

- Notes from last week
 - Template strand must be read 3'→5'
- Chapter 15: Regulation of Gene Expression in Prokaryotes
 - Concept Areas
 - Overview
 - **Lactose Metabolism in E. Coli**
 - **Positive and Negative Control**
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- Gene Regulation
 - Why do we need gene regulation?
 - **Recognize environmental conditions**
 - Overall efficiency
 - **Up or down regulate individual, or groups of, genes accordingly**
 - Development (more eukaryotes)
- Gene Regulation in Prokaryotes
 - **Which is not a cis-acting element?**
 - Repressor
 - **Cis-acting** regulatory elements are the same type of molecule they regulate
 - Are almost always located upstream of the gene cluster they control
 - Molecules that bind these cis-acting sites are **trans-acting**
 - General scheme: regulatory proteins control transcription either recruit or block RNA polymerase
 - Positive Regulation

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- o Negative Regulation:
 - Under negative control, gene expression occurs unless it is shut off by some form of a regulator molecule (Constitutive expression unless repressor is bound)
 - Repressor bound: decreased transcription
 - No Repressor bound: increased transcription
- Allosteric Regulation
 - In the *lac* and *trp* operons, why is the repressor said to be an allosteric molecule?
 - o It undergoes a conformational change when it interacts with another molecule
 - Allosteric molecules change their conformation when they interact with other molecules, and this conformation change affects their chemical activity
 - Allosteric regulation...
- Prokaryotic Operon
 - Which statement is true regarding a bacterial operon?
 - o Contains information for more than one protein product
 - Operon: group of structural genes plus sequences that control transcription
 - o Get polycistron that codes for gene products
- Lac Operon
 - The *lac operon is normally expressed*
 - o In the presence of lactose and the absence of glucose
 - The Lac Operon has to do with the ability of E. Coli to utilize the sugar lactose. Lactose is a 12 carbon sugar made of 2 simpler 6 carbon sugars, glucose and galactose. Glucose is...
 - Which term is used to describe enzymes that are produced only when specific substrates are present in the environment
 - o Inducible

- Inducible best describes enzymes that were produced only when specific substrates are present in the environment to induce their reproduction
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□ Lac Operon Mutants

- $I^+ O^c Z^+$
 - $I^+ O^c Z^+$ contains a mutant operator that is constitutive; the DNA sequence at the operator is altered so the repressor can never bind
 - - = mutation
 - + = wild-type
 - c = constituent

□ Be able to fill in the table

- Analysis of *lac* expression in the absence or presence of lactose in partial diploid merozygotes was used to prove the operon model for the *lac* operon
- Table: Presence of β -galactosidase activity

□ Positive Control of the *lac* Operon

- Which of the following statements describes the effect of high glucose concentrations in a bacterial cell of transcription of the *lac operon* structural genes?
 - When glucose is present, the levels of cAMP are low. CAP alone will not bind to the CAP binding site, and thus the structural genes are not transcribed
 - High levels of glucose result in catabolite repression
 - The **catabolite-activating protein (CAP)** is involved in repressing expression of the *lac* operon when glucose is present
 - Catabolite-Activating Protein (CAP) exerts positive control over *lac* Operon

□ Tryptophan Operon

- Tryptophan is an essential amino acid
 - No tryptophan = no growth
 - If sufficient tryptophan present, none of the enzymes involved in its synthesis are produced.
- What kind of gene regulation?