

FOODS FROM MICROORGANISMS

Microorganisms are widely used in the food industry to produce various types of foods that are both nutritious and preserved from spoilage because of their acid content.

In the dairy industry, many products result from fermentation by microorganisms in milk and the products of milk. For example, buttermilk results from the souring of low-fat milk by lactic acid. The flavor is due to substances produced by species of *Streptococcus*, *Leuconostoc* and *Lactobacillus* as they grow.

A fermented milk product with a puddinglike consistency is yogurt. Two bacteria, *Streptococcus thermophilus* and *Lactobacillus bulgaricus*, are essential to its production. After the milk has been heated to achieve evaporation, the bacteria are added, and the condensed milk is set aside at a warm temperature to produce the yogurt. Sour cream is produced in a similar way, using cream as a starter material.

The protein portion of the milk, the casein, is used to produce cheese and cheese products. Precipitated from the milk, the protein curd is an unripened cheese such as cottage cheese. The leftover liquid, the whey, can be used to make cheese foods.

When the cheese is allowed to ripen through the activity of various microorganisms, various cheeses are produced. Soft cheeses, such as Camembert, do not spoil rapidly. Camembert cheese is a product of the growth of the fungus *Penicillium camemberti*. Hard cheeses have less water and are ripened with bacteria or fungi. Swiss cheese is ripened by various bacteria, including species of *Propionibacterium*, which produces gas holes in the cheese. Blue cheese is produced by *Penicillium roqueforti*, which produces veins within the cheese as it grows.

Other fermented foods are also the product of microbial action. Sauerkraut, for example is produced by *Leuconostoc* and *Lactobacillus* species growing within shredded cabbage. Cucumbers are fermented by these same microorganisms to produce pickles.

Bread is another product of microbial action. Flour, water, salt, and yeast are used to make the dough. The yeast most often used is *Saccharomyces cerevisiae*. This organism ferments the carbohydrates in the dough and produces carbon dioxide, which causes the dough to rise and creates the soft texture of bread. Unleavened bread is bread that contains no yeast.

1 Complete the definitions choosing from the words underlined in Foods from microorganisms.

- a. are vegetables preserved in vinegar or salt water.
- b. is a dairy product composed of the fat layer skimmed from the top of milk before homogenization.
- c. embraces the establishments where milk is processed into a variety of products.
- d. is a dairy product cultured with bacteria to give it a pungent taste.
- e. is a fine powder obtained by grinding grains.

- f. is a mixture of flour and water ready to be baked.
- g. is a substance, consisting mainly of casein obtained from milk by coagulation, which is used to make cheese.
- h. is a sweet milk-based dessert.
- i. is a type of cheese that has *Penicillium* mould in it which creates blue streaks.
- j. is bread baked without a rising agent.
- k. is curd drained but not pressed so that it still contains some whey.
- l. is finely cut cabbage fermented by lactic acid bacteria.
- m. is the liquid left over after churning butter.
- n. is the liquid remaining after milk has been curdled to produce cheese
- o. is the protein found in milk.

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Answer these questions about Foods from microorganisms.

- a. How is yogurt produced?
- b. What is sour cream produced from?
- c. What fraction of milk is used to produce cheese?
- d. What are the holes in Swiss cheese produced by?
- e. What are the blue veins in some cheeses produced by?
- f. What is the basis of sauerkraut?
- g. What is bread dough made of?
- h. What is the function of *Saccharomyces cerevisiae* in bread production?
- i. Is *Saccharomyces cerevisiae* used in the production of unleavened bread too?