

## Chapter 11 Gene Expression

Cells use information in genes to build hundreds of different proteins, each with a unique function, but not all proteins are required by the cell at one time. By regulating gene expression, cells are able to control when each protein is made.

### Role of Gene expression:

Gene expression is the activation of a gene that results in the formation of a protein.

- a gene is said to be “expressed”, or turned on, when transcription occurs.
  - o Some proteins play structural roles, others are enzymes, some serve only in immune responses.
  - o We don’t want genes (proteins being made) turned on if we don’t need them.
    - Think about it – if your entire genome was turned on, you’d have skin the color of your eyes, hair the color of your eyes, perhaps legs growing out of your eyes, etc.
      - Genome – the complete genetic material contained within an individual.

### Protein synthesis in Prokaryotes is controlled by “On-Off” switches

- When you eat or drink a dairy product, *E. coli* in your stomach absorbs the lactose and breaks down into its 2 parts, glucose and galactose. This requires 3 different enzymes, which are each coded for by 3 different genes.
- There is an “on-off” switch that transcribes and then translates the 3 genes when lactose is present, and “turns off” the gene when lactose is not there (Operator).
- There is a promoter, which is a DNA sequence that recognizes the enzyme RNA polymerase, and thus promotes transcription.
- There are structural genes present that code for particular polypeptides (enzymes) to be made when lactose is present.
  - A group of genes that code for enzymes involved in the same function (structural genes), their promoter site, and the operator, all make up the operon.
  - The operon that controls the metabolism of lactose is called the lac operon.