

# Chronic obstructive pulmonary disease

Emphysema is a form of chronic obstructive pulmonary disease (COPD) that involves permanent abnormal enlargement of gas exchange airways accompanied by destruction of lung alveoli (the little sacs where oxygen and carbon dioxide pass across a thin membrane into and out of the blood vessels). In emphysema, obstruction occurs as a result of loss of elasticity in lung tissues.

While some degree of emphysema is considered normal in the elderly, the disease usually is secondary to cigarette smoking and chronic bronchitis. However, 1 to 2 percent of all cases of emphysema are linked to an inherited deficiency of alpha-1-antitrypsin, an enzyme that prevents protein breakdown. This leads to unchecked digestion of the tissues of the lungs, setting the stage for emphysema.

The major mechanism of airflow limitation in emphysema is loss of elastic recoil of the alveoli. Because damaged or destroyed alveolar walls cannot support and hold open airways, expiration (exhalation) is impaired. In essence, the air is "trapped" in the lungs making passive expiration difficult. The lungs don't shrink, they actually expand. The result is a buildup of carbon dioxide (CO<sub>2</sub>).

Respiratory Quotient: An important nutritional objective is to reduce the amount of carbon dioxide being produced by the body. Carbohydrate is the macronutrient that increases RQ (respiratory quotient), which is a measure of the ratio of the volume of CO<sub>2</sub> expired to the volume of oxygen consumed. By decreasing carbohydrate in the diet, we are effectively decreasing the amount of CO<sub>2</sub> produced, thereby decreasing the burden of expiration on the patient. This also helps to decrease respiratory infections and acidosis associated with emphysema. Therefore, the prescribed diet is high in fat (as much as 55 percent) and protein and low in carbohydrate.

Serious weight loss (anorexia) can occur in individuals with emphysema due to significant shortness of breath and the resulting gastrointestinal distress brought on by inadequate oxygen to GI cells. Underweight patients also may have higher bitter taste thresholds that are related to bicarbonate levels and pH. As a result, meats and vegetables may taste bland.

Oral Antioxidants. Oxidative stress contributes to chronic obstructive pulmonary disease. Neutrophil and macrophage-initiated release of reactive oxidant species (ROS) is a feature of inflammatory respiratory conditions. Definitive proof that antioxidant therapy can arrest the progression of respiratory disease is lacking, but several lines of evidence support its plausibility. N-acetylcysteine (NAC) is the most widely investigated antioxidant used in clinical and experimental settings. In Germany it enjoys the status of a drug in pulmonary applications. NAC possesses mucolytic properties, and, as a thiol-containing compound, it may act as an antioxidant by providing cysteine as a substrate for enhanced intracellular production of glutathione. It has been shown to decrease hydrogen peroxide-induced damage to epithelial cells in vitro.

N-acetylcysteine treatment has reduced cigarette smoke-induced abnormalities in polymorphonuclear neutrophils, fibroblasts and epithelial cells in vitro. N-acetylcysteine given orally has increased lung lavage glutathione levels, reduced superoxide production, and decreased lung lavage PMN's. Treatment with NAC has reduced the number of viral infections and airway bacterial colonization in patients with COPD. In a Swedish study, the decline in FEV<sub>1</sub> in COPD patients who took NAC for 2 years was less than in the reference group. A usual and well-tolerated dose of NAC is 500 milligrams taken with food, the only notable side effect being occasional

mild GI distress.

Limited studies are available to characterize the effects of intervention in respiratory disease with other common antioxidants. One recent study evaluated the effect of 50 mg./day of vitamin E and 20 mg./day of beta carotene on 29,133 male smokers aged 50-69 with COPD. The results indicated that supplementation did not affect the recurrence or the incidence of chronic cough, phlegm or dyspnea. But the prevalence of chronic bronchitis and dyspnea at baseline was lower among those with a high dietary intake of beta carotene or vitamin E and a high serum beta carotene and vitamin E, suggesting that diet, not supplementation, conferred some protection, even among elderly, long-term smokers. Supporters of antioxidant supplementation would no doubt call attention to the low dose of vitamin E used in the trial; on the other hand, restraint with beta carotene supplementation would theoretically be called for in light of recent studies that suggest that smokers suffer higher rates of lung cancer with administration of synthetic beta carotene.

An evaluation of 66 coal miners found that superoxide dismutase activity was increased in miners with progression of coal workers' pneumoconiosis and reduced glutathione was decreased in those with chronic bronchitis at follow-up. Increased levels of vitamin E were associated with decreased risk of disease progression.

Dietary factors were evaluated in more than 9,000 patients by the NHANES II Study and correlated with respiratory symptoms. Serum and dietary vitamin C, dietary fish and a higher zinc-copper ratio conferred protection against bronchitis and wheezing. Vitamin C has bronchodilatory effects and may exert its effect by altering arachidonic acid metabolism. Other mechanisms may be vitamin C's antioxidant effect, its ability to stimulate histamine metabolism, and its direct effect on smooth muscle and cyclic AMP.

Vitamin A. The relationship between vitamin A status and the degree of lung airway obstruction was examined in a cross-sectional study of 36 males between 43 and 74 years of age who were healthy nonsmokers (n=7), healthy smokers (n=7), mild chronic obstructive pulmonary disease (COPD) patients (n=9), COPD-moderate-severe patients (n=7) and COPD-moderate-severe patients with exacerbations (n=6). In addition, in 12 male smokers between 45 and 61 years of age with mild COPD, 6 subjects consumed vitamin A at 1,000 retinol equivalents per day and 6 subjects received a placebo for 30 days. Low serum retinol concentrations were found in the COPD-moderate-severe and COPD-moderate-severe with exacerbations groups. There was improvement in pulmonary function tests after vitamin A supplementation, which supports the assumption of a local vitamin A deficiency in patients with chronic obstructive pulmonary disease.

Omega-3 Fatty Acids From Fish. The evidence supporting fish oil supplementation for patients with respiratory disease is primarily epidemiological. In examining cross-sectional data from the Atherosclerosis Risk in Communities Study, the estimated effect of pack years of smoking on COPD was attenuated with greater fish consumption in a statistically significant manner. Fish consumption appears to negate some of the harmful effects of smoking on the lung.

Another study evaluated the dietary intake of 8,960 patients with chronic obstructive pulmonary disease who were current or former smokers. Chronic bronchitis was diagnosed in 667 patients, emphysema in 185 patients and spirometry detected COPD in 197 patients. After adjusting for variables, the intake of eicosapentaenoic acid and docosahexaenoic acid (from fish oil and omega-3 fatty acids) were inversely related to the risk of chronic obstructive pulmonary disease. The authors conclude a high intake of omega-3 fatty acids may protect cigarette smokers against chronic obstructive pulmonary disease. The omega-3 fatty acids may reduce the production of inflammatory mediators such as leukotrienes from arachidonic acid and subsequent

oxygen radicals from white blood cells.

Side effects of fish oil administration are limited to anti-coagulation (ecchymoses, epistaxis) and GI intolerance (fishy eructation, diarrhea). Beneficial effects may be seen in arthritis, hypertension and depression.

Aerosolized glutathione. A novel means of administering antioxidant support to patients with respiratory disease is with glutathione delivered via nebulizer. Its use in various clinical and investigational settings has numerous precedents. It is a therapy embraced by many practitioners of complementary medicine for the treatment of COPD.

Respiratory IV: Along with the proper diet prescription and supplements, a beneficial treatment for COPD patients at the Hoffman Center is a "Respiratory IV," which includes such important anti-inflammatory micronutrients as vitamin C, copper, magnesium, selenium and zinc, followed by glutathione.

Bioidentical hormones: Many COPD patients are debilitated, weak and suffer from weight loss and muscle wasting. Identification of hormone deficiencies and their correction with bio-identical androgens such as testosterone and DHEA is imperative.

Immune support: Use of nutrients and supplements that support optimal immune function is vital in COPD, which is often exacerbated by respiratory infections. Products such as Advanced Immune Support, Immpower, Advanced Seasonal Support, Transfer Factor, Olive Leaf and Oregacillin help support the body's defenses against lung pathogens.

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