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 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 they can 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, Rozpedowski, Polakova, Merico, & Compaqno, 2006; Russo, Berkovitz Šiman-Tov, & Poli, 1995).

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

Saccharomyces cerevisiae is one of the most notable forms of yeast and is known as baker’s or brewer’s yeast. It is receiving attention especially in the area of longevity or life expectancy enhancement research. Currently, there is an intense focus on dietary restriction or caloric restriction (CR) to increase life expectancy in humans. CR is arguably the most effective method in a laboratory setting to increase life span in mammals and numerous other species (Roth, Ingram, & Lane, 2001). CR continues to demonstrate the ability to decrease or at least delay the incidence of many diseases correlated in part to aging, including cardiovascular disease, cancer, and diabetes mellitus. CR research in primates demonstrates positive changes in a diverse number of important health markers including lipids, blood pressure, weight, and insulin sensitivity (Roth et al., 2004). Whether or not these same positive effects occur long term in humans is not known, but the

Key Words: Brewer’s yeast, baker’s yeast, Saccharomyces cerevisiae, preventive medicine, alternative medicine.
most recent clinical research suggests a strong potential correlation in part due to brewer’s yeast. This simple yeast seems to have a number of longevity genes that are activated when CR occurs (Bishop & Guarente, 2007; Dilova, Easlon, & Lin 2007), which have led to some novel clinical trial designs and results.

Recent Clinical Research and Applications

No diet has been definitely proven to prevent aging or cancer. Every time researchers think a specific extreme diet works better than something in moderation, researchers are humbled to learn that this is not a simple case to prove. CR in humans may be receiving a lot of attention currently because low-fat diets do not have as much evidence as was believed previously. Perhaps the amount of fat, carbohydrates, or protein in the diet do not matter because animal studies and specific population studies show that the one common factor between mammals that live longer is reduced overall caloric intakes. Whether one tries to determine why some Japanese populations live so long or why laboratory animals put on an CR diet can increase their life span significantly, one of the common themes again is simple CR. A common analogy that can be used is that humans are like automobiles; if overused or overheated, a breakdown can occur. However, taking care of a car without putting a lot of stress on it may improve longevity. Different cars are also made differently, and where one car may not need continual shop work, another may require frequent maintenance. While the same can be said for humans, this is not to imply that genes do not matter. In fact, brewer’s yeast may be teaching researchers that genetics are a key component to extending life span.

The recently published study, the Comprehensive Assessment of the Long-Term Effects of Reducing Intake of Energy (CALERIE) trial, is perhaps the culmination of the initial studies on brewer’s yeast that may have led to the most clinical relevance for humans (Heilbronn et al., 2006). This study was completed at a research laboratory in Baton Rouge, LA. A total of 48 total individuals participated in this unique study, and individuals were randomized to one of four groups for 6 months:

- Control group (followed a weight maintenance diet).
- CR group (reduced calories by 25%).
- CR group with exercise (12.5% caloric restriction plus 12.5% increase in energy expenditure from exercise).
- Severe CR group (890 calories per day until 15% weight reduction occurred than placed on a weight maintenance diet).

The average weight reduction of the participants at 6 months was 1.0% (about 2 pounds) in the control group; 10.4% (17 to 18 pounds) in the caloric restricted group; 10.0% (17 to 18 pounds) in the caloric restriction with exercise group; and 13.9% (24 to 25 pounds) in the severe CR diet group. These results are impressive in terms of weight reduction in a short period of time. Fasting insulin levels were significantly reduced in all intervention groups, but glucose levels did not change. The core (inside body) temperature was significantly reduced in the CR group and the CR with exercise group. A reduction in core body temperature may be associated with an increased life span. Other metabolic changes suggested that the intervention groups might be improving their life spans; however, this is preliminary. Patient menus were specifically designed. In the severe CR diet, 5 daily protein shakes, with 75 grams of protein, 110 grams of carbohydrates, 5 grams of fat, and a 10-gram of fat per day starter (also known as a “bolus”), comprised the 890 calories per day.

Overall, the target weight was reached by 8 weeks in men and 11 weeks in women. The average age of participants was 37 to 39 years old; 16 of the individuals were African American, 2 were Asian, and the rest were Caucasian. Approximately 56% of the volunteers were women. The average body mass index (BMI) and weight at the start of the study was 27 to 28 (overweight) and 175 to 180 pounds. Only 2 individuals did not complete the study; one was from the control group (personal reasons) and another was from the severe CR diet group. Overall, compliance was excellent, and individuals were highly motivated. Researchers of this trial believe that it may be possible to slow the aging process by severely reducing caloric intake, causing a reduction in body temperature, lower insulin, fewer thyroid hormone changes, and less DNA damage with regard to metabolic changes.

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 may improve several aspects of preventive medicine. Yeast-based technology also is being used as a molecular mechanistic model of caloric restriction with the ultimate goal of improving the human life span (Dilova et al., 2007; Gershon & Gershon, 2000; Jazwinski, 1990). The current and potential impact of yeast-based technology in medicine is encouraging and should receive more attention.

References


