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Med Lab Sci

MCB 202

Respiration starts with glucose (usually). In aerobic respiration initial reactions are common as a result of which pyruvic acid is formed by breakdown of glucose.

The process is called Glycolysis or EMP Pathway (Embden-Meyerhof-Parnas Pathway). This process does not require O2 although this can take place in the presence of oxygen. After this stage, the fate of pyruvic acid is different depending upon the presence or absence of oxygen.

If oxygen is present there is complete oxidation of pyruvic acid into H2O and CO2 and chemical reactions through which this occurs is called Tri-Carboxylic Acid cycle (TCA Cycle) or Krebs Cycle. This cycle occurs in mitochondria. If oxygen is absent, pyruvic acid forms ethyl alcohol (C2H5OH) and CO2 without the help of any cell organelle. This process is called anaerobic respiration.

Aerobic respiration is an enzymatically controlled release of energy in a stepwise catabolic process of complete oxidation of organic food into carbon dioxide and water with oxygen acting as terminal oxidant. The common mechanism of aerobic respiration is also called common pathway because its first step, called glycolysis, is common to both aerobic and anaerobic modes of respiration. The common aerobic respiration consists of three steps—glycolysis, Krebs cycle and terminal oxidation.

Glycolysis

It is also called EMP pathway because it was discovered by three German scientists Embden, Meyerhof and Parnas. Glycolysis is the process of breakdown of glucose or similar hexose sugar to molecules of pyruvic acid through a series of enzyme mediated reactions releasing some energy (as ATP) and reducing power (as NADH2). It occurs in the cytoplasm. It takes place in the following sub steps.

Krebs cycle

The cycle was discovered by Hans Krebs (1937, 1940, Nobel Prize 1953). It occurs inside mitochondria. The cycle is also named as citric acid cycle or tricarboxylic acid (TCA) cycle after the initial product. Krebs cycle is stepwise oxidative and cyclic degradation of activated acetate derived from pyruvate.

Terminal oxidation

It is the name of oxidation found in aerobic respiration that occurs towards the end of catabolic process and involves the passage of both electrons and protons of reduced coenzymes to oxygen.