

Regulation of Genes

I. Control genes – regulate expression of other genes

A. Prokaryotes

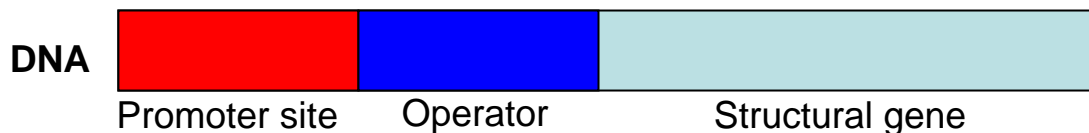
1. Regulatory genes code for regulatory protein, attach to DNA segments to induce or repress a gene

2. Operon consists of:

a. Cluster of genes that work together

b. Operator – “on-off switch” for gene; controls access of RNA polymerase

c. Promoter – site where RNA polymerase can bind to DNA and begin transcription



3. Operon can be switched off by a repressor

a. Repressors always present

b. Activated/inactivated by an inducer

4. *Lac* operon (p. 347) in *E. Coli*

a. Controls production of enzymes to digest lactose – turned on when lactose is present

5. Negative control systems – repressor protein prevents transcription

- a. Inducible enzyme – produced when substrate is present; repressor is **innately active**; example: *lac* operon
- b. Repressible enzyme – produced when substrate is absent; repressor **innately inactive**; example: tryptophan operon
 1. Tryptophan is an amino acid needed for *E. coli* survival
 2. *E. coli* can make tryptophan if it is unavailable from its host
 3. Presence of tryptophan activates a repressor to switch the gene off
 4. When tryptophan is absent, repressor is inactive and gene is **on**

6. Positive control systems – activator protein permits transcription

B. Eukaryotes

1. Much less understood than prokaryotes
2. Each cell expresses a small part of its genes – necessary for cell differentiation

II. “Jumping genes” or transposable elements

- A. Segments of DNA that move from one location on a chromosome to another
- B. A type of recombination
- C. Transposons can bring multiple genes for antibiotic resistance into a single plasmid
- D. Barbara McClintock – Nobel Prize in 1983 (at age 81) for discovery of transposons in Indian corn (a eukaryote)
- E. May be important in antibody variation