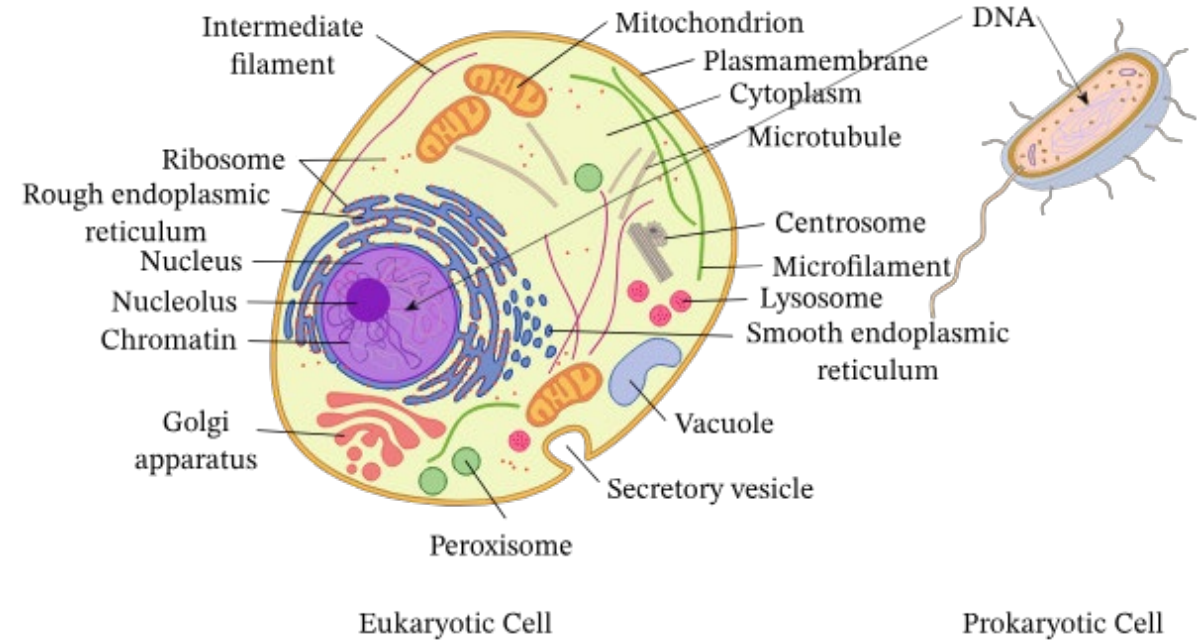
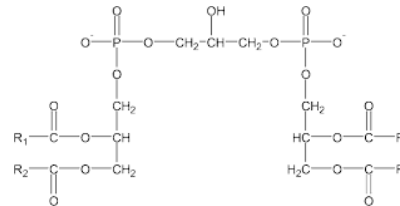
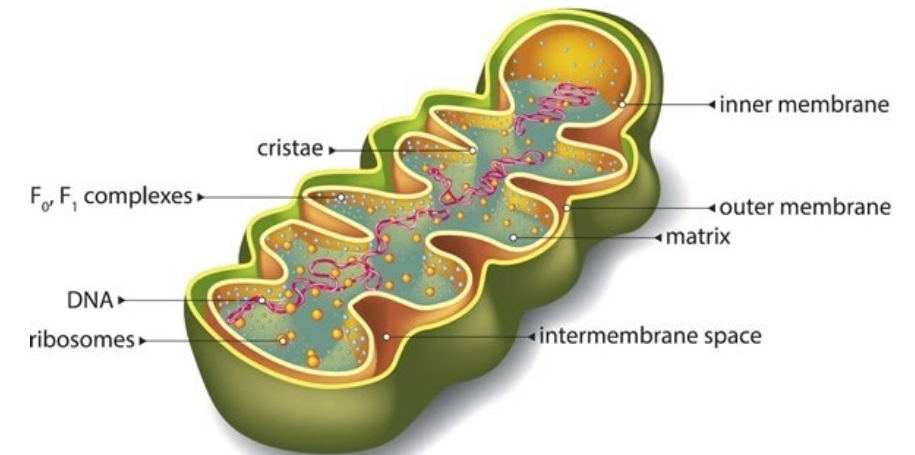


Mitochondria

- Without mitochondria, animal cells are dependent on **anaerobic glycolysis** for ATP production. When **glucose** is converted to pyruvate by glycolysis, only a very small fraction of the total free energy present in the glucose is released. In aerobic respiration, pyruvate is imported from the cytoplasm into the mitochondrion and oxidized. This allows 15 times more ATP to be made than that produced by glycolysis alone.
- Mitochondria are membrane-bound cell organelles that generate most of the chemical energy needed to power the cell's biochemical reactions.
- Bacteria do not have mitochondria because they are prokaryotic cells, which lack membrane-bound organelles.
- The number of mitochondria in a cell can vary widely in the organisms, tissues, and cell types. A liver cell can have more than 2000.
- The number of mitochondria in a cell is primarily regulated by the balance between mitochondrial fission (division), fusion (merging), and mitophagy (selective removal of damaged mitochondria),
- Genome (DNA) of mitochondria is similar to the genome of bacteria.
- The number of cristae varies in mitochondria of different cells.
- The inner membrane is highly specialized. Its lipid bilayer contains a high proportion of the “double” phospholipid *cardiolipin*, which has four fatty acids.

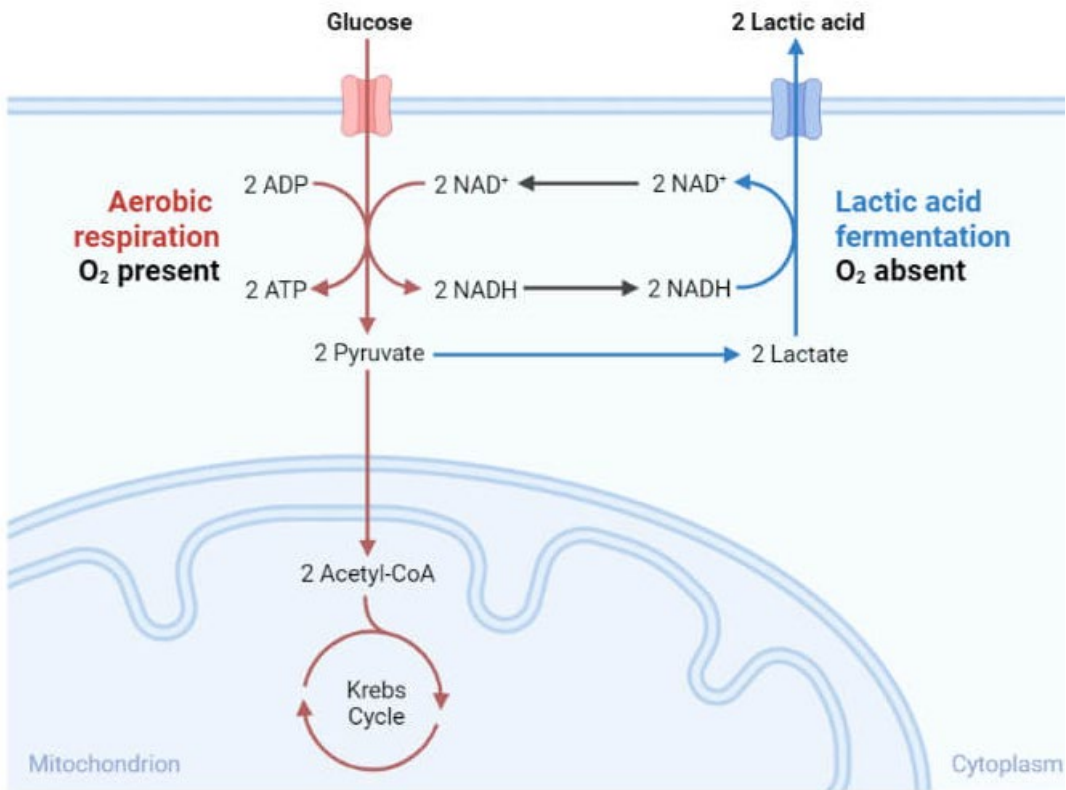


Mitochondria

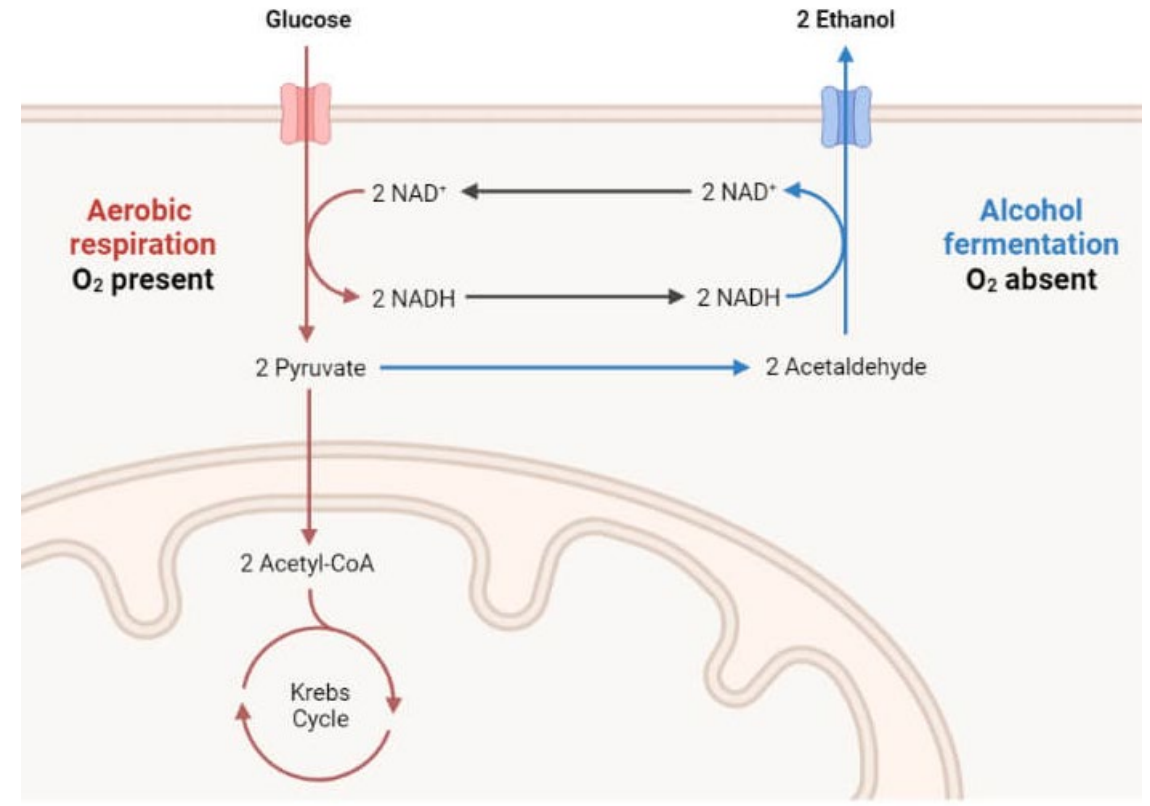


Anaerobic respiration

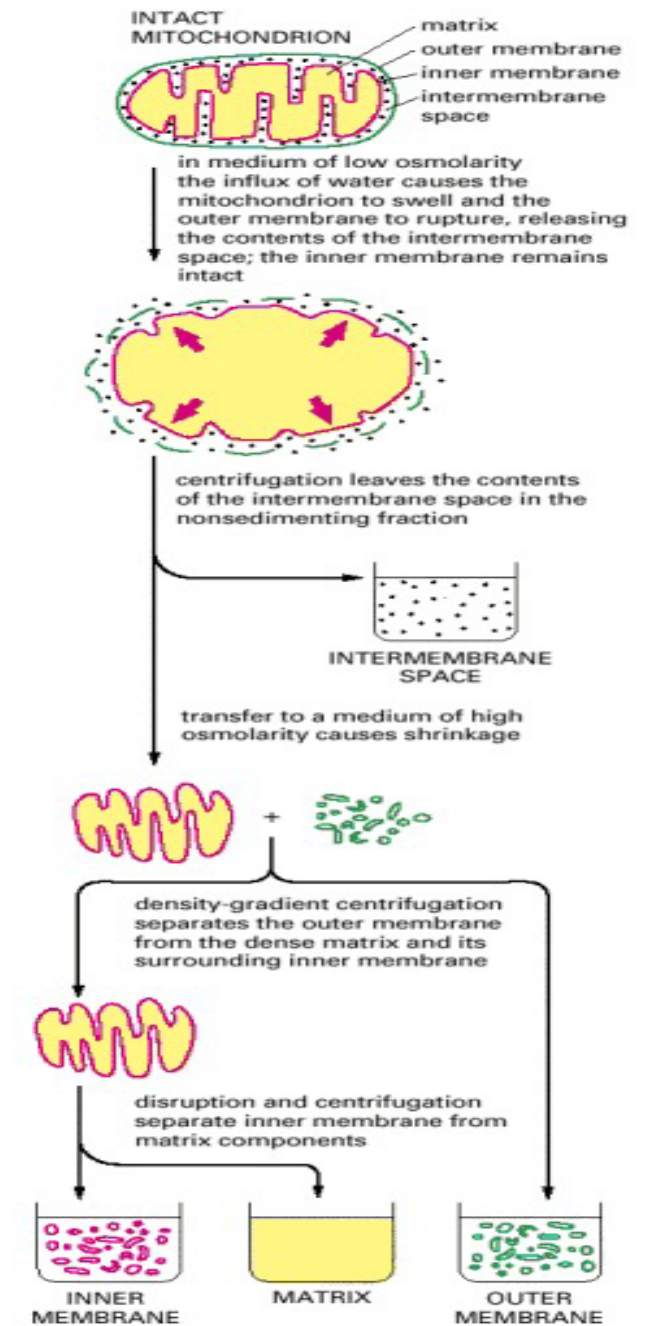
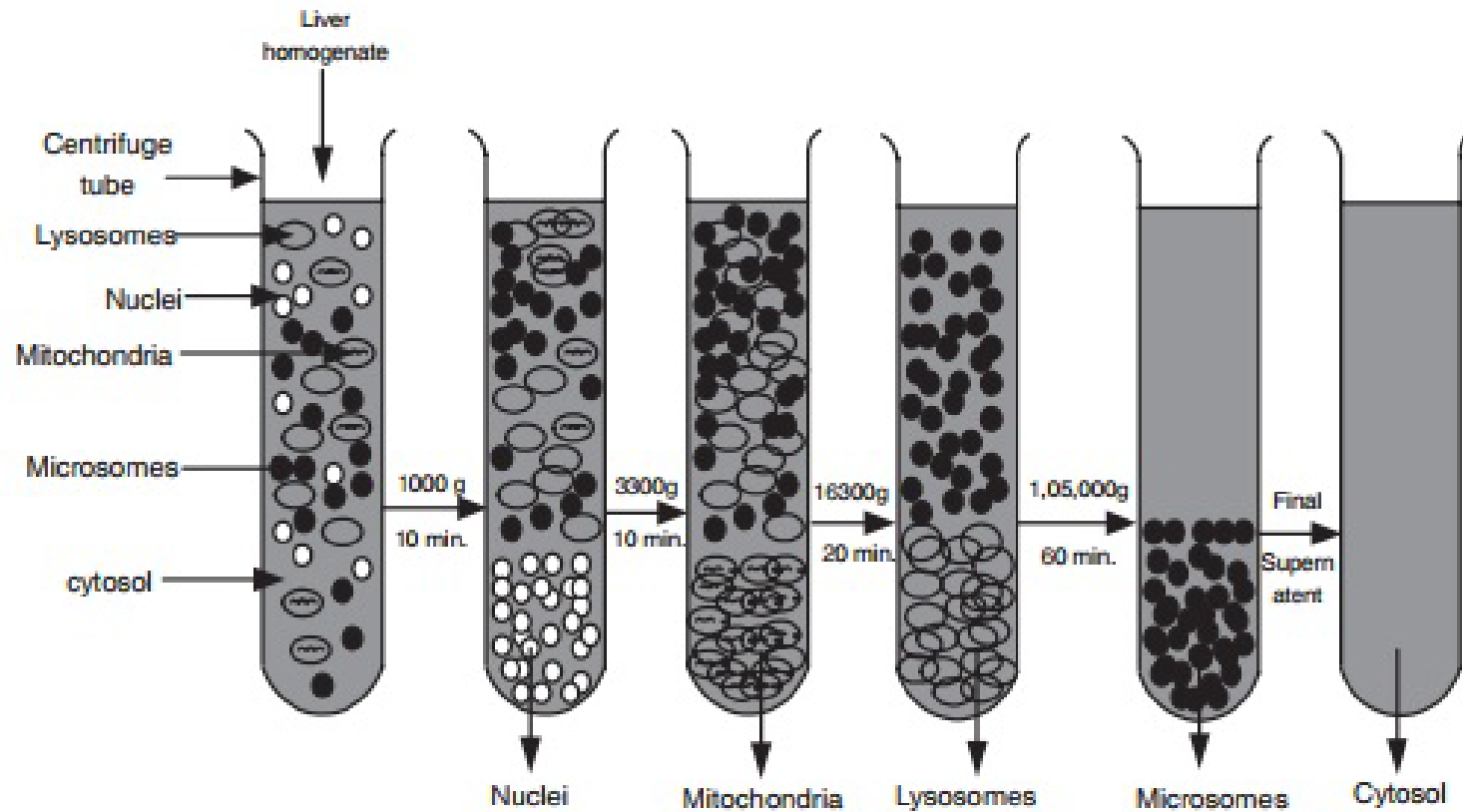
Lactic acid fermentation: **bacteria and mammals**



Ethanol fermentation: **yeast**

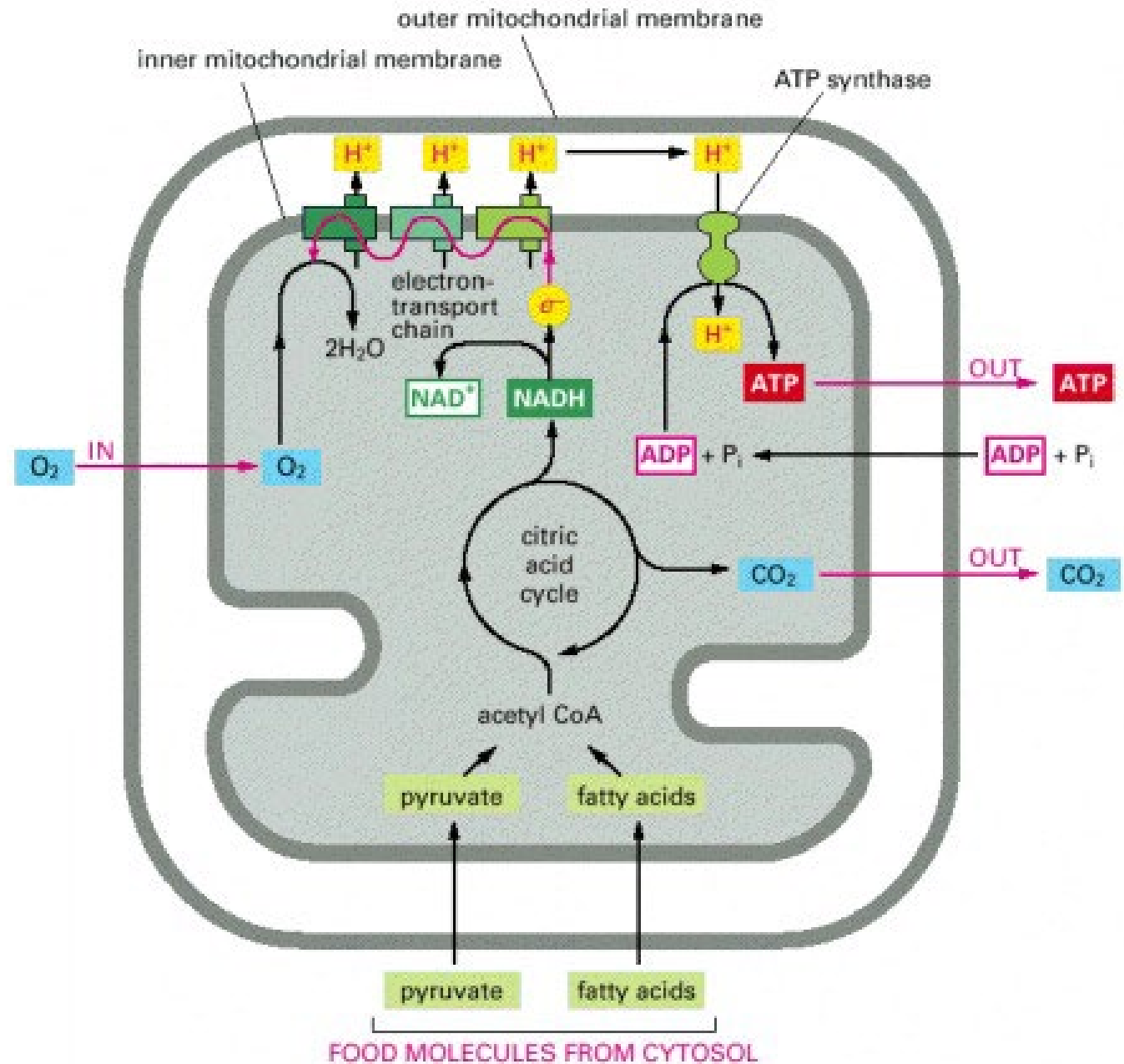


Isolation of mitochondria by differential centrifugation and Biochemical fractionation of purified mitochondria into separate components



High-Energy Electrons Are Generated via the Citric Acid Cycle or Krebs cycle

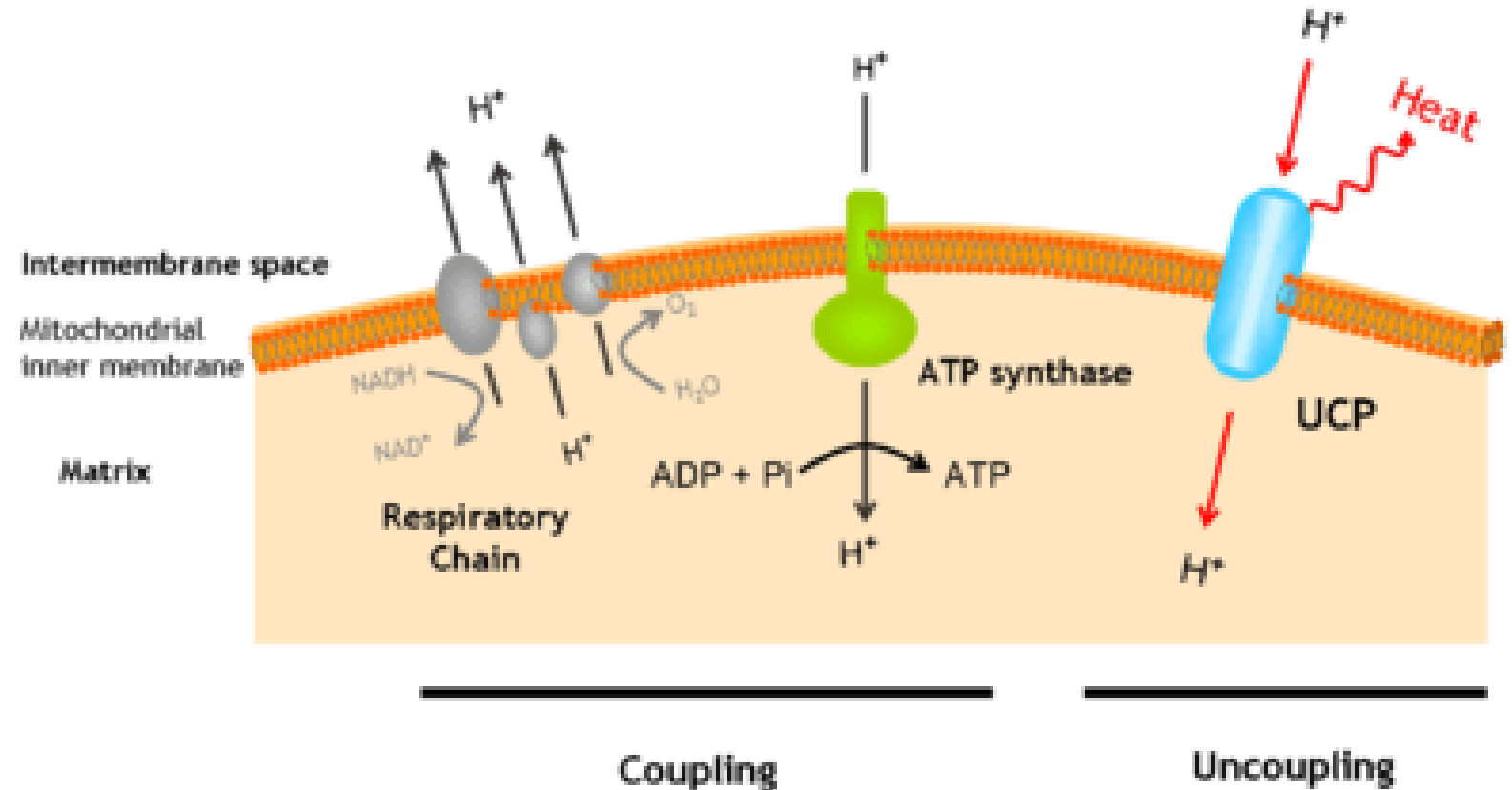
The **chemiosmotic hypothesis** was proposed by Peter Mitchell in 1978 which suggests that the action of **ATP synthase** is coupled with that of a proton gradient. According to this hypothesis protons are pumped across the inner mitochondrial membrane as electrons move through the electron transfer chain. It is the action of the proton gradient that causes a proton motive force that allows **ATP synthase** to phosphorylate ADP by inorganic phosphate to form **ATP**.



Mitochondrial thermogenesis:

is the process by which mitochondria produce heat to help maintain body temperature

In some specialized [fat](#) cells, mitochondrial [respiration](#) is normally uncoupled from ATP synthesis. In these cells, the energy of oxidation is dissipated as heat rather than being converted into ATP. The inner membranes of the mitochondria in these cells contain a special transport [protein](#) that allows protons to move down their [electrochemical gradient](#), by-passing [ATP synthase](#). Hibernating animals and newborn human babies protect from the cold



- **Thermogenin**, known as uncoupling protein, or **UCP1**) is a mitochondrial carrier protein found in brown adipose tissue.
- **Mitochondrial uncouplers** are substances that disrupt the coupling between electron transport and phosphorylation reactions in mitochondria. This process inhibits the production of ATP.