# Methods in behavioral genetics

# What are genes and how do they work-2?

Genes are functional fragments of DNA which are responsible for the structure of a protein or a RNA molecule.

#### How does the hereditary information turns into body traits?

The process of genetic information conversion to individual properties is called the protein synthesis, which one includes several stages and involves both RNA and DNA.

Synthetic reactions occur partially in the nucleus but principally in cytoplasm.



Why proteins do matter? It because of their participation in a lot of processes and structures in our body.

## Proteins roles in the human body

Class	Functions	Examples
Structural	Provide structural components	Collagen Keratin
Contractile	Move muscles	Miosin Actin
Transport	Carry essential substances throughout the body	Hemoglobin Lipoprotein
Storage	Store nutrients	Casein Ferritin
Hormone	Regulate body metabolism and nervous system	Insulin Growth hormone
Enzyme	Catalyze biochemical reactions in the cell	Sucrasa Tripsin
Protection	Recognize and destroy foreign substances	Immunoglobulins

### Principles of DNA and RNA complementarity



CoG, G&C	CoG, G&C
AnT, TeA	AhU , UsA T does not involved in RNA

# RNA types roles in protein synthesis

Туре	Localisation	Function	Picture
mRNA	Nucleus, then migrates to cytoplasm	Messenger of hereditary information to ribosomes	MALANANAN
rRNA		Structural component of ribosomes	Sister
†RNA	Cytoplasm	Transfers specific amino acids to ribosomes	

Protein Synthesis (Updated) https://www.youtube.com/watch?v=oefAI2x2CQM

#### TRANSCRIPTION: (nucleus)

- DNA unzips, using the enzyme, helicase, which unwinds it and breaks the hydrogen bonds.

- CBP (complementary base pairing) occurs when RNA nucleotides move into place with  $A \rightarrow U$ ,  $T \rightarrow A$ ,  $G \rightarrow C$ , and  $C \rightarrow G$ .

- The RNA nucleotides rejoins, using the enzyme, RNA polymerase.



- Genes contain sections of DNA called introns, which are interruptions and are removed by ribozymes, and exons (expression), which get expressed or become the protein.



### TRANSLATION: (ribosome)

- Once the mRNA has let the nucleus, it gets associated with ribosomes;

- mRNA binds to smaller ribosomal subunit, then the larger subunit joins.





- polypeptide lengthens 1 amino acid at a time;
- the ribosome is large enough for 2 + RNA molecules, 1 coming, 1 outgoing.





- a stop codon does not have a special tRNA molecule so this allows the mRNA to "fall off" the ribosome and the ribosome to break into 2 subunits. - Several ribosomes, called a polysome, move along a strand of mRNA at once, so several polypeptides of the same type can be made at once using one mRNA molecule.



# PROTEIN structuring: (ribosome)

# 1. peptide bonds

2. α-helix or β sheet by H-bond

3. 3D structure covalent bonds between R-groups

4. several

polypeptides

Primary protein structure sequence of a chain of animo acids

Secondary protein structure hydrogen bonding of the peptide backbone causes the amino acids to fold into a repeating pattern

Tertiary protein structure three-dimensional folding pattern of a protein due to side chain interactions

Quaternary protein structure protein consisting of more than one amino acid chain











**Protein Structure and Folding** 

<u>https://www.youtube.com/watch?v=hok2hyED9go</u>