Brewer's/Baker's Yeast (Saccharomyces Cerevisiae) And Preventive Medicine: Part I

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Yeast is the term generally applied to a unicellular fungus, and there are hundreds of species now identified. One of the most notable and well-known species of yeast in health and wellness is known as Saccharomyces cerevisiae, which is also known by its more common names, brewer's yeast or baker's yeast. It is usually grown on hops or another substrate similar to the plant utilized in the beer-making industry, after which it is harvested and killed. The final product is generally half composed of protein, as well as a large amount of B vitamins and minerals, and depending on the technology, a diverse number of other healthy compounds. Typically, brewer's yeast is used as a protein supplement, energy booster, immune enhancer, or other vehicle where other compounds can be inserted to create a commercialized health product. A more extensive review of the preventive medical aspects of yeast will be covered in Part 2 of this article to be published in a future issue of Urologic Nursing. Yeast-based technology is also being used as a molecular mechanistic model of caloric restriction with the goal of improving the human life span. The current and potential impact of yeast-based technology in medicine is encouraging.

Yeast has been used in the preparation of various foods and beverages for as long as there has been recorded history on leavened bread and beer. However, it was only in the 1800s, primarily from research by Pasteur, that some of its components were better characterized (Davidson, 1999).

Yeast is a single-celled fungus, and hundreds of species have been identified. The yeast organisms of the genera *Saccharomyces* and *Candida* have been the most useful. These single-cell organisms are so small that hundreds of millions could fit in one teaspoon. Green plants feed via photosynthesis, but yeast consume carbohydrates and other potential nutrients, and can excrete alcohol. Essentially, yeast breathe air and exhale carbon dioxide (Davidson, 1999).

Yeast reproduction can be accomplished in different ways, some through a process of fission or budding (known as "vegetative"), and others involve a sexual or more diploid method of replicating. Yeast are inactive in freezing temperature, grow slowly at cold temperatures and steadily at moderate-to-warm temperatures (24^{O} C/80^{O} F), and without restraint at 38^{O} C/100^{O} F. Yeast cannot survive in temperatures higher than 60^{O} C/140^{O} F (Davidson, 1999).

Yeast are malleable and adaptable to their environment despite being simplistic in anatomy, and yeast operate differently when making bread or brewing ale. Replete amount of air and some food allow yeast to grow quickly in the dough, and produce large concentrations of carbon dioxide. This gas pressure causes dough to rise, and alcohol is a minimal by-product. However, in a basic fermentation housing unit where there is almost no air but higher concentrations of available sugar, yeast switch to a different mode of survival and production by breathing minimally and producing mainly alcohol from their sugar intake (Mortimer & Johnston, 1959; Piskur, Rozpedowska, Polakova, Merico, & Compaqno, 2006; Russo, Berkovitz Siman-Tov, & Poli, 1995).

Brewer's/Baker's Yeast (Saccharomyces Cerevisiae)

Saccharomyces cerevisiae is one of the most notable forms of yeast and is known more commonly as baker's or brewer's yeast. For this reason, the nexus between baking and brewing industry used to be well-known. A model of a combined bakehouse and brewhouse from an Egyptian tomb dated 2000 B.C. can be observed in the British Historical Museum. However, the specific form of yeast is not often used currently for baking and brewing. Regardless, this type of

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yeast has been used to produce items such as bourbon whiskey, apple cider, and a fermented rice beverage, commonly known as "sake" (Davidson, 1999).

There are many different strains of Saccharomyces cerevisiae that have evolved or been identified, and those that are used for bakers are currently different from those used in brewing, and are thus cultured on different substrates. The different species and strains also differ in ways that impact flavor. The enzymes produced by the yeast are involved in complex chemical reactions during fermentation and include not only the formation of different alcohols, but also organic acids and esters, which impacts flavor and varies from strain to strain (Mortimer & Johnston, 1959; Piskur et al,, 2006; Russo et al., 1995).

In addition to fermenting and flavoring other foods, yeast may be utilized as food. They contain a good concentration of protein as well as most of the B-complex vitamins, with the exception of vitamin B-12. Further, while yeast are widely used as dietary supplements in countries whose diets are protein deficient, they are gaining more attention as immune maintenance products in well-developed countries. Currently, yeast is being consumed in a variety of animals and humans with minimal adverse effects. The recommended feeding levels of yeast for food-producing animals are 8 mg/kg body weight/day for cattle and horses, 14.4 mg/kg body weight/day for swine, and 18.4 mg/kg body weight/day for poultry (Davidson, 1999; Mortimer & Johnston, 1959; Piskur et al., 2006; Russo et al., 1995).

Conclusion

Generally, brewer's yeast is used as a protein supplement, energy booster, immune enhancer, and a vehicle whereby other compounds can be inserted to create a commercialized product that could improve several aspects of preventive medicine. A more extensive review of these preventive medical aspects of yeast will be covered in Part 2, which will be published in a future issue of *Urologic Nursing*.

A large randomized trial of cancer prevention that elicited positive results used a brewer's yeast product (500 mg) daily that contained 200 mcg per selenium compared to placebo and found a potentially lower risk of several cancers, including prostate cancer (Clark et al., 1996). Another notable example was the recent encouraging result of a modified yeast-based product EpiCor™ (Embria Health Sciences, Ankeny, IA) to reduce cold and flu incidence in patients who have kept their vaccines up to date. Another recent manipulated product may simultaneously improve immune and bone health. Yeast-based technology is also being used as a molecular mechanistic model of caloric restriction with the ultimate goal of improving the human life span (Dilova, Easlon, & Lin, 2007; Gershon & Gershon, 2000; Jazwinski, 1990). The current and potential impact of yeast-based technology in medicine is encouraging and should receive more attention.

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