

Lesson 5: Friday, March 27, 2020. Biology MHS

AIM: How does the ribosome use the mRNA message to build a functional protein?

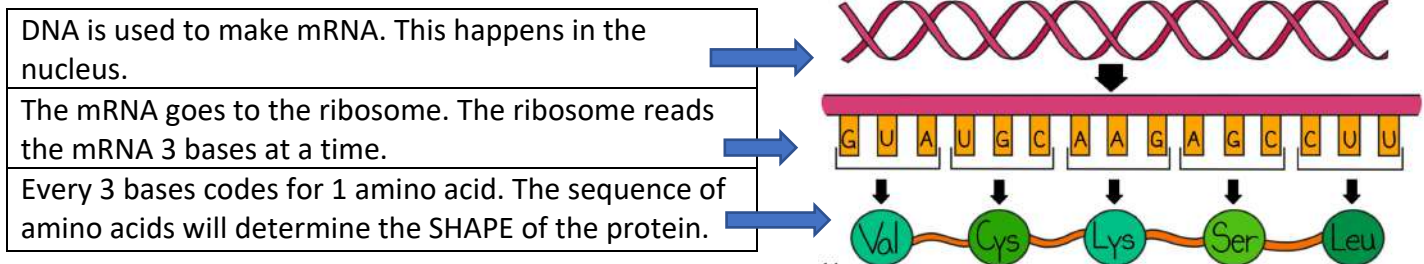
- **Recall:** DNA can be used to make mRNA using the DNA → RNA base pairing rules. **mRNA** (messenger RNA) leaves the nucleus and goes to the **ribosome**- the site of protein synthesis
- The ribosome will read the mRNA message **3 bases at a time**. Once again, the ribosome will read the mRNA in groups of 3 letters at a time. Look at the mRNA below. It's been "spaced out" into groups of 3 so we can think about how the ribosome will read this message.

mRNA message G A U C C A U G U C G C

- You should know from the beginning of the year that **amino acids are the building blocks of proteins**. Did you know that there are 20 different amino acids? And, that each protein is built from a specific combination of amino acids? Here is where the mRNA message comes in.
- Every 3 mRNA bases codes for **1 amino acid**. The sequence of bases in the mRNA message will instruct the ribosome *which amino acids* are needed to build the protein.
- The *sequence of amino acids* is very important, because it will determine the final **SHAPE** of the protein. As you might remember, the shape of most proteins determines their **jobs**. Enzymes, receptors, hormones, and antibodies are all molecules *whose function depends on their SHAPE*.
- If there is a change in the amino acid sequence, there could be a *change in the shape of the protein*, and then it may no longer be able to perform its function.

The 20 amino acids:

Alanine	Methionine
Cysteine	Asparagine
Aspartic Acid	Proline
Glutamic Acid	Glutamine
Phenylalanine	Arginine
Glycine	Serine
Histidine	Threonine
Isoleucine	Valine
Lysine	Tryptophan
Leucine	Tyrosine



How do I know **which** amino acid the ribosome will code for if I am given an mRNA sequence? Do I have to memorize all of the amino acids?

- To determine which amino acid a group of 3 mRNA bases codes for, you must use the **universal genetic code chart** →
- What amino acid does "AUU" code for?
- The first base is **A**, so I will look in the **A row**. The second base is **U**, so I will look in the **U column**. From here, I can see that AUU } ILE
- ILE is an abbreviation for "*isoleucine*-" one of the 20 amino acids.
- What amino acid for "GAC" code for? Look in the **G row**, the **A column**, and see that GAC } ASP
- ASP is an abbreviation for "*aspartic acid*-" one of the 20 amino acids

Universal Genetic Code Chart
Messenger RNA Codons and the Amino Acids for Which They Code

		SECOND BASE				
		U	C	A	G	
FIRST BASE	U	UUU } PHE UUC } UUA } LEU UUG }	UCU } UCC } SER UCA } UCG }	UAU } TYR UAC } UAA } STOP UAG }	UGU } CYS UGC } UGA } STOP UGG } TRP	U C A G
	C	CUU } CUC } LEU CUA } CUG }	CCU } CCC } PRO CCA } CCG }	CAU } HIS CAC } CAA } GLN CAG }	CGU } CGC } ARG CGA } CGG }	U C A G
	A	AUU } AUC } ILE AUA } AUG } MET or START	ACU } ACC } THR ACA } ACG }	AAU } ASN AAC } AAA } LYS AAG }	AGU } SER AGC } AGA } ARG AGG }	U C A G
	G	GUU } GUC } VAL GUA } GUG }	GCU } GCC } ALA GCA } GCG }	GAU } ASP GAC } GAA } GLU GAG }	GGU } GGC } GLY GGA } GGG }	U C A G