

Pre-2005

Tsukada, et al., Immunopotential of intra-epithelial lymphocytes in the intestine by oral administrations of beta-glucan. *Cell Immunol*, 2003.221(1):1-5.

Rice, et al., Oral delivery and gastrointestinal absorption of soluble glucans stimulate increased resistance to infectious challenge. *J PharmacolExpTher*, 2005.314(3):1079-1086.

Breivik, et al., Soluble beta-1,3/1,6-glucan from yeast inhibits experimental periodontal disease in Wistar rats. *J ClinPeriodontol*, 2005.32(4):347-352.

Sener, et al., Protective effect of beta-glucan against oxidative organ injury in a rat model of sepsis. *IntImmunopharmacol*, 2005.5(9):1387-1396.

Kirmaz, et al., Effects of glucan treatment on the Th1/Th2 balance in patients with allergic rhinitis: a double-blind placebo-controlled study. *EurCytokine Netw*, 2005.16(2):128-134.

Pre-2010

Lehne, et al., Oral administration of a new soluble branched beta-1,3-D-glucan is well tolerated and can lead to increased salivary concentrations of immunoglobulin A in healthy volunteers. *ClinExpImmunol*, 2006.143(1):65-69.

Aarsaether, et al., Cardioprotective effect of pretreatment with beta-glucanin coronary artery bypass grafting. *ScandCardiovascJ*, 2006.40(5):298-304.

Sandvik, et al., Oral and systemic administration of beta-glucan protects against lipopolysaccharide-induced shock and organ injury in rats. *ClinExpImmunol*, 2007.148(1):168-177.

Berdal, et al., Aminated beta-1,3-D-glucan improves wound healing in diabetic db/dbmice. *Wound Repair Regen*, 2007. 15(6):825-832.

Preus, et al., A randomized, single-blind, parallel-group clinical study to evaluate the effect of soluble beta-1,3/1,6-glucan on experimental gingivitis in man. *J ClinPeriodontol*, 2008.35(3):236-241.

Talbott and Talbott, Effect of beta-1,3/1,6-glucan on upper respiratory tract infection symptoms and mood state in marathon athletes. *J Sports SciMed*, 2009.8(4):509-515.

Pre-2017

Karaaslan, et al., Case series of topical and orally administered beta-glucan for the treatment of diabetic wounds: clinical study. *J Cutan Med Surg*, 2012.16(3):180-186

Medeiros, et al., Effects of purified *Saccharomyces cerevisiae*(1->3)-beta-glucan on venous ulcer healing. *Int J Mol Sci*, 2012.13(7):8142-8158.

Talbott and Talbott, Baker's yeast beta-glucan supplement reduces upper respiratory symptoms and improves mood state in stressed women. *J Am Coll Nutr*, 2012.31(4):295-300.

Carpenter, et al., Baker's yeast beta-glucan supplementation increases monocytes and cytokines post-exercise: implications for infection risk? *Br J Nutr*, 2013.109(3):478-486.

Talbott, et al., Beta-glucan supplementation, allergy symptoms, and quality of life in self-described ragweed allergy sufferers. *Food Sci Nutr*, 2013.1(1):90-101.

Vetvicka, et al., Placebo-driven clinical trials of yeast-derived β -(1-3)-glucan in children with chronic respiratory problems. *Ann Transl Med* 2013.1(3):26.

Zykova, et al., Macrophage stimulating agent soluble yeast beta-1,3/1,6-glucan as a topical treatment of diabetic foot and leg ulcers: A randomized, double blind, placebo-controlled phase II study. *J Diabetes Investig*, 2014.5(4):392-399.

Richter, et al., Clinical trials of yeast-derived beta-(1,3) glucan in children: effects on innate immunity. *Ann Transl Med*, 2014.2(2):15.

Samuelsen, et al., Effects of orally administered yeast-derived beta-glucans: a review. *Mol Nutr Food Res*, 2014.58(1):183-193.

Javmen, et al., Beta-glucan from *Saccharomyces cerevisiae* induces IFN-gamma production in vivo in BALB/c mice. *In Vivo*, 2015. 29(3):359-363.

Richter, et al., Beta-glucan affects mucosal immunity in children with chronic respiratory problems under physical stress: clinical trials. *Ann Transl Med*, 2015.3(4):52.

Zhou, et al., Baker's yeast beta-glucan decreases episodes of common childhood illness in 1- to 4-year-old children during cold season in China. *J Parenter Enteral Nutr* 2016.40(1): 115-144.

Detailed

The results of all studies [in vivo, in vitro, human clinical trials with dietary insoluble yeast beta-glucans] taken together clearly indicate that oral intake of insoluble yeast beta-glucans is safe and has an immune strengthening effect. ...Insoluble B-glucans are able to activate both the innate and

adaptive immune responses...Two independent randomized, double-blind, placebo-controlled clinical trials showed that daily oral administration of the proprietary insoluble (1,3)-1,6)-B-glucan, derived from brewers' yeast, reduced the incidence of common cold episodes during the cold season [25%] in otherwise healthy subjects. – Immune (Immunological) modulatory effects: Stier H, Ebbeskotte V, Gruenwald J, Immune-modulatory effects of dietary Yeast Beta-1,3/1,6-D-glucan. Nutr J, 13:38, PMID: 24774968 PMC40112169, Apr 28, 2014.

The presence of a particulate activator can rapidly initiate assembly and amplification of a host defense system involving humoral and cellular interactions with B-glucans. ...Animals pretreated with purified glucan particles are subsequently more resistant to bacterial, viral, fungal, and protozoan challenge, reject antigenically incompatible grafts more rapidly and produce higher titers of serum antibodies to specific antigens. Administration of glucan particles ...stimulates...proliferation of macrophages and increases in phagocytic and secretory activities of macrophages. ...A cascade of interactions and reactions initiated by macrophage regulatory factors can be envisioned to occur and to eventuate in conversion of the glucan-treated host to an arsenal of defense. – An Arsenal of Immune Defense: Czap, Joyce K., The Role of Beta.-Glucan Receptors on Blood and Tissue Leukocytes in Phagocytosis and Metabolic Activation. Pathology and Immunopathology Research; 5:286-296. Harvard Medical School. 1986.

The percentage of phagocytic macrophages was found to be strongly dependent on both the particle size and the particle Fc density. ...Interaction with the smaller particles (micronized 0.5 μm and 1 μm) at a low Fc density resulted in a greater percentage of phagocytic macrophages than with high Fc density. ...Therefore, larger microparticles (micronized 3 μm and 4.5 μm) may be more efficient at delivering a greater therapeutic payload to macrophages, but smaller opsonized microparticles (0.5 μm to 2 μm) can deliver bio-active substances to a greater percentage of the macrophage population. – Pacheco P, White D, Sulchek T, Effects of microparticle size and Fc density on macrophage phagocytosis. PLoS One. 2013 Apr 22;8(4):e60989. PMID:23630577; PMCID:PMC363260 .

Beta Glucan has been shown to enhance the envelopment and digestion (phagocytosis) of pathogenic microorganisms that cause infectious disease...The Beta-1,3/1,6 glucans additionally enhance the ability of macrophages, one of the most important cells in the immune system, to kill tumor cells. Laboratory studies have revealed the new MG Glucan is significantly effective at activating macrophages, and via the macrophages, the entire immune cascade including T-Cells and B-Cells. – Activation of Immune Defense Against Infectious Disease: Hunter K, Gault R, Jordan F, Mode of Action of B-Glucan Immunopotentiators-Research Summary Release. Department of Microbiology, University of Nevada School of Medicine, Jan 2001.

*The important benefit of B-glucan is to improve the immune system and to decrease cholesterol levels in the blood. ...Several studies have reported the benefits of B-glucan as: antiseptic, antioxidant, anti-aging, immune system activators, protection against radiation, anti-inflammatory, anti-diabetic anti-cholesterol etc. ...Beta-glucan extract of *S. cerevisiae* can reduce total cholesterol approaching normal values at doses of 10 mg of 32.79% (blood plasma) and 33.71% (in the liver). The extract was capable of reducing triglyceride levels in a dose of 10 mg of beta-glucan 64.43% (blood plasma)... – Kusmiati, Dhewantara FX, Cholesterol-Lowering Effect of Beta Glucan Extracted from *Saccharomyces cerevisiae* in Rats. Sci Pharm, 14;84(1):153-65. PMID: 271105D6 PMCID: PMC4839553, Feb 2016.*