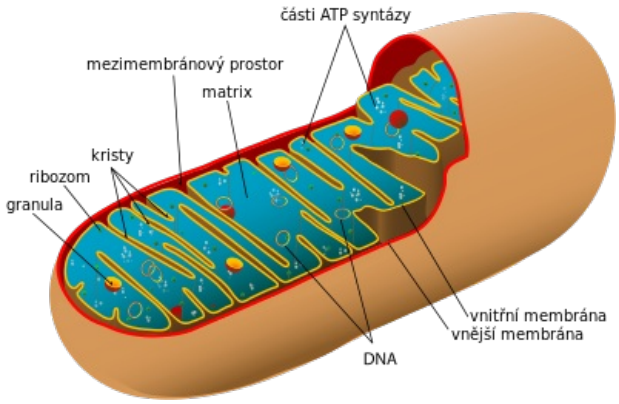
Mitochondria and their structure

Mitochondria are bound to the cytoskeleton in the cell. According to Lynn Margulis's *endosymbiotic theory*, they evolved from aerobic bacteria that were previously engulfed by phagocytic archaebacteria. Part of their genome moved into the nucleus of the "host" cell and thus became dependent on it, but the rest of the genome remained in the mitochondria. In addition to their own genes, they also have their own proteosynthetic apparatus showing the characteristics of prokaryote (70S ribosomes), and are therefore referred to as **semiautonomous organelles**.



Structure of mitochondrion

Mitochondrial Outer Membrane

They are separated from the external environment by a membrane similar to the endoplasmic reticulum. This membrane is relatively well permeable to most substances with a lower molecular weight, but prevents the entry of proteins and other macromolecules. At the same time it contains:

- enzymes of fatty acid and phospholipid metabolism;
- the so-called TOM complex (*translocase of the outer membrane*) transferring proteins from the cytoplasm to the intermembrane space.

The intermembrane space has a composition similar to the cytosol (ie, the protein content in it is low compared to the matrix) and contains, for example, **cytochrome c** and **proapoptotic proteins**.

Inner Mitochondrial Membrane

Membrane highly selective, polar molecules almost do not pass through it (with the exception of a few that have their own transporters). The inner membrane contains:

1. phospholipid cardiolipin;
2. respiratory chain enzymes;
3. so-called TIM complex (translocase of the inner membrane) transporting certain proteins.

It extends towards the matrix in the form of various protrusions, most often cristae and tubules.

Mitochondrial matrix

It has the form of a dense protein gel containing enzymes of many metabolic pathways (Krebs cycle, β-oxidation of MK, ornithine cycle and others). Furthermore, mDNA (and the corresponding tRNA and mRNA), ribosomes or inorganic ions (such as Ca^{2+}).