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Review Article

Effect of Anti-Oxidants on Chronic Obstructive Pulmonary Disease

Bridreth khokhare*

Nutrition Research Expert, India

***Corresponding Author:** Bridreth khokhare, Nutrition Research Expert, India.

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Abstract

Chronic obstructive pulmonary disease (COPD) is an inflammatory lung disease and is the fifth leading cause of death worldwide. The major symptoms include breathing difficulty, cough, mucus (sputum) production and wheezing. It's caused by long-term exposure to irritating gases, smoking and particulate matter. People with COPD are at increased risk of developing heart disease, lung cancer and a variety of other health issues. Nutritional support, anti-oxidants rich foods in particular can be of great benefits to control and partially reverse the effects of COPD. To increase the quality of life and reduce the complication associated with the progression of COPD, nutritional support is highly recommended. Researchers around the world have speculated several works on the role of antioxidant rich food for the control of COPD. These recent developments have given way for the preparation of more such herbal formulations and supplements. In this review, recent developments on the supplement of various organic compounds and its use on the control of COPD will be discussed.

Keywords: Chronic Obstructive Pulmonary Disease; Omega 3 Fatty Acid; Nutrients; Herbal Extracts; Inflammations.

Introduction

Chronic obstructive pulmonary disease or COPD is a progressive lung disease and is difficult to identify in early stages due to common symptoms as of cough and cold [1]. The common syndrome of emphysema and chronic bronchitis and patients with COPD have both the conditions. Chronic bronchitis is inflammation of the lining of the bronchial tubes, which carry air to and from the air sacs (alveoli) of the lungs and is characterized by daily cough and mucus (sputum) production [2]. Emphysema is a condition in which the alveoli at the end of the smallest air passages (bronchioles) of the lungs are destroyed mainly due to exposure to cigarette smoke, other irritating gases and particulate matter. Main causes of COPD includes Smoking (both active or passive), smokers with asthma, occupational exposure to chemicals, fumes and particulates, exposure to smoke while cooking (especially in rural area), Age, genetic makeup and high pollutants. COPD is marked with high concentration of Reactive oxygen species (ROS) in lungs and less availability of antioxidants in blood. ROS and reactive nitrogen species (RNS) are major cause of oxidative stress and reduction of antioxidants in body increase of free radicals leads to oxidative stress [3]. This in turn interferes with cell signaling, leading to progressive inflammation and reduction in body's innate immune defenses. This imbalance may then provoke pathological reactions causing a range of respiratory issues including Infectious disease and onset of chronic obstructive pulmonary disease (COPD).

Symptoms

COPD is a chronic disease and often don't appear until significant damage has accrued. In case of smokers and due to regular exposures to particulates, the condition becomes severe with passing time [4]. Major symptom is regular coughing with mucus secretion. other symptoms includes chest tightness, shortness of breath during any physical activities, early morning chocked throat, frequent respiratory infections, weight loss with progression of disease etc [5].

Prevention

For treatment of COPD, general recommended includes Medications, oxygen therapy and surgery. As there is no cure for COPD which allows the researchers to work on various other approach including nutritional therap. Many nutraceutical ingredients are rich in antioxidants and may help in reducing the effects related to COPD [6]. Source material of these antioxidants and PUFA (Poly unsaturated fatty acids) are curcumin, citrus fruits, grapes, pine tree bark, fish and algae and fruits [7,8].

In this regard, few of the nutraceutical ingredients has been reviewed that has shown clear indication in reducing the progression of respiratory disorders and in countering the progressive complications related to COPD.

Pycnogenol (Pine bark Extract)

Pycnogenol is extracted from pine bark and has multiple health benefits including cardio vascular health, immunity support, cognitive health support and controlling COPD progression. Safety and use of pycnogenol in cardio-vascular disorders is well documented and there and many products in the market. In COPD, pycnogenol supplements reduce the number of inflammatory cells and pro-inflammatory mediators such as collagen I and α-SMA [9,16], caused by cigarette smoke and lipopolysaccharide exposure in bronchoalveolar lavage fluid [9]. In a recent rat model study by Je-Won Ko., *et al*. has shown clear benefits in containing progression of COPD. They believed that pycnogenol markedly reduced the collagen deposition caused by cigarette smoke and lipopolysaccharide exposure, which was closely involved in TGF-β1/Smad 2/3 signaling, and is associated with pulmonary fibrotic change [9].

Polyphenols from green tea

Likewise, Green tea is a rich source of polyphenols which are strong anti-oxidants. Dietary polyphenols exert a wide range of beneficial biological functions beyond their antioxidative properties and are involved in regulation of cell survival pathways leading to anticarcinogenic [17] and antimutagenic [17] functions. In *in-vitro* experimental models, polyphenols inactivate cellular oxygen radicals, prevent membrane lipid peroxidation and nucleic acid oxidative damage. It is indicated in recent studies that polyphenols beneficial properties are due to their interaction with cellular signaling pathways and related machinery that mediate cell function under both normal and pathological conditions [10].

Curcumin

Turmeric is a spice widely used in Asia as ingredients in curries and for medicial purposes for centuries now and has been used in Ayurveda (Indian traditional medicine) for the treatment of several diseases. It is well known for its numerous health benefits, and is widely used in creams, lotions and other oral medicaments. Curcumin in turmeric is used to treat many skin and digestive issues and is known to have anti-inflammatory and antioxidant properties [11]. In COPD, Curcumin medicates anti-inflammatory effects by down regulating inflammatory transcription factors and pro inflammatory enzymes in lungs. It also induces glutathione biosynthesis and inhibits NF-kappaB activation and interleukin-8 release in alveolar epithelial cells [12].

Resveratrols

Resveratrol (3, 5, 4′-trihydroxystilbene) is a component of red wine extract that has anti-inflammatory and antioxidant properties. It is Known to have positive effect in antiaging drug with protective effects against lung cancer, may be used as an alternative to corticosteroids in COPD therapy. Recent studies has indicated that resveratrol may be effective in nutratherapy for macrophage pathophysiology in COPD. Resveratrol inhibited basal release of Interleukin-8, the major factor of inflammation in smokers and patients with COPD. This study was conducted by Culpitt and co-workers where they have assessed the effect of resveratrol on both basal and stimulated cytokine release [13].

Omega 3 fatty acids

Docosahexaenoic acid (DHA) is an omega-3 fatty acid found in cold-water, fatty fish, flax seeds and Seaweed or fish oils. Omega-3 fatty acids is crucial for heart, and infants require DHA, especially during the first 6 months for active development of brain, eyes, and nervous systems [14]. Recent study conducted by Isabelle Romieu and co-workers has shown that there are many positive effects of omega-3 fatty acids in reducing the symptoms of oxidative stress of respiratory systems [15]. Regular supplementation of omega-3 fatty acid, helps in reduction of inflammatory cytokines and thus alleviates the effects of COPD. Comparative studies of omega 3 supplementation and without omega-3 fatty acid in diet has shown many positive effects. Eyal Shahar and collaborators have shown benefits of Omega-3 supplementation among smokers with COPD conditions and its protection [2]. These studies clearly indicate that nutraceutical with various organic compounds may greatly enhance the health of patients with COPD.

Conclusion

Nutritional support in case of chronic respiratory disorders is of great importance. There are plenty of food sources that are rich in anti-oxidants, micronutrients and unsaturated fatty acids. Regular consumption of these foods can lead to a better life style and reduced inflammation. It is also suggested that plenty of nutraceuticals are available in the market with list of ingredients and its effects. Along with healthy diet and physical exercise, use of anti-oxidant rich nutrients are highly recommended for healthy lifestyle.

Conflict of interest statement

None.

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