The Dr. Royal Lee Historical Archive Collection from Selene River Press

Let's Live Magazine
Dr. Royal Lee, 1958

Plant Protein Producers

Mushrooms have been cultivated commercially for over 400 years and served as a delicacy for over 2000 years, gracing the tables for the feasts of Caesar where epicurean tastes elevated these plants to high places. We do not think of mushrooms we buy in a store as molds, yet there is little essential difference between the common molds we find in breads and the common mushroom. Also of the same family are the yeasts and fungi. The common characteristic of the some 80,000 different kinds of these plant growths is that they have no chlorophyll, they produce spores and are parasites, i.e., they produce no food supply of their own, but must find a pre-existing live host for their metabolic needs.

Use to Mankind

In addition to other things, it is this property of living on pre-existing food supplies which makes these plants useful to man. For example, the "rising" of bread is caused by the escape of the bubbles of carbon dioxide evolving from the fermentation action of yeasts upon carbohydrates; another fungus can change the alcohol of fermenting substances such as apple juice into acetic acid and so produce cider vinegar. This same action also produces many kinds of cheese. Various cheeses are inoculated with the species penicillium to produce the characteristic green-veining and improvement of flavor such as we find in the popular Roquefort cheese. It is interesting to note that some old-time medical books recommended Roquefort cheese for many ailments now treated by penicillin.

Edible Toadstools

While present day botanists shy away from the term "toadstools," the descriptive nature of the term recalls the storybook pictures of our youth. Many will recall the mushroom hunters who gathered in farm pastures where the ground was enriched with manure, and gathered the fleshy morsels, priding themselves on their botanical know-how in being able to differentiate the poisonous varieties.

Today mushrooms are grown commercially on a vast scale. This is an occupation which requires great skill, as mushrooms are very demanding as to their environment and food supply. They require proper ventilation and need an adequate supply of oxygen and are inhibited by an excess of carbon dioxide. All of this accounts for the relatively high market price of this prized edible.

High Food Value

After the water is removed, the remainder of the mushroom solids run about 30 percent protein. More than 12 amino acids have been reported, including arginine, methionine, tryptophan, glutamic acid and valine. Betaine, choline and lecithin, the well-known lipotrophic factors, have also been reported. During the course of their growth mushrooms produce urea, an essential constituent of the body

fluids which helps to promote osmosis and is instrumental in elimination of wastes in the urine. (For more on urea see *Vitamin F and Carbamide in Calcium Metabolism*, Lee Foundation reprint No. 20.)

According *to Food Toxicology and Food Products*, 43 to 62 grams (about 2 oz.) of mushroom protein is sufficient to maintain nutritional balance in a healthy person of 154 pounds. Over six enzyme groups have been reported in mushrooms, including the important copperbound group (tyrosinase) which is also found in potatoes and is considered to be an important member of the ever-increasing vitamin C complex group. The copper is bound to the protein in a manner analogous to its linkage in hemocyanin, the blood pigment of certain lower animals. Mushrooms eaten raw offer a compatible source of raw protein in the diet and are quite tasty. They should only be eaten raw, however, if in a wholly fresh and wholesome condition.

Yeast in China

Yeasts are also superior food sources of valuable nutrients. Many will recall the great interest which was aroused a few years back when beneficial results by the daily use of bakers' yeast were reported in treatment of boils, acne, constipation and other gastro-intestinal disease and skin diseases. While the publicity has since died, there are many people who continue the practice to this day and continue to report beneficial results. The Chinese have used yeasts and mold in their diets for over 2000 years. Soy sauce (a rich source of amino acids) and cheese-like food made from soybeans and rice are considered essential components of the Chinese diet. The Oriental food pattern differs from ours because it is one in which little protein is obtained from animal foods; most of the protein they eat is from plants. They accomplish this largely by the use of molds and yeasts which produce foods high in quality vegetable proteins. Today we know that Brewer's yeast is a superior protein food, even compared with meat proteins, on a quantitative basis.

Nutrition from Yeast

In 1945 some 871,000 pounds of calcium gluconate was produced in the United States, most of it from the action of fungus fermentation. Brewer's yeast was placed on naval life rafts during the war as emergency rations because of its keeping qualities and complete protein nature. Malted barley is widely used as a source of diastase which converts starch into maltose and dextrose, used as yeast food. The nutrition from yeast may be classified into five basic effects:

(1) Source of mineral salts, particularly sulfates, phosphates and potassium
(2) Source of carbon-bound molecules, particularly glucose, fructose, and mannose (natural sugars)
(3) Energy requirements
(4) Source of nitrogen- as protein
(5) Growth factors

The nation's farmers are now only 6 percent of our total worker force while world population grows ever larger. Many authorities have offered the suggestion that our best chance of supplementing the increasing demand for protein supply is by the cultivation of the various yeasts and molds and fungi as supplemental food sources. Of the over two billion forms of life in the world, these yeasts and molds offer our best chance for solving a problem, which threatens to become catastrophic.

Let's Live Magazine, Dr. Royal Lee, 1958, Plant Protein Producers