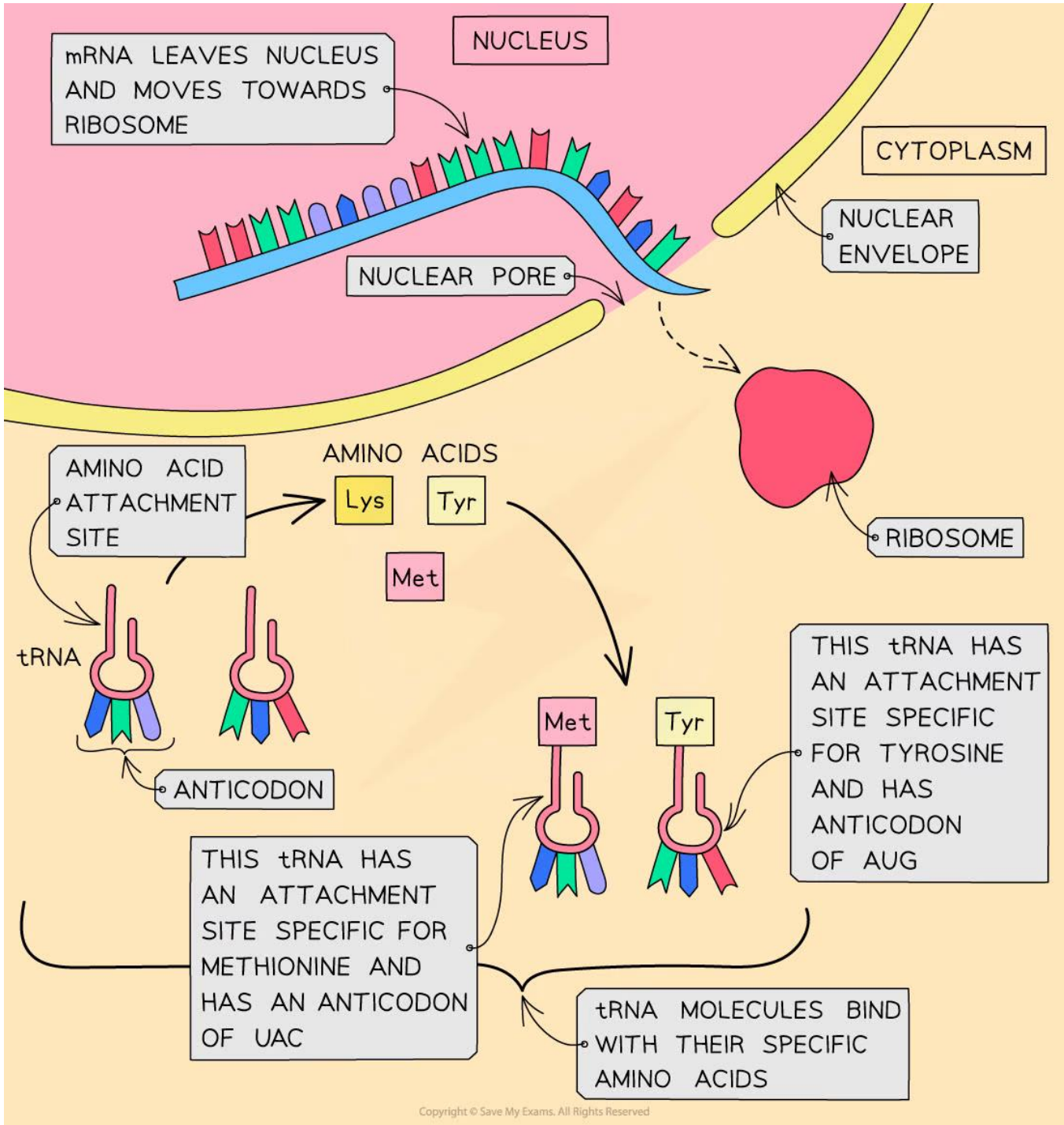
4. **Carboxylation:** It means **addition** of carboxylic group (COO^-) to the protein e.g. carboxylation of glutamic acid residues in some clotting factors to help them to bind calcium and formation of blood clot.

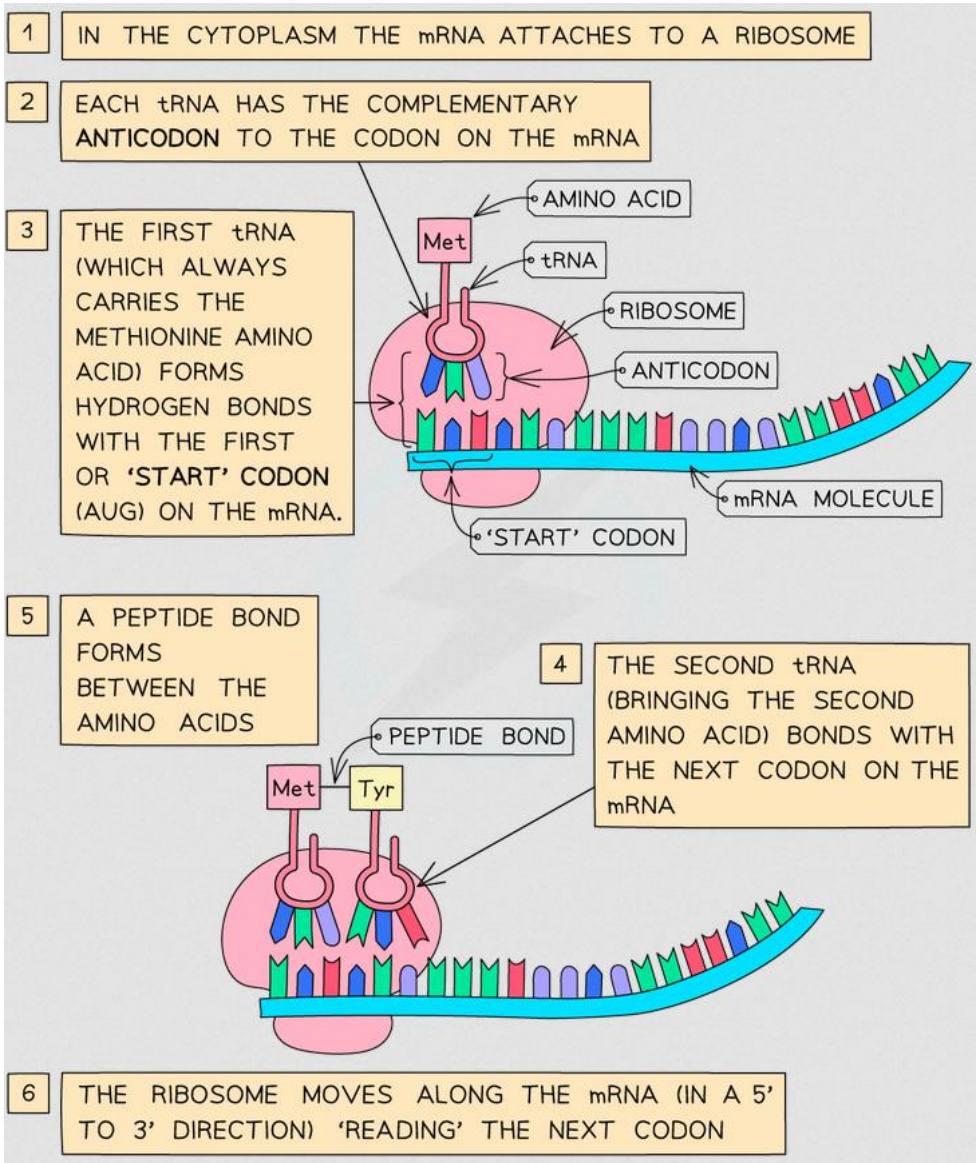
protein إلى acetyl group إضافة، عملية ← active or inactive وهذا يجعله

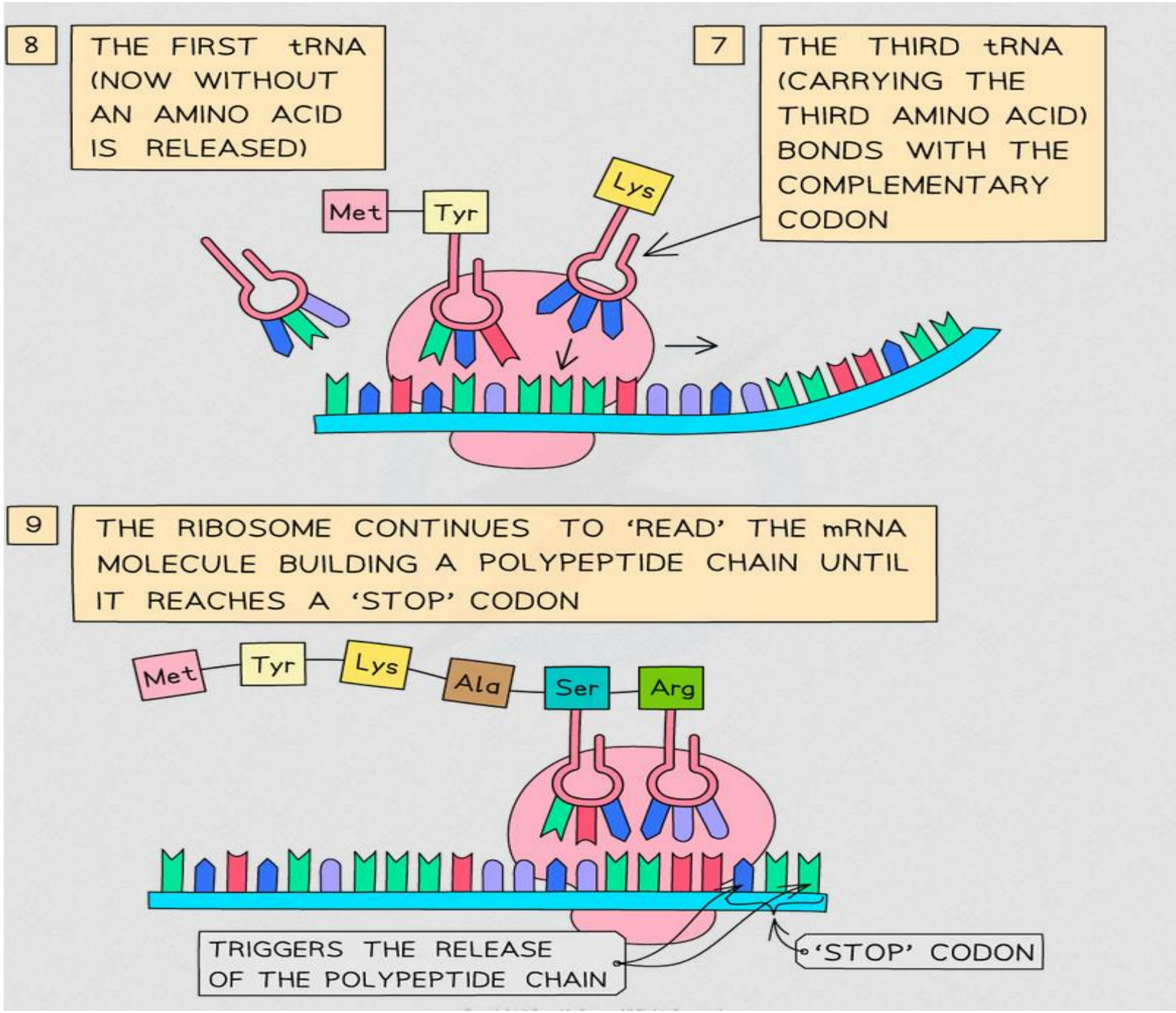
5. **Acetylation:** It means **addition** of acetyl group to the proteins. Acetyl radicals may be connected to the ε amino group of lysine. This is very important in histones as it leads to separation from DNA, which becomes transcriptionally active.

لـ فقط المخطط هو المطلوب

it's important in separation of histones ← acetylation from DNA.




1
IN THE CYTOPLASM THE mRNA ATTACHES TO A RIBOSOME
2
EACH tRNA HAS THE COMPLEMENTARY **ANTICODON** TO THE CODON ON THE mRNA
3
THE FIRST tRNA (WHICH ALWAYS CARRIES THE METHIONINE AMINO ACID) FORMS HYDROGEN BONDS WITH THE FIRST OR **'START' CODON** (AUG) ON THE mRNA.
AMINO ACID
Met
tRNA
RIBOSOME
ANTICODON
mRNA MOLECULE
'START' CODON
5
A PEPTIDE BOND FORMS BETWEEN THE AMINO ACIDS
4
THE SECOND tRNA (BRINGING THE SECOND AMINO ACID) BONDS WITH THE NEXT CODON ON THE mRNA
PEPTIDE BOND
Met
Tyr
6
THE RIBOSOME MOVES ALONG THE mRNA (IN A 5' TO 3' DIRECTION) 'READING' THE NEXT CODON


8
THE FIRST tRNA (NOW WITHOUT AN AMINO ACID IS RELEASED)
7
THE THIRD tRNA (CARRYING THE THIRD AMINO ACID) BONDS WITH THE COMPLEMENTARY CODON
Met
Tyr
Lys
9
THE RIBOSOME CONTINUES TO 'READ' THE mRNA MOLECULE BUILDING A POLYPEPTIDE CHAIN UNTIL IT REACHES A 'STOP' CODON
Met
Tyr
Lys
Ala
Ser
Arg
TRIGGERS THE RELEASE OF THE POLYPEPTIDE CHAIN
'STOP' CODON