OatWell® oat bran: Proven and advanced nutrition for your heart

Oat (Avena sativa L.) is a typical northern cereal. As such, it prefers a wet, cold climate with rain during the growing phase and sunshine and long hours of daylight during the harvest season. For approximately 2000 years, oats and barley were staples of the diet in Nordic countries. Only at the beginning of the 19th century were oats partially replaced by other cereals and potatoes. The greatest virtue of oats is its 100% naturalness – the only grain not affected by the controversy around GMOs and that the benefits are many. Oats not only contain the beta-glucans, but also antioxidants, plant sterols, protein, and polyunsaturated fatty acids. Today, interest in oats is increasing, and it retains a strong image as a nutritious, health-promoting ingredient in food applications due to its high bioactive and functional food applications due to its advanced nutrition for your heart.

The mixed linkages that form oat beta-glucans are important for their physical properties, such as viscosity and solubility. The presence of two types of linkages prevents compact folding of oat beta-glucans, making them soluble in water. The (1-->3)-linked residues result in kinks in the otherwise ribbon-like shape of the molecule, allowing water to penetrate and solubilize the fiber. The longer (1-->4) sequences are believed to be responsible for the partial water insolubility properties of oat beta-glucans, because they provide surfaces that are capable of forming junction zones.

Oat beta-glucans are asymmetric molecules that assume an extended conformation in aqueous solution, best described as worm-like chains. One theoretical model describes beta-glucans in solution as an extended random coil. Oat beta-glucans are large molecules. Available data on molecular weight distribution vary between 2.68 x 10^4 and 3 x 10^5 g/mol. These variations probably depend on differences in raw materials, processing, and methods of determination. Even at low concentrations in water solutions, oat beta-glucans interact, causing marked resistance in water flow and creating a viscous solution. If the concentration is high enough, a gel is formed through associations between molecules.

Increased viscosity is a fundamental characteristic of oat beta-glucan solutions and has an important impact on their physiological behavior in the intestine and, thus, their physiological function. Viscosity plays an important role in cholesterol lowering effects and not only on the amount of beta-glucans. Therefore it is critical not only to know the beta-glucan concentration, but also the solubility viscosity and molecular weight of beta-glucans influence viscosity and bioavailability. Viscosity is mainly determined by molecular weight but also by molecular structure, resulting from the distribution of (1-->3) and (1-->4) links. In conclusion, to maintain functional attributes, the food containing oat beta-glucan must be controlled during processing and in food matrices. The physiological effects of oat beta-glucan depend at least in part on the viscosity and not only on the amount of beta-glucans. Therefore it is critical not only to know the beta-glucan concentration, but also the solubility viscosity and molecular weight of beta-glucans in the product.
acids generally are recycled, i.e., sulfation bile acids, resulting in viscous oat ß-glucans encapsulate bile acids, and may reduce insulin resistance27. A low-GI diet may help prevent type II diabetes38,44, have a low GI. Epidemiological data suggest that a hydrates that are slowly digested in the intestine and positive metabolic effects of diets containing carbohydrates. Studies show that in the intestine food digestion to take longer. Another hypothesis is that in the intestine food is "incorporated" in the viscous oat ß-glucan solution making it more difficult for enzymes in the intestine to degrade the food components and causing digestion to take longer. Another hypothesis is that oat ß-glucans form a protective layer along the intestinal wall that acts as a viscous barrier slowing food uptake from the intestine.

Blood cholesterol and oat ß-glucans

Substantial clinical evidence from the last 40 years has documented that oat ß-glucans have an effect on blood cholesterol levels and control of lipoprotein metabolism26,27. At the level of statistical significance, biological relevance can be attached to very small changes in a marker. This is exemplified by reference to blood cholesterol levels (total cholesterol, LDL-cholesterol) in which at the population level, a few percent change has large implications on the risk of coronary heart disease. Oat ß-glucans are believed to favorably affect blood cholesterol and lipoprotein metabolism mainly by increasing viscosity in the small intestine. There are different theories concerning the mechanisms of the blood cholesterol lowering effect of oat ß-glucans. One theory26 proposes that the viscous oat ß-glucans encapsulate bile acids, resulting in their excretion in the feces. Bile acids generally are recycled, i.e., they are taken up in the lower part of the intestine and used again. Through excretion in feces, the body loses bile acids and has to synthesize new ones, which is done in the liver. The building block for bile acids is cholesterol, which the liver extracts from the blood, decreasing blood cholesterol levels. Another hypothesis is that fermentation of soluble fiber by bacteria in the large intestine produces propionate. The propionate is then absorbed by the colon cells and goes to the liver where it is thought to have an effect on cholesterol synthesis. A third theory is that oat ß-glucans interfere with the absorption of lipids, probably by reducing or delaying the emulsification and lipid hydrolysis process.

Oat ß-glucans as prebiotics

The lower part of the intestine, the colon, has been identified as a key organ affecting general health. The growth and metabolism of the many individual species inhabiting the colon depend primarily on the substrates available to them, most of which come from the diet. Oat ß-glucans, which are indigestible in the small intestine but are fermented by bacteria in the colon, are prebiotics. Prebiotics are nondigestible food ingredients that selectively stimulate the growth or activities of bacteria in the colon. They beneficially affect a series of intestinal functions by modulating the structure, composition, and metabolic activity of mucosa and microflora in the colon. The end products created from prebiotic fermentation in the colon are short-chain fatty acids, e.g., butyric acid, that serve as nutrients for mucosal cells.

Oat ß-glucans and weight management

Satiety is a complex bodily sensation that signals that the stomach is full and it is time to stop eating. When consumed 20-30 min before eating a meal, oat ß-glucans form a thick viscous fluid in the stomach and small intestine that stimulates the sensation of satiety and helps limit appetite. By reducing the desire for food intake, the effect can help in weight control when combined with a healthy, balanced diet and adequate exercise. As a result of the extended period of digestion, nutrients are utilized by the body over a longer period and, thus, may contribute to a longer period of satiety in weight management programs28,29.

OatWell® oat bran

High-quality oats are grown in Scandinavia and Canada. Highly refined and other oat and oat bran products. Viscosity, solubility and molecular weight are important production control parameters. Over the last 10 years numerous clinical trials have proven the physiological effect of OatWell® oat bran on cholesterol reduction and blood sugar responses30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46. Biochemical, biological relevance can be attached to very small changes in a marker. This is exemplified by reference to blood cholesterol levels (total cholesterol, LDL-cholesterol) in which at the population level, a few percent change has large implications on the risk of coronary heart disease. Oat ß-glucans are believed to favorably affect blood cholesterol and lipoprotein metabolism mainly by increasing viscosity in the small intestine. OatWell® oat bran include fiber applications for cardiovascular health, energy enhancement, modification of GI, and weight management.

Innovative uses for OatWell® oat bran in food applications

Compliance with existing dietary guidelines would be greatly improved if common food products rich in oat ß-glucans were available. Primally® is a new product that has been introduced to the Swedish market, a 200-mL cup of a yogurt and muesli in a top cup. The muesli contains 4 g of oat ß-glucans from OatWell® oat bran per serving. The effect of yogurt and muesli containing oat ß-glucans on blood sugar and insulin responses to a mixed breakfast meal was determined in clinical studies performed at Lund University (Sweden). The test meal significantly lowered blood sugar and insulin responses (GI) compared with a reference meal without oat ß-glucans. The difference was 36% and 44%, respectively. Primally® containing ß-glucans eaten with high GI foods, like white bread, produce a favourable blood sugar response to the whole meal.
The effect of Primaliv® on cholesterol and other blood parameters were also tested in a clinical study by Oresund Diabetes Team (Lund). The results showed a significant lowering of both total cholesterol (9.4%) and LDL (10.8%) compared with a control product. The primary target group for the yogurt and müsli product is health-conscious consumers.

A new product will soon be launched to the Dutch market: The multi grain bread Pró-FIT® has successfully received the Code of Practice of the Voedingscentrum in the NL (40). 4 slices of Pró-FIT® bread per day containing 3 gr oat beta-glucan from OatWell® oat bran has proven to reduce the cholesterol significantly in comparison to commercial available bread. It means that the Voedingscentrum acknowledges that this Vitalbrood Pró-FIT® has a positive effect on heart health. Vitalbrood Pró-FIT® is the only bread that can make this scientifically proven cholesterol lowering claim. In general, bread is a very important component of the Dutch daily food intake. Therefore the Pro-FIT® bread with its cholesterol lowering effect considerably adds heart health in comparison to commercial available bread.

A cholesterol lowering bread contributes to increasing awareness of the importance of a healthy diet and can have large implications on the risk of coronary heart disease at the population level.(14)

**Health claims for oats and OatWell® oat bran products**

**Approved Health Claims in the Netherlands**

Since 1998 there has been an agreement for a Code of Practice in the Netherlands concerning the scientific support for health benefits for food- and drinking products. This Code indicates guidelines that have to be satisfied for the scientific support of a health claim. The Code of Practice has been created by the Voedingscentrum in close cooperation with consumer organisations, business organisations, institutes and the government.(20) The producers of food and drinking products can voluntary use this Code of Practice to scientifically prove the health benefit of the claim of their product. In 2005 the multi grain bread Pró-FIT® containing OatWell® oat bran has successfully received the Code of Practice of the Voedingscentrum.

**Approved Health Claims in the United Kingdom**

A scientific dossier was submitted to the UK Joint Health Claims Initiative (JHCI) on behalf of Crean Nutrition Swedish Oat Fiber concerning the use and application of oat β-glucans in oat-based products and their association with reduced risk of cardiovascular disease. The JHCI Expert Committee and the JHCI Council confirmed 2004, that the totality of the evidence substantiated a health claim: whole oats, oat bran, OatWell® oat bran rolled oats, and whole oat flour, as part of a diet low in saturated fat and a healthy lifestyle, can reduce cholesterol. The soluble oat fiber β-glucans may serve as a marker for oat products that are the subject of the claim. Products carrying the claim should contain at least 0.75g of soluble oat fiber (β-glucans per serving) which is one-quarter of the suggested daily intake of 3g.

**Approved Health Claims in Sweden**

In 1997, the U.S. Food and Drug Administration (FDA) reviewed 37 clinical studies concerning the effect of oat β-glucans on blood cholesterol, especially the significance and dose-response of the effect. Based on the findings, the FDA approved the first food-specific claim for oat bran authorising the use of a health claim that states: "Soluble fiber from foods such as oat bran, as part of a diet low in saturated fat and cholesterol, may reduce the risk of coronary heart disease." The claim is based on a daily intake of 3g of oat β-glucans, and the food product must contain at least 0.75 g per serving.

**Summary**

Oat products have a strong image as nutritious, health-promoting ingredients in food applications due to their high bioactive and functional component contents. Probably the most well recognised health-promoting ingredient from oats is β-glucan, a soluble fiber. Significant positive health effects have been attributed to oat β-glucans, including cholesterol control, modulation of glucose and insulin responses, weight management, and improved gastrointestinal function. As a component of oats, β-glucans can be incorporated into a wide variety of innovative food products.

A significant lowering of plasma LDL (up to 10%) cholesterol may be achieved with daily consumption of approximately 3g of β-glucans. A 30-50% reduction in blood glucose peak can be achieved when β-glucans constitute 8-10% of the carbohydrates in a food product.

Approved claims differ from country to country but are permitted in the United States. At the EU level the concept of enhanced function claims (such as may lower cholesterol levels) and disease risk reduction claims (such as reduced risk of CVD) has started to gain wider acceptance and is included in some national guidelines such as those of Belgium, Finland, Netherlands, Sweden and the UK. A proposal for a regulation on nutrition and health claims on foods is under discussion. This regulation is intended to harmonise provision/action on Member States related to health claims and consumer protection. Furthermore a European commission concerted action – the Process for the Assessment of Scientific Support for Claims on Foods (PASSCLAIM) had the following principal objectives:

- to evaluate existing schemes which assess scientific substantiation;
- to produce a generic tool for assessing the scientific support for health claims for foods;
- to establish criteria for markers which can be used to explore the links between diet and health. The scientific substantiation of claims according to the PASSCLAIM criteria might require substantial studies in humans. This may be particularly true for oat product specific claims (NL, SE, UK) that can be made on a range of products containing oat β-glucans.
an excellent grain product. We don't need to change it. Just use it. It has been in our diets for hundreds of years. We have survived eating it—and that should be a very good sign.

References