Cardio Health with Oat beta-glucans

There are various sources of beta-glucan that differ substantially in structure and therefore activity. The oat (*Avena sativa*) is a cereal grain and is one of the oldest human food staples. Oats have the highest protein quality and the most remarkable constituent of the oat is its unique soluble fibre, called beta-glucan. On the other hand yeast and mushrooms, the nongrain sources of beta-glucan.

Beta-glucan is the principal constituent of cell walls in the oat seed which is present in relatively low concentrations (about 2-4 percent). The outer branny regions of the oat have the thickest cell walls and represent a richer source of beta-glucan (roughly 6-7 percent).

The primary health benefits of this beta-glucans include cholesterol reduction and other risk factors for heart disease and metabolic syndrome. Metabolic syndrome consists of a constellation of metabolic disorders including elevated cholesterol, insulin resistance, hypertension and obesity.

Now a days oat beta-glucans are commercially available in a compact dosage form as dietary supplements or can be formulated into functional beverages and bars. Oat beta-glucans has no side effects and it is both palatable and well tolerated. This soluble fibre imparts a pleasant, creamy mouthfeel when incorporated into foods or beverages. It also tends to mellow tart flavours.

These unique properties arise from the specific molecular conformation associated with the beta-(1-3), (1,4) mixed linkage. Beta-glucan from oats are comprised of (1-3), (1-4) beta-D-glucan linkage. Due to this beta glucan from oats are highly water soluble and thus build substantial viscosity in the gut, a mechanism of action for improvement of serum lipids, glycaemic response and the sanitation effect. This structure also lends itself to fermentation pathways resulting in enhanced colonic health, as well as showing considerable promise for the prophylaxis and treatment of many infectious diseases.

On the other hand yeast and mushrooms, the nongrain sources, are comprised predominantly of (1-3), (1-6) linkages. This structure results in water insolubility, thereby comprising its ability to build viscosity in the gastrointestinal tract.

Cardiovascular Benefits

Daily ingestion of modest quantities of oat beta-glucan can cause a significant reduction in serum cholesterol, notably harmful LDL cholesterol. It was found that controlled prepared diet can reduce up to 20 percent LDL while less stringent dietary control have shown the reduction in the 5 –12 percent range.

It was also found that the food containing combination of viscous fibres including oat beta-glucan and other ingredients (such as plant sterols and soy protein) resulted in decrease in mean LDL cholesterol up to 28 percent. Also there are no significant differences in efficacy of cholesterol reduction between this dietary portfolio and the statin drug treatment.

Cholesterol reduction with oat beta-glucan is dose-responsive and found that response is greater for subjects having higher initial levels of cholesterol. Also in 1977, the Food and Drug Administration enacted a health claim addressing the cardiovascular benefits of oat beta-glucan. The claim provides a minimum effective daily dose of 3 gm, which may be divided into sub doses as small as 0.75 gm.

The mechanism by which oat beta-glucan reduces cholesterol is not yet clear. However, it has been demonstrated that development of viscosity in the gut, which ensues from the solubilisation of beta-glucan, is an essential precursor.

As beta-glucan is a hydrocolloid, it has the capacity to form highly viscous solutions at low concentrations in vivo and this can lead to binding and increased excretion of bile acids, reduced absorption of fat and cholesterol and a reduced absorption rate of available carbohydrates. Any or all of these events can result in decreasing cholesterol levels. This also suggests that beta-glucan is likely to be more effective when taken with meals.

Yeast beta-glucans do not qualify this cardiovascular health claim approved by Food and Drug Administration. They are marketed and evaluated as immunomodulatory agent and a biological response modifier.

Metabolic Syndrome and Carbs

Metabolic Syndrome includes number of disorders, each representing a significant risk factor for cardiovascular disease. This includes elevated LDL cholesterol, insulin resistance, hypertension and obesity.

Oat beta-glucan reduces the insulin levels by its ability to form highly viscous solutions at low concentrations in the gut and thus it provides cardiovascular and related health benefits.

Oat beta-glucan also reduces the glycaemic response due to the viscosity of beta-glucan, which can increase the duration of intestinal transit and result in delayed digestion of starches and other available carbohydrates.

A 60 percent reduction in the glycaemin index of glucose was found when 11 gm oat beta-glucan is added to a 50 gm carbohydrate (glucose) meal. This significant blunting of the glycaemic response leads to significant blunting of the insulinaemic response. Similar results were obtained when study was carried out on persons having type 2 diabetes. Thus, oat beta-glucan is emerging as a tool for diabetes and serum glucose management.

There is an inherent dose relationship between beta-glucan dose and glycaemic and insulinaemic responses due to the viscosity of beta-glucan, which is concentration dependent. Significant glycaemic and insulinaemic responses have been observed for doses as low as 1.4 gm beta-glucan and the threshold dose for an effect is probably considerably lower.

Hypertension and Weight Loss

It was found that dietary intake of oats can reduce the blood pressure. Reductions in systolic and diastolic pressure of 7.5 mm Hg and 5.5 mm Hg respectively have been reported. The results of another study indicate that oats may allow hypertensive individuals to reduce or even eliminate their antihypertensive medications.

Epidemiologic evidence suggests an inverse relationship between oat consumption and blood pressure and reduced blood pressure may contribute to improved blood pressure.

Blunting of the postprandial glucose and insulin response has been linked to reduction in the rate of return of hunger and also reduction in subsequent energy intake. The increased viscosity of the alimentary bolus caused by solubilised beta-glucan can delay nutrient absorption and result in reduced hunger.

The soluble fibres in oats (beta-glucan) induce high levels of satiety. This phenomenon may be mediated by increased secretion of gut hormones such as cholecystokinin, which enhances satiety. Satiety can lead to weight loss and it was found that significant weight loss has been demonstrated for diets containing oats beta-glucan.

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