

# MILK





# Milk Processing Toolkit



## MILK

### 1.- Milk - General Information

#### Milk Processing System

##### Milk Collection



##### Milk Production



Milk is the product proceeding from the complete and uninterrupted milking of healthy, well fed and rested cows, that is accomplished under sanitary conditions. For obtaining dairy well-qualified derivatives, besides a satisfactory management and hygiene conditions, the milk should present some physiochemical characteristics that will determine the flavor, odor, texture and desirable quality in the final product. When evaluating the quality of the milk, the acidity is the most important parameter concerning to the technological aspect, since it indicates the metabolization degree of the lactose into lactic acid, which implicates the resistance of the milk to the thermal treatments and its transformation into good-qualified products. The density should be between 1.028 g/mL and 1.032 g/mL and the temperature at 15°C. The total dry extract of the milk represents the whole solid composition of the milk, that reaches a total of 11.5% at least. The non-fat dry extract (NFDE) is the solid part of the milk except the fat, and its minimum value should around be 8.5%.

After secreting in the udder, the milk may be contaminated by microorganisms from three main sources: from within the mammary gland, from the external surface of the udder and teats, from the surface of the milking equipment and utensils, and from the tank. A microbiological quality of the milk is a very ample and generic term. The main microorganisms involved into contamination of the milk are the bacteria, virus, fungus and yeasts. There are two great bacteria groups in the milk: mesophyllous and psychrotrophic. The mesophyllous

group are those microorganisms able to multiply at optimum temperatures within the range from 30°C to 45°C, whereas the psychrotrophic ones multiply around 25°C - 30°C. Because their potential for multiplying, the milk bacteria can cause chemical alterations, therefore making the product non-appropriate for consumption and industrialization.

The milk is a natural food with a high nutritional value, since it has a high concentration of calcium that is essential to the formation and maintenance of the bones. The milk proteins are complete, so providing the formation and maintenance of the body tissues. It contains the A vitamin, as well as the vitamins B1, B2 and minerals that favor the growth and the maintenance of a healthy life. In addition, the milking activity is characterized by being a great generator of job, income and tributes.

### Milk Quality

The production of the hygienically pure milk depends on the following factors: the cows' health condition, their feeding and management, the adequate milking and subsequent cares until the consumption moment. In relation to the cows, they must be healthy, therefore avoiding the use milk from animals that carry tuberculosis, brucellosis, apthous fever, mastitis and others, as well as they must be maintained as free from the Dermatobia hominis' larvae as well as from cattle ticks.

The quality of the milk also depends on the initial microbial load of the milk and on the bacteria multiplication speed. The initial microbial load is directly related to the correct management of the milking, equipment cleaning, and hygiene at milk collection.

Milk Centesimal composition (by each 100gr eatable part)	
Energetic value	497 kcal
Carbohydrates	39 g
Protein	25 g
Lipids	27g
Cholesterol	85 mg
Calcium	890 mg
Magnesium	77 mg
Moisture	3%
<b>Reference:</b> TACO - Tabela Brasileira de Composição de Alimentos Núcleo de Estudos e Pesquisas em Alimentação - NEPA - Universidade Estadual de Campinas - UNICAMP	

## 2.- Milk Collection and Production processing

### Milk Collection processing



## 2.1.-Milk Collection processing

### Milk Collection

Some cares must be taken for milking procedure, as described below. The milking place must be clean and airy. Clean utensils such as semiclosed-opening buckets, milk cans and filter must be used. An adequate time must be fixed for milking. The milker must use boot, cap and clean clothes. The first three jets of milk into the black-bottomed cap for the diagnosis of mastitis must be discarded. No interruptions should occur, when milking procedure is accomplished. When the milking is finished, the milk must be filtered or strained through a plastic or stainless steel sieve. Then, the milk is cooled in a cooling tank for bulk collection. In the case of the mechanical milking, the mechanical milker must be kept clean, as well as the teats must be disinfected before and after milking.

The maintenance of the milk quality depends on the interaction among all segments of the milky chain, and it is essential the storage and transport to be made under appropriate hygiene and temperature conditions.

The equipment cleaning is basically performed in order to remove the organic and mineral residues in milk from its surface.

### Milk Transportation

There are two types of milk transport to the processing plant: in large cans and in bulk.

The first type should be accomplished in cover-provided trucks in order to avoid the heating of the milk, but usually it reduces the quality of the milk, since the milk cans are not a good thermal insulating.

By the other hand, the transport in bulk is accomplished by tank-trucks, that are provided with thermal isolation, therefore an easier control of the milk temperature is obtained. The collection is performed in cooling tanks available in the farm or collection center.

In the farm or in the collection center, the suction hose is connected to the tank valve and the milk is pumped to the truck. When the milk is totally transferred to the truck, the pumping is concluded, by preventing the air from mixing to the milk.

The tank-truck has more than one compartment to avoid the milk from agitating too much, which could provoke the decreased quality of the milk.

## 2.2.-Milk Production processing

### Milk Production processing



#### A.-Milk Reception

The reception of the milk in milk cans requires a resistant platform because the milk cans are made of tinned iron, steel or aluminum, besides several employees and high number of samples (1 sample by milk can) for analysis.

The reception of the milk in bulk demand a simpler platform. The milk discharge is accomplished, by using sanitary pumps and hoses as well as a lower number of samples for analysis (1 sample by truck) is necessary.

By the other hand, the transport in bulk is accomplished by tank-trucks, that are provided with thermal isolation, therefore an easier control of the milk temperature is obtained. The collection is performed in cooling tanks available in the farm or collection center.

The routine analyses performed in the healthy milk are: fat content, relative density, cryoscopic index, total and nonfat milk solids, alizarol, reductase.

#### B.-Milk Filtration

At reception, milk must be obligatorily submitted to filtration in order to eliminate the detritus it might contain. The filters provided with flannel and compressed cotton may be used to detain the impurities. Some centrifugal methods that separate the impurities and detritus from the milk under centrifugal action are still available.

#### C.-Cream Separation

The centrifugation of the milk is important for the production of Coalho- type cheese because this one should have around 3.0 to 3.2% fat matter, since the excessive fat matter in the milk can cause the separation of the fat when the cheese is melted at the moment of consumption.

#### D.-Pasteurization

The pasteurization is performed by heating the milk at 65°C temperature for 30 minutes (slow pasteurization) in stainless steel vat with an appropriate production capacity, and provided with steam jacket and entrance for cold water. So, after the milk reaching a temperature of 65°C, the heating must be controlled, by keeping constant this temperature for 30 minutes.

The thermometer must be used to measure the temperature, and the clock to measure the pasteurization time. The pasteurization is accomplished in the same vat to be used for production of the cheese.

### **E.-Milk Cooling**

The cooling should be accomplished just after pasteurization. The milk must be cooled down to 35°C (coagulation temperature) in the same production vat, through the entrance of cold water into the steam jacket of the vat.

### **3.-Milk products**



#### **Pasteurized milk**

It is the milk that undergoes specific thermal process that eliminates the pathogenic bacteria. It is usually sold in either polyethylene or cardboard packagings.

#### **Butter**

It is the product obtained by mechanical agglomeration of the milk fat matter, and is added with salt or not. The butter is formed by beating the cream, that is previously obtained by the skimming of milk.

#### **Requeijao**

It is a soft cheese type with high moisture content (from 60 to 80%), pasty and rindless. It just undergoes lacteal fermentation and its production may be considered as the utilization of the sour milk.

#### **Yogurt**

It is a fermented milk obtained through the process resulting from the lactic fermentation, as well as by the coagulation of the milk due to the action of two microorganisms: *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. It may be added or not of fruits, sugar and other ingredients that improve its presentation, besides modifying its flavor.