



## Natural Antioxidants and Tissue Inflammation

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#### Mini Review

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### Abstract

The phenolic compounds present in food cover a wide range of structures that have different biological properties. Highlighting its antioxidant properties and the presence mainly of spices, herbs and other foods. Some compounds present in spices can be listed for their antioxidant activity, such as: cloves have eugenol, pinene in their composition, cinnamon also has eugenol, limonene, pinene, catechins and other phenolic compounds in their composition, anise has pinene, rutin, apigenin, oregano has apigenin, quercetin, rosmarinic, caffeic, p-coumaric acids, and others. Rosemary presents the carnosic, rosmarinic, caffeic and hydroxycinnamic. The tissue inflammatory process normally starts with the presence of free radicals that are associated with the oxidative process activated by reactive oxygen species represented by peroxides, superoxide ion, presence of hydroxyl radical, singlet oxygen, among others. The highlighted phenolic compounds have in their structure one or more hydroxyls that have the property of donating a hydrogen atom to free radical structures, which can block the triggering of the oxidative process and thus inflammation.

**Keywords:** Natural antioxidants; Inflammation; Spices; Phenolic Compounds

**Abbreviations:** SOD: Superoxide Dismutase; GTX: Glutathione Peroxidase; CAT: Catalase PGE2: Prostaglandin E2; LTB4: Leukotriene B4; ROS: Reactive Oxygen Species; LPS: Lipo Poly Saccharide.

### Introduction

Antioxidants naturally present in fruits and vegetables, especially spices, which have phenolic structures with oxidoreductive characteristics and the ability to donate one or more hydrogen atoms to free radical molecules in plant and animal tissues. They can react with reactive oxygen species (ROS); nitrogen (RNS) and sulfur (RSS), preventing the triggering of the oxidative process [1,2]. The presence of phenolic compounds in fruits and vegetables is related to a

decrease in the level of oxidation and inflammation and is associated with the prevention of chronic diseases such as cardiac, arthritis, muscular dystrophy, diabetes, Alzheimer's and Parkinson's diseases, cancer, among others [3,4].

The inflammatory process normally starts with oxidation through reactive oxygen species, represented by peroxides, superoxide ion, hydroxyl radical and singlet oxygen. These compounds can be formed by the body's normal metabolism and also by environmental factors such as sunlight, pollution, cigarettes, ionizing radiation, alcohol and also by intrinsic factors such as infections by bacteria, viruses, fungi and parasites. The body can react against the oxidative process through different intrinsic enzymes such as superoxide dismutase (SOD), glutathione peroxidase

(GTX), catalase (CAT) and through different vitamins such as C, E, A, carotenoids and phenolic compounds [5].

Bacterial, viral and fungal pathologies involve oxidative and inflammatory processes in an associated manner, being related to the activation of several pro-inflammatory and anti-inflammatory mediators such as cytokines (IL-1B; IL-6; IL-10; IL-12. INF 8 and TNFa) and enzymes such as iNOs and COX-2 [5]. These elements are regulated by the NF-KB transcription factor, which is responsible for the entire process and which is activated by increases in reactive oxygen species [6]. The mechanisms of oxidative stress and inflammation are closely related to the balance of cytokine production [7,8]. Phenolic compounds are widely present in foods, with different phenols and polyphenols being found and can be identified in coffee, tea, red wine, cocoa, fruits and vegetables and spices, encompassing phenolic compounds that may have different beneficial effects on the human body [7]. Phenolic compounds may have their mechanism of action associated as a donor of hydrogen protons to free radicals, thus reducing the oxidative process [1].

Among the fruits, some non-traditional ones stand out in Brazil such as açaí, cashew, acerola, uvaia, among others, where bioactive compounds such as vitamin C, anthocyanins, flavonoids, carotenoids, among others, are found. Some of these have significant amounts of phenols and polyphenols being evaluated by different methodologies using DPPH, ABTS, FRAP and beta carotene clearance [9]. Phenolic compounds, in addition to the antioxidant action, also present the possibility of modulating the expression of genes involved in the intracellular defense mechanism against the oxidative and degenerative processes of cellular structures [10]. In models of inflammation, spice extracts reduce the concentrations of prostaglandin E2 (PGE2), leukotriene B4 (LTB4), IL-6 and TNF- $\alpha$  in a dose-dependent manner. Studies it was observed that the anti-inflammatory effect of spices in cellular protection is related to changes in the activity of the enzymes SOD, CAT and in the reduction of lipid peroxidation. In in vitro culture of neutrophils stimulated with lipopolysaccharide (LPS) inflammatory compound and when treated with extracts of spices, the production of nitric oxide was reduced, with no toxicity for cells in vitro. Like rosemary, other spices, such as cinnamon, oregano, coriander, cloves, among others, are also important because they have similar antioxidant activities [10].

## Conclusion

Currently, great importance has been given to phenolic compounds naturally present in the composition of fruits and vegetables due to their participation in the neutralization of free radicals and in the formation of reactive oxygen species (ROS), nitrogen (RNS) and sulfur (RSS), preventing triggering

the entire oxidative process. Due to these properties, the phenolic compounds present in fruits and vegetables are being called phytochemicals and the foods that contain them nutraceuticals. The participation of natural antioxidants in inhibiting the triggering of inflammation has been demonstrated in several laboratory and population studies, however more information must be obtained to collaborate more with the importance of a greater consumption of fruits and vegetables. Studies must continue, aiming at the integration of the various phenolic compounds naturally present in foods and their participation in the inhibitory processes of oxidation and inflammation.

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