

Receptor-mediated endocytosis

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Previous chapters have focused on targeting intracellular proteins. However, the principle of regulation also applies to the uptake of proteins from the extracellular space by endocytosis, which is mediated by the interaction of the protein with a membrane receptor on the cell surface.

Receptor

The mentioned receptor is a glycoprotein, located in special places of the membrane, so-called coated pits. On the cytosolic side of these sites is a clathrin coat. Due to its three-armed structure, **clathrin** is able to form a reticulate mantle around the wells of the membrane or around various cytoplasmic vesicles, vacuoles. Upon delivery of ATP, the clathrin network can be enzymatically disrupted and clathrin can be used for further interactions.

After binding of the absorbed protein to the receptor, the well is deepened, and the clathrin eventually forms a closed network, releasing a **coated vesicle** from the membrane into the cytoplasm. It then quickly loses its clathrin mantle and turns into an **endosome** or **receptosome**. It usually enlarges by merging with other endosomes. The function of these organelles is to decide where to transport the absorbed protein. An important mechanism is the **acidification of the endosome content**. This is done by the action of the ATP-dependent H^+/K^+ pump in the endosome membrane.

Absorbed transferrin in a more acidic environment releases Fe and transfers it to the cytosol for ferritin. The endosome then merges with the cytoplasmic membrane. The apotransferrin receptor complex appears on the cell surface, in a higher pH environment in which apotransferrin is released for re-use.

Proteins after absorption

Other proteins taken up by receptor-directed endocytosis face a different fate in endosomes. Cholesterol-transporting **LDL-apoprotein** is transferred to the lysosome upon binding to the membrane receptor and after endocytosis. Here, it is degraded by lysosomal proteases while the receptor is reused on the cell surface. **Immunocomplexes, insulin, or some growth factors** are degraded in lysosomes with their receptors. This is an example of modulating the effect of protein hormones, as this reduces their blood levels and the number of their receptors in the target cells.

In human

Receptor-mediated endocytosis transports IgG from breast milk through the intestinal enterocytes of the newborn. On the other side of the cell adjacent to the capillary, endosome carrying the IgG-receptor complex fuses with the cytoplasmic membrane and the antibody is released into the bloodstream of the child with a fragment of the receptor called the **secretory component**.

In viruses

The described receptor-mediated endocytosis is also involved in the **entry of some viruses into the host cell**. After endosome + lysosome fusion, the acidic environment results in the fusion of the virion envelope with the lysosomal membrane, thereby releasing the nucleocapsid with the viral nucleic acid into the cytosol.

In the final stage of viral reproduction, newly synthesized viral nucleocapsids are released from the cell by *erupting* from it, encasing it in a plasma membrane.

In bacteria

Bacterial toxins (diphtheric and cholera toxin) also enter the cell through receptor-mediated endocytosis.

References

Related Articles

- Translation of membrane and secretory proteins (protein sorting, targeting)
- Translation, post-translational processing of proteins in eukaryotes
- Post-translational modifications and protein targeting

Source

- ŠTÍPEK, Stanislav. *Stručná biochemie : Uchování a exprese genetické informace*. 1.

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- ŠTÍPEK, Stanislav. *Stručná biochemie : Uchování a exprese genetické informace*. 1. edition. Medprint, 1998. ISBN 80-902036-2-0.