

The importance of compartmentalization for a cell

All reactions taking place in cells take place in a certain space - a **compartment**, which is separated from other compartments by semipermeable membranes. In this way, even chemically diverse environments are separated, which helps to optimize the course of chemical reactions in them.

Enzymes catalyzing individual reactions often have different **temperature and pH optima** and if there is only one space in the cell, some of the enzymes would probably not be functional or the catalysis mediated by them would not be efficient enough. By dividing the space, **optimal conditions** can be created for the course of individual enzymatically catalyzed reactions.

At the same time, the cell itself is protected from the activity of lytic enzymes. For example, by confining cellular digestion to lysosomes, unwanted self-digestion of cellular structures becomes impossible. A common phenomenon associated with disruption of cell compartmentalization (eg spillage of lysosomal or mitochondrial contents) is necrosis or activation of apoptosis – programmed cell death.

The separation of the environment also affects the **regulation of metabolic pathways**. The latter can be more precise and targeted and does not interfere with the operation of pathways running in other compartments. Sometimes the course of reactions can be regulated already at the point of entry of individual substrates into the compartment (transfer through the membrane, often mediated by transport mechanisms).

However, compartmentation also places increased demands on the energy consumption of the cell. It is necessary to use ATP-dependent transporters **transporting substances across membranes against the concentration gradient and thus creating different environments in separate spaces**.