**CH 8.6-8.7: Gene Regulation, Structure, & Mutations**

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| Objectives | Vocabulary | |
| * **Describe** how the *lac* operon is turned on or off. * **Summarize** the role of transcription factors in regulating eukaryotic gene expression. * **Describe** how eukaryotic genes are organized. * **Evaluate** three ways that gene alterations can alter genetic material. | * Lac operon * Repressor protein * Operon * Transcription factor * Intron | * Exon * Point mutation * Frameshift mutation * Transposon |

**Regulation of Gene Expression in Prokaryotes**

* Both prokaryotic and eukaryotic cells are able to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ which genes are expressed and which are not, depending on the cell’s \_\_\_\_\_\_\_\_\_.
  + If specific proteins are not needed all of the time, it would be a \_\_\_\_\_\_\_\_\_\_\_ of energy for the cell to continually make them
  + Review…
  + What did we call the sequence of DNA that signals for the start of transcription?
* Prokaryotes group genes with similar functions into clusters called an operon
* An \_\_\_\_\_\_\_\_\_ is a group of genes with similar functions under the control of one promoter
* Example: The Lac Operon
  + The Lac Operon consists of 3 genes necessary for digesting lactose
  + The three genes on the prokaryotic DNA strand below are involved with \_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_ down lactose

**Regulation of Gene Expression in Eukaryotes**

* The regulation of gene expression in eukaryotes is more \_\_\_\_\_\_\_\_\_\_\_\_\_ than in prokaryotes for several reasons…
  + Eukaryotes have many more \_\_\_\_\_\_\_\_ than prokaryotes
    - Typical prokaryote = \_\_\_\_\_\_\_\_\_\_ genes
    - Humans = \_\_\_\_\_\_\_\_\_\_\_\_ genes
  + Similar genes in eukaryotes are not \_\_\_\_\_\_\_\_ together like in prokaryotes…they are often found on different \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Additionally, a nuclear \_\_\_\_\_\_\_\_\_\_\_\_\_ separates transcription and translation in eukaryotes, so there are many more opportunities for gene regulation
    - Regulation may occur \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_, or \_\_\_\_\_\_\_\_\_\_\_ transcription,…but most often occurs at the \_\_\_\_\_\_\_\_\_\_\_\_\_
* Special proteins, called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_factors and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ help to arrange RNA polymerase on the promoter site properly

Intervening DNA Sequences in Eukaryotes

* In eukaryotes, many genes are interrupted by **\_\_\_\_\_\_\_\_\_\_\_\_** —long segments of nucleotides that have no \_\_\_\_\_\_\_\_\_\_ information.
  + These portions are said to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with protein synthesis
* The portions of a gene that are translated or expressed into proteins are called \_\_\_\_\_\_\_\_\_\_
* After a eukaryotic gene is transcribed, the introns in the resulting mRNA are \_\_\_\_\_\_\_ out by proteins called \_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Spliceosomes also \_\_\_\_\_\_\_\_\_\_ or “stitch” the remaining \_\_\_\_\_\_\_\_\_\_ together
* The new mRNA containing only \_\_\_\_\_\_\_\_\_\_, exits the nucleus

**Mutations**

* Errors in DNA \_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_ may cause mutations that code for \_\_\_\_\_\_\_\_\_\_\_\_ amino acids
* Mutations may…
  + have \_\_\_\_\_\_\_\_\_ effect on an organism
  + be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* The two main types of mutations are gene \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and gene \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Gene Rearrangements

* Gene rearrangements are mutations that move an \_\_\_\_\_\_\_\_\_\_ gene to a new location on a chromosome
  + This may affect a gene’s expression because it is exposed to different \_\_\_\_\_\_\_\_\_\_\_\_\_ proteins
  + It could be comparable to moving to France but not being able to \_\_\_\_\_\_\_\_\_\_ French
* Sometimes gene rearrangements occur when DNA does not \_\_\_\_\_\_\_\_\_\_\_ properly during cell division
* Other gene rearrangements are the result of \_\_\_\_\_\_\_\_\_\_\_\_\_\_, special genes that can actually \_\_\_\_\_\_\_\_ and change positions along a DNA strand. Before a transposition, a gene sequence may read A B C, but after it may read \_\_\_\_\_\_\_\_\_\_\_. Transposons are responsible for the streaked \_\_\_\_\_\_\_\_ pattern seen on Indian corn… their positions prevent \_\_\_\_\_\_\_\_\_ proteins from being produced, causing portions of the cob to lack color

**Gene Alterations**

* Gene alterations are mutations that change a portion of a \_\_\_\_\_\_\_\_\_\_ gene
* Two types of gene alterations are…
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mutations
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mutations

Point Mutations

* In a **point mutation,** a single nucleotide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_So, if a codon reads GGG, after a point mutation it may read \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Since several codons code for the same amino acid, sometimes point mutations do \_\_\_\_\_ alter the protein being made…but sometimes they do. Point mutations may also be called\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Frameshift Mutations

* In a **frameshift mutation,** nucleotides are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Because the genetic code is read in \_\_\_\_\_\_\_\_\_\_\_, insertions and deletions often upset the triplet grouping
* These mutations may cause a gene’s nucleotides to \_\_\_\_\_\_\_\_\_\_, causing the \_\_\_\_\_\_\_\_\_ three nucleotide sequences to be read
* Sometimes scientists compare proteins to sentences…
  + Imagine deleting the letter C from the sentence…

THE CAT ATE \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* The remaining triplet sequences would be altered and rendered \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Summarize the role of transcription factors in regulating eukaryotic gene expression
2. Describe how eukaryotic genes are organized
3. Evaluate three ways that gene alterations can alter genetic material