

Transcript and Related Materials

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Notes

Structure and regulation of trp operon- Part I

The trp operon is a repressible operon system . This operon was studied in *E. coli* and it is responsible for controlling the synthesis of the amino acid tryptophan. The trp operon is an anabolic operon and by default it is always turned on.

Structure of the trp operon:

The trp operon contains regulatory sequences and structural genes. The regulatory sequences are the promoter (P) and the operator (O) followed by a unique sequence called as the leader region which plays an important role in the mechanism of attenuation. The five structural genes are present immediately downstream of the leader region. Gene E and D code for the enzyme anthranilate synthase, gene C codes for anthranilate isomerase , gene B codes for tryptophan synthase β and gene A codes for tryptophan synthase α . All these enzymes are involved in the tryptophan synthesis pathway. In addition to these genes a trp repressor gene (R) and its promoter (PR) are located at some distance upstream from the operon.

Regulation of the trp operon:

The trp operon is under negative repressible control which means that the product of the R gene i.e. the repressor molecule is made as an inactive negative regulator. The amino acid tryptophan is a co-regulator for the trp repressor. When the concentration of tryptophan in the cell increases two molecules of tryptophan bind to the dimeric trp repressor changing its conformation to the active DNA binding conformation and helping it to bind to the operator (O). Upto three trp repressor dimers can bind to the operator depending on the conformation of the repressor. The central dimer binding is the tightest. This prevents RNA polymerase from binding to the promoter region thus preventing transcription and translation from taking place.