**Yogurt**

Yogurt is milk based fermented food. Yogurt is produced using active cultures of bacteria to ferment cream or milk. Yogurt that is produced in the United States is made with two specific live and active cultures of **lactic acid bacteria (LAB)—*Lactobacillus bulgaricus* (*Lb. bulgaricus*)** and ***Streptococcus thermophilus* (*S. thermophilus*)**. These bacteria metabolize some of the milk sugar (lactose) in the milk into lactic acid. This action helps change the consistency of liquid milk into yogurt. The production of fermented milk, or yogurt, requires that the milk is first concentrated by the addition of dairy solids, evaporated, or membrane filtered. The mixture is then heated to destroy undesirable organisms, and cooled. Then, the starter cultures are added. Yogurt products may also have added ingredients such as sugar, sweeteners, fruits or vegetables, flavoring compounds, sodium chloride, coloring stabilizers, and preservatives.

**Inoculum Preparation**

The fermentation process involves the inoculation of pasteurized milk that has been enriched in milk protein with concentrated cultures of bacteria, which is then incubated at 40–44°C for 4–5 h. During fermentation, lactic acid is produced from lactose by the yogurt bacteria, the population of which increases 100- to 10,000-fold to a final concentration of approximately 109/mL. The reduction in pH, due to the production of lactic acid, causes a destabilization of the micellar casein at a pH of 5.1 to 5.2, with complete coagulation occurring around pH 4.6. At the desired final pH, the coagulated milk is cooled quickly to 4–10°C to slow down the fermentation process.

Fermentation of milk with LAB leads to specific organoleptic characteristics (taste, aroma) of the final product. The metabolism of LAB and the interactions between the selected strains are responsible for the production of lactic acid, the coagulation of milk proteins, and the production of various compounds. Variables such as temperature, pH, the presence of oxygen, and the composition of the milk further contribute to the particular features of a specific product.

**Types of microorganisms**

Certain strains of ***S. thermophilus***, ***Lb. bulgaricus***, and other **LAB**, such as **Lactococcus cremoris** and some species of **Leuconostoc**, produce exocellular polysaccharides that modify the texture of a fermented milk product i.e., by increasing the viscosity or creating a “ropy” texture. Lactic acid is also responsible for the slightly tart taste of the fermented milk product, whereas the other characteristic flavors and aromas are additional results of LAB metabolism. For example, acetaldehyde provides the characteristic aroma of yogurt, whereas diacetyl, produced by Lc. diacetylactis and Leuconostoc cremoris, impart a buttery taste to some fermented milks. Acetoin, acetone, lactones, and volatile acids are other important flavor components that may be present in certain fermented milks as by-products of bacterial metabolism.

**General Yogurt Processing Steps in production**

1. [Adjust Milk Composition & Blend Ingredients](http://www.milkfacts.info/Milk%20Processing/Yogurt%20Production.htm#YMilk)
2. [Pasteurize Milk](http://www.milkfacts.info/Milk%20Processing/Yogurt%20Production.htm#YPast)
3. [Homogenize](http://www.milkfacts.info/Milk%20Processing/Yogurt%20Production.htm#YHomo)
4. [Cool Milk](http://www.milkfacts.info/Milk%20Processing/Yogurt%20Production.htm#YCoolMilk)
5. [Inoculate with Starter Cultures](http://www.milkfacts.info/Milk%20Processing/Yogurt%20Production.htm#YStarter)
6. [Hold](http://www.milkfacts.info/Milk%20Processing/Yogurt%20Production.htm#YHold)
7. [Cool](http://www.milkfacts.info/Milk%20Processing/Yogurt%20Production.htm#YCool)
8. [Add Flavors & Fruit](http://www.milkfacts.info/Milk%20Processing/Yogurt%20Production.htm#YFruit)
9. [Package](http://www.milkfacts.info/Milk%20Processing/Yogurt%20Production.htm#YPkg)
10. **Adjust Milk Composition & Blend Ingredients**

Milk composition may be adjusted to achieve the desired fat and solids content. Often dry milk is added to increase the amount of whey protein to provide a desirable texture. Ingredients such as stabilizers are added at this time. Stabilizers are used in yogurt to improve the body and texture by increasing firmness, preventing separation of the whey (syneresis), and helping to keep the fruit uniformly mixed in the yogurt. Stabilizers used in yogurt are alginates (carageenan), gelatins, gums (locust bean, guar), pectins, and starch.

1. **Pasteurize Milk**

The milk mixture is pasteurized at 185°F (85°C) for 30 minutes or at 203°F (95°C) for 10 minutes. A high heat treatment is used to denature the whey [proteins](http://www.milkfacts.info/Milk%20Composition/Protein.htm#MilkProtChem). This allows the proteins to form a more stable gel, which prevents separation of the water during storage. The high heat treatment also further reduces the number of spoilage organisms in the milk to provide a better environment for the starter cultures to grow. Milk is pasteurized before the starter cultures addition to ensure that the cultures remain active in the yogurt after fermentation to act as [probiotics](http://www.milkfacts.info/Nutrition%20Facts/Milk%20and%20Human%20Health.htm#Probiotics).

**Homogenize**

The blend is homogenized (2000 to 2500 psi) to mix all ingredients thoroughly and improve yogurt consistency.

1. **Cool Milk**

The milk is cooled to 108°F (42°C) to bring the yogurt to the ideal growth temperature for the starter culture.

1. **Inoculate with Starter Cultures**

The [starter cultures](http://www.milkfacts.info/Milk%20Processing/Yogurt%20Production.htm#YCult) are mixed into the cooled milk.

1. **Hold**

The milk is held at 108°F (42°C) until a pH 4.6 is reached. This allows the fermentation to progress to form a soft gel and the characteristic flavor of yogurt. This process can take several hours.

1. **Cool**

The yogurt is cooled to 7°C to stop the fermentation process.

1. **Add Fruit & Flavors**

Fruit and flavors are added at different steps depending on the type of yogurt. For set style yogurt the fruit is added in the bottom of the cup and then the inoculated yogurt is poured on top and the yogurt is fermented in the cup. For swiss style yogurt the fruit is blended with the fermented, cooled yogurt prior to packaging.

1. **Package**

The yogurt is pumped from the fermentation vat and packaged as desired.

References

1. Edward R. Farnworth, Handbook of fermented functional foods, Second edition.
2. <http://www.milkfacts.info/Milk%20Processing/Yogurt%20Production.htm>