Introduction to the Krebs cycle

The Krebs cycle (citrate cycle, citric acid cycle) is a metabolic pathway located in the matrix of mitochondria. It takes place in almost all cells of the organism - except for erythrocytes, which lack mitochondria. Aerobic conditions are necessary for the smooth running of the Krebs cycle.

🔎 *For more information see Regulation of the Krebs cycle.*

Cells suffering from a lack of oxygen are speed limited. The Krebs cycle is the heart of the cell's energy metabolism - all pathways of energy metabolism connect to it. For example, the respiratory chain, gluconeogenesis, transamination and deamination of amino acids or lipogenesis. Therefore, it cannot be determined whether it is an anabolic or catabolic pathway. That's why we call it the **amphibolic pathway**.

🔎 *For more information see Overview of Energy Metabolism.*

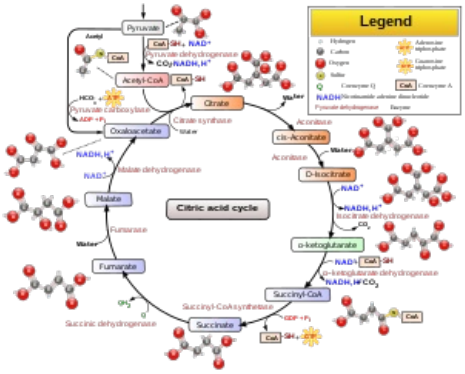

Diagram of the Krebs cycle

Krebs cycle function

Oxidation of acetyl residues (supplied in the form of acetyl-CoA)

Oxidation of acetyl-residues (CH_3-CO−) to final CO_2. The reaction is a source of reducing equivalents (H^+), which are transferred to cofactors NAD^+ or FAD to form reduced forms:

- $NADH + H^+$,
- $FADH_2$.

Reduced cofactors enter the respiratory chain, where they are regenerated - reoxidized, and therefore represent a mutual connection between the Krebs cycle and the respiratory chain. The Krebs cycle is the main supplier of reduced cofactors for the respiratory chain and therefore an important source of ATP for the cell. In the Krebs cycle itself, however, only one GTP is directly produced per one of its "turns".

The culmination of many catabolic pathways into the Krebs cycle

Many catabolic pathways produce Krebs cycle intermediates or metabolites such as pyruvate and acetyl-CoA. These can be oxidized to CO2, but also used as substrates for the synthesis of other substances.

Delivery of precursors to anabolic pathways

For example, gluconeogenesis, the biosynthesis of tetrapyrroles (heme), the formation of amino acids (for example glutamate, at the same time the most abundant excitatory neurotransmitter in the brain) or the supply of acetyl-CoA for the synthesis of fatty acids.

Participation in the excretion of amino nitrogen

The Krebs cycle is closely linked to the urea synthesis cycle and to the formation of glutamate, which are the two main reactions used to eliminate nitrogen derived from amino acids from the body.

Historical Correlation: The Krebs Cycle is named after Sir ***Hans Adolf Krebs*** (1900–1981), a German, later English physician and biochemist. He was awarded the Nobel Prize in Physiology and Medicine in 1953 "for his discovery of the citric acid cycle". He received the award together with the German, later American biochemist Fritz Albert Lipmann, who won it "for his discovery of co−enzyme A and its importance for intermediary metabolism".