# Chapter 16: Cell Communication

#### Learning Objectives:

* Biology I – III2: Compare mechanisms of regulation of gene expression.

1. In-Class Activities

1. Students can work in groups to create five multiple choice questions that they think would make good questions on the upcoming exam covering this chapter.  The groups will then share their questions with the class. The professor will choose 2-3 questions from the questions shared during the class to use on the exam.  This activity serves as a great review for the chapter.
2. Students should choose from the following Critical Thinking Questions on page 459-460 and answer three of them at home.  Students will then break into groups in class to discuss the answers to the questions. They will then choose one answer and present their best answer to the class.
3. Create Playdoh models of both the lac and tryp operon models on a manila folder (so you can transport it). Be able to explain how these operon models work when you show your model. Be able to explain the following: positive regulation, negative regulation, repressible operon, inducible operon, operon, operator, repressor protein, promoter, corepressor and inducer.

2. In-Class Project:

Prepare a 5 slide minimum presentation on one of the following conditions that involve epigenetics and the formation of cancer.

1. Tumor Suppressor Genes
2. Oncogenes
3. EGFR pathway
4. Altered expression of miRNAs
5. c-Flip protein
6. Histone acetylation

\*Include: A) a brief summary of the mechanism; B) how the epigenetic change causes cancer; C) potential treatments D) any other interesting information. Here is a good starting resource: <https://www.whatisepigenetics.com/fundamentals/>

3. Outside of Class Homework:

1. Why have genes under regulation?

2. What is the function of the promoter?

3. What is the function of the operator?

4. What happens if lactose levels are low? Put the following list in order (1-5).

RNA polymerase is blocked from transcribing the genes for the lactose metabolizing enzymes

When RNA polymerase binds to the promoter, it cannot get past the LacI repressor protein

The enzymes B-galactosidae, B-galacosidae permease, and transacetylase are not required by the cell due to low levels of lactose Lactose does not bind to the repressor protein, LacI

LacI, a repressor protein, is bound to the operator, which follows the promoter

5. What happens if tryptophan levels are high? Put the following list in order (1-4).

The trp repressor-tryptophan complex can now bind to the operator of the trp operon

Tryptophandoes not need to be produced by the trp operon

Tryptophan will bind to the repressor protein, changing its conformation

RNA Polymerase is blocked from transcribing the genes needed to synthesize tryptophan

6. What happens if lactose is present and glucose is scarce? Put the following list in order (1-7). Start with the repressor part first.

The three enzymes involved in the metabolism of lactose are transcribed and expressed cAMP binds to CAP regulatory protein, causing it to bind to the promoter of the lac operon

The enzymes needed for lactose metabolism must be transcribed when lactose is present

cAMP levels increase because glucose is scarce (ATP is not being produced through cell respiration)

Lactose binds to the LacI repressor, changing LacI’s shape and making it fall off the operator

CAP binding causes RNA Polymerase to bind to the promoter (higher affinity) and transcribe the gene at a higher level than before

Now that LacI has been removed for the operator, RNA polymerase can proceed with transcription