



**FACULTY OF AGRICULTURAL SCIENCES
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GENETIC CODE

In the DNA and RNA there are four types of nucleotide or bases viz., A, G, T, C and A, G, U C respectively. If it is assumed that each base codes for one amino acid, then only four amino acids can be coded. If two bases together are responsible for production of one amino acid, then they will code for $4^2 = 16$ amino acids. If three bases together code for an amino acid then $4^3 = 64$ amino acids could be coded. As the essential amino acids in a biological system are 20 in number, the possibility of one or two bases coding for each amino acid is remote.

Crick and Brunner (1961) suggested that the genetic code might be a triplet code, involving three nucleotide bases to code for an amino acid. Neinberg et al., (1961) constructed a complete genetic code dictionary.

The pattern of genetic code indicates the following:

1. Codons for the aromatic amino acids begin with uracil

UUC	}	Phenyl alanine (Phe)
UUC		
UGG		Tryptophan (Trp)

UUC	}	Tyrosine (Tyr)
UUC		

2. Codons for amino acids that form amides begin with Guanine and Adenine

GAU	}	Asparagin (Asp)
GAC		
GAA		
GAG		Glutamin (Glu)

3. For many of the synonymous codon specifying the same amino acid, the first two bases of the triplet code are constant, while the third varies, being less specific.

CCU	}	proline (pro)	CGU	}	Glycine (Gly)
CCC					
CCA					
CCG					
			CGC		
			CCA		
			GGG		

Grick (1966),. The third base tends to Wobble or in unsteady and proposed Wobble hypothesis.

FEATURES OF TRIPLET CODE

1. Some of the nucleotides have to code for more than one amino acid and hence, called 'ambiguous code" e.g. UUU codes for phenyl alanine – presence of streptomycin, it may code for isoleucine, leucine ro serine.

2. The code contains many synonyms and hence called 'degenerate code'. Almost all the amino acids are represented by more than one codon. e.g. Arginine, serine, leucine have six synonymous codons.
3. The code is read continuously without interruption and no codon is reserved for punctuation. Hence it is called 'commaless code'.
4. There is no overlapping of base sequences specifying for different amino acid, and no single base in a triplet can take part in the formation of more than one codon. Hence, it is called a non-overlapping code. e.g. UCAGAA - UCA - Serine, GAA-Glutamine. But overlapping as UCA, CAG, AGA etc. does not occur to code for other amino acids.
5. As the same code applies for all living systems it is called an 'Universal code'. (Orgaell DNA's are found to have different meaning than in nuclear DNA).
6. Among the triplet codons, AUG, is the chain initiation codon as it initiates the synthesis of polypeptide chain. Codons UAA, UAG and UGA are the terminating codons as they terminate translation of the polypeptide chain. As these three codons do not specify any amino acid they are called non-sense codons.

IMPORTANT QUESTIONS:

1. Briefly explain WOOBLE hypothesis.
2. Describe genetic code and important features of genetic code.
3. Briefly explain importance of genetic code.
4. Write down all the genetic code for essential amino acids.
5. What is start codon and stop codon?