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Food Science and Technology Notes

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SEP - - 1974

HOMEMADE CULTURED MILK PRODUCTS

by

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Introduction

There is little doubt that fermented milks have been consumed since man first milked cows. Prior to modern times there were no means nor knowledge of the necessity for proper sanitation, adequate refrigeration or heat treatment of milk to prevent spoilage. Milk left unconsumed would naturally ferment, and the characteristics of the resulting products were dependent upon the microorganisms present in the original milk.

It wasn't until about 100 years ago that man first discovered these microscopic organisms, and learned that they were responsible for the many favorable and unfavorable changes that occur in raw milk and other foods. Since that time, man has learned how to best control fermentations and to produce uniform, high-quality cultured milk products.

Modern methods for making cultured milk products in dairy processing plants are highly technical. They involve extreme precautions to protect all ingredients from contamination with microorganisms which may cause difficulties during manufacturing and defects in the finished products.

The simple procedures described in this publication for making cultured buttermilk, sour cream, and yogurt in the home take advantage of knowledge employed by the highly trained dairy technologist. This is accomplished by recommending that the homemaker buy fresh products from a grocery store. These products can be used as a source of microorganisms to ferment like products in the home.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U. S. Department of Agriculture. W. E. Skelton, Dean, Extension Division, Cooperative Extension Service, Virginia Polytechnic Institute, Blacksburg, Virginia 24061.

The Nature of Fermentation

The term "cultured" as it applies to dairy products, means controlled fermentation by known types of harmless, active bacteria to produce products having desirable flavor and body characteristics.

Anyone acquainted with the production and care of milk knows that if it is not handled under strict sanitary conditions, and if it has not been properly refrigerated, it will quickly spoil. The type of fermentation which takes place under such conditions, however, may differ widely from one experience to the next. These natural fermentations are related to the microorganisms present and are undesirable in most cultured dairy products.

Role of Different Microorganisms in Lactic Cultures (1,2)

1. Lactic Acid Producing Bacteria.

Streptococcus (S.) lactis and S. cremoris are the main lactic acid producing bacteria in lactic cultures. Both produce primarily lactic acid from lactose, and are said to be homofermentative.

Lactic acid producing bacteria vary in their ability to produce lactic acid and in certain other characteristics. Some strains produce acid rapidly, others slowly. Consequently, lactic acid producing bacteria for composing cultures have been selected primarily on the basis of rate of acid development, and freedom from off-flavors and other undesirable defects.

2. The Citric Acid Fermenting Bacteria.

These organisms are sometimes referred to as the flavor bacteria. They ferment the citric acid in milk and produce diacetyl, volatile acids and carbon dioxide. All of the produced compounds affect the flavor of lactic cultures and the flavor of products to which lactic culture is added.

The most prevalent citric acid fermenting species in lactic cultures is Leuconostoc citrovorum. It does not produce acid in milk but certain cultures greatly enhance acid production when associated with S. lactis or S. cremoris. Accumulation of flavor compounds occurs after enough acid to coagulate the milk has been produced by the S. lactis bacteria.

Controlled Fermentation is Necessary

Pure cultures of bacteria are necessary to develop the desired flavor and aroma in dairy products. Dairy plant laboratories obtain pure cultures of microorganisms from specialized laboratories and grow them under strict sanitary conditions, using utmost precautions to prevent contamination with other microorganisms. These cultures are used as "starters" to ferment commercially processed cultured buttermilk, sour cream, yogurt, cottage cheese, and other cheeses.

Before such products are cultured with a starter, the raw milk or cream must be pasteurized to destroy microorganisms which may be present. The elimination of undesirable microorganisms aids proper fermentation and the development of desirable flavor and aroma. Milk and cream used for homemade cultured products should also be pasteurized to destroy troublesome microorganisms and to make good-flavored, wholesome

products. Since cultured products made by dairy plants contain desirable kinds of bacteria they may be used as starter-cultures for homemade products. The freshest commercial products available should be used, however, because bacteria become less active with age.

Churned Buttermilk

Few plants process butter today, and it is difficult to obtain a uniformly high-quality churned buttermilk. However, homemakers who desire churned buttermilk can obtain a fairly good product by churning fresh sweet cream or alternately by churning cultured cream.

When uncultured "sweet" cream is used, it may be churned to produce butter and "sweet-churned" buttermilk. This buttermilk may be cultured by following steps 3, 4, 5 and 6 given in the procedure below.

An alternate procedure is to culture the cream as outlined on page 4 prior to churning. This will produce a sour-cream butter and a churned buttermilk that is rather thin-bodied and has a mild acid flavor. No further culturing is necessary. The product should be refrigerated until consumed.

Cultured Buttermilk

Cultured buttermilk is usually made from skim milk or reconstituted, nonfat dry milk, however, whole milk, or partially skimmed milk may be used. When unhomogenized milk is used a cream layer will form on the surface during ripening. Adequate agitation, however, will disperse the cream uniformly throughout the buttermilk.

The following steps are recommended for making cultured buttermilk.

1. Use a clean container and fill it nearly full with a known amount of the milk to be fermented. Do not fill the container because expansion during heat treatment may cause it to overflow.

2. Set the container of milk on a rack in a larger container. Add water to the outer container until the level is higher than the level of milk in the inner container. Place a lid over the container of milk.

3. Heat the milk to 180°F (82.2°C) and hold at this temperature for 30 minutes. Cool with cold water to 70°F (21.1°C). NOTE: Different temperature and time of heating are used to treat milk to be made into cottage cheese.

4. Add one-fourth cup of starter culture to each gallon of milk used (2 tsp. per quart) and mix thoroughly for one minute.

5. Set the container of inoculated milk again in the larger container. Fill the larger container with water regulated to 68°F (20°C) during summer or 72°F (22.2°C) during winter. Cover the milk and allow it to set undisturbed for 12 to 16 hours, or until it is curdled and has developed a pleasing sour flavor. Because of the setting time involved, it is best to set the milk in the evening so it may ripen overnight.

6. Cool the cultured milk to below 50°F (10°C) by placing the container in a pan of ice water. Stir the buttermilk during cooling only enough to obtain a smooth body.

Refrigerate the cold buttermilk in its original container, or store it in thoroughly cleaned containers. The cultured buttermilk will develop its maximum flavor and aroma 24 hours after cooling.

A cup of this buttermilk may be saved in a thoroughly cleaned jar and used as a starter for the next batch of buttermilk. However, it is best to obtain a new starter at least once a week since bacteria become less active as they age.

Cultured Cream

In recent years, the popularity of sour cream has increased tremendously. Cultured cream, more commonly known as commercial sour cream, consists of cream treated and soured in such a manner that a pleasing acid flavor is produced.

The thick body of sour cream makes it especially useful as a dressing for baked potatoes and other cooked vegetables and spreads and as a base for all sorts of appetizing dips, salad dressings and spreads.

Cultured cream can be made easily in the home by the following procedure.

1. Use fresh, sweet, light cream or a mixture of equal parts heavy cream and milk. Cream may be obtained by skimming the cream layer formed after unhomogenized milk remains undisturbed in the refrigerator for 12-24 hours. (The partially skimmed milk that remains may be used for drinking or for making buttermilk, cottage cheese, or yogurt.) The same procedure may be used to culture half-and-half, however, the finished product will have a more fluid consistency.

2. Fortify by adding 3 Tbsp. of instant nonfat dry milk to each quart of cream and mix thoroughly until all lumps have disappeared.

3. Pasteurize the fortified cream by heating to 180°F (82.2°C) in a double boiler over boiling water. Hold it at this temperature for 30 minutes. Keep the cream covered while it is being pasteurized. Cool quickly to 70°F (21.1°C).

4. To each quart of pasteurized cooled cream, add 3 Tbsp. of cultured buttermilk starter. Mix the starter into the cream thoroughly and pour into sterilized containers. Allow to set at 70°F (21.1°C) until it is sour. Ripening will require about 6 or 7 hours if an active starter is used. Ripening and aging processes carried out in small containers will prevent excessive agitation, which may damage the thick body of the sour cream.

5. When the desired acid flavor has developed, place the cultured cream in the refrigerator to age for 12 to 24 hours. Aging increases the thickness of the cream, making it more desirable for spreading, and allows time for development of desirable flavor and aroma.

Yogurt

Yogurt is a cultured dairy product which can be made in the home. The culture used in making yogurt is a 50/50 mixture of two species of bacteria; one is a rod shaped organism named Lactobacillus bulgaricus and the other is a pearl-shaped bacterium named Streptococcus thermophilus. These bacteria grow well together in milk between 102 and 122°F (38.9 and 50°C).

Yogurt may be made in the home by the following procedures.

1. From nonfat dry milk and evaporated milk.

A. Add 4 cups of instant nonfat dry milk to 8 cups (2 quarts) of boiled water that has been cooled to 120°F (48.9°C), one small can evaporated milk, and 1/4 cup (2 oz.) of yogurt culture or 1/2 cup of plain yogurt obtained from the local retail grocery store.

B. Mix well by stirring with a clean spoon and pour into suitable, thoroughly cleaned containers.

C. Place the containers in a warm oven or warm water at 110°F to 112°F (43.3 to 44.4°C) and remove when coagulated (gelled). Coagulation should occur in 4 to 6 hours.

D. After coagulation, immediately place the containers of yogurt in the refrigerator at 36 to 40°F (2.2 to 4.5°C) and allow to cool. Store in the refrigerator until consumed.

2. From fresh whole milk with added solids.

A. In a double boiler,heat 8 cups (2 quarts) of fresh whole milk to 180°F (82.2°C).

B. Cool to 120°F (48.9°C) and add 1 cup of instant nonfat dry milk, 1/4 cup of yogurt culture or 1/2 cup of plain yogurt obtained from the local grocery and mix well with a clean spoon.

C. Pour into suitable thoroughly cleaned containers and place in a warm oven or warm water at 110°F to 112°F (43.3 to 44.4°C) and remove when coagulated or gelled.

D. After coagulation, immediately place the containers of yogurt in the refrigerator at 36 to 40°F (2.2 to 4.5°C) and allow to cool. Store in the refrigerator until consumed.

A jar of finished yogurt may be saved and used to make the next batch of yogurt.

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