

# FARM MICROBIOLOGY LAB: THE YOGURT FERMENTATION

In contrast to the wild fermentation characteristic of sauerkraut production, the production of most dairy products such as cheese, buttermilk and yogurt involves the use of **starter cultures** to generate a controlled fermentation. Generally, active starter cultures are added at a rate of about 5-10% of the milk in the fermentation vat. The choice of starters, salt concentration, temperatures and times of incubation determine what product will result.

The production of yogurt from milk requires the use of a combination of two or more starter cultures such as *Streptococcus thermophilus* and *Lactobacillus bulgaricus*. These two organisms ferment the milk sugar, lactose, to lactic acid, important in preservation. The acid also causes the major milk protein, casein, to form a solid curd. Other components of the milk are converted to products that, together with the lactic acid, give yogurt its characteristic flavor. One of these products is acetaldehyde (CH<sub>3</sub>CHO).

Lactic acid bacteria can have a variety of effects on milk. Those lactics which can ferment lactose (not all can do that!) will produce lactic acid by homofermentation **or** lactic acid, ethanol and carbon dioxide by heterofermentation. The resulting acid causes the casein to solidify into a curd. Proteolytic organisms, which cause hydrolysis of the casein resulting in watery milk, are generally inhibited by the low acid environment.

In this exercise you will make some highly edible yogurt and hopefully appreciate the effect of a dual starter culture on milk.

## **Period 1**

Cultures (grown in milk overnight at 37°C)

*Streptococcus thermophilus*  
*Lactobacillus bulgaricus*

### Materials

2 clean glass jars with screw caps  
Pasteurized whole milk  
Nonfat dried milk

### Procedure

1. Into each of the two glass jars, dispense 150 ml of milk (approx. 2/3 full).
2. Add 12 grams (approx. one heaping tablespoon) of nonfat dried milk to each jar and mix thoroughly by shaking.
3. Steam the milk for 30 minutes. While this procedure may serve to reduce the number of contaminating organisms and deactivate certain natural inhibitory substances in the milk, **the main purpose of the heating is to “condition” the casein**. This will result in a much smoother product with a minimum of free whey. (Note that the instructor will set up additional bottles to serve as possible replacements – occasional breakage occurs in the steamer – and to use up the excess milk.)
4. To one of the jars, add 2 ml of *S. thermophilus* and 2 ml of *L. bulgaricus*. The other jar will serve as the uninoculated control.
5. Place the jars in the 45°C water bath. The jars will be incubated until firm coagulation in the inoculated jars is observed; this will only take several hours. The jars will then be refrigerated until the next period.

## **Period 2**

### Procedure

1. Note the solid appearance of your yogurt as compared to the uninoculated jar.
2. Determine the “organoleptic acceptability” of your yogurt. Various condiments are provided or you may supply your own.