

Event Card 1: Tryptophan Levels Increase

- **Description:** When the levels of tryptophan in the environment increase, tryptophan molecules bind to the *trp* repressor protein.
- **Effect on the Operon:**
 - The binding of tryptophan activates the repressor, causing it to change shape.
 - The active repressor then binds to the operator region of the *trp* operon.
 - This binding prevents RNA polymerase from transcribing the structural genes of the operon, effectively turning off gene expression for tryptophan synthesis.

Event Card 2: Tryptophan Levels Decrease

Description: When tryptophan levels in the environment decrease, tryptophan molecules are no longer available to bind to the trp repressor protein.

Effect on the Operon:

- The repressor protein becomes inactive and changes back to its original shape.
- The inactive repressor cannot bind to the operator region of the trp operon.
- This allows RNA polymerase to bind to the promoter and transcribe the structural genes of the operon, turning on gene expression for tryptophan synthesis.

Event Card 1: Lactose is Present

Description: When lactose is available in the environment, it is transported into the bacterial cell.

Effect on the Operon:

- Lactose binds to the lac repressor protein, causing it to change shape and become inactive.
- The inactive repressor cannot bind to the operator region of the lac operon.
- This allows RNA polymerase to bind to the promoter and transcribe the structural genes (lacZ, lacY, and lacA) of the operon, leading to the production of enzymes necessary for lactose metabolism.

Event Card 2: Lactose is Absent

Description: When lactose is not present in the environment, there are no lactose molecules to bind to the lac repressor.

Effect on the Operon:

- The lac repressor remains active and binds to the operator region of the lac operon.
- This binding prevents RNA polymerase from transcribing the structural genes of the operon, effectively turning off gene expression for lactose metabolism.
- The cell conserves resources by not producing unnecessary enzymes when lactose is unavailable.