

What are free radicals?

Rebecca Gerschman

🕒 In 1954 Rebecca Gerschman published her famous article 'oxygen poisoning' in Science.

🕒 The existence of free radicals is confirmed by numerous authors and related to the aging process:

🕒 Harman 1956

🕒 Halliwell 1991

🕒 A real research fever broke out after these findings to try and eliminate the effect of the free radicals.

Free radicals

🕒 Essentially they are oxygen molecule shapes although they may be other elements with an enormous electron appetite.

🕒 The loss of electrons in different molecules destabilises biological processes.

🕒 Since their discovery they have been related to the aging processes.

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Reactive oxygen species and their formation

⌚ Free radicals randomly form different reactive oxygen species inside a cell normally not exceeding 3-5% of oxygen transformations in the breathing chain.

⌚ Reactive oxygen species fulfil an essential role in ATP synthesis and other physiological reactions, however their excess is highly damaging to the cell.

⌚ Each reactive oxygen species has one or several physiological elimination systems.

Free radical action could be divided into two large groups: normal physiological processes and those considered abnormal.

Image Legend: A) Formation of active oxygen species

B) Fenton reaction

Bottom Legend: Illegible

Free radical formation

- ⌚ They are formed randomly.
- ⌚ Neutralising substance needs cannot be predetermined.
- ⌚ Uncommon neutralisers inside the cell may have negative effects.
- ⌚ Some substances found like free anti-radical exercise unpredictable actions.

Free radical action in the cell

- ⌚ They alter its function.
- ⌚ They may cause cell breakage and apoptosis.
- ⌚ They produce toxic metabolites.
- ⌚ It has been demonstrated they cause so-called oxidative stress and physiological aging phenomena.
- ⌚ In addition the commencement of anomalous reactions and genetic modifications has been attributed to them.

Action of free radicals on cell membrane

- ⌚ The cell membrane has a high lipid component which is oxidised by free radicals.
- ⌚ In the image a type of free radical where ferrous ions intervene which becomes ferric (Fenton Reaction).
- ⌚ The amount of oxidative damage grows with the age of organism and is considered to be the main cause of the senescence onset phenomenon.

Types of anti-oxidants

⌚ Exogenous

⌚ Vitamin E

⌚ Vitamin C

⌚ Betacarotene

⌚ Flavonoids

⌚ Today, the effect of thousands of substances are known to act on the free radicals. However, what other effects might they have?

⌚ Endogenous

⌚ Glutation

⌚ Coenzyme Q

⌚ Tioctic acid

⌚ Cofactors:

⌚ Lycopenes

⌚ Copper

⌚ Zinc

⌚ Iron

⌚ Magnesium

⌚ Enzymes:

⌚ Catalase

⌚ Superoxide

⌚ Dismutase

⌚ Glutation

⌚ Peroxidase