Lecture 28
BT 206
10 April 2023



- All metabolic reactions are catalyzed by enzymes (proteins)
- Feedback inhibition stops a cell from performing unneeded chemical reactions
 - Stops enzymes that are already synthesized
- What prevents synthesis of enzymes that are not needed?

- Protein synthesis requires tremendous energy
 - □ Cell does not waste energy
 - Regulating protein synthesis economizes cells energy

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Regulation of Bacterial Gene Expression

Genes

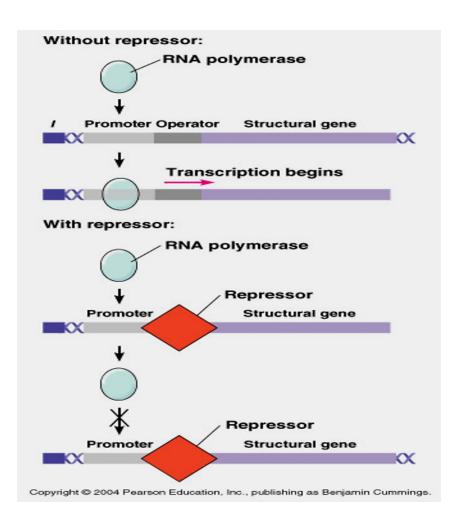
- □ 60-80% are constitutive
 - Not regulated
 - Products produced at fixed rate
 - Genes turned on all the time
 - Code for enzymes essential to major life processes
 - Example Enzymes needed for glycolysis

Genes

- □ Inducible genes
 - Production of enzymes is regulated
 - □ Inducible enzymes
 - Present only when needed
 - □ Trypanosoma
 - Surface glycoproteins
 - Produces one glycoprotein at a time
 - Eludes immune system



- Regulation of transcription
 - Repression
 - Decreases gene expression
 - Decrease enzyme synthesis
 - Response to overabundance of an end product
 - Regulatory proteins called repressors
 - □ Block RNA polymerase



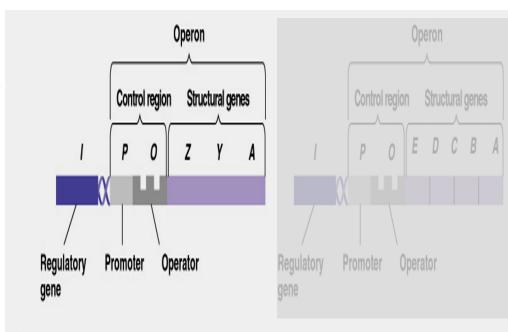
- Regulation of transcription
 - □ Induction
 - Turns on genes
 - Substance that turns on gene
 - □ Inducer
 - Inducible enzymes

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- Induction enzymes
 - □ β-galactosidase (*E. coli*)
 - □ Cleaves lactose
 - \Box Medium without lactose = little to no β-galactosidase
 - Lactose added to medium large amounts of βgalactosidase produced
 - □ Lactose is converted to allolactose
 - Allolactose is the inducer

Operon Model

- Three genes for lactose utilization
 - Located next to each other on bacterial chromosome
 - Regulated together
 - □ Called structural genes
 - lac structural enzymes are transcribed and translated
 - lac for lactose

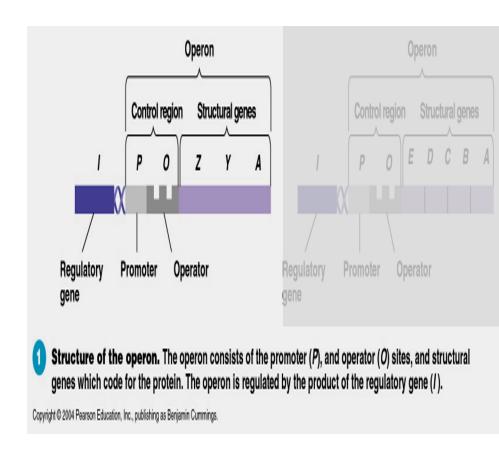


Structure of the operon. The operon consists of the promoter (*P*), and operator (*O*) sites, and structural genes which code for the protein. The operon is regulated by the product of the regulatory gene (*I*).

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Operon Model

- Operon model
 - □ lac operon
 - Promoter region
 - Region of DNA where RNA polymerase initiates transcription
 - Operator region
 - Go or stop signal for transcription of the structural genes
 - Structural genes
 - Genes for metabolism of lactose



Operon Model

- Inducible operon
 - Near lac operon is regulatory gene
 - I gene
 - Codes for repressor protein

