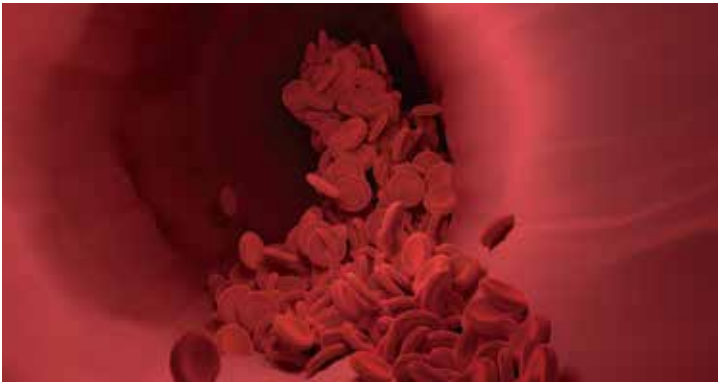




Beta-Glucans in CVD and Immune Health



Beta-glucans, a type of soluble fiber (SF) derived from several plant sources and formed by D-glucose molecules linked by beta-glycosidic bonds have been postulated as having many therapeutic health benefits. The most concentrated sources include oats, barley, mushrooms, and seaweed; which though similar in structure, the position and branching of their glycosidic bonds differentiates their potential health benefits.

Beta-glucans in oats and barley, for example, contains 1,3 and 1,4 glycosidic linkages. They appear to have potent effects on cardiovascular health and modulate the microbiome. Beta-glucans from fungi, seaweed, and yeast, on the other hand, contain 1,3 and 1,6 linkages. Research shows that these 1,6 linkages allow these beta-glucans to have potent benefits on immune stimulation by binding with immune receptors.

Beta-Glucans and Cardiovascular Health

The use of beta-glucans has garnered interest in recent decades as evidence has shown that they may help in many heart health conditions. In fact, many countries have approved beta-glucan health claims. Sufficient conclusive research on the role of beta-glucans in cardiovascular health to date has moved the European Food Safety Authority to issue a recommendation that 4 g of beta-glucan from either oats or barley should be consumed daily per 30 g of total dietary carbohydrate. Similarly, the FDA created a statement recommending at least 3 g of oat or barley beta-glucans daily for cardiovascular health. Strong evidence shows that beta-glucans helps to manage cholesterol. A 2017 review paper on beta-glucans and cholesterol reported that studies over the past 20 years have suggested a cholesterol-lowering effect from diets supplemented with beta-glucans. Beta-glucans also increases the production of short-chain fatty acids (SCFAs), which is linked to reductions in cholesterol by upregulating genes that increase the hepatic uptake of serum cholesterol, and, additionally, may even decrease the activity of the enzyme HMG-CoA reductase responsible for cholesterol synthesis.

A recent 2022 meta-analysis looking at studies on dietary oat beta-glucans found that across 13 trials with over 927 participants, there was a significant decrease in total

cholesterol and LDLs. The daily consumption ranged between 1.6 and 6 g of oat beta-glucans per day and the interventions lasted from three to eight weeks. These recent studies reinforce previous research on the ability of beta-glucans to reduce cholesterol, lending more support to the European Food Safety Authority and FDA recommendations.

Beta-Glucans and Immune Function

Beta-glucans may also exert positive effects on health via immune modulation. Many types of mushrooms and yeast, which have been used medicinally for thousands of years, are excellent sources of beta-glucans. It is the unique chemical structure of these types of beta-glucans that give them this ability. The 1,6 glycosidic bonds, absent in grains such as oats and barley, appear to allow fungal and even yeast beta-glucans to bind with immune receptors.

Both fungal and yeast beta-glucans, upon ingestion, interact with the mucosal immune system in the digestive tract. They are absorbed by the intestinal epithelium and presented to immune cells. Beta-glucans then bind to the receptors, primarily dectin-1, which is found on the surface of macrophages, natural killer cells, neutrophils, and dendritic cells. This process initiates a cascade of reactions that increase the activation of B cells, cytokines, nitric oxide, and other mediators of immune system. Due to this documented ability to stimulate an immune response, the use of beta-glucans as a pharmaceutical product has been approved for use not only in the United States but also in Canada, Sweden, Japan, and China, among others.

Fungal and yeast beta-glucans may enhance the immune response to ward off potential viral and microbial infections. A recent study by Stothers et al, (2023) sought to examine this effect by injecting mice with beta-glucan and then introducing an infectious microbial agent. The mice received intraperitoneal injections of beta-glucans on days one and two of the trial, and then were infected with a microbe one, three, seven, or 14 days later. The researchers found increases in immune mediators within hours after the injections, and this conferred protection against infection for up to 14 days.

Interest in human studies has been ongoing as well, particularly in children and older adults. A 2021 systematic review compiled high-quality randomly controlled/clinical trials (RCTs) involving upper respiratory tract infections in human participants. Thirty-four RCTs from 2005 to 2020 were included. The trials included yeast beta-glucans, or products utilizing mushroom beta-glucans from oyster mushroom and shiitake. Dosages ranged from 2.5 mg to 1 g, and study duration ranged from four to 26 weeks. Participant ages extended from young children all the way to 65 and older. Overall, they concluded that beta-glucans appear to strengthen the immune response, particularly against upper respiratory tract infections, and help to ward off infections. They even found a positive benefit for seasonal allergy sufferers.