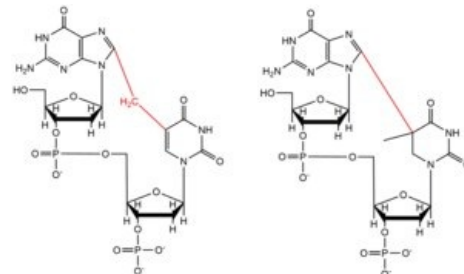


Oxidative stress

Nowadays, we often encounter a phenomenon called "oxidative stress". Oxidative stress is the cause of many diseases, such as Alzheimer's disease, various types of cancer, coronary artery disease and diabetes mellitus, as well as many others.

Characteristics

Oxidative stress is an imbalance between the antioxidant capacity of a cell and the amount of free radicals. It is generally believed that reactive oxygen species (ROS) are responsible for the development of oxidative stress. hydrogen peroxide ' H_2O_2 ' hydroxyl radicals ' $\text{OH}\cdot$ '. *These substances are the product of normal cellular metabolism in every living organism, which obtains energy by oxidation. The development of oxidative stress is therefore the result of an imbalance at various levels in the cell. For this reason, enzymes are produced in the cell that are responsible for detoxifying the cell from ROS and combating oxidative stress. Thus, antioxidant enzymes perform a "defense function".*



DNA crosslink caused by oxidative stress

Superoxide dismutase (SOD)

The superoxide anion is produced by a one-electron reduction of the oxygen molecule and initiates the formation of a radical chain reaction. There is a theory that SOD, which dismutates superoxide anion to hydrogen peroxide, plays a key role in the process of antioxidant reactions. For this reason, superoxide dismutases (SODs) are the major defense system of cellular protection against superoxide. These enzymes contain redox metals in their catalytic core and "" convert the superoxide radical "" into hydrogen peroxide and oxygen. Three different isoforms of SOD have been identified in humans:

Superoxide dismutase (SOD)

- *mitochondrial manganese SOD* (MnSOD, SOD2), whose homozygous disorder in mice causes cardiovascular disorders and death shortly after birth;
- *cytosolic zinc-copper SOD* (Cu / Zn-SOD, SOD1);
- *extracellular SOD* (ecSOD, SOD-3), which plays an important role in the '*oxidation state regulation process*'.

Catalase (CAT)

Catalase is a "intracellular antioxidant enzyme" that is localized mainly in peroxisomes and, to some extent, in the cytosol. It catalyzes a reaction causing the conversion of hydrogen peroxide to water. During the removal of hydrogen peroxide, it indirectly detoxifies superoxide radicals, which are converted to hydrogen peroxide by superoxide dismutase. Catalase "" is highly effective at higher levels of oxidative stress "" and provides protection to cells from the hydrogen peroxide that is produced in the cells. The enzyme is particularly important with limited glutathione capacity or reduced glutathione peroxidase (GPx) activity. It plays an important role in the development of oxidative stress tolerance in cell adaptive sensitivity. E. coli contains two types of catalases: HP (hydrogen peroxidase encoded by katG) and HPII (hydrogen peroxidase encoded by katE).

Odkazy

Použitá literatura

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Kategorie:Patobiochemie Kategorie:Patofyziologie