Editorial

“Heterocyclic Antioxidants in Nature: Synthesis, Isolation and Medical Applications”

For decades, the humanity has been exposed to a lot of environmental agents that decompose the food, medicines and our own living organism. The oxidative agents derived from oxygen (reactive oxygen species, ROS) have represented a challenge for researchers who have proposed diverse alternative methods to avoid the oxidation. From the incorporation of substances that act as scavengers of free radical in the food to the synthesis of simple and complex organic/inorganic compounds that maintain the physico-chemical properties of food and medicines of scarce shelf life, all these factors have been studied in the whole world, trying to give new alternatives to the preservation and durability of our everyday life. Thereby, when the living organisms are overwhelmed in their defenses due to free radicals, vulnerability of the antioxidant system, the oxidative stress appears which is the beginning of many biological side effects as carcinogenesis, cardiovascular diseases, dysfunctions of the immune system, cerebral diseases and even, the same aging process.

For the references, we can find diverse examples of substances with very varied chemical structure, principally heterocycles, that can retain the generated free radical of diverse forms and causing finally a damage in the DNA, lipids and proteins.

Thus, Nrf2 activators represent a good drug target for designing agents to treat diseases associated with oxidative stress. In this sense, the synthesis of heterocyclic chalcone-based Nrf2 activators with reduced lipophilicity has been afforded with a high impact in an enhanced oral bioavailability and a superior pharmacodynamic effect in vivo [1]. Moreover, amido-linked bis heterocycles-benzoxazolyl/benzothiazolyl/benzimidazolyl-pyrazoles and isoxazoles were used to assay their antioxidant activity. The results revealed that synthesized pyrazole and isoxazole derivatives exhibited comparatively greater antioxidant activity than the benzoxazolyl/benzothiazolyl/benzimidazolyl-pyrazolines and isoxazolines, being in some cases a greater radical scavenging activity when compared with the standard drug ascorbic acid [2]. It is clear that oxidative stress has for long been linked to the neuronal cell death in many neurodegenerative conditions. Antioxidant therapies, some of them conventional, have been less effective in preventing neuronal damage caused by oxidative stress due to their inability to cross the blood brain barrier (BBB).

At present, nanomedicine is a novel alternative to treat these diseases derived from oxidative stress, and nanoparticles containing antioxidants have shown promise as high-performance therapeutic nanomedicine in attenuating oxidative stress with potential applications in treating and preventing neurodegenerative conditions [3]. Hence, reactive oxygen and nitrogen species have been implicated in diverse pathophysiological conditions, including inflammation, neurodegenerative diseases and cancer. Previous studies suggest roles of lipid peroxidation and oxysterols in the development of neurodegenerative diseases and inflammation-related cancer. Thereby, many authors have related to the oxidative stress with these pathologies, and they have summarized these DNA lesions with these neurological diseases and cancer [4].

In the present special issue, we have compiled an important group of contributions in the field of the natural antioxidant with heterocycle and hydrocarbon framework that are discussed from the isolation, synthesis and therapeutic applications in the scope of oxidative stress and the effects on the human health by means of foods, drugs and all organic material to be preserved.

This special issue contains 10 mini-reviews and reviews. In addition, wherever appropriate, illustrations, flow charts or tables for easier and straightforward understanding of the contents are presented.

Thus, the first article of this special issue by Prof. Khatkar describes the pharmaceutical properties of arjunolic acid as a triterpenoid saponin isolated mainly from Terminalia arjuna bark, and associated with the various important physiological functions as antioxidant, antimicrobial, cardioprotective, among other. The second review carried out by Prof. Kulharia mentions the xanthine oxidase and monoamine oxidase inhibitory potential of coumarins as an important antioxidant that is present in nature. The next article shows a review from Prof. Marcotullio which is highlighted furanodienone that has been recently investigated in order to establish its biological activities as antioxidant, anti-inflammatory, cytotoxic, antimicrobial and antiproteozoon. The next contribution by Matos et al. explains about the use of benzopyrone framework as antioxidant and the daily use in many foods. The next review by Prof. Nabavi compiles references about hydroxytyrosol and derivatives that are responsible for the nutraceutical properties and pharmacological effects of olive oil. The sixth contribution mentions chitosan, a natural biodegradable compound derived from crustacean shells such as crabs and shrimps, whose main attributes correspond to be associated with various important biological effects such as anticancer, wound healing, antimicrobial, antioxidant and as excipients in various formulation including control release drug delivery products. The seventh contribution by Prof. Sobarzo-Sánchez mentions a kind of alkaloid called aporphine and derivatives, whose antioxidant properties are described in several isolated compounds as boldine, for instance, and used as an important natural antioxidant. The next contribution by Prof.