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EXOTIC FOOD FROM FERMENTED MILK*

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Cultured Milk

Few Americans enjoy yogurt or realize how easy it is to make. It is a popular food in many European, Asian and African countries. Yogurt is called many things in many lands: for example, *yaghourt*, *madzoon* or *matsoon*, *koumiss kefir*, *prostokvasha*, *kisela mleko*, *leban* or *liban*.

Tradition has it that Abraham was the first man to make yogurt, having been taught the process by an angel. Both Abraham and Moses served goat's milk yogurt to their guests, and it was one of the many foods eaten by the ancient Hebrews.

Whether prepared or bought at the market, yogurt is a dairy product made from milk — cow, mare, sow, goat, buffalo, etc. Bacteria cultures of *Streptococcus thermophilus* and *Lactobacillus bulgaricus* (Fig. 1) are added to the milk with the result that the milk sugar is split into lactic acid. The casein, lactalbumin and milk proteins are broken down into peptones and amino acids. Finished yogurt has about 200,000,000 bacteria per ml and is rich in the vitamin B complex. Yogurt making is a manifestation of microbial ecology.

The most important characteristic of the yogurt bacteria is their ability to ferment sugars to lactic acid. Lactic acid production is desirable in making products such as sauerkraut, yogurt or cheese but undesirable in the fermentation of wines.

The Wonder Food

Since the 1920's much research has been done on yogurt's nature and properties. Yogurt emerges as one of nature's most perfect foods and one of modern medicine's most valuable aids. Metchnikoff, who was amazed at the physical characteristics of Bulgarian tribes that used yogurt regularly, published an account of his studies in *The Prolongation of Life*. His views were looked upon by conservative investigators in this country as overdrawn and as unsupported by experimental evidence (7).

*Adapted from Experiment 18 in *Spectrum of Microbes* (Goss, 1974) published by Kendall/Hunt, Dubuque, Iowa.

In studying the primitive Masai tribesmen of East Africa, Mann (1) of Vanderbilt University found evidence that yogurt lowered blood-cholesterol levels. He believes that yogurt, although a high-cholesterol food, may actually *lower* the blood-cholesterol level. Mann surmises that there is some substance in yogurt bacteria — perhaps a fatty acid — that inhibits the body's production of cholesterol in the liver.

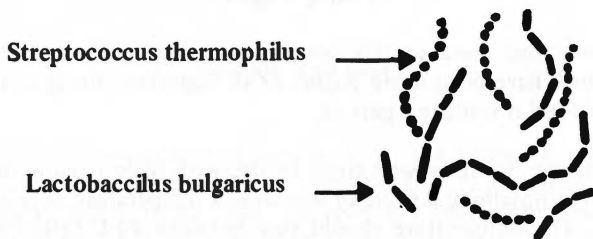


Figure 1: Bacteria involved in yogurt making.

Niv and others (4) compared the effects of yogurt and neomycin sulfate in treating 45 children with infantile diarrhea. The presumable cause of the diarrhea was assessed as either infectious, antibiotic-induced, allergic, nutritional or unknown. The 25 patients treated with yogurt had a more rapid recovery. The induction of a lactic flora and the initiation of normal functional pattern in the gut by the easily digestible nutrients of yogurt may explain the beneficial results obtained.

A negative effect in rats has been observed by Richter and Duke (6). Rats kept on an exclusive diet of yogurt avidly ate the yogurt, grew at a normal rate, were active, mated, conceived, and gave birth to normal healthy litters. However, all the rats developed cataracts. They accounted for the results by the high content of galactose in commercially available yogurt. It was found that most of the butterfat in milk is removed before its conversion to yogurt. To improve the consistency, manufacturers add skim milk powder, thus increasing the caloric percentage of galactose.

Yazicioglu and Yilmaz (9) evaluated commercial samples of yogurt from the Ankara market for their antibacterial effect. Fresh yogurt and yogurt one-month-old was found to have an antibacterial effect on pathogens isolated from hospital patients. In one experiment, yogurt was found to have an antibacterial effect *in vitro* on fecal strains of *Salmonella typhimurium*.

An occasional side effect of antibiotic therapy is sterilization of the bowel. The resultant diarrhea may produce as much discomfort as the original condition. Yogurt is beneficial in restoring the normal flora pattern of the intestine while inhibiting proteolytic organisms (8).

Since the yogurt bacillus is not a usual inhabitant of the intestinal tract and does not just set up shop and keep reproducing itself there, it must be eaten regularly for a person to derive the optimum benefit from it. Undoubtedly, yogurt will not act the same in all individuals, but for those who benefit from its use, yogurt is a very important product.

Making Yogurt

Yogurt was first used in this country as a health food. European and American chefs have been using yogurt as an ingredient for ages. It improves the flavor of food it is made a part of.

Yogurt is easy to make well consistently, with little trouble or fuss. The only trick is maintaining a more-or-less steady temperature over a period of some hours. The temperature should stay between 40 C (105 F) and 45 C (115 F) for 5 – 10 hours. The incubation time depends on the amount of inoculum used and on culture activity. Incubation temperature can easily be obtained by the use of an oven, laboratory incubator, double boiler, a source of warm water, or a blanket. You can purchase a yogurt maker, which includes the incubator, for about \$10.00.

The high temperature results in a cleaner fermentation, with adverse effects from contaminants being essentially nil. Practice of good sanitation is essential for a satisfactory product. The essential thing is to be sure that all materials and utensils you will use are scrupulously clean.

You can start with pasteurized whole milk, homogenized or not, powdered milk, condensed or evaporated milk or a combination of these. The only thing not to start with is raw, unpasteurized milk. Add the yogurt culture to the milk. Use at least 2 tablespoons of plain commercial yoghurt (purchased at a grocery store) to a quart of milk. Use the original culture only once, for the first batch.

Stir or blend the mixture. Pour the mixture into glass or ceramic containers with covers. In the lab we use beakers and cover them with saran wrap. You might try using pint or quart Mason jars. If whey forms on top of the yogurt, it has been over-incubated. Stir the whey back into the curd and reduce incubation time for subsequent batches.

Some people add to their milk a packet of plain gelatin, softened in cool tap water first. This can be useful if you want a thicker, more jelly-like product.

At home we use 3 cups of powdered milk, 3 cups of water and 1 rounded teaspoon of yogurt starter (original starter purchased from a General

Nutrition Center). The ingredients are mixed and poured into a one and one-half quart size covered casserole and incubated for 6-8 hours.

When the yogurt has developed that good, tart taste and its consistency is like a rennet custard, refrigerate it. When cold and stirred with a spoon, it turns to liquid. Tartness or mildness can be controlled. Long incubation produces tart, tangy yogurt. Refrigeration — as soon as the yogurt begins to thicken — produces a milder product.

How Do You Like It?

The proof of the pudding is, of course, in the eating. Try your yogurt either unflavored or flavored. Some common flavors are vanilla, chocolate, orange, banana, and apricot. Fruit, preserves or fruit flavoring may be stirred into the chilled yogurt. The resulting product is referred to as Swiss-style yogurt. Or you might like to blend the fruit and yogurt in an electric blender. It makes a delicious milk shake. Europeans like their yogurt sweetened with honey. Another idea is to add fruit or fruit flavoring to the bottom of the container and allow the milk mixture to ferment; the resulting product is termed a sundae.

Experiment with yogurt. It lends itself to many variations. Substitute yogurt in recipes calling for sour cream or buttermilk. Results will be similar.

How about making some yogurt cheese? Make a bag of doubled cheesecloth. Place 1 quart or less of yogurt in the bag. Hang the bag by tying it on to the sink faucet for overnight. In the morning remove the cheese from the bag; add a pinch of freshly ground pepper and blend well. Flavor with dill, parsley, chopped green olives, green peppers or chives, garlic, etc. Or try adding grated Roquefort, bleu, or any other strongly flavored cheese. Go easy on the flavorings. Serve on crackers.

Yogurt can be cooked. The bacteria will be killed in cooking, but the flavor and its binding qualities remain to give a distinctive taste. There are a number of recipes (2,3,5) that call for yogurt. One of our favorites is yogurt coffee cake. You make it by mixing together 1 cup sugar, 2 cups flour, 2 tsp. baking powder and 1 tsp. soda. Cut in $\frac{1}{4}$ cup of butter or margarine. Add 1 beaten egg and 1 cup of yogurt. Beat thoroughly. Prepare the topping by mixing $\frac{2}{3}$ cup brown sugar and 2 tsp. cinnamon together. Now pour half of the batter into a greased 8" x 8" pan. Sprinkle half the sugar mixture over the batter. Add the remainder of batter and sprinkle with rest of sugar mixture. Bake at 375 F for about 40 minutes. The cake is done when a toothpick inserted into the center comes out clean.

Once you've made your first quart of home-cooked yogurt, you can go on forever, just be sure not to eat all of your current batch. Save at least ½ cup to use as a starter for the next batch.

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Dirty Books

School books are notorious carriers of potentially dangerous bacteria. Books that are handed on to children in one class to their successors in the next year pose a considerable health hazard, according to the Institute for Educational Media, Frankfurt, Germany.

Medical Director D. R. Witzenhausen said, "Paper is an ideal breeding ground for bacteria." Dr. Witzenhausen, Head of Stuttgart Institute for Hygiene and Microbiology, carried out examinations of schoolbooks and discovered staphylococci, streptococci, klesiella pneumoniae and other dangerous "bugs" among their pages.

The American Biology Teacher, 37(5):308