Reactive free radical

Unpaired electrons make free radicals highly chemically reactive towards other substances, or even towards themselves: their molecules will often spontaneously dimerize or polymerize if they come in contact with each other. Most radicals are reasonably stable only at very low concentrations in inert media or in a vacuum.

Reactive free radicals are highly reactive molecules or atoms that possess unpaired electrons. They are generated as natural byproducts of various metabolic processes in the body, such as cellular respiration and immune system activity. Free radicals can also be formed due to exposure to external factors like radiation, pollution, and certain chemicals.

While the body has natural defense mechanisms to neutralize free radicals, an imbalance between the production of free radicals and the body's ability to detoxify and repair the damage they cause can lead to a condition called oxidative stress. Oxidative stress occurs when there is an excess of free radicals, overwhelming the body's antioxidant defenses.

Reactive free radicals can damage cellular components, including DNA, proteins, and lipids, through a process called oxidation. This damage is known as reactive free radical damage. It can disrupt normal cellular functions and contribute to the development of various diseases, including:

Cardiovascular diseases: Reactive free radicals can oxidize low-density lipoprotein (LDL) cholesterol, leading to the formation of plaque in the arteries and increasing the risk of heart disease and stroke.

Cancer: Free radicals can cause mutations in DNA, potentially leading to the development of cancerous cells.

Neurodegenerative diseases: Oxidative stress is implicated in neurodegenerative conditions like Alzheimer's disease and Parkinson's disease. Free radicals can damage neurons and contribute to their degeneration.

Aging: Accumulated damage from reactive free radicals over time can contribute to the aging process.

To counteract the harmful effects of reactive free radicals, the body relies on antioxidants. Antioxidants are compounds that can neutralize free radicals and help prevent or repair cellular damage. They can be obtained through a balanced diet that includes fruits, vegetables, nuts, and seeds, which are rich in vitamins (such as vitamins C and E) and minerals (such as selenium and zinc).

In summary, reactive free radical damage refers to the harm caused by highly reactive molecules or atoms called free radicals. This damage can contribute to various diseases and the aging process. Maintaining a healthy lifestyle, consuming a balanced diet, and ensuring adequate antioxidant intake can help mitigate the effects of reactive free radicals and oxidative stress [1)]

1)
Liu W, Cui X, Zhong Y, Ma R, Liu B, Xia Y. Phenolic metabolites as therapeutic in inflammation and neoplasms: molecular pathways explaining their efficacy. Pharmacol Res. 2023 Jun 2:106812. doi: 10.1016/j.phrs.2023.106812. Epub ahead of print. PMID: 37271425.