

General principles of regulation of metabolic pathways at the cell level

The organism must constantly change the activity of metabolic pathways. It is regulated both according to the immediate needs and possibilities of a particular cell, and according to the needs of the organism as a whole.

At the level of the organism, regulation is mediated by signals that come to the cells from the outside. They are transferred across the cell membrane and inside they connect with the regulatory events of the cell itself. Regulations tend to have a number of steps that fall into **cascades**. ***It often ends with a change in enzyme activity, which thus acts as an effector of regulation. Usually only one enzyme of the metabolic pathway is subject to regulation, the so-called key or regulatory enzyme.*** Key enzymes usually catalyze the slowest reactions of metabolic pathways.

File:Regulatory cascade.png
Regulation of metabolic pathways

The speed of a certain ``metabolic pathway *as a whole is determined by its slowest step. As we have already stated, it is this step that is usually subject to regulation. Both the quantity of key enzyme molecules and their activity (i.e. catalytic efficiency) can change. Key enzymes often catalyze ``virtually irreversible, eg strongly exergonic reactions.*

Events that change the speed of metabolic pathways can be divided into three groups:

1. **Regulations** that use compartmentation of metabolic events
2. **Enzyme concentration control**
3. **Activity modulation** (catalytic efficiency) of enzyme molecules