

Lac Operon

1. In the absence of lactose, the lac operon becomes repressed. The repressor binds to the operator region inhibiting transcription.
2. In the presence of lactose, the lactose will act as an inducer of the lac operon. Lactose then converts into allolactose by the enzyme β -galactosidase. Allolactose acts as an inducer by binding to the lac repressor protein, causing it to change and release its grip on the operator. The RNA polymerase then binds to the promoter region and initiates transcription. The lac operon is then activated, and the enzymes necessary for lactose metabolism are produced.
3. In the absence of glucose, the lac operon is also activated and upregulated. Glucose is the preferred carbon source for *E. coli*. When there is no glucose the CAP becomes activated. CAP binds to the CAP binding site, increasing the rate of transcription. The lac operon is upregulated, allowing the cell to utilize alternative carbon sources, such as lactose, for energy production.
4. In the absence of glucose and the presence of lactose, transcription occurs. The lac repressor is released from the operator. cAMP levels are high which activates CAP. This enhances transcription by binding to the CAP binding site. RNA polymerase then binds to the promoter region and transcription occurs.
5. Regulation of this type takes place during transcription and post-transcription. Transcription is when the information in a gene is duplicated and placed into a second mRNA. Post-transcription is when mRNA is processed.

