

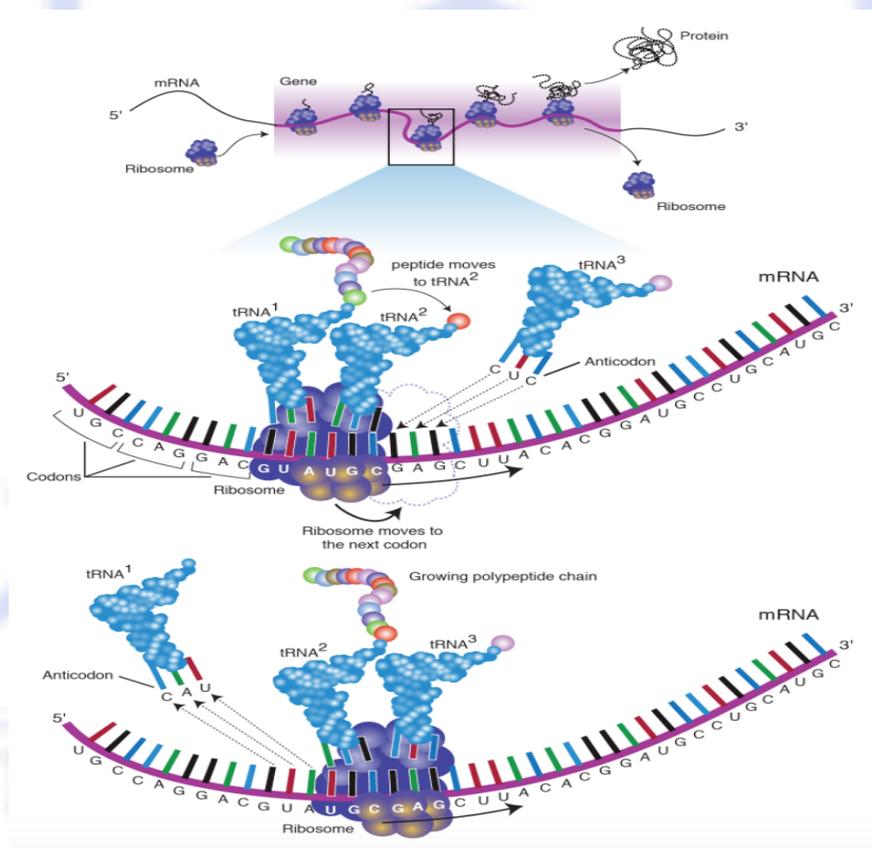
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## Gene expression in cloned cells

### What is Gene expression?

The **central dogma** of biology describes the way by which information is taken from genes and used to create proteins. To do so DNA transcription result in RNA (mRNA), then RNA translation constructs proteins. This procedure is known as **gene expression** and all life forms use it to create the building blocks of life from genetic information. this requires reading the genetic code (3 letters) written in the DNA (template). So that the cell translates the genetic code, as it is each group of three letters it adds one of the 20 different amino acids that are the basic units needed to build proteins (final product) as shown in the figure below.



This is a controlled process in which genes are expressed enables the cell to control its size, shape and functions. The expressed gene affects the organism's phenotype such as eye and hair color.

## Gene expression profiling:

After gene being transformed into cloned cell, it's important to measure which genes are being expressed in a cell at any given moment. This method can measure thousands of genes at a time; some experiments can measure the entire genome at once. Gene expression profiling measures mRNA levels, showing the pattern of genes expressed by a cell at the transcription level. This frequently means measuring relative mRNA amounts in two or more experimental conditions, then considering which conditions resulted in specific genes being expressed.

Gene expression profiling is used by a variety of biomedical researchers, from molecular biologists to environmental toxicologists. This technology can provide accurate information on gene expression, towards numerous experimental objectives.

It tells us how a cell is functioning at a specific time. This is due to cell gene expression is influenced by external and internal stimuli, including whether the cell is dividing, what factors are present in the cell's environment, the signals it is receiving from other cells, and even the time of day.

Several techniques are used to determine gene expression. These include DNA microarrays and sequencing technologies.

## Uses of Gene expression profiling

- 1- It enables us to investigate the effects of different conditions on gene expression by altering the environment to which the cell is exposed, and determining which genes are expressed. Alternatively, if we previously know a gene is involved in a certain cell behaviour, this helps us to determine whether a cell is carrying out this function. For example, certain genes are known to be involved in cell division; if these genes are active in a cell, we can say the cell is undergoing division, or whether a cell is differentiated.
- 2- It's used in hypothesis generation. If very little is known about when and why a gene will be expressed, expression profiling under different conditions can help design a hypothesis to test in future experiments. For example, if gene A is expressed only when the cell is exposed to other cells, this gene may be involved in intercellular communication.

- 3- It is also investigated the effect of drug-like molecules on cellular response. We could identify the gene markers of drug metabolism, or determine whether cells express genes known to be involved in response to toxic environments when exposed to the drug.
- 4- It can be used as a diagnostic tool. If cancerous cells express higher levels of certain genes, and these genes code for a protein receptor, this receptor may be involved in the cancer, and targeting it with a drug might treat the disease. So that gene expression profiling might then be a key diagnostic tool for people with this cancer.

### **Types of gene expression profiling:**

- 1- RNA sequencing.
- 2- real-time quantitative PCR.
- 3- quantification by digital PCR

