

What are Antioxidants and Phytonutrients, and what these do?

- i. *Pham Huy LA et al.; Review: Free radicals, antioxidants in disease and health in The International Journal of Biomedical Sciences: 2008.*
- ii. *Mastorci et al. Review: undernutrition and overnutrition burden for diseases in developing countries. Role of oxidative stress biomarkers. Antioxidant;2017.*
- iii. *Matsuda M et al. Increased oxidative stress in obesity: Implication for metabolic syndrome, hypertension, hyperlipidemia, atherosclerosis, and cancer. Obesity Research and Clinical Practice; 2013.*
- iv. *Butterfield DA et al. Oxidative stress, dysfunctional glucose metabolism, and Alzheimer disease. Nature Review, Neuroscience; 2019.*
- v. *Reiter RJ et al. Melatonin, a full-service anticancer agent: Inhibition of initiation, progression, and metastasis. International Journal of Molecular science; 2017.*

Every cell in the human body requires the energy to survive. This vital energy for survival gets made in each cell inside mitochondria, considered the power generator of the cell. This process involves glucose, oxygen, water, and essential minerals and vitamins. The oxygen is the life-sustaining element we breathe, and without it, life is not possible for more than a few minutes. The process of making energy from oxygen and glucose creates waste materials in the cells. These waste materials are carbon dioxide and oxygen waste called free radicals. The free radicals are toxic to the cells and must get removed, or these will destroy the cells. The body has an efficient system to get rid of carbon dioxide via the lungs. However, to get rid of the oxygen free radicals, the body relies on the elements present in our foods called -antioxidants and Phytonutrients. Phyto is a Greek word for plants, and the health-promoting chemical elements present in the plants are called Phytonutrients.

The current medical research has clearly shown that the accumulation of oxygen waste called free radicals (oxidative stress) causes premature aging and several chronic diseases in the body, including cancer. The free radicals inside the body come from two sources:

- *Internal source* – During the process of energy production in the cells as described above.
- *External source* – These include environmental pollutants such as factory and automobile fumes, cigarette smoke, chemicals in the foods - pesticides, preservatives, chemical additives in foods to enhance taste, certain medications, and radiation.

The theory of oxygen free radicals (oxidative stress) and chronic diseases is well known for the past 50 years. However, the opinion is getting heightened attention as many food and lifestyle diseases are becoming fast-growing epidemics. The medical science supports that the

plant-based diet with a high intake of fruits, vegetables, seeds, nuts, herbs, and spices reduces oxidative stress and the risk of chronic diseases.

List of Oxidative stress diseases

Oxidative stress has a vital role in the development of chronic and degenerative Food and Lifestyle diseases:

- Metabolic diseases – Such as Obesity, Metabolic syndrome, Type2 diabetes, Heart disease, High blood pressure, arthritis, and more.
- Cancer
- Allergic diseases from a weak immune system – Asthma, and allergic rhinitis (these are growing at an epidemic proportion amongst the young city dwellers).
- Autoimmune diseases- These are the diseases in which the body destroys its tissues. Include diseases such as- Rheumatoid arthritis, Hashimoto Thyroiditis (Hypothyroidism), Type 1 diabetes in children and young adults, Multiple sclerosis, and skin disorders such as Psoriasis and Eczema.
- Neurodegenerative diseases – Such as Parkinsonism and Alzheimer (senile dementia)
- Premature aging
- Early cataract and visual disturbances from the retinal disease (macular degeneration).

The excess of oxygen free radicals in the body is called oxidative stress. The oxygen-free radicals react with DNA in the cells and cause an unhealthy change in the genes. This phenomenon is called the gene mutation. DNA-gene modification is a significant cause of cancer. The gene mutation could also be the reason why Type2 diabetes and Heart disease, which were uncommon before the 1970s, have become epidemics over the past 50 years. Both these diseases are considered genetic, but the genes take centuries to change. So, the most likely reason for the widespread epidemic of these diseases is gene mutation (an epigenetic phenomenon). A drastic change in the food and lifestyle in the past 50 years is the most likely cause of epigenetic modification and increased incidence of these diseases.

Prevention and control of the epidemics of these new diseases require changing the Food, the Lifestyle, and the Environment. Food and lifestyle are under individual human control, so starting with healthy plant-based diets is the first step.

What foods contain Antioxidants and Phytonutrients?

An antioxidant molecule present in natural foods neutralizes the damaging free radicals and preserve the health of the body cells. Antioxidants are also called free radical scavengers or the clean-up crew of the body. The body is unable to produce the antioxidants of its own, and these must come from the food we eat. The animal and commercial foods do not contain antioxidants;

these are present only in fresh plant-based foods — natural antioxidants include-Vitamin A, Beta carotene, Vitamin C, Vitamin E, and Selenium.

“The critical rule about antioxidants: Get these from natural sources- fruits and vegetables, seeds and nuts; not from the commercially produced supplements.”

Multiple medical studies have clearly shown that taking antioxidant supplements rich in vitamins A, C, E, Beta carotene, and Selenium will not fix the problem. However, there is abundant evidence to suggests that eating whole fruits, vegetables, whole grains, seeds and nuts, herbs, and spices will protect against food and lifestyle diseases.

- Vitamins – Beta carotene (provitamin A in yellow/orange vegetables and fruits), Vitamin C (Citrus fruits such as lemon, amla, oranges, Mausammi), Vitamin E (green vegetables, whole grains, lentils, legumes, seeds, guava, and nuts). Amongst all the beans, Rajma beans are the most abundant source of antioxidants. The gas problem with Rajma beans can be prevented by the sprouting these before cooking. The sprouting process converts polysaccharides into oligosaccharides starches, which cause less gas in the digestive tract.
- Minerals – Iron, zinc, copper, and selenium
- Sprouted lentils, beans, seeds (Methi), and grains (wheatgrass) – The germinating process of these foods until sprouts appear increases the mineral, vitamin, and protein content by 30%.

Peanut is considered a legume and should be sprouted with skin intact because it's pink/red skin is rich in antioxidant resveratrol (also present in red grapes and red wine).

- Melatonin (sleep hormone) – Every living animal in the universe needs the sleep hormone melatonin produced in the brain on exposure to sunlight and bright daylight. There is a large body of research that supports that melatonin is a powerful antioxidant which plays a vital role in the rest, repair, and rejuvenates process during sleep. People who do shift work or those who have a poor sleep have a higher risk of developing heart disease, Type2 diabetes, and cancer.

The list of foods with high antioxidant content

In a report in the Nutrition Journal, Carlsen MH et al. (2010), published an Antioxidant Food Database which examined the antioxidant content of more than 3100 foods, beverages, spices and herbs used around the world. The Indian foods, spices, and herbs which were high in Antioxidant content in the order of high to low are as follows:

- Cloves and Cinnamon
- Amla

- Triphala and Arjun Ki Chaal (the bark of the tree Arjuna Terminalia; an ancient cardiovascular drug) – A cardioprotective herb used as Ayurvedic remedy since Vedic times. Its use described in Charaka Samhita, Sushruta and Ashtanga Hridayam by Vagbhatta who advocated the use of stem bark powder of the plant.
- Walnuts with skin
- Almonds with skin.
- Ginger and Turmeric
- Saffron

The new medical research is beginning to look at the role of dietary Phytochemical antioxidants in the prevention of cancer, cardiovascular diseases, diabetes, and many other chronic diseases known to be related to oxidative stress. A drastic change in the food and lifestyle in the past 50 years is the culprit underlying the epidemic of the new diseases. Going back to natural foods and balanced lifestyle dictated by the dark and light cycles of the sunlight will help us conquer these diseases. Melatonin, the natural sleep hormone is considered by medical science as a full-service “Anti-cancer agent,” which inhibits cancer initiation, progression, and metastasis (spread) of cancer.

(Note: For guidelines on the Holistic Food and Balanced Lifestyles to preserve health, prevent and reverses the new diseases, refer to the section on Holistic meal and Balanced Lifestyle on the website)