

Malt: An ancient food with modern benefits



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By now it is well known that consumers want healthier snacks. Low cal, no cal, fortified, organic, non-GMO ... all terms speaking to the notion that today's snackers are keeping a keen eye on what they put in their stomachs.

The FDA's revamped nutritional label, which now contains—among other categories—a special notice for “added sugar,” reflects this newfound emphasis on ingredients that provide more than just flavor.

For snack food companies, this often means providing sweeteners with substance in a landscape where empty calories no longer fly. Luckily, a solution for this conundrum was recently invented ...

... about 10,000 years ago.

Humans have consumed barley for over 0,000 years. The barley grain, from which malt extract is derived, was a staple of Roman gladiators, called *hordearii* or "barley-eaters." Hippocrates and Pliny referenced barley's health benefits, and its medicinal effects were recognized in African and Asian cultures.

(Much) more recently, in the early 1900's malt extract was sold in the U.S. as a tonic for pregnant mothers. In the ensuing decades, malt extract became nostalgically remembered as a cornerstone of American culinary culture, conjuring fond memories of vintage "malt shops," snacking on chocolate malted milk balls at the movies, and Ovaltine, whose main ingredient is malt extract. Today, malt extract is considered the secret to making authentic bagels and pretzels.

However, malt's complete nutritional properties have only recently been appreciated by nutritional science.

Malt extract is produced by mixing malted barley with hot water and allowing the natural enzymes to break down the starch in the whole grain into sugars, mostly maltose. The mash's insoluble parts are filtered out, but most of the whole grain's nutrients remain in the extract.

Maltose is a simple disaccharide sugar consisting of two bonded glucose molecules. And despite recent pushes to reduce sugar in snacks, not all sugars are created equal. Amid growing scientific consensus that one of the most common types of sugar, fructose, can be toxic to the liver (sugarscience.ucsf.edu), malt extract contains less than 1 percent fructose.

Many added sugars contain significant amounts of fructose; typical formulations of high fructose corn syrup contain upwards of 50 percent. Table sugar and even sweeteners that sound healthy, like organic cane syrup, also are 50% fructose.

Fructose has been implicated in several metabolic disorders due to the way the body processes it, in distinction to glucose (1). Unlike other sugars, fructose is processed in the liver. In addition to obesity, since 1980, concerns have grown about two new conditions linked to fructose consumption from added sugar:

- Non-alcoholic fatty liver disease (NAFLD), characterized by excess fat build-up in the liver
- Non-alcoholic steatohepatitis (NASH), characterized by fatty liver, inflammation and "steatosis"—scarring that cuts off blood flow to the liver.

Maltose presents no such dangers. The sugar in malt extract is mostly maltose, which breaks down into glucose and can then be used by virtually every cell in the body. In the brain, it is the preferred energy source. Muscle cells import glucose from the blood for a quick energy boost. Certain cells, such as red blood cells, can *only* use glucose for energy.

But malt extract is more than just maltose. Indeed, malt extract—unlike other refined sweeteners such as table sugar, brown sugar, corn syrup, rice syrup or tapioca syrup not to mention artificial sweeteners like stevia and aspartame—is rich in nutrition (2).

Malt Extract contains protein, essential amino acids, soluble fibers, vitamins B2, B3, and B6; the minerals iron, calcium, and potassium; and the micro-minerals magnesium, manganese, and selenium. Refined sugar and artificial sweeteners contain none of these nutrients (3).

While clearly no “empty calorie,” the real nutritional punch of malt extract is found in its complement of antioxidants, in particular polyphenols, whose health benefits include anti-inflammation, anti-tumor, anti-cancer, anti-microbial, and anti-allergic (4). Gram for grain, malt extract has five times the antioxidant power of fresh broccoli (5).

At least 20 different phenols have been discovered in substantial quantity in malt. These include flavan-3-ols, proanthocyanidin oligomers, hydroxycinnamic acid derivatives, and flavonols (6). Flavan-3-ols, in particular, have robust research showing anti-cancer effects (7). Proanthocyanidin oligomers have been shown to be antidiabetic and neuroprotective (8). And there is active research into the antioxidant and cardioprotective properties of flavonols (9).

Other major contributors to malt's antioxidant properties are catechin, caffeic acid, ferulic acid, and sinapic acid (10). Caffeic acid has been linked to bone health (11) and ferulic acid to skin health (12).

While malt extract changes the starches into more easily digestible simple carbohydrates, it has been shown to increase the antioxidant power of the original grain-barley (13). Phenolic compounds that are chemically bound and biologically unavailable are released, further increasing the anti-oxidant power of malt extract (14).

Yet another source of malt extract's nutritional power comes from the class of molecules called Maillard reaction products. Bakers have always appreciated how amino acids and sugars in malt extract combine to produce a brownish color and enhanced flavor profile. Now, it also is understood that byproducts of the Maillard reaction have antioxidant effects (15) and, particularly, provide protection against heart disease (16).

Gut health

The more we learn about the intestinal microbiome's complexity, the more we realize its effect on our health. Its metabolic byproducts can be toxic or beneficial, and include the synthesis of vitamins, amino acids, and short chain fatty acids (the latter of which are a necessary energy source for the mucosal cells in the intestinal lining) (17). Intriguingly, malt extract can play an important role in the maintenance of our companion biome.

Probiotics serve as fertilizer and pesticide for gut flora. However, because probiotics themselves are alive, they can be difficult to preserve in an active state until consumption. This is where malt extract comes in. Survival of probiotic bacteria during storage is a major problem for dairy products, such as yogurt, cheeses and fermented milks. It has been shown that such bacteria survive better in malt extracts compared to other extracts during refrigerated storage (18).

Malt extract also has been shown to protect the viability of the probiotics *L. plantarum*, *L. acidophilus* and *L. reuteri* under acidic conditions typically found in yogurt, kombucha and other fermented foods. Survival of *L. acidophilus* increases significantly even at low concentrations of maltose while *L. reuteri* stability thrives in the presence of maltose—glucose does not bring these benefits (19). Likewise, *L. fermentum* cultured in malt extract achieves high maximum cell populations via maltose and free amino nitrogen (20). Malt extract also protects *L. plantarum* under gastrointestinal tract conditions, ensuring organisms survive passage to the gut. Malt extracts were found to significantly enhance the probiotic's viability as compared to other extracts and control conditions (21).

For snack food products, malt extract is truly a sweetener with substance. It has no fructose, the toxic sugar found in sugar cane sweeteners and high fructose corn syrup. Compared to other glucose syrups like rice syrup, corn syrup, wheat syrup and tapioca syrup, it is abundant with nutrients.

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