

What can barley foods do for you?

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Are you or a loved one suffering from heart disease or diabetes? The answer is likely “yes”, since Americans are increasingly at risk for premature death from both cardiovascular disease and diabetes – due to our increasing weight, elevated cholesterol, high blood pressure, and abnormal blood sugars.

You can, however, take heart – help is at hand. BARLEY is now recognized as an important part of a delicious, heart-healthy lifestyle. Isn't it wonderful that something so cheap, natural, tasty, and satisfying is also so good for you?

Barley good for you? Yes, barley. Food barley. Beer barley is another matter. Suffice it to say that the path to better health is not paved with beer bottles. While good beer may have therapeutic and medicinal properties, as widely asserted in Czech Republic, that is a story told elsewhere. In fact, barley for beer and barley for food differ in one very significant factor: beta-glucan.

Barley for beer must be low in beta-glucan and barley for food must be high in beta-glucan. Beta-glucan is the primary building block of cell walls in the grains of both barley and oats. Wheat and rye have cell walls too, but they don't contain beta-glucan.

In fact, a diet high in refined grains, sugars, and excessive saturated fats, puts you at high risk for heart disease and diabetes. What makes beta-glucan so special (for food) is that it is a source of soluble dietary fiber. Fiber is so vital for good health that the Institute of Medicine recommends at least 25 grams per day for everyone over the age of four.

Barley is a rich source of both types of fiber – both soluble and insoluble. However, researchers have identified beta-glucan as the primary component in barley that is responsible for lowering cholesterol. Based on scientific evidence, the Food and Drug Administration (FDA) finalized a rule in 2006 allowing barley foods to carry a health claim specific to soluble fiber and coronary heart disease. Qualifying products may use the following claim:

“Soluble fiber from foods such as [name of food], as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease. A serving of

[name of food] supplies [x] grams of the soluble fiber necessary per day to have this effect."

For history and science buffs, here's a brief history of barley foods and beer, and an explanation of why beta-glucan is the "brewer's bane and dieter's delight". About 10,000 years ago, when the Middle East was a less fractious place, some hungry and observant human took a sideways look at the grain on a spiny-looking ancestral barley plant and thought "*hmm ... that looks good enough to eat.*" One thing led to another, plants were domesticated and civilization flourished.

Most folks found they preferred to eat food made from wheat, rather than barley. On the other hand, barley grain served as the perfect substrate for tasty feel-good beverages. The primary food distinction between wheat and barley is that in a dough made from wheat flour will rise whereas a dough made from barley flour will not. The end result is that wheat flour is great for making light yeast breads and barley flour is great for making doorstops. However, malted barley has the perfect balance of protein and starch to feed alcohol-producing yeasts and thus to make beer.

For 9,000 years, the food and beverage uses of barley went hand-in-hand. On the whole, barley foods were for the poor. One of the tastier tidbits of barley food history is that the Roman gladiators were called the "hordearii" (barley men) because they subsisted on barley bread. One can surmise however, that the gladiators had no more interest in eating barley bread than in fighting lions. They just weren't offered much of a choice. Scottish peasants, whom we may associate more with oats than barley, also had few choices. They apparently subsisted – morning, noon, and night – on barley porridge, with a side of boiled greens on a good day. In Tibet, barley was, and continues to be, an essential part of the daily diet. Toasted barley flour, along with green tea and rancid yak butter, is used to make a food called tsampa. Special barley foods continue to be popular in some regions and may have unique health-promoting properties. For example, "dakos" is a traditional barley rusk on the island of Crete. Local bakeries use flour milled from whole (hulled) barley. In some cases, even the awns are ground with the grain. This whole grain barley food, awns and all, is thought to be one of the reasons for the low rate of colon cancer in the Cretan region.

In the rest of Europe, barley foods, with their negative associations of subsistence, bondage, and poverty, were gradually, gratefully, and generally replaced by wheat-based foods. Around 200 years ago, plant breeders began selecting barley and wheat in earnest, leading to the very distinct wheat and barley varieties of today. Worldwide (and in Oregon) most barley today is used for animal feed, but there is little added value.

Currently, the greatest value lies in malting barley. Malting barleys varieties are selected for low beta-glucan in order to give the yeast easier access to starch and protein inside each cell. A few breeders, anticipating a market for human food barley, selected for the opposite character – high beta-glucan, in order to capitalize on the nutritional qualities of barley grain and the new food claim allowed by FDA. Two traits associated with this first generation of food barley varieties are hullless grain and waxy starch.

Almost all feed and malt barley varieties have adhering hulls. Food barley grain that has an adhering hull is “pearled” to remove the hull. While pearling leads to a loss of bran and its nutritional components, the total beta-glucan content is not affected since there is more beta-glucan in the endosperm than in the bran. A variant form of a gene called *nud* (which stands for grain *nudity*) causes the hull not to adhere and the grain threshes clean, just like wheat. One of the most descriptive barley variety names is the hulless (*nud*) cultivar ‘Godiva’.

The jury is still out on whether the hulless (a.k.a. naked) trait is desirable. Hulless varieties may have germination and/or seedling vigor issues that can lead to lower yields, particularly under stressful field conditions. On the chromosome as *Nud*, there is a gene called *GBSSI*, which encodes an enzyme called granule bound starch synthase. *GBSSI* is involved in synthesis of the amylose fraction of barley starch. When *GBSSI* is functional, barley starch consists of ~ 25% amylose and 75% amylopectin. When *GBSSI* is not functional (due to a naturally occurring mutation involving loss of ~ 400 base pairs of DNA), less amylose is produced, leading to a ratio of ~ 5% amylose and 95% amylopectin. The higher amylopectin content causes the starch to be waxy, and waxy starch varieties usually have a higher beta-glucan content.

Waxy starch also has a number of other interesting properties for baking and other food use. Breeders have selected for waxy starch in order to increase beta-glucan content and add novelty and value to food varieties. Many of these waxy varieties are also hulless. Two familiar examples in the US are ‘Merlin’ and ‘Waxbar’. There are also hulled waxy barleys – an example is ‘Salute’. It is also possible to get high beta-glucan with a non-waxy starch and to have waxy starch with lower beta-glucan. In other words, all possible combos of hull adherence, starch type, and beta-glucan content are currently available.



Classic barley foods: a handful of tsampa (toasted barley flour, green tea, and yak butter) gets another Himalayan day off to a great start.



Contemporary barley foods: Andrew Ross unveils his barley baked goods in Oregon's Willamette Valley.