

Free radicals and natural antioxidants in the cellular environment

G J Sharma

Manipur University, India

Abstract

The broad field of free radicals and antioxidants covers an emerging area known as redox biology and has been perceived as focusing around the use of antioxidant supplements to prevent a variety of human diseases. During the events of evolution, the emergence of photosynthetic system in aerobic organisms, plants in particular, generates reactive oxygen species and has opened up a paradoxical situation compelling life confront hostile environment and to be able to adapt, the redox processes have become increasingly significant. Antioxidants/free radicals permeate the entire living systems in the cellular milieu. Life is a balance between the two like a tug-of-war: Antioxidants serve to decrease the levels of free radicals permitting them to perform useful biological functions without causing much damage. However, some damages are inevitable requiring repair systems to maintain cellular integrity and viability. Reactive oxygen species are all over the cellular environment in aerobic microbes, plants and animals. These species protect life from various types of infections and involve in critical signalling pathways. Eventually, these species also often kill cells, tissues and organs in the end. The continual damages by these species, failing repair pathways, can cause age-related tumour development, Neuro-degenerative diseases and several human disorders. It would have been wonderful if life had evolved entirely in the anaerobic environment, in which case, the life-spans would have been much longer and diseases would have rarely occurred. Interestingly various medicinal plants possessing bio-active molecules can prevent human diseases. These molecules having diverse chemical structures possess high antioxidant profiles and encounter damaging radical species very efficiently at time scales of micro, Nano, Pico and femto seconds in cellular environment thereby preventing molecular damages to DNA and membranes. In this presentation, some of these aspects shall be discussed with reference to a few medicinal plants such as turmeric and tropical ginger.

gjs1951@rediffmail.com

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