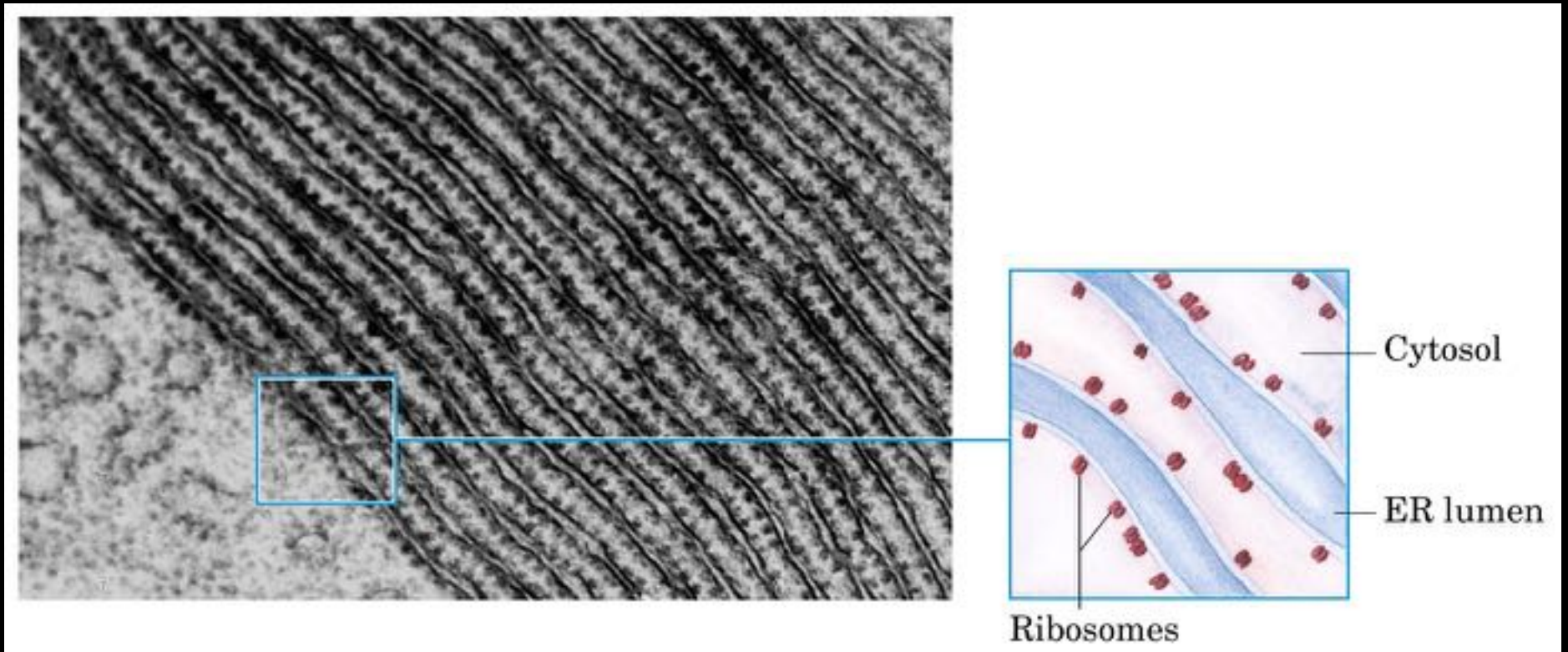
Tradução

Retículo endoplasmático

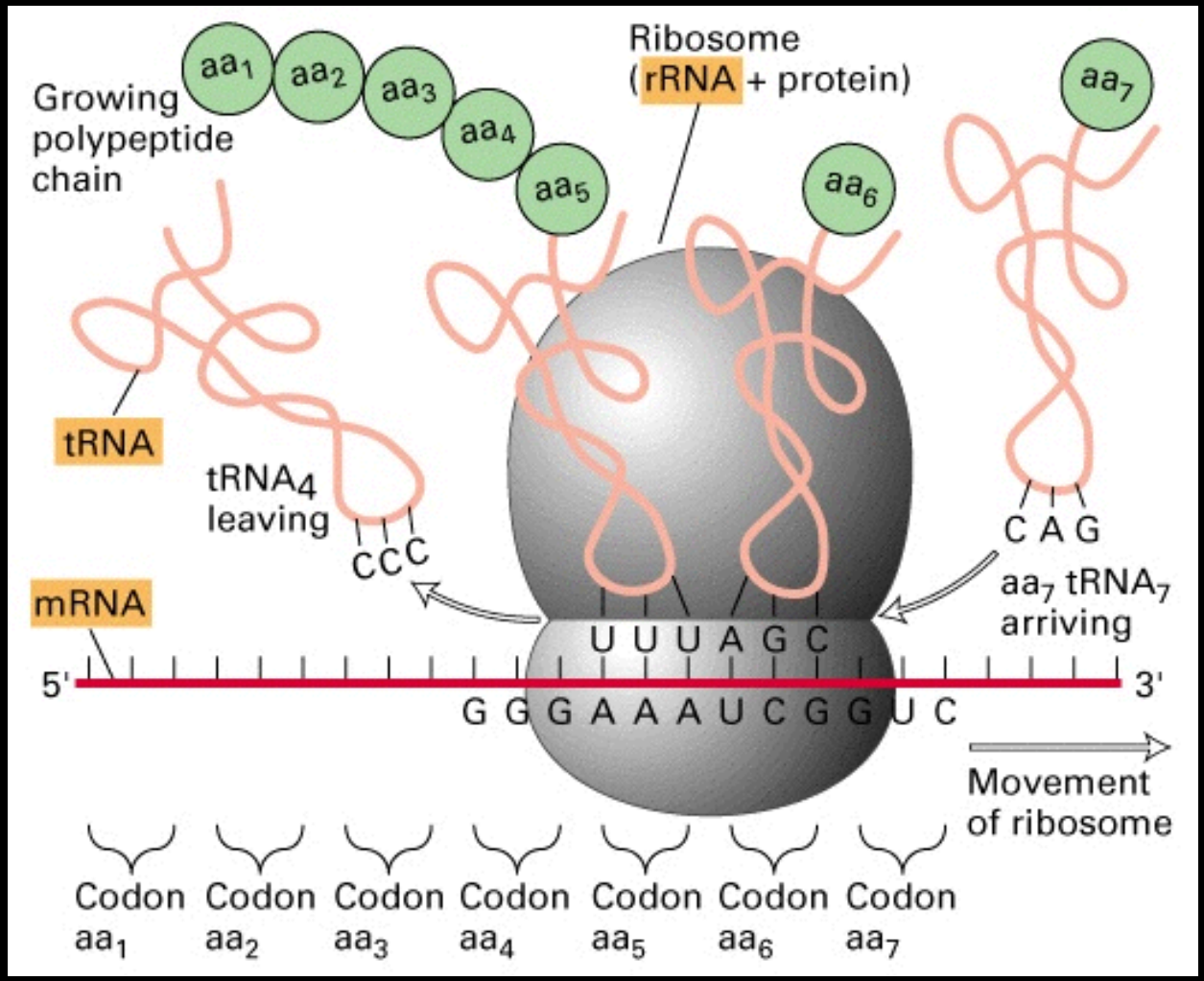


Tradução: etapas

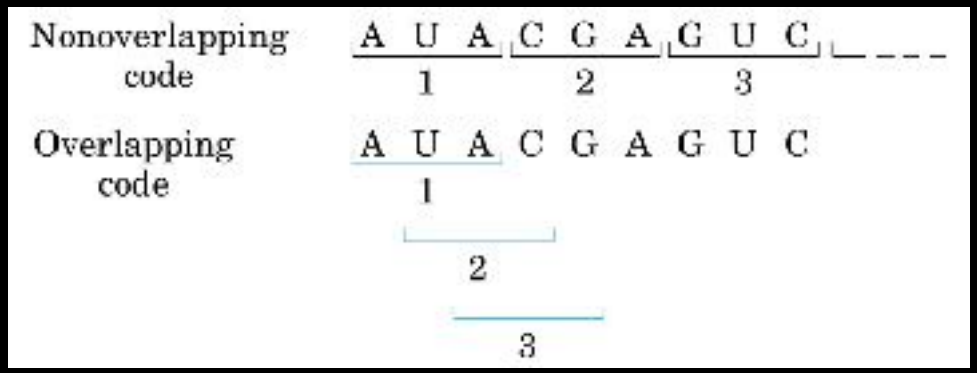
Components Required for the Five Major Stages of Protein Synthesis in *E. coli*

Stage	Essential components
1. Activation of amino acids	20 amino acids 20 aminoacyl-tRNA synthetases 20 or more tRNAs ATP Mg^{2+}
2. Initiation	mRNA *N*-Formylmethionyl-tRNA Initiation codon in mRNA (AUG) 30S ribosomal subunit 50S ribosomal subunit Initiation factors (IF-1, IF-2, IF-3) GTP Mg^{2+}
3. Elongation	Functional 70S ribosome (initiation complex) Aminoacyl-tRNAs specified by codons Elongation factors (EF-Tu, EF-Ts, EF-G) GTP Mg^{2+}
4. Termination and release	Termination codon in mRNA Polypeptide release factors (RF_1, RF_2, RF_3) ATP
5. Folding and posttranslational processing	Specific enzymes, cofactors, and other components for removal of initiating residues and signal sequences, additional proteolytic processing, modification of terminal residues, and attachment of phosphate, methyl, carboxyl, carbohydrate, or prosthetic groups

RNA: função


Growing polypeptide chain
aa1
aa2
aa3
aa4
aa5
aa6
aa7
Ribosome (rRNA + protein)
tRNA
tRNA4 leaving
C C C
C A G
aa7 tRNA7 arriving
mRNA
5'
3'
U U U A G C
G G G A A A U C G G U C
Movement of ribosome
Codon aa1
Codon aa2
Codon aa3
Codon aa4
Codon aa5
Codon aa6
Codon aa7

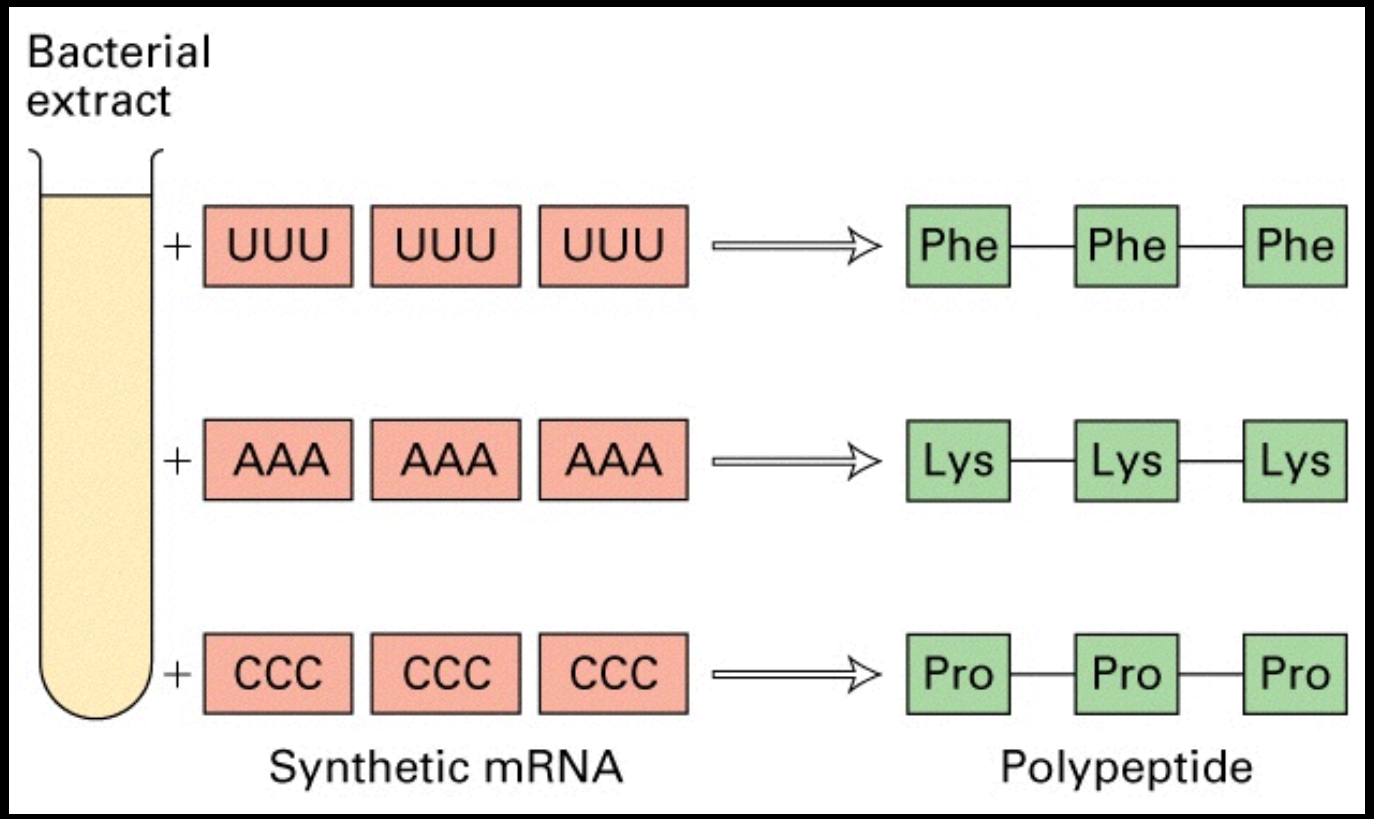
Código genético: características?



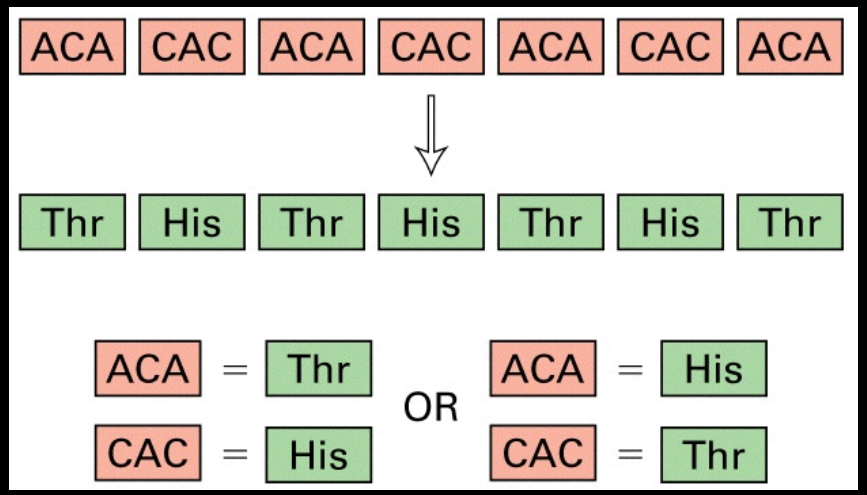
		MUTATION	PHENOTYPE
Wild-type sequence	A B C A B C A B C A B C A B C A B C A B C A B C	NONE	rII$^+$
FC0 mutant	A B C A A B C A B C A B C A B C A B C A B C A B	+	rII$^-$
Supression of FC0	A B C A A B A B C A B C A B C A B C A B C A B C	+ −	rII$^+$
Two base additions	A B C A A B C A B C B A B C A B C A B C A B C A	+ +	rII$^-$
Three base additions	A B C A A B C A B C B A B C C A B C A B C A B C	+ + +	rII$^+$

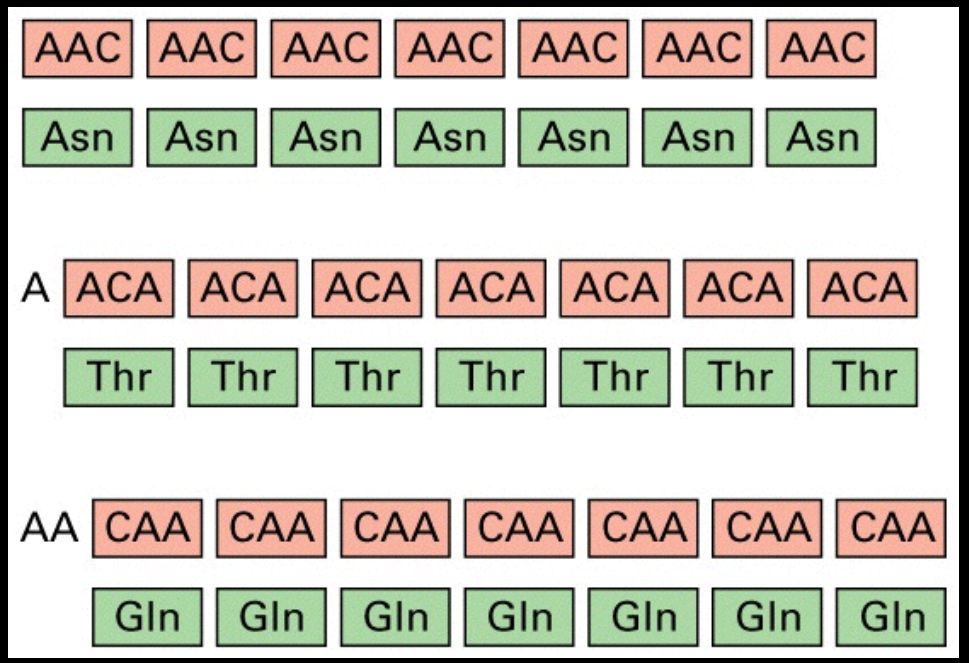
+ Base addition
− Base deletion

Código genético: experimentos

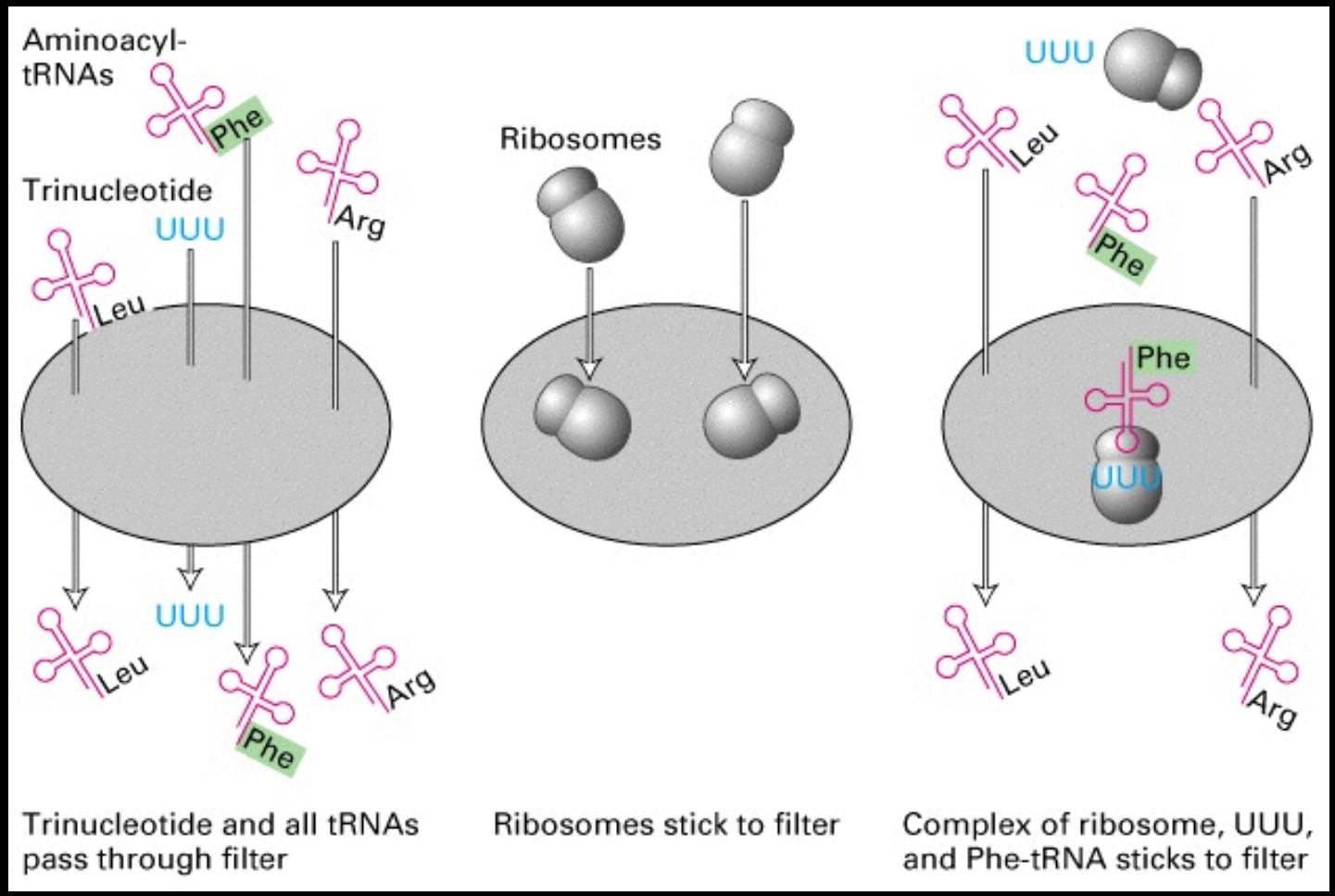


Código genético: experimentos





Código genético: experimentos



Código genético

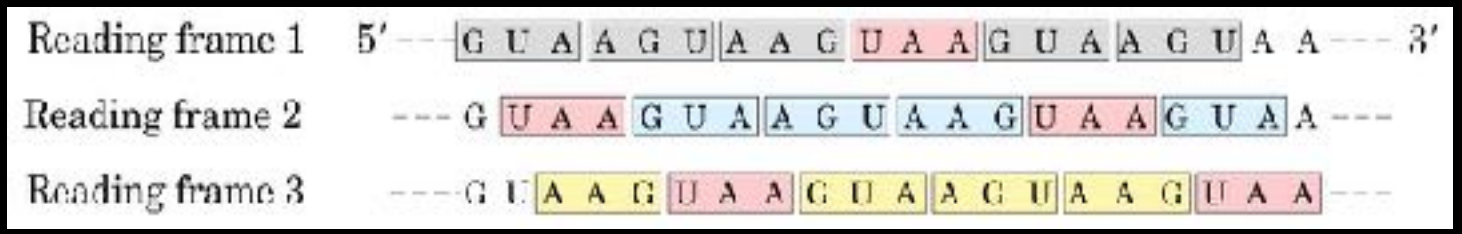
First letter of codon (5′ end)	Second letter of codon: U		Second letter of codon: C		Second letter of codon: A		Second letter of codon: G	
U	UUU	Phe	UCU	Ser	UAU	Tyr	UGU	Cys
	UUC	Phe	UCC	Ser	UAC	Tyr	UGC	Cys
	UUA	Leu	UCA	Ser	UAA	Stop	UGA	Stop
	UUG	Leu	UCG	Ser	UAG	Stop	UGG	Trp
C	CUU	Leu	CCU	Pro	CAU	His	CGU	Arg
	CUC	Leu	CCC	Pro	CAC	His	CGC	Arg
	CUA	Leu	CCA	Pro	CAA	Gln	CGA	Arg
	CUG	Leu	CCG	Pro	CAG	Gln	CGG	Arg
A	AUU	Ile	ACU	Thr	AAU	Asn	AGU	Ser
	AUC	Ile	ACC	Thr	AAC	Asn	AGC	Ser
	AUA	Ile	ACA	Thr	AAA	Lys	AGA	Arg
	AUG	Met	ACG	Thr	AAG	Lys	AGG	Arg
G	GUU	Val	GCU	Ala	GAU	Asp	GGU	Gly
	GUC	Val	GCC	Ala	GAC	Asp	GGC	Gly
	GUA	Val	GCA	Ala	GAA	Glu	GGA	Gly
	GUG	Val	GCG	Ala	GAG	Glu	GGG	Gly

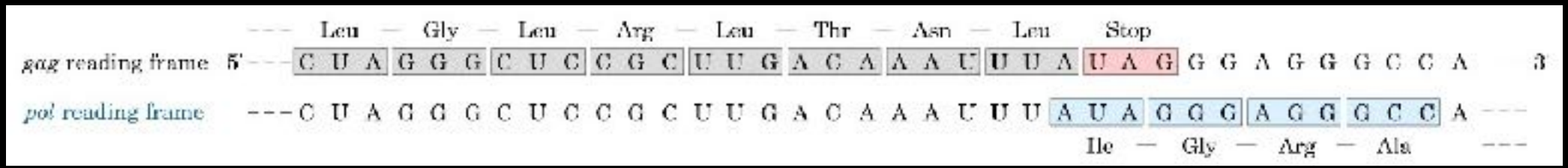
table 27–4

Degeneracy of the Genetic Code

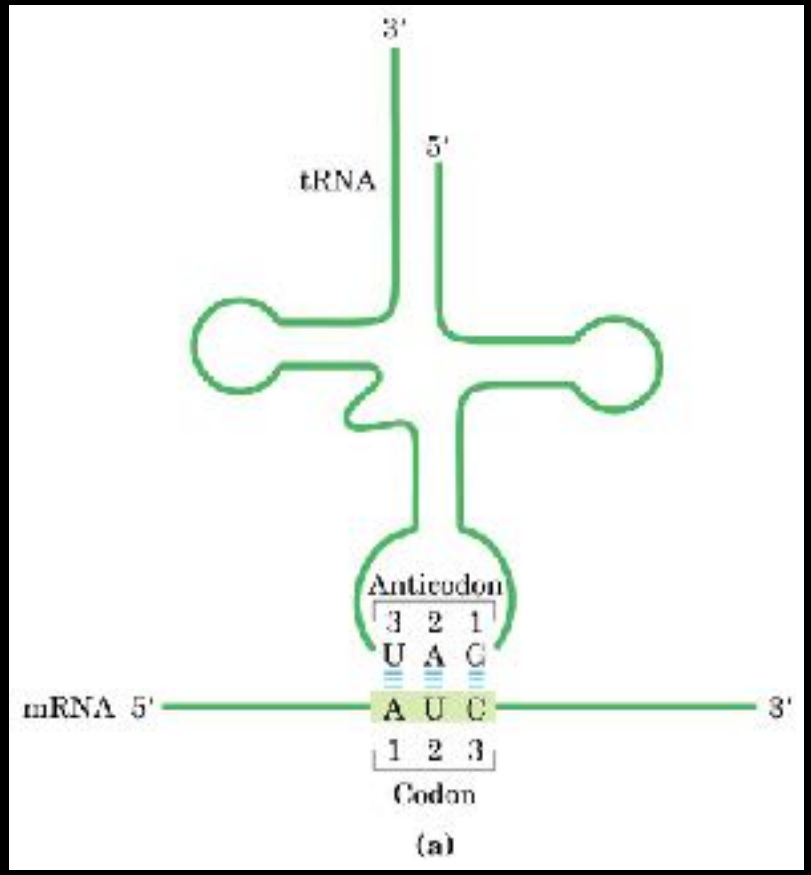
Amino acid	Number of codons
Ala	4
Arg	6
Asn	2
Asp	2
Cys	2
Gln	2
Glu	2
Gly	4
His	2
Ile	3
Leu	6
Lys	2
Met	1
Phe	2
Pro	4
Ser	6
Thr	4
Trp	1
Tyr	2
Val	4

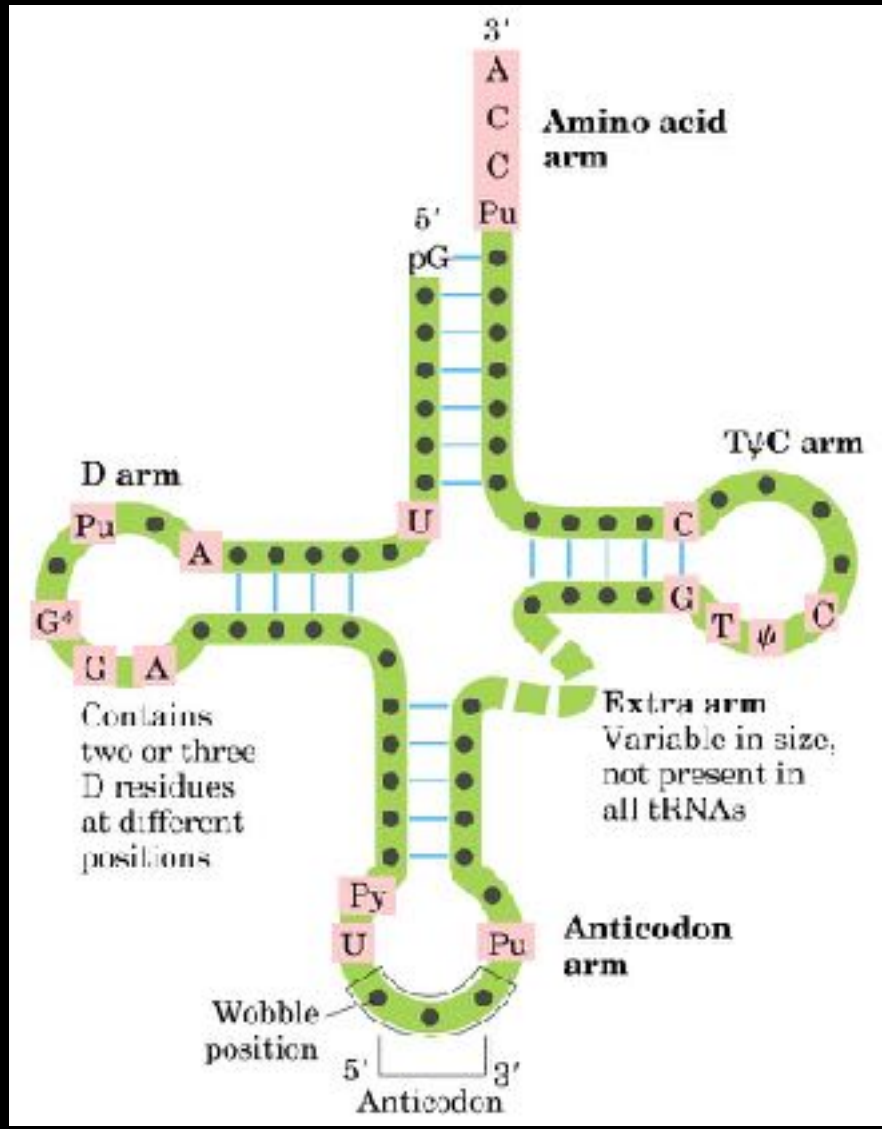
Fase de leitura



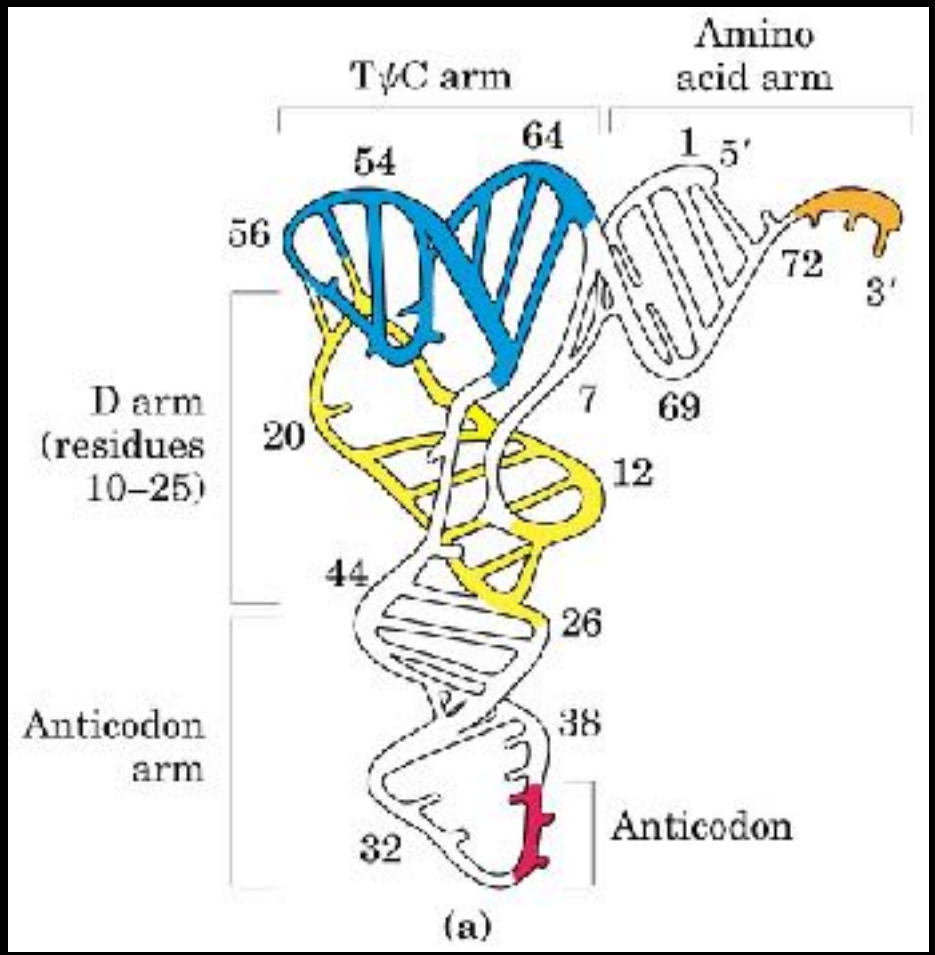


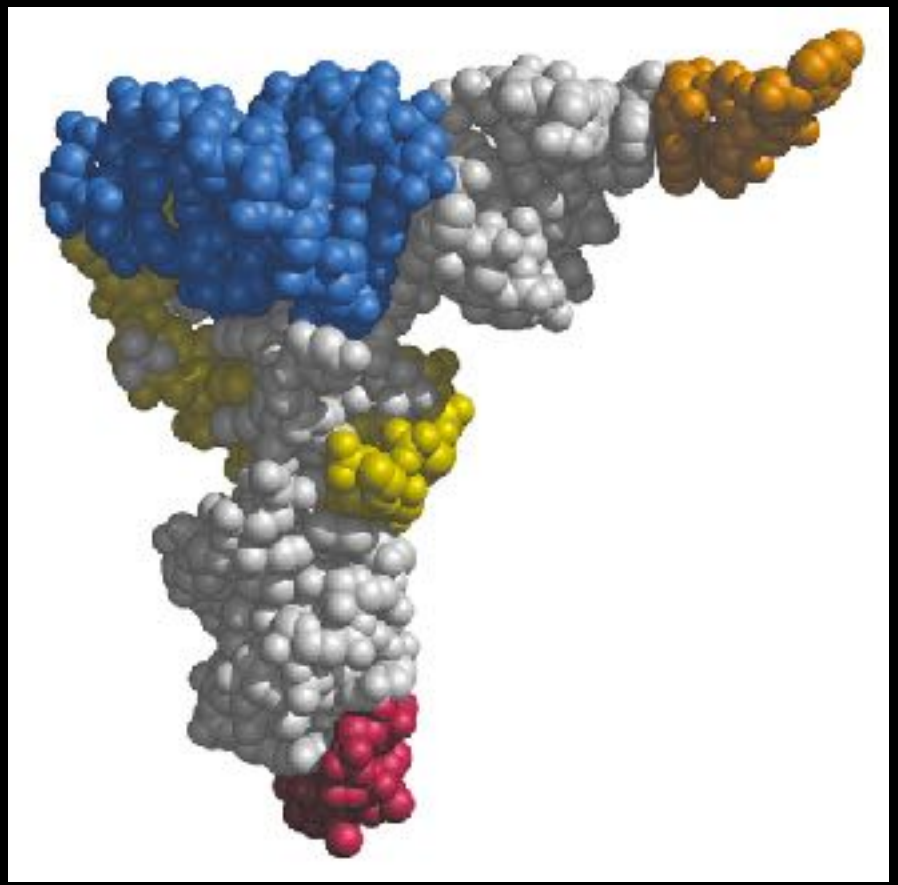
tRNA


3'
5'
tRNA
Anticodon
3 2 1
U A C
mRNA 5'
A U C
3'
1 2 3
Codon
(a)

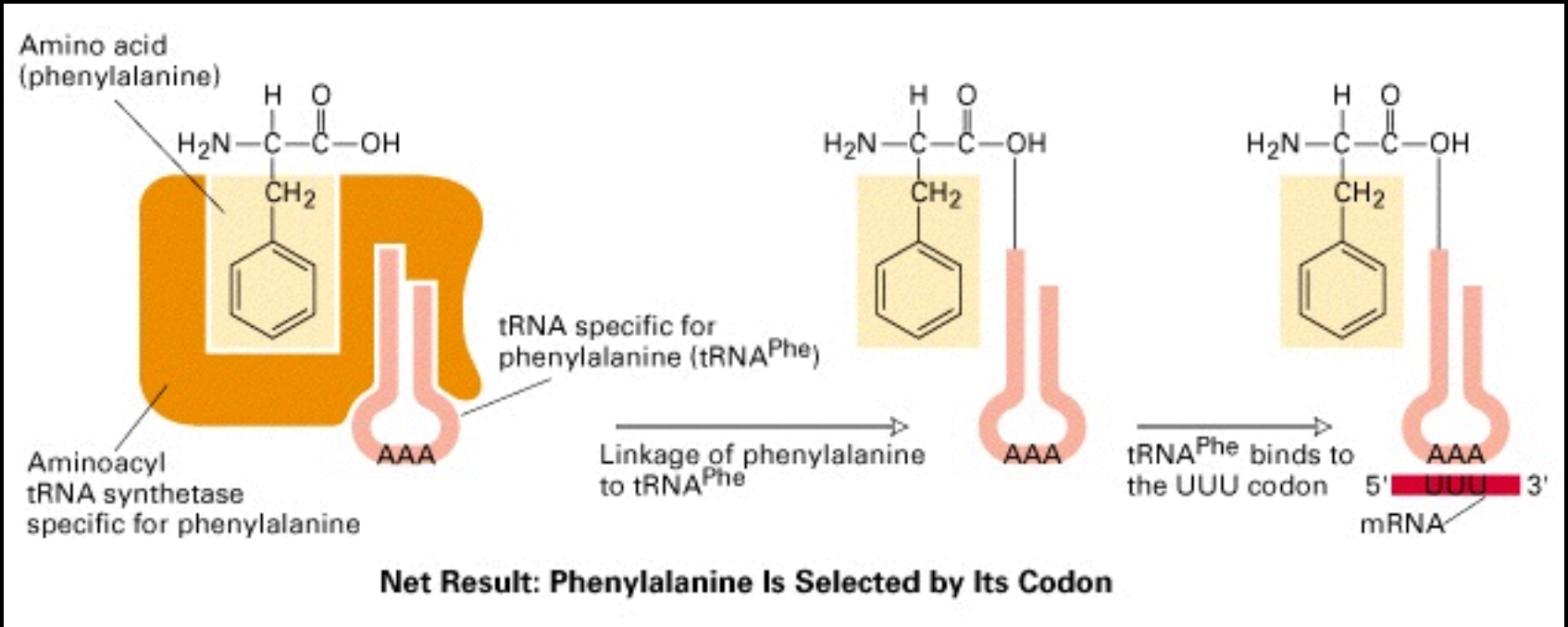

3'
A
C
C
Pu
Amino acid arm
5'
pG
TψC arm
D arm
Pu
A
U
C
G
T
ψ
C
G*
G
A
Contains two or three D residues at different positions
Extra arm
Variable in size, not present in all tRNAs
Py
U
Pu
Anticodon arm
Wobble position
5'
3'
Anticodon

tRNA

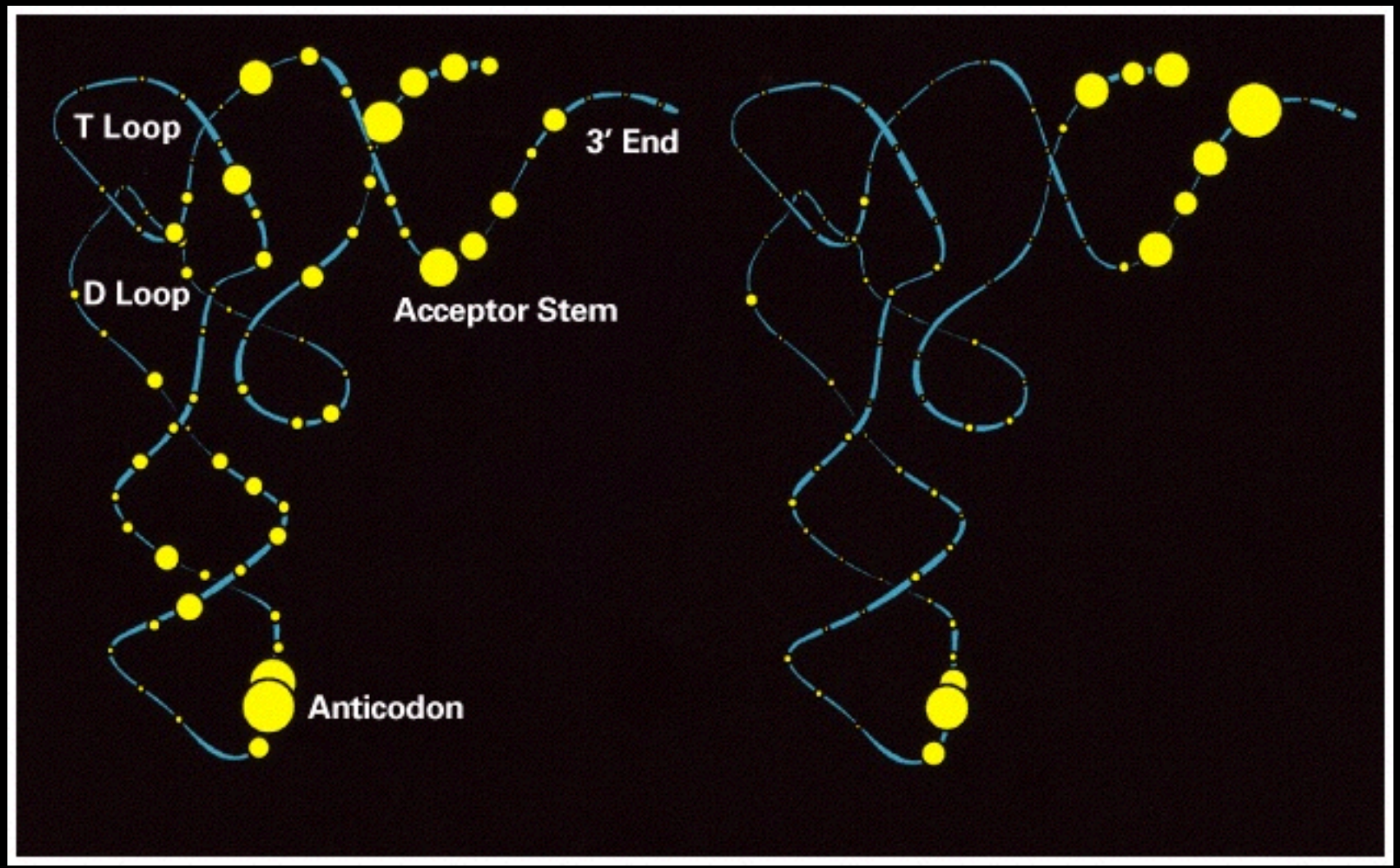

TψC arm
Amino acid arm
64
54
1
5′
56
72
3′
D arm (residues 10–25)
7
69
20
12
44
26
Anticodon arm
38
Anticodon
32
(a)



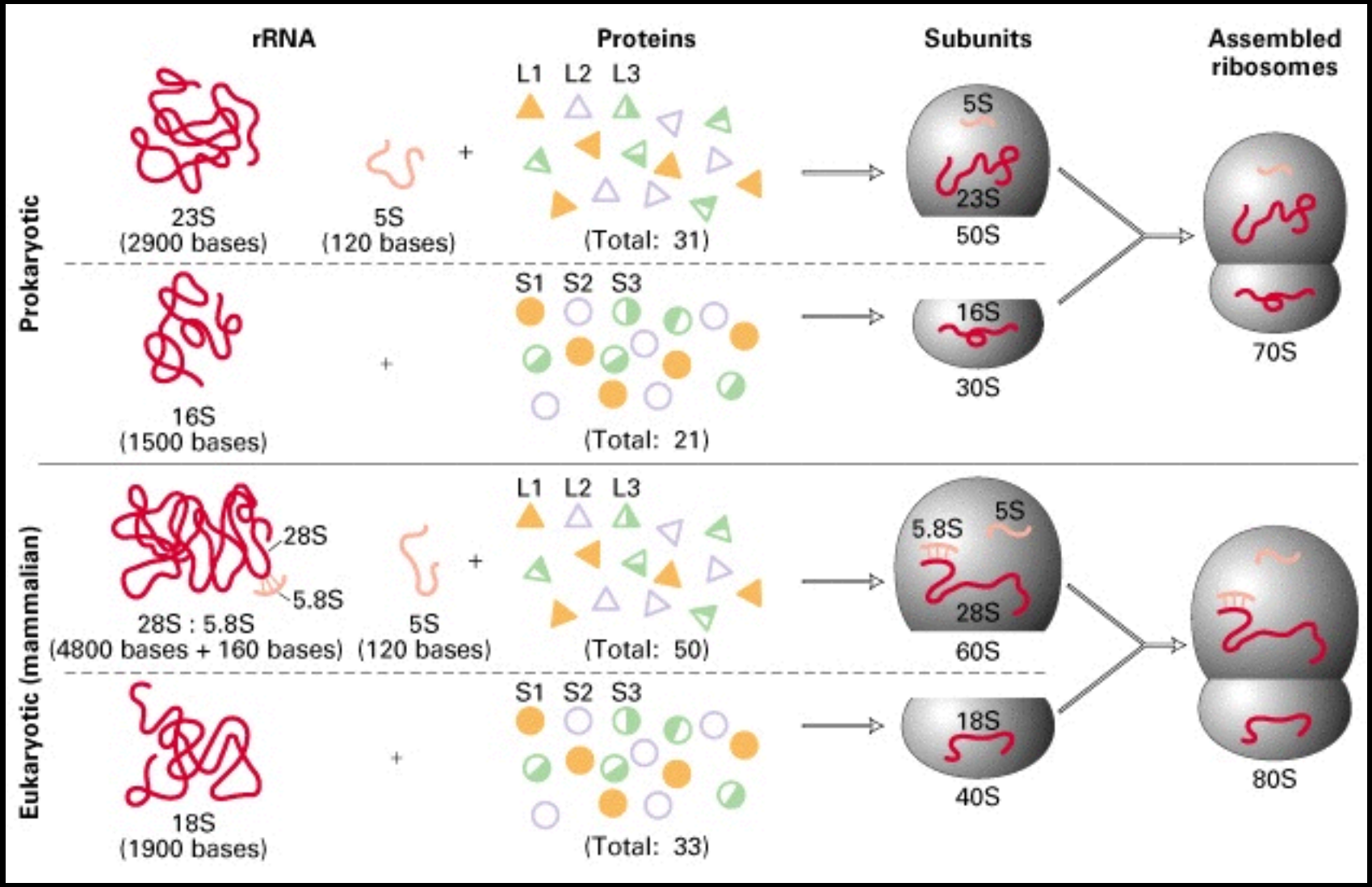
Aminoacil-tRNA sintetase



tRNA: reconhecimento

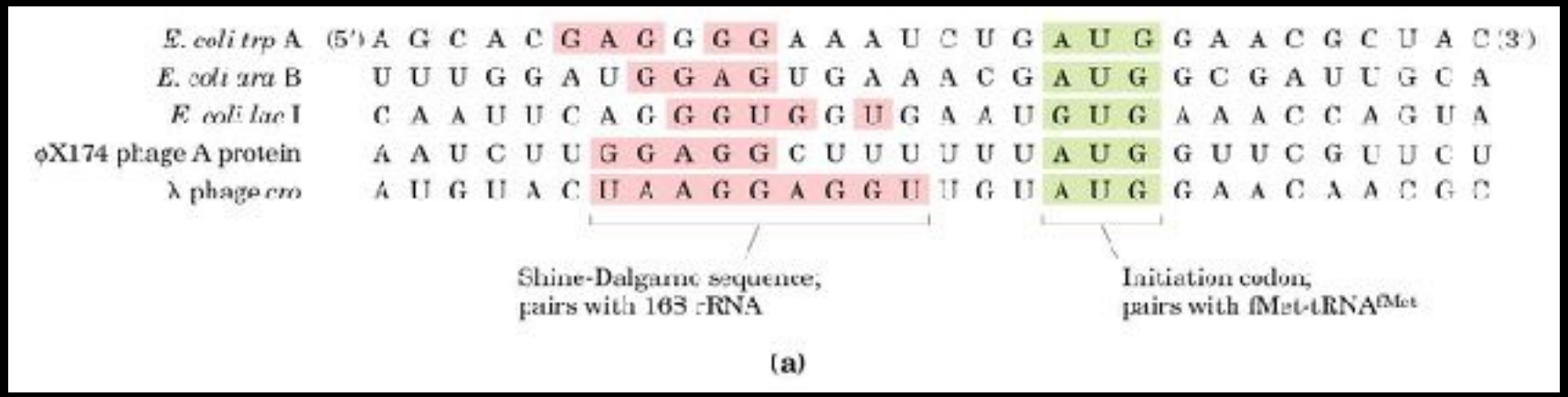


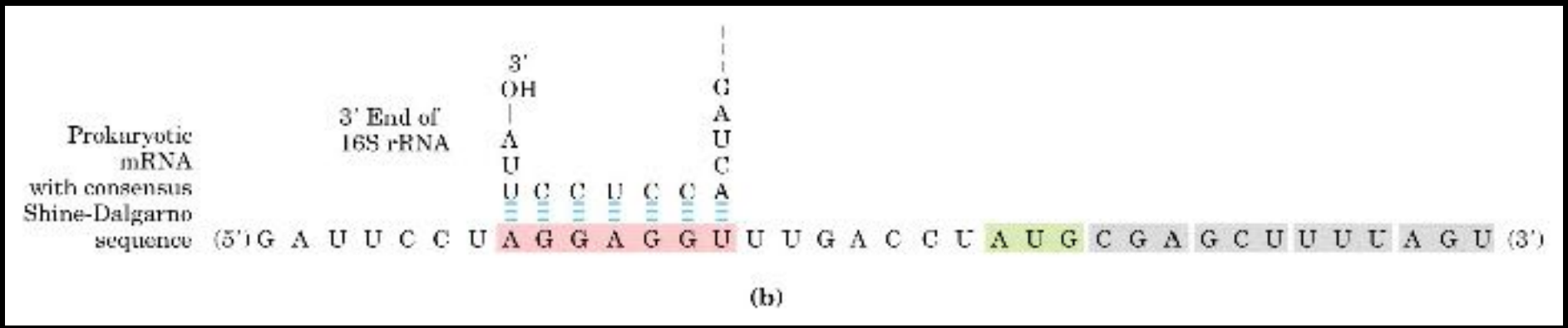
rRNA


rRNA
Proteins
Subunits
Assembled ribosomes
Prokaryotic
23S
(2900 bases)
5S
(120 bases)
L1 L2 L3
(Total: 31)
5S
23S
50S
16S
(1500 bases)
S1 S2 S3
(Total: 21)
16S
30S
70S
Eukaryotic (mammalian)
28S
5.8S
28S : 5.8S
(4800 bases + 160 bases)
5S
(120 bases)
L1 L2 L3
(Total: 50)
5.8S
5S
28S
60S
18S
(1900 bases)
S1 S2 S3
(Total: 33)
18S
40S
80S

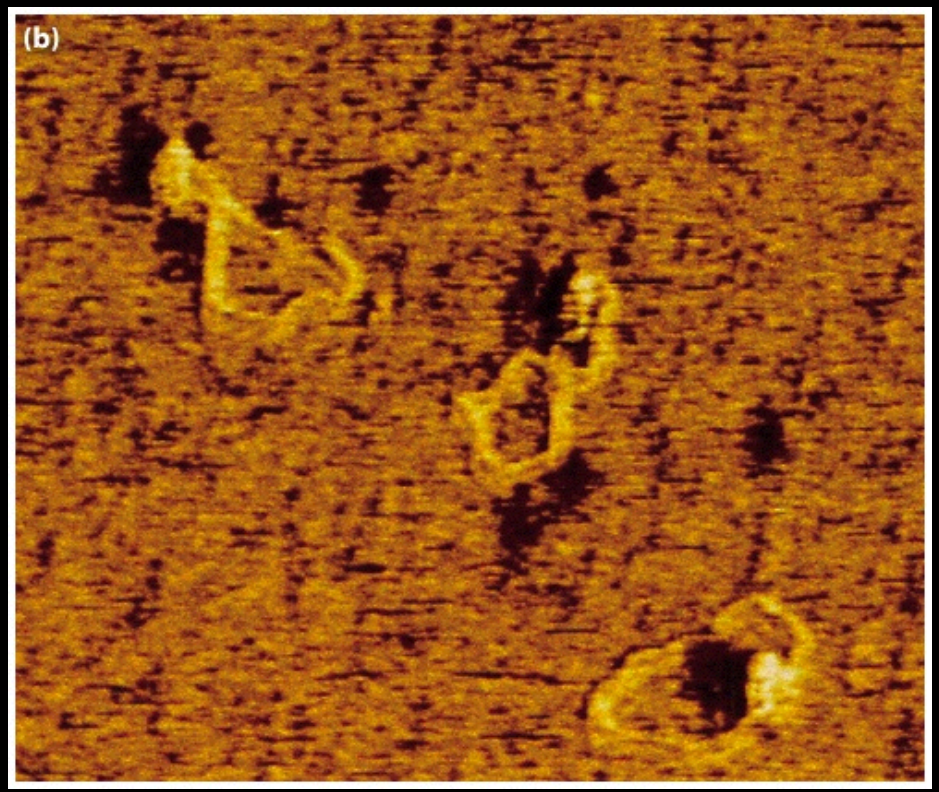
Reconhecimento do mRNA

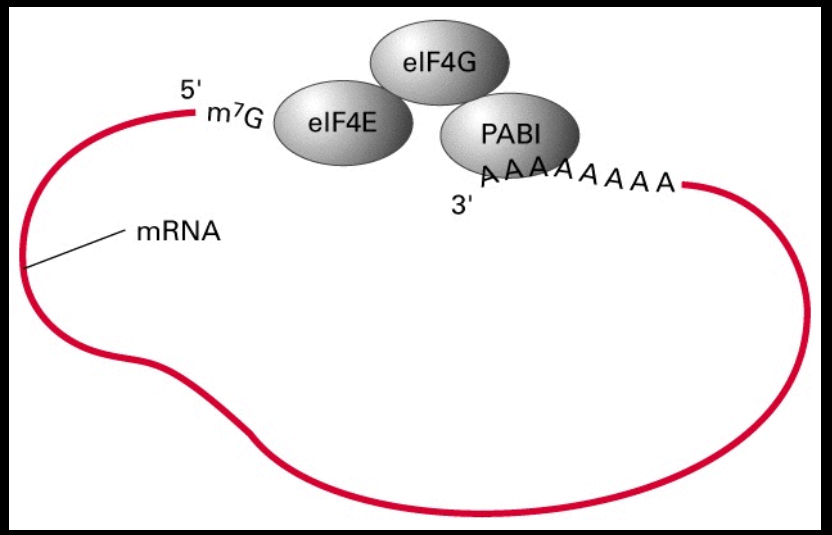
Procariotos

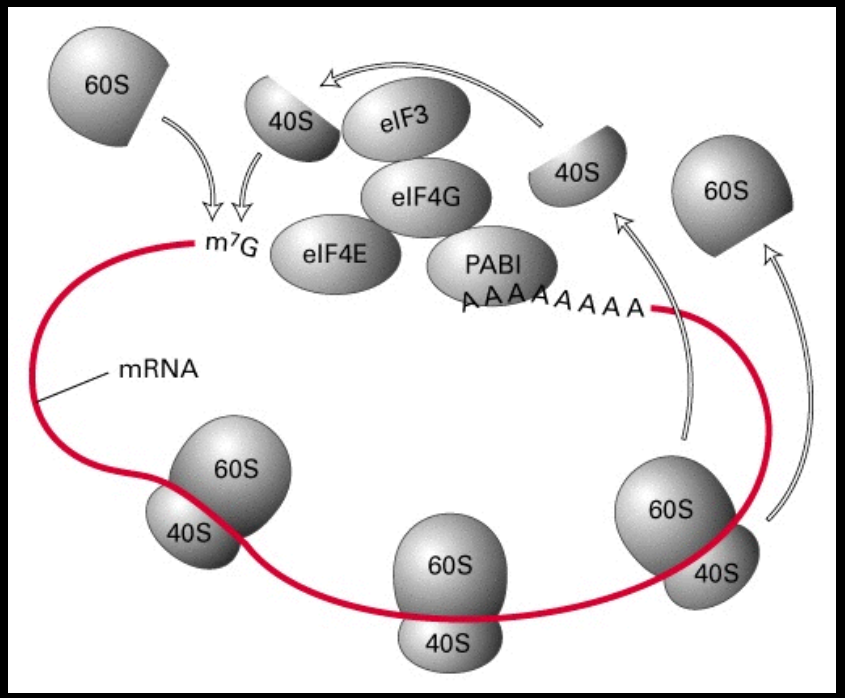




mRNA de eucariotos

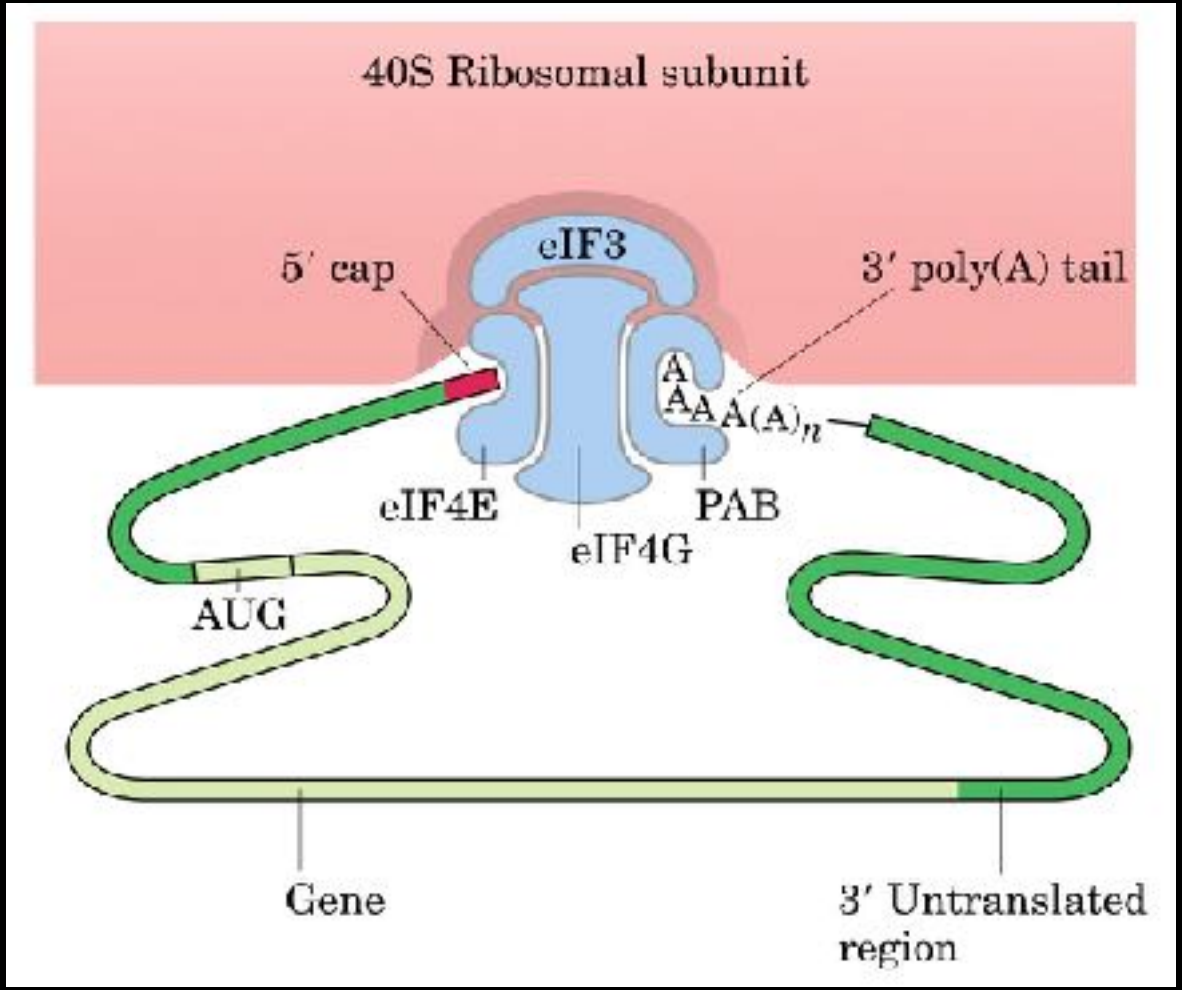




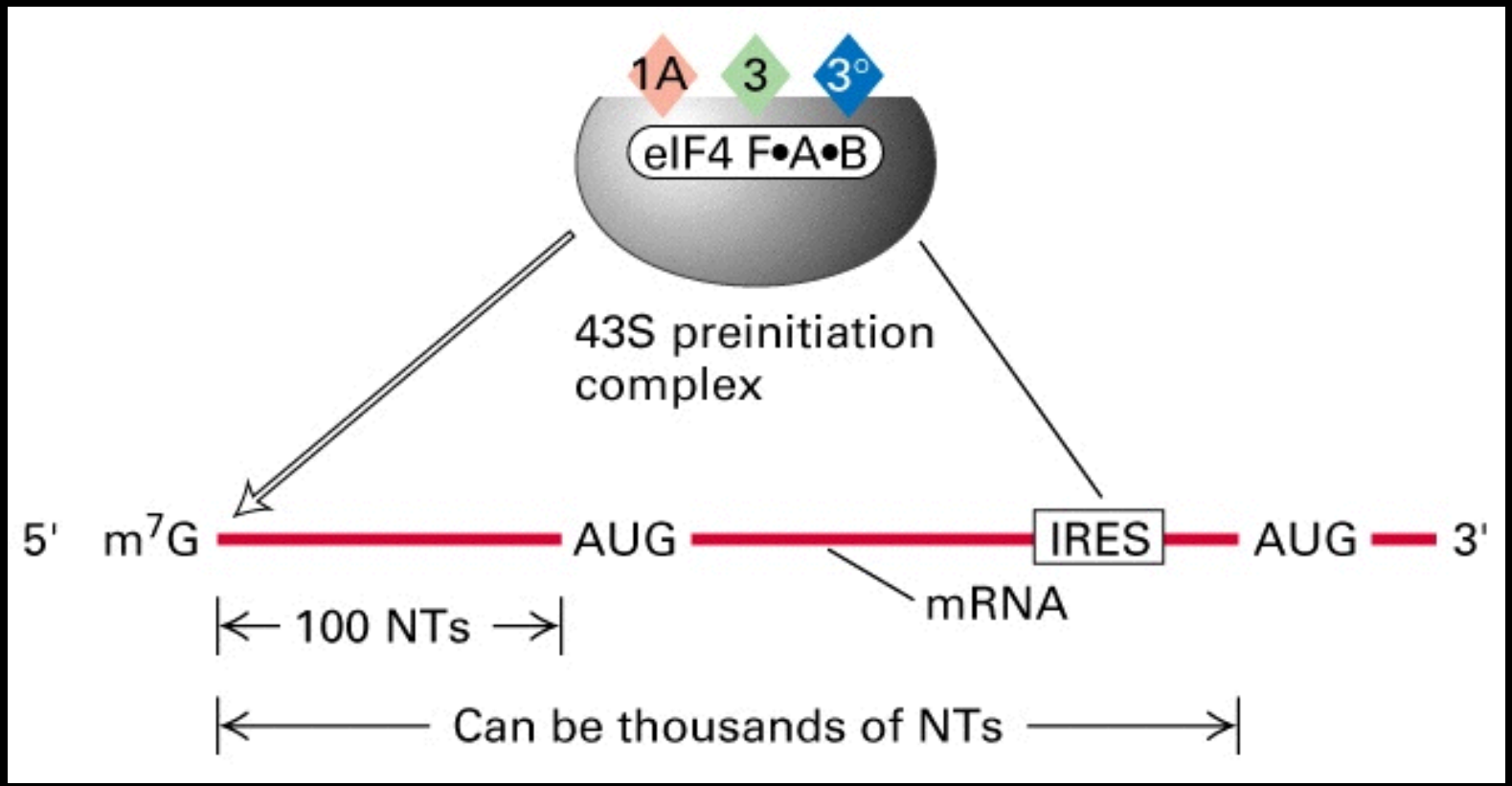


Reconhecimento do mRNA

Eucariotos



Tradução: iniciação



Tradução: fatores proteicos

Protein Factors Required for Initiation of Translation in Bacterial and Eukaryotic Cells

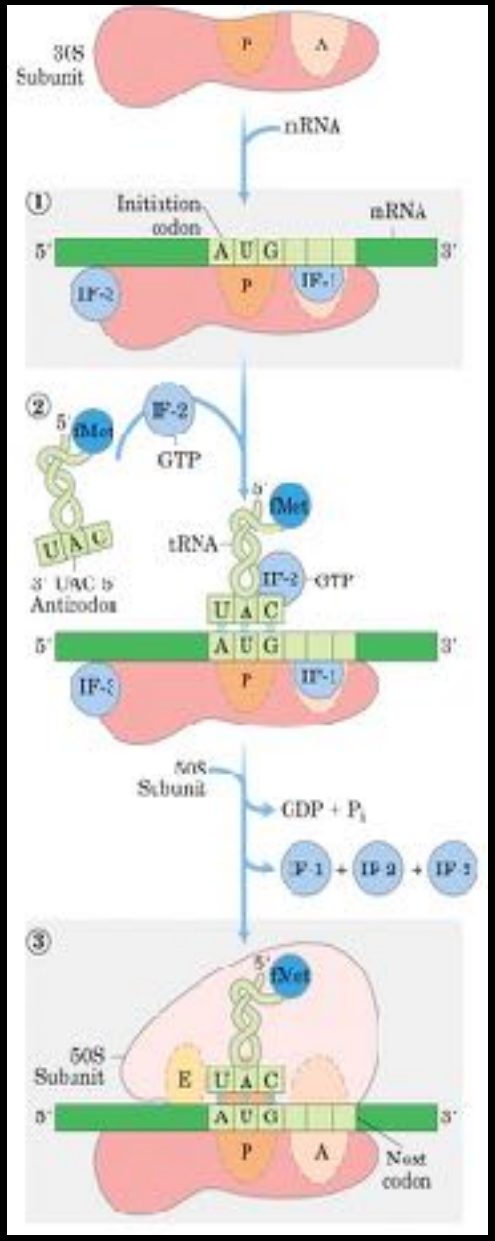
Bacterial

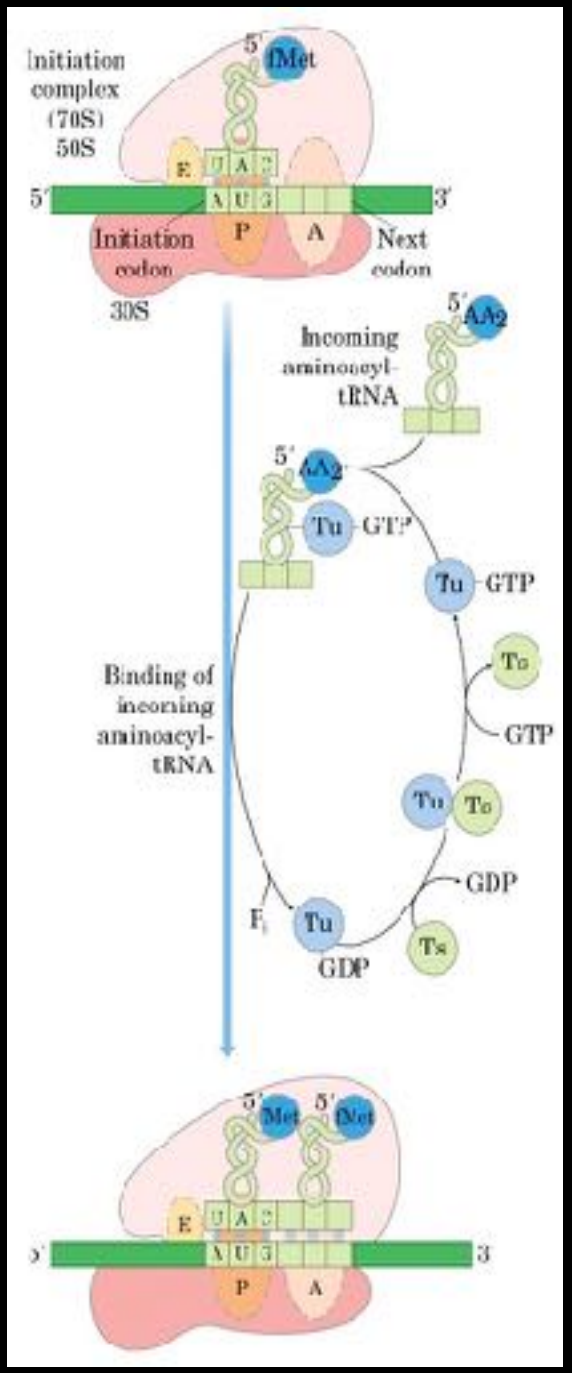
Factor	Function
IF-1	Prevents premature binding of tRNAs to A site
IF-2	Facilitates binding of fMet-tRNA^{fMet} to 30S ribosomal subunit
IF-3	Binds to 30S subunit; prevents premature association of 50S subunit; enhances specificity of P site for fMet-tRNA^{fMet}

Eukaryotic

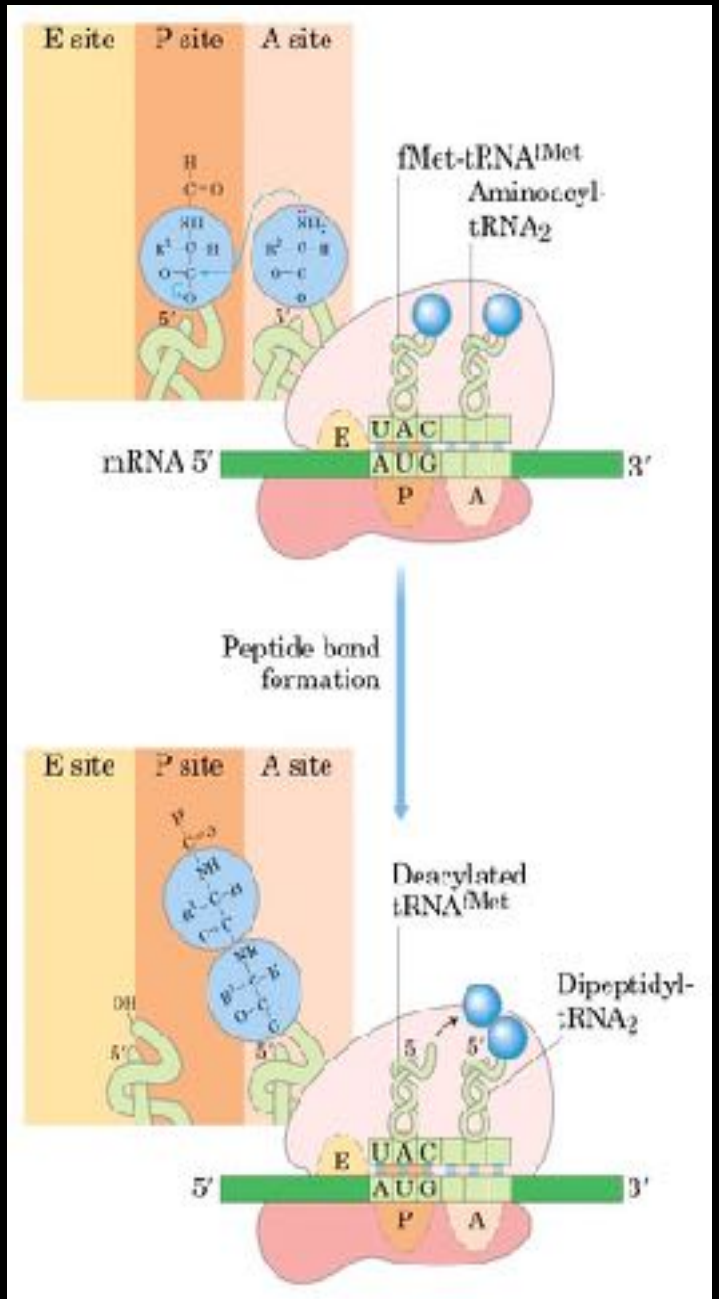
Factor*	Function
eIF2	Facilitates binding of initiating Met-tRNA$^{Met}_i$ to 40S ribosomal subunit
eIF2B, eIF3	First factors to bind 40S subunit; facilitate subsequent steps
eIF4A	RNA helicase activity removes secondary structure in the mRNA to permit binding to 40S subunit; part of the eIF4F complex
eIF4B	Binds to mRNA; facilitates scanning of mRNA to locate the first AUG
eIF4E	Binds to the 5' cap of mRNA; part of the eIF4F complex
eIF4G	Binds to eIF4E and to poly(A) binding protein (PAB); part of the eIF4F complex
eIF5	Promotes dissociation of several other initiation factors from 40S subunit as a prelude to association of 60S subunit to form 80S initiation complex
eIF6	Facilitates dissociation of inactive 80S ribosome into 40S and 60S subunits

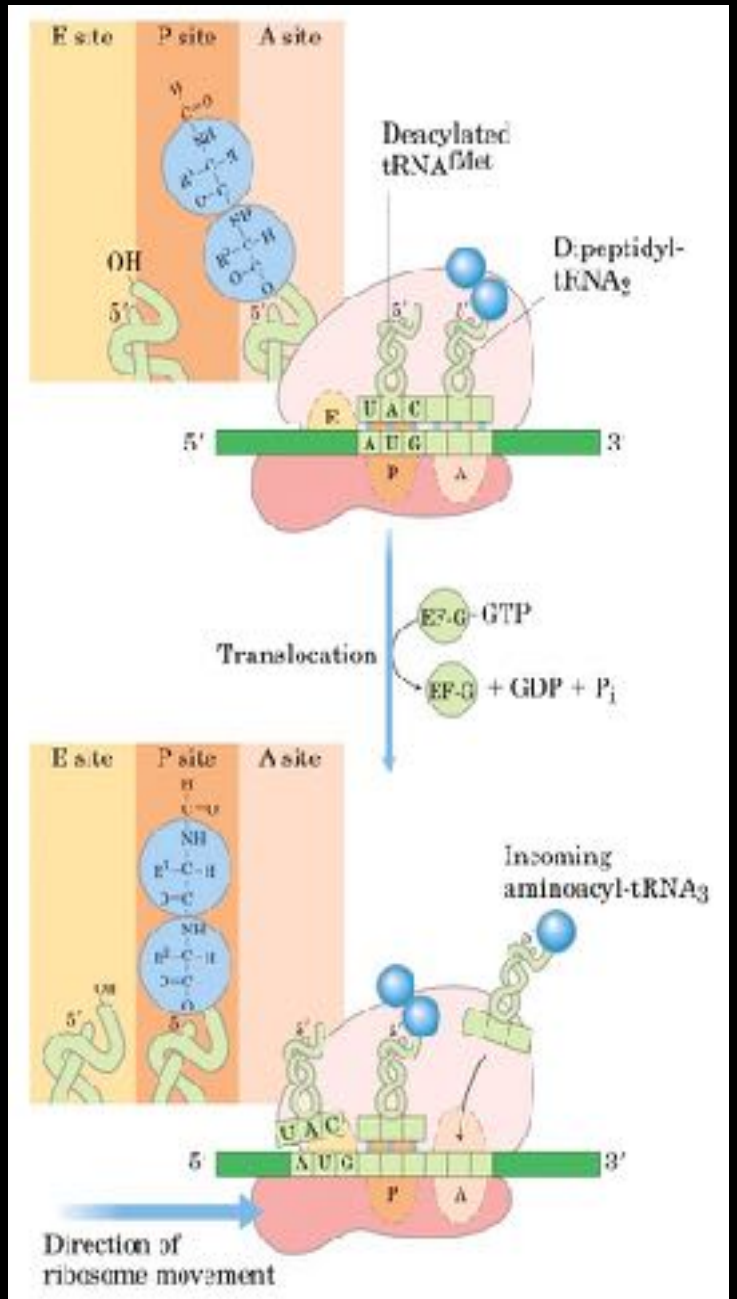
Tradução: iniciação



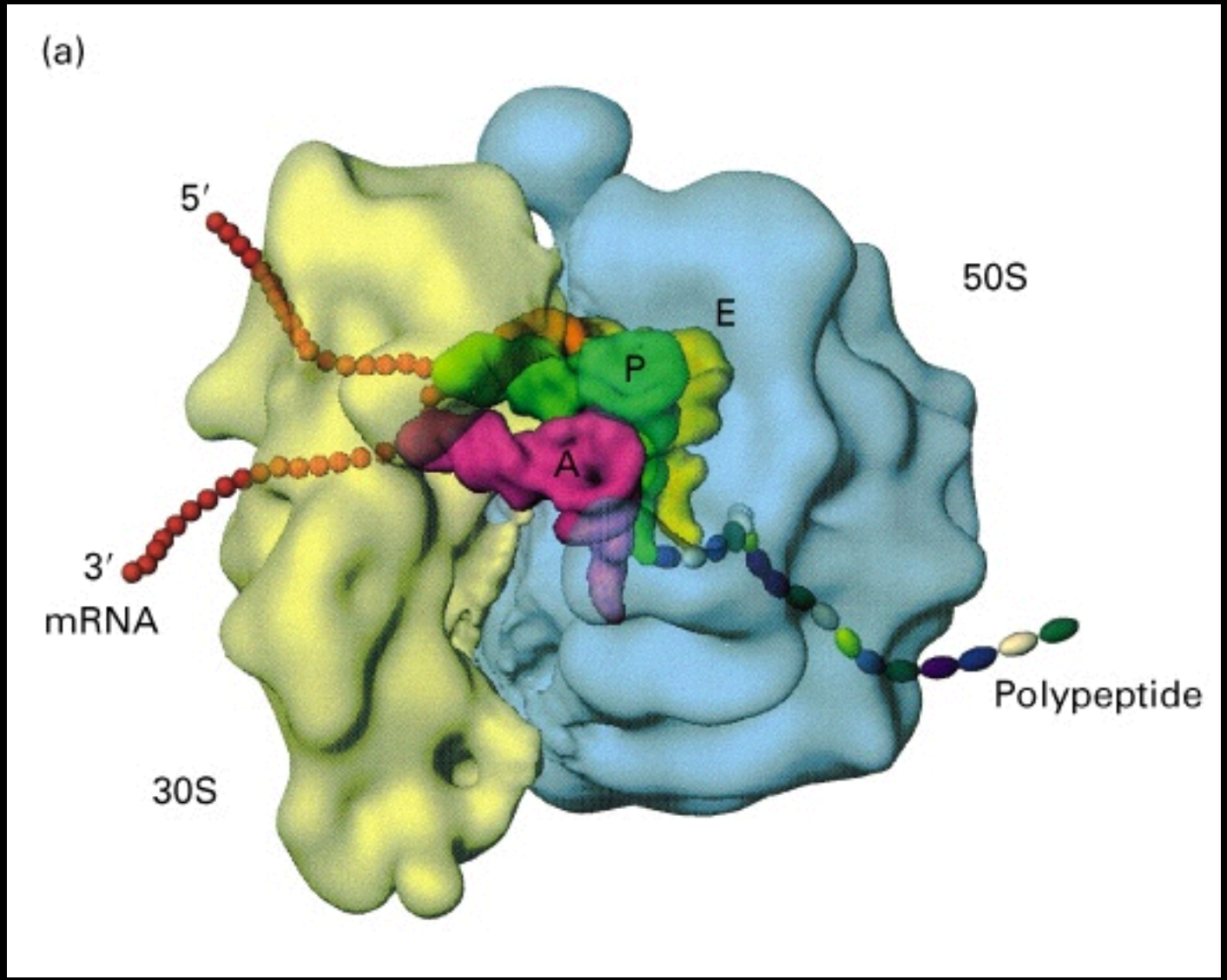


Tradução: alongamento

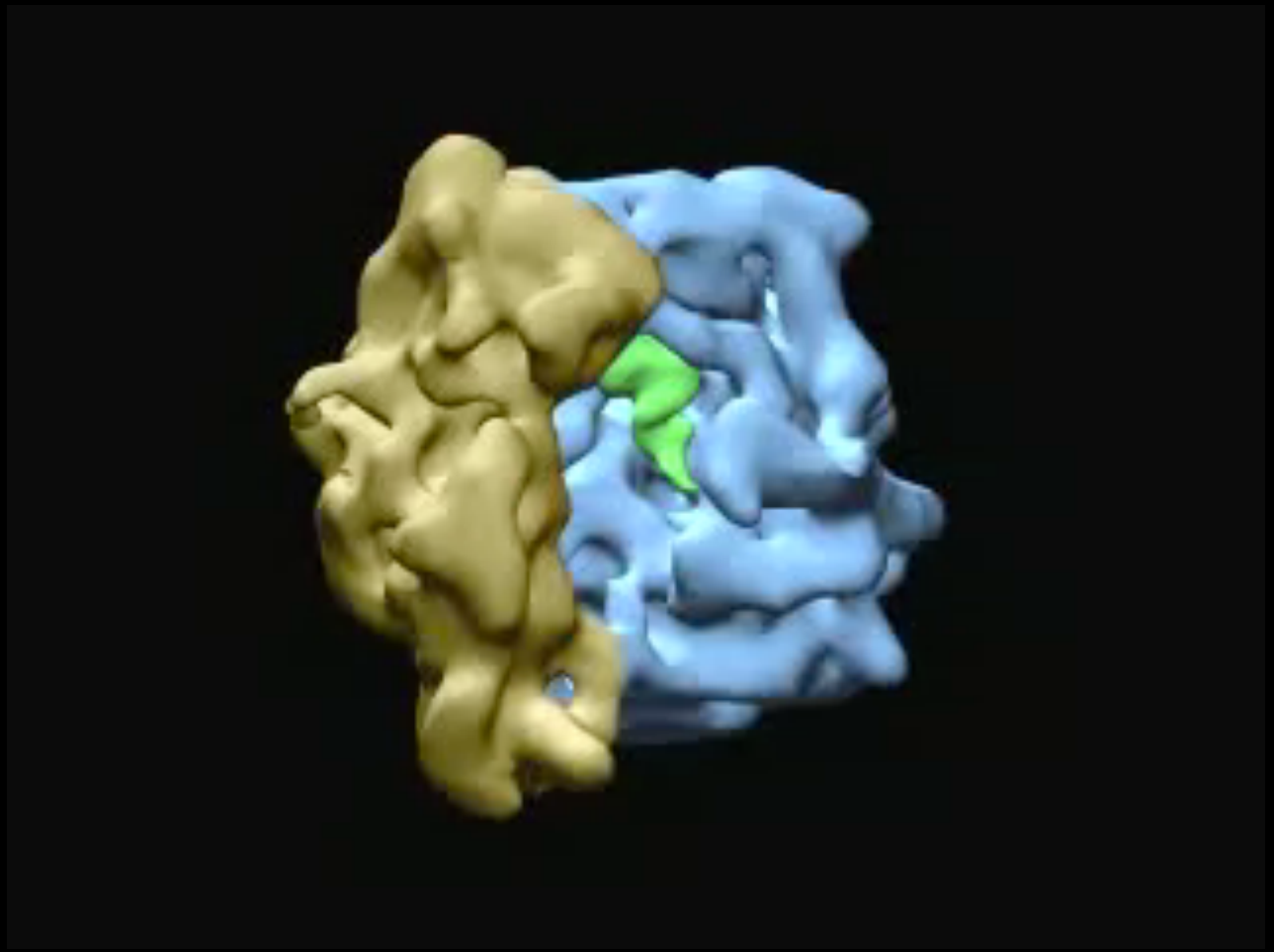




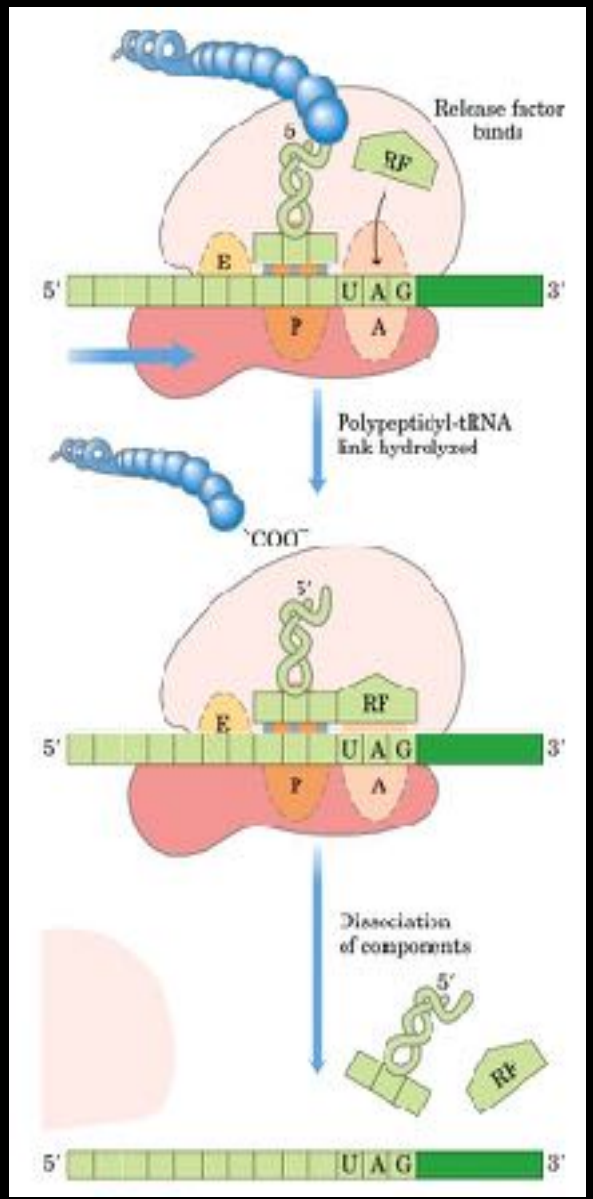
Ribossomo em tradução: estrutura

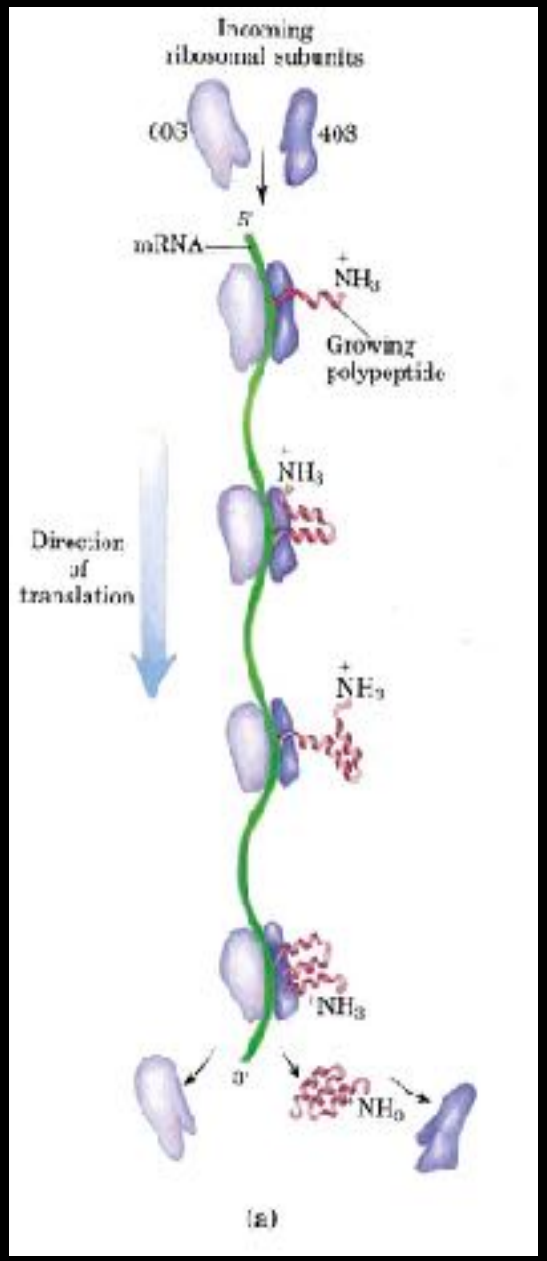


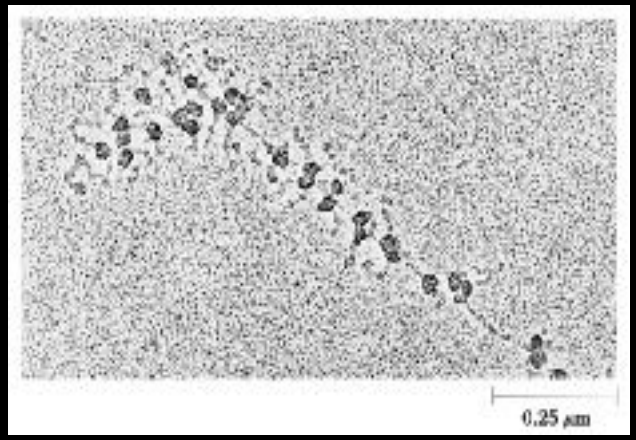
Alongamento: animação

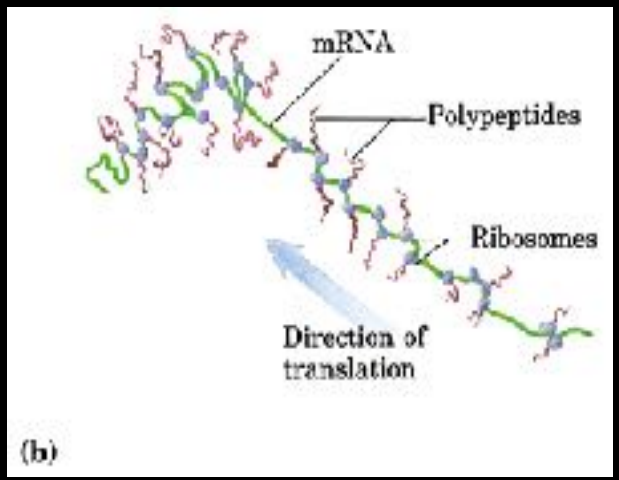


Tradução: terminação



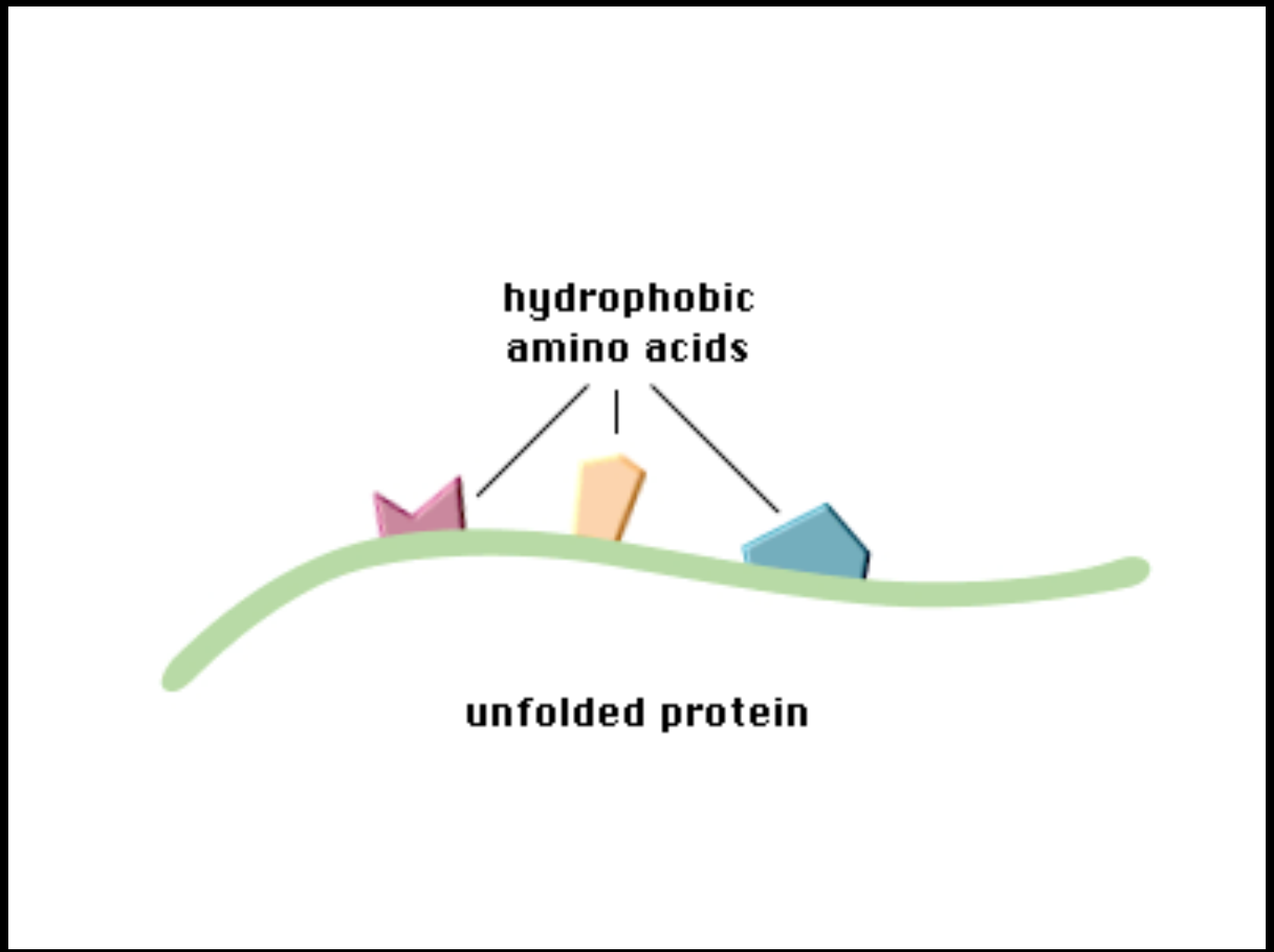




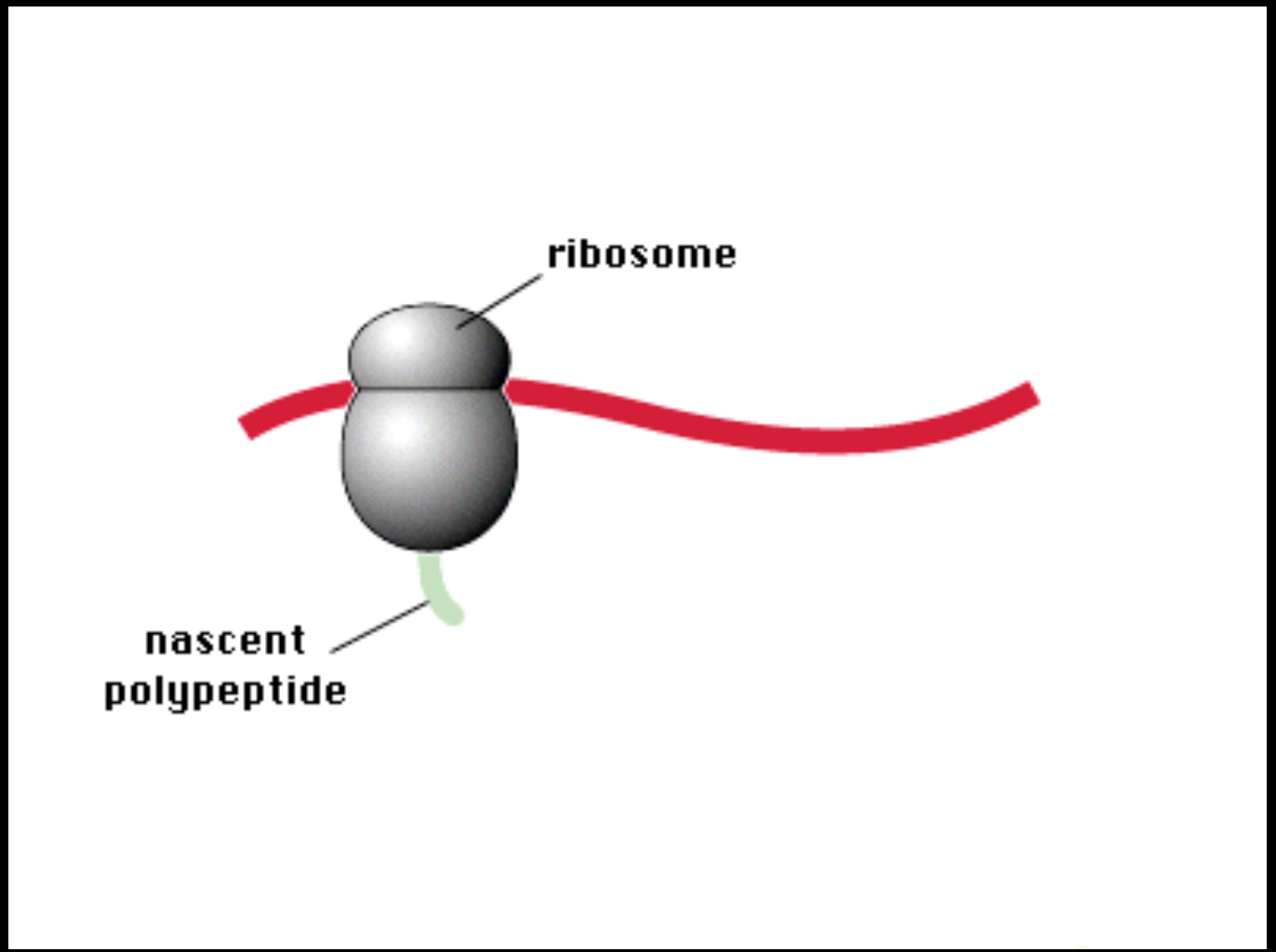


Tradução: animação

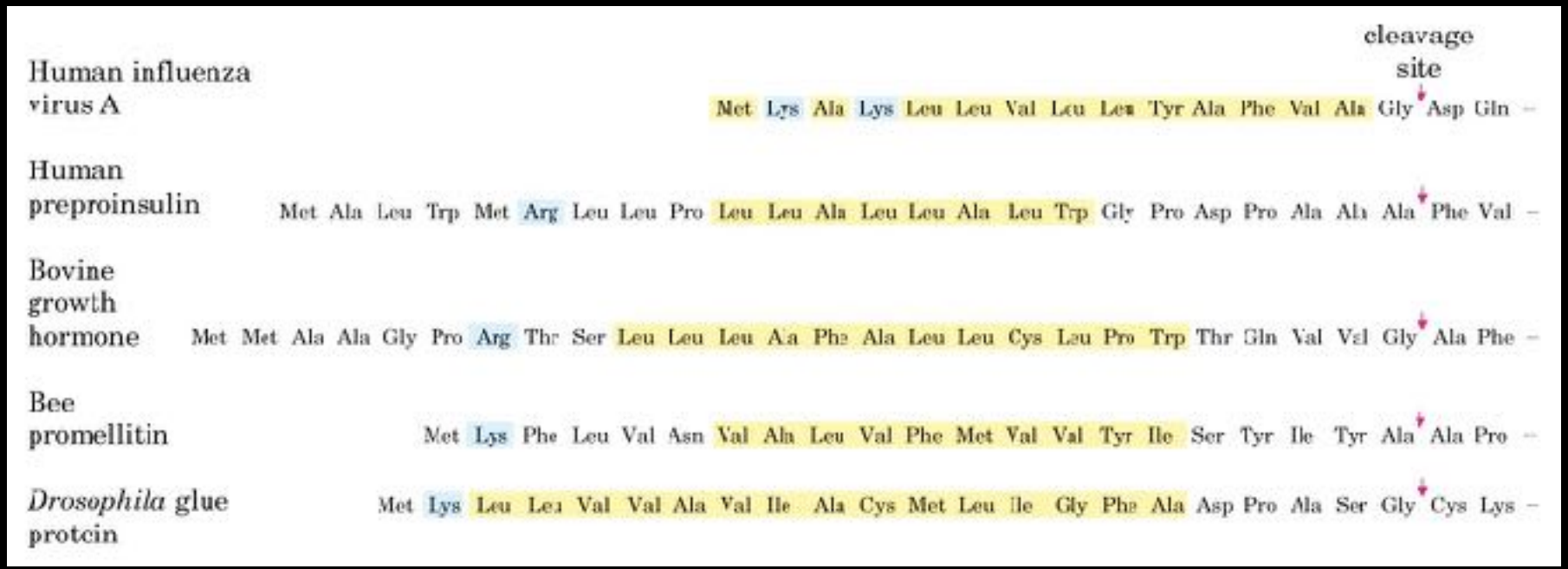
Chaperonas: animação



Chaperonas e degradação: animação



Tradução: peptídeo sinal



Proteínas de exportação