Operator Encyclopedia Article

Operator

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The operator is a regulatory region that controls the **transcription** of gene(s) located downstream.

The operator typically is located between the gene(s) it controls and the region of the **DNA** where the initiator of transcription, **RNA polymerase**, binds. When a repressor protein occupies the operator, the RNA polymerase is physically prevented from moving along the DNA and producing the **messenger RNA** (**mRNA**). When the repressor protein is detached from the operator, the polymerase is free to move and mRNA production, and ultimately, protein production, commences.

Typically, the operator is located just upstream of the genes it controls. This location allows RNA polymerase to bind to the DNA, but, if the operator is occupied, for the initiation of transcription to remain blocked. Once the operator is free, however, polymerase movement, and hence transcription, can commence immediately. The genetic system is thus primed for rapid activity.

In **bacteria**, several genes may be controlled simultaneously by the region to which the polymerase binds and one or more operators. When under such multiple control, the entire system is called an **operon**. The best-studied operon is the **lac operon** of *Escherichia coli.*