

Section 8.6 Gene Expression and Regulation

Prokaryotic cells turn genes on and off by controlling transcription.

- A **promotor** is a DNA segment that **allows a gene to be transcribed**.
- An **operator** is a part of DNA that **turns a gene “on” or “off.”**
- An **operon** includes a **promoter, an operator, and one or more structural genes** that code for all the proteins needed to do a job.

>**Operons** are most common in **prokaryotes**.

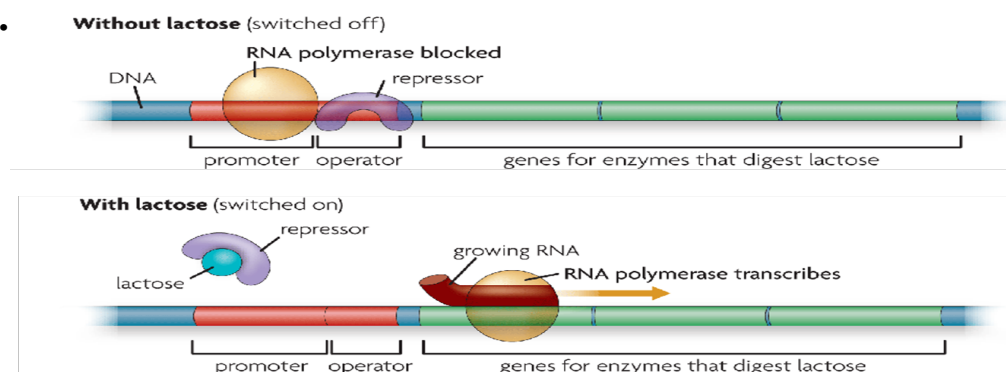
>The **lac operon** was one of the first examples of gene regulation to be discovered.

>The **lac operon** has three genes that code for enzymes that break down lactose.

- The **lac operon** acts like a **switch**.

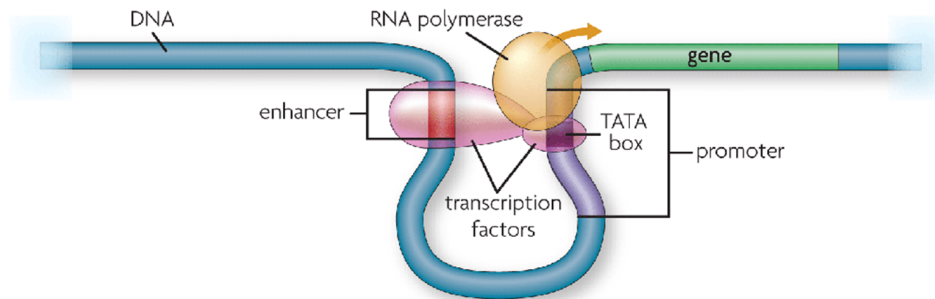
- The **lac operon** is “off” when **lactose is not present** repressor is **attached**.

- The **lac operon** is “on” when **lactose is present** repressor is **removed**.

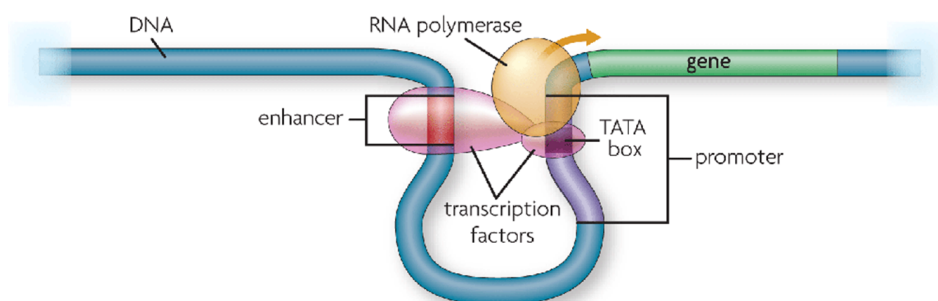


Eukaryotes regulate gene expression at many points.

- Different sets of genes are *expressed* in different types of cells.
- Transcription is controlled by *regulatory DNA* sequences and *protein transcription factors*.



- › Most eukaryotes have a *TATA box promoter*.
- › *Enhancers and silencers* speed up or slow down the rate of transcription.
- › Each gene has a *unique combination* of regulatory sequences.



- RNA processing is also an important part of gene regulation in eukaryotes.
- mRNA processing includes *three major steps*.
- *Introns* are removed and *exons* are spliced together.
- A *5' cap* is added.

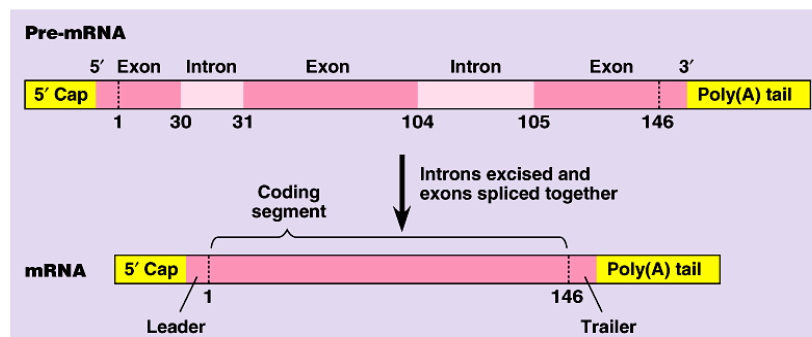
"Capping", the process that creates a specially altered nucleotide on the 5' end of the mRNA strand

- A *poly A tail* is added.

A *poly A tail* consists of multiple adenosine monophosphates; in other words, it is a stretch of RNA that has only adenine bases.

In eukaryotes, not all nucleotides carry instructions for making proteins.

- *Exon* = the portions of a gene that get *translated into proteins*.
- *Intron* = the noncoding portions of a gene that *interrupt exons*.
- In humans, less than *10%* of our genes are exons.
- Introns are separated from exons during *transcription*.

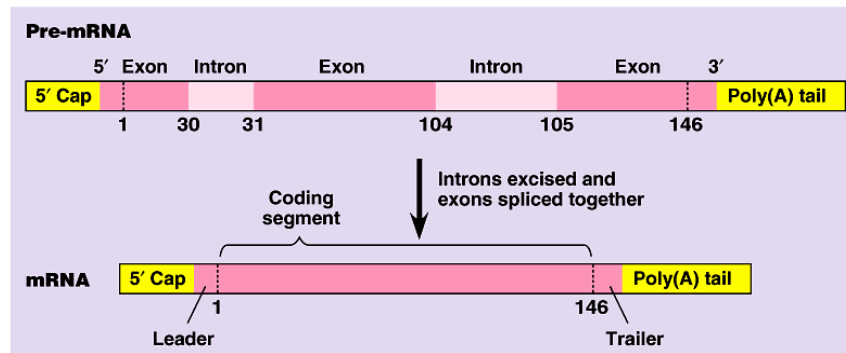


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Exons play a role in evolution.

One exon may influence which molecules an *enzyme is able to recognize*, while another may determine whether a *protein will respond to particular signal molecules*.

By possessing introns and exons, cells can *shuffle exons* between genes and create new combinations. This enables cells to manufacture many *different* proteins by juggling exons between genes.



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