



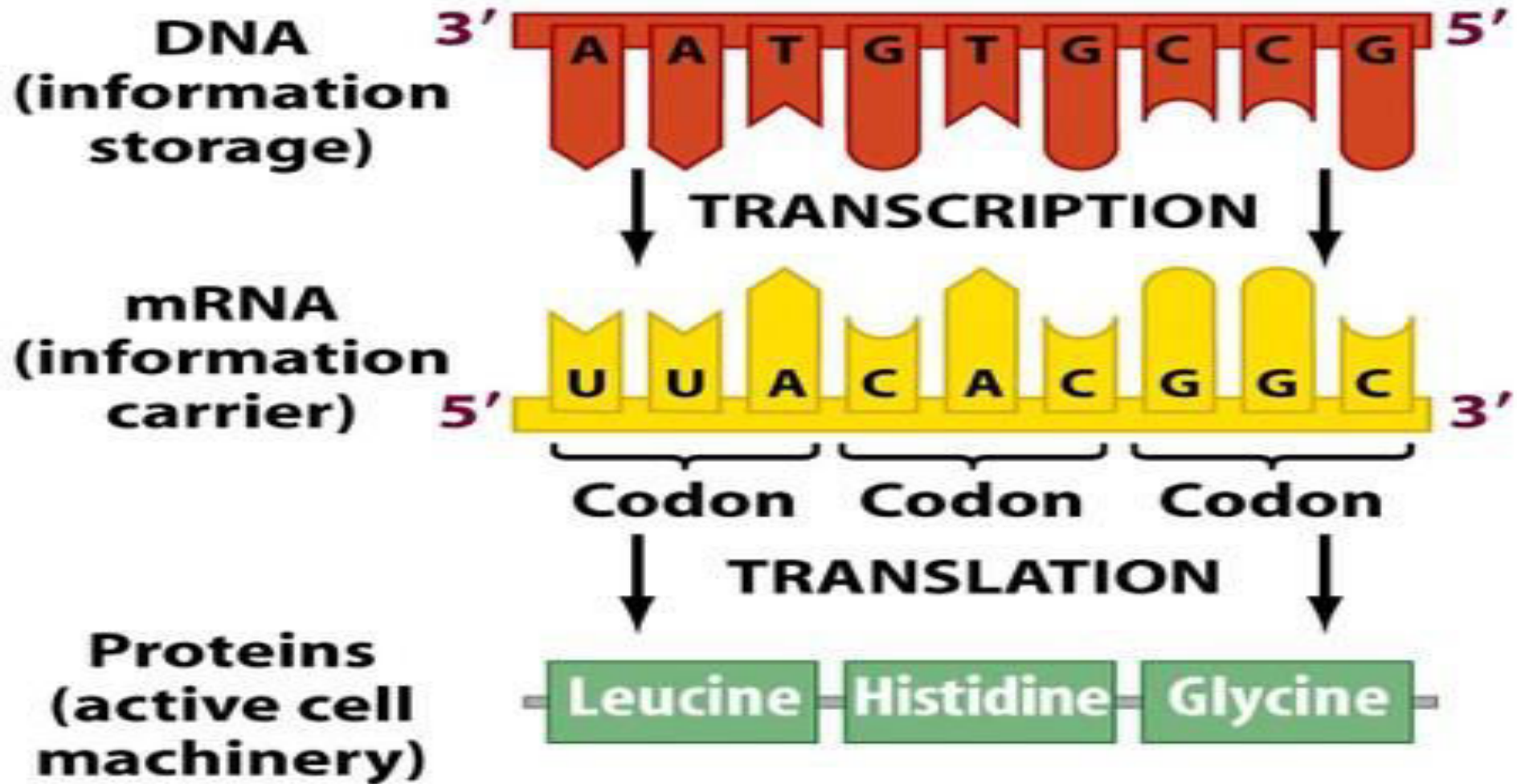
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FACULTY OF ENGINEERING & TECHNOLOGY  
DEPARTMENT OF BIOTECHNOLOGY

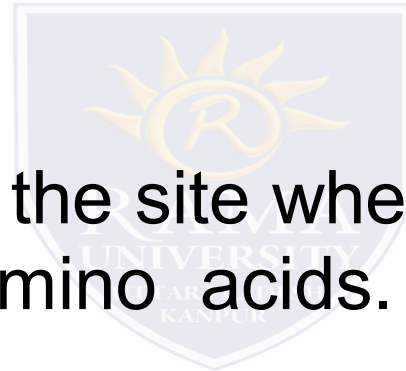
## Protein Synthesis in Prokaryotes:

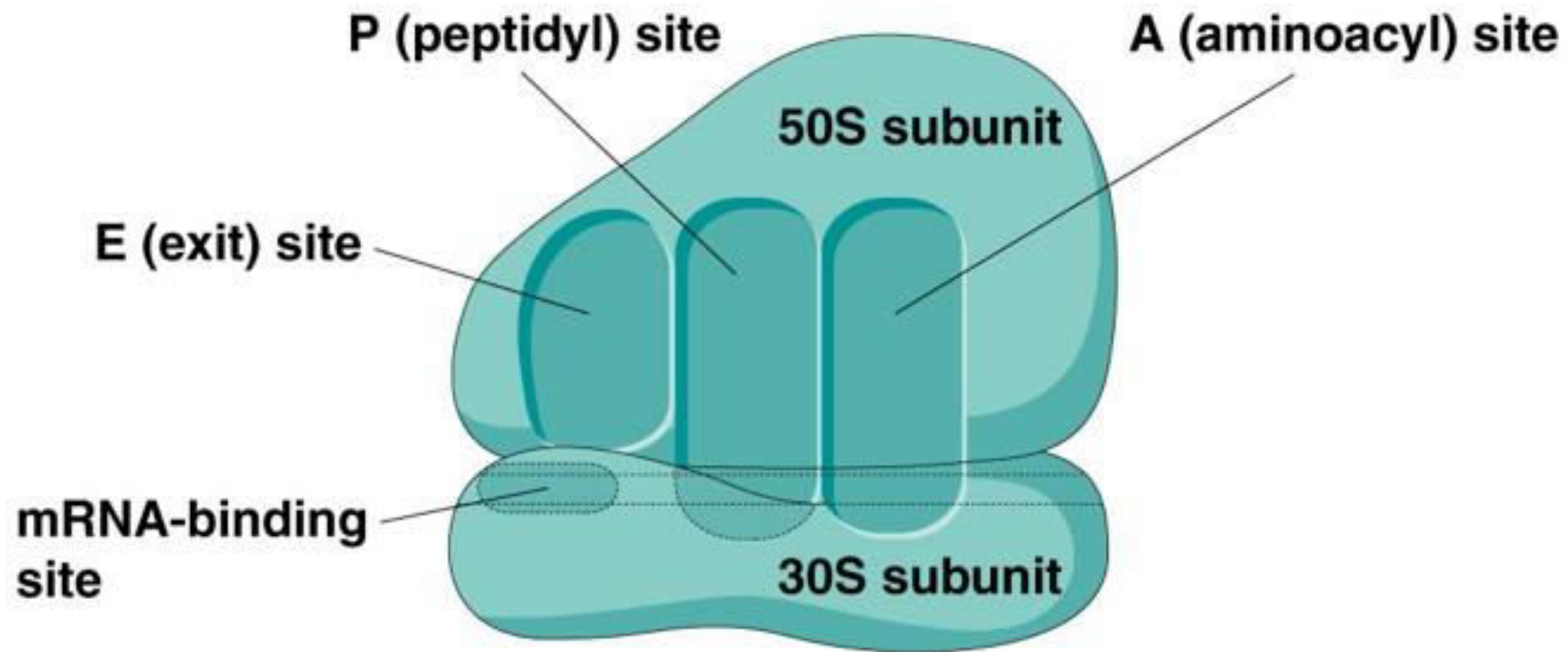
**Information flows from DNA to RNA to proteins.**



Three sites in the two subunits are associated with translation:

- **A site (aminoacyl site):** the site where the aminoacyl tRNA binds.
- **P site (peptidyl site):** the site where the peptide bond is formed between two amino acids.
- **E site (Exit site):** the site where the tRNA leaves the ribosome.





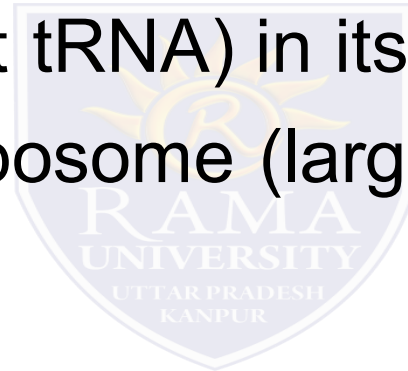
Initiation involves all the steps before the formation of the peptide bond between the first two amino acids in the peptide chain.

### **What molecules involved in translation initiation?**

1. mRNA
2. Ribosome
3. Specific initiator tRNA (start codon!)
4. Initiation factors
5. Energy (GTP guanine triphosphate)



1. The small ribosome finds the mRNA
2. Finding the start codon
3. Place the start tRNA (Met tRNA) in its correct location
4. Assembly of the entire ribosome (large and small) and the start tRNA (tRNA Met)



### Translation initiation in bacteria starts with (Finding the mRNA):

1. The interaction between the small ribosomal subunit (30S) and two initiation factors (**IF 1 and IF 3**).
2. The complex (30S ribosomal subunit + IF1 + IF 3) bind to the mRNA at a specific location.



## The ribosome binding site in mRNA

1. The binding site in mRNA is not only the start codon (AUG). **WHY?**
  2. A sequences upstream of the start codon are essential for specific binding of ribosome to the correct location.
- **The ribosome binding site (RBS)** in prokaryotic mRNA is called **Shine-Dalgarno sequence**.



## Shine-Dalgarno sequence

- 8-12 specific nucleotide sequence upstream of the start codon (of each gene/transcript).
- The sequence interacts with the complementary sequence in 16S rRNA in the small ribosomal subunit.
- Interacts specifically with the small ribosomal subunit 30S.

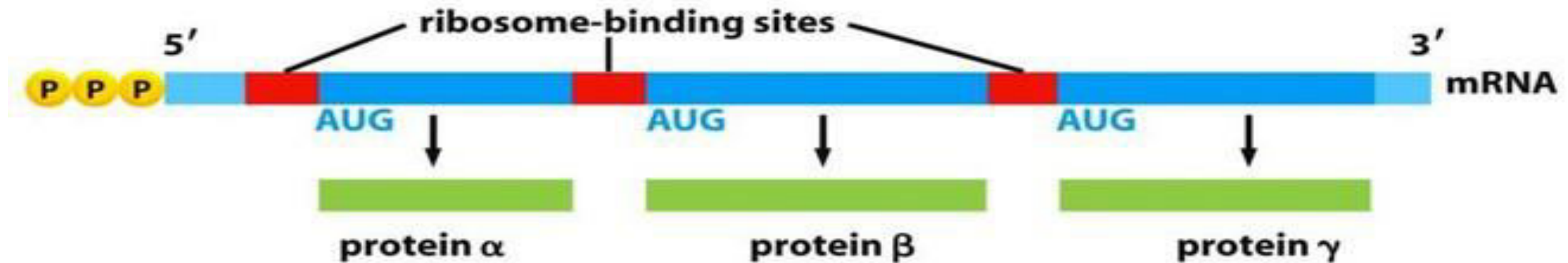
## Shine-Dalgarno sequence

- This ensures **specificity** of where the ribosome assembles and start translating.
- This sequence helps translating a polycistronic transcript and each gene therein independently!

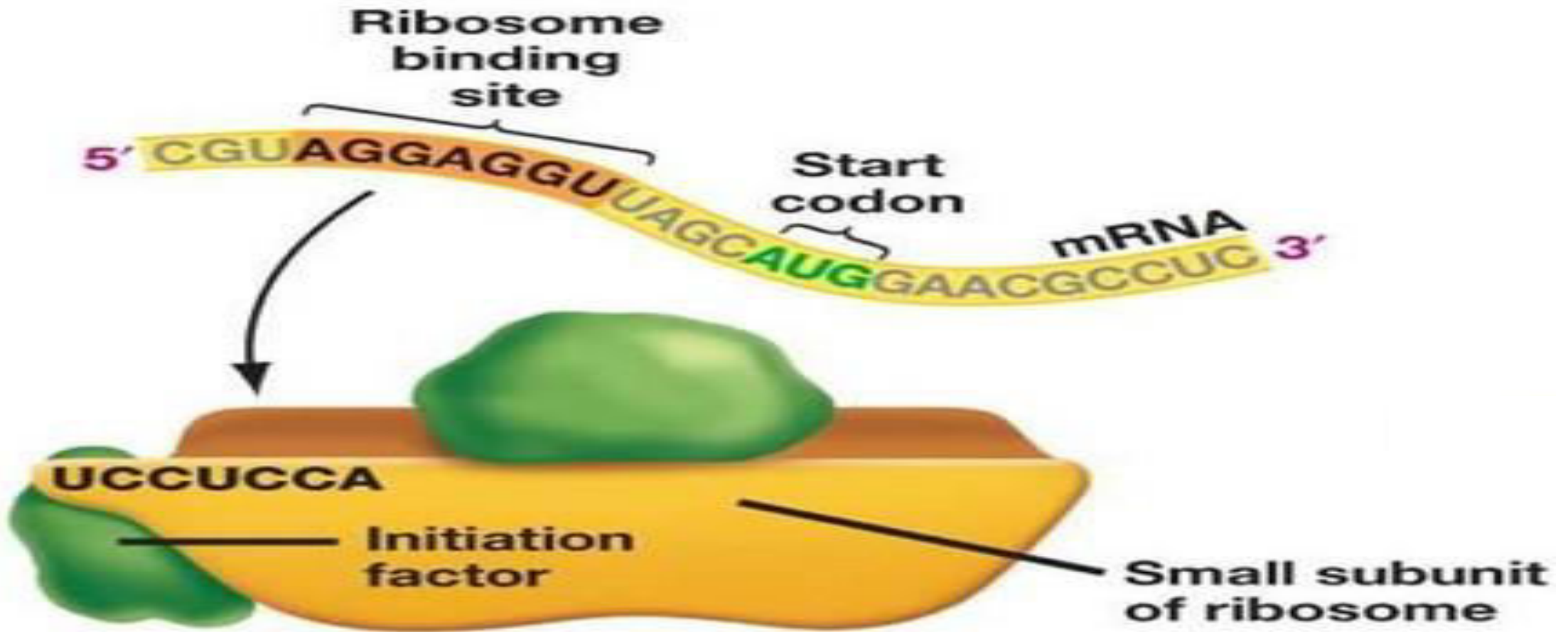


## Translation initiation in bacteria

Before each protein coding gene in a polycistronic transcript, a ribosome binding site exist.



## Shine-Dalgarno sequence



**1. mRNA binds to small subunit of ribosome.**

1. The interaction between the small ribosomal subunit (30S) and two initiation factors (**IF 1 and IF 3**).
2. The complex (30S ribosomal subunit + IF1 + IF 3) bind to the mRNA at a specific location.
3. A special initiator tRNA binds to the 30S ribosome and mRNA at the start codon.

