

# Difference Between Structural and Regulatory Genes

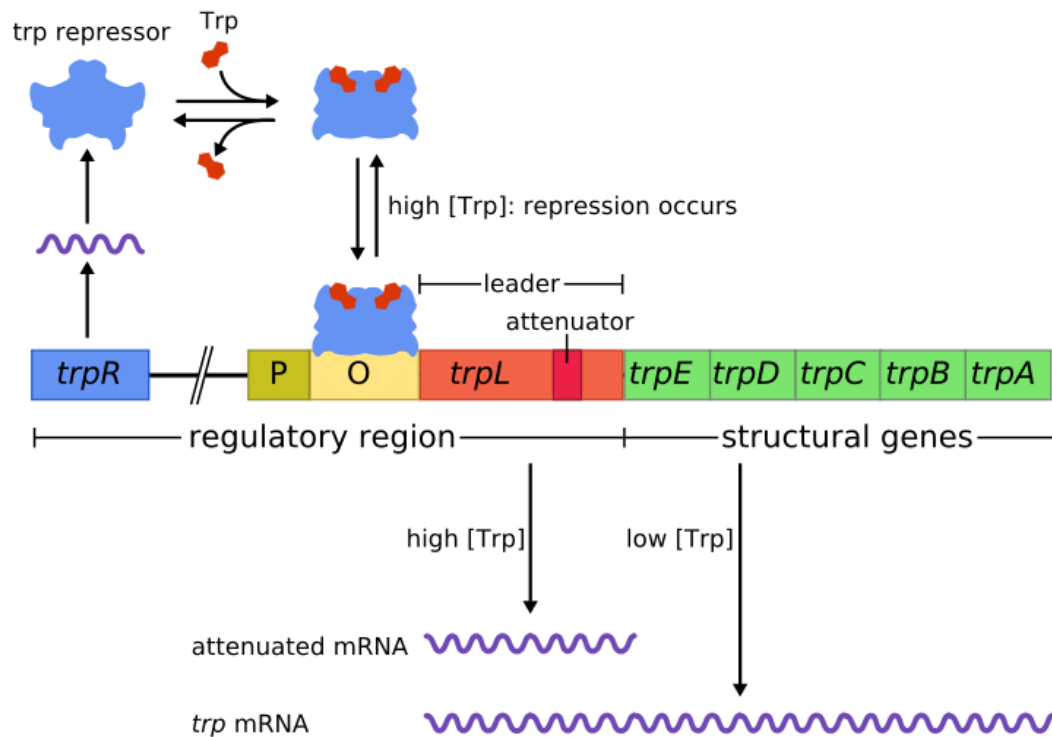
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## Key Difference - Structural vs Regulatory Genes

In the context of heredity, the structural and functional unit is the gene. They are made up of DNA containing the genetic information for the synthesis of proteins. The size of human genes differs, and ranges from a small number to a large number of base pairs. According to the human genome project, the estimated number of genes that human possess is 20,000 to 25,000 genes. Each and every person has two copies of a gene. These two copies are inherited from the parents (one by each parent). There are two types of genes. Structural genes and regulatory genes. **In the context of structural genes, it is a type of gene that encodes for any type of RNA (except siRNA and miRNA) and protein that are not regulatory proteins. Regulatory genes are a set of genes that involves the controlling of expression of structural genes.** This is the **key difference** between structural and regulatory genes.

## What are Structural Genes?

A structural gene is a type of gene that codes for a particular protein or RNA. These genes codes for all proteins except regulatory proteins. Structural gene products contain structural proteins and enzymes. In a typical aspect, these structural genes contain corresponding DNA sequences to a specific sequence of amino acid that results in a protein. Structural genes ensure the produced proteins do not involve in any form of gene regulation. These genes are also encoded by different non-coding RNA such as rRNA and tRNA. Regulatory miRNA (micro RNA) and siRNA (short interfering RNA) are not encoded by structural genes.

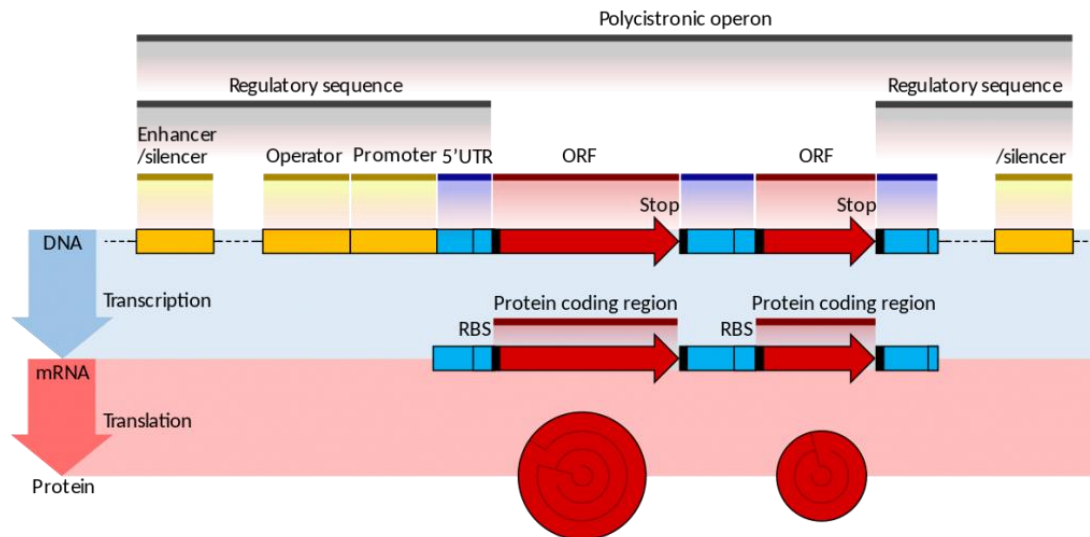


**Figure 01: Structural Genes**

The prokaryotic structural genes are presenting adjacent to each other as an operon. Genes of the operon always perform related functions. The formation of an operon leads to regulation of gene expression. The most common and best example of an operon is *lac* operon. It consists of three structural genes, *lac Z*, *lac Y* and *lac A*. All these structural genes are regulated by a single operator and a promoter. When determining the genetic-based disease conditions, they could be identified using the investigation of content and the location of these structural genes.

## What are Regulatory Genes?

Regulatory gene is a type of gene that involves the control of expression of one or more other genes. Under normal conditions, the regulatory genes are composed of regulatory sequences, and they are present at the 5' end of the transcription start site of the structural gene it regulates. They also may possess the regulatory sequences at 3' end of the transcription start site. The regulatory sequences can be present many kilo bases distant from the start site of transcription. These regulatory genes have the ability to encode a protein or can act as encoding a gene for in the context of miRNA. A gene that encodes for a protein which possesses an inhibitory action upon an operator gene could be described as an example for a regulatory gene. An operator gene is a type of gene that binds to different repressor proteins, which inhibit the translation process.



**Figure 02: Regulatory Genes**

In prokaryotes, regulatory genes mainly encode for repressor proteins. These repressor proteins bind to promoters of the gene and prevent the recruiting and functioning of RNA polymerase. This in terms inhibits the transcription process. Some regulatory genes involve in the encoding of activator proteins. These proteins bind to a particular location of a DNA molecule and increase the transcription process.

## What are the Similarities Between Structural and Regulatory Genes?

- Both Structural and Regulatory Genes are code for proteins or RNA.
- Both Structural and Regulatory Genes are made up of nucleotides.
- Both Structural and Regulatory Genes are important in living organisms.

## What is the Difference Between Structural and Regulatory Genes?

Structural vs Regulatory Genes	
Structural gene is a type of gene that encodes for any type of RNA (except siRNA and miRNA) and protein that are not regulatory proteins.	Regulatory genes are a set of genes that involve the controlling of expression of the structural genes.
Structure	
Structural genes are complex structures.	Regulatory genes are simpler structures.
Function	
Structural genes are encoded for structural proteins and enzymes.	Regulatory genes regulate the transcription of structural genes.

# Summary - Structural vs Regulatory Genes

A structural gene is a type of gene that codes for a particular protein or RNA. These genes code for all proteins except any type of regulatory proteins. Structural gene products contain structural proteins and enzymes. Structural genes ensure the produced proteins do not involve in any form of gene regulation. Regulatory gene is a type of gene that involves the control of expression of one or more genes. In prokaryotes, the regulatory genes mainly encode for repressor proteins. This is the difference between structural and regulatory genes.

## Reference:

1. Study.com, Study.com. [Available here](#)
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## Image Courtesy:

1. 'Trp operon' By Histidine - Own work, (CC BY-SA 3.0) via [Commons Wikimedia](#)
2. 'Gene structure prokaryote 2 annotated' By Thomas Shafee - Shafee T, Lowe R (2017). "Eukaryotic and prokaryotic gene structure". WikiJournal of Medicine 4 (1). DOI:10.15347/wjm/2017.002. ISSN 20024436., (CC BY 4.0) via [Commons Wikimedia](#)

## How to Cite this Article?

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