

Week 7 – Control of Gene Expression

Part I – Control of Gene Expression in Prokaryotes

Learning Goal: Understand how gene expression can be turned on and off in prokaryotes

After the pre-class assignments you should be able to:

- Define and relate the terms operon, polycistronic mRNA, and structural gene
- Label a diagram of the *lac* operon and state the function of each component
- Identify proteins and small molecules that regulate expression of the *lac* operon
- Describe how the *lac* repressor and CRP regulate expression of the *lac* operon

By the time you take the final exam you should also be able to:

- Identify the differences between positive and negative forms of regulation
- Interpret data as it relates to the *lac* operon and other similar methods of regulation
- Predict whether gene expression of an operon will occur given specific environmental conditions
- Identify changes in gene expression based on the haplotypes found in the cell (i.e. using partial diploids)

Part II – Control of Gene Expression in Eukaryotes

Learning Goal: Understand mechanisms that help control gene expression in eukaryotes

After the pre-class assignments you should be able to:

- Describe the role of histone proteins in DNA packaging, nucleosome formation, and chromatin structure
- Discuss how histones are chemically modified to increase or decrease the expression of a gene
- Describe how DNA methylation affects gene expression in eukaryotes
- Discuss the role of *Xist* in regulating gene expression at the chromosome level and why this is important for regulating gene dosage
- Describe how alternative splicing allows for multiple gene products to be produced from the same gene
- Describe the role of posttranslational protein modifications in the control of gene expression

By the time you take the final exam you should also be able to:

- Explain how chromatin packaging affects gene expression in eukaryotes
- Predict the effect of mutations in gene regulatory elements on gene expression
- Predict how DNA methylation patterns and histone acetylation will affect gene expression
- Evaluate the effect of different chromatin modifying enzymes on gene expression