

## **Milk Sanitation and procedures**

### **Principles applying to the production, processing and handling of all milk and milk products**

- 1- From raw material production to the point of consumption, dairy products produced under this Code should be subject to a combination of control measures, and these control measures should be shown to achieve the appropriate level of public health protection.
- 2- Good hygienic practices should be applied throughout the food chain so that milk and milk products are safe and suitable for their intended use.
- 3- Hygienic practices for milk and milk products should be implemented within the context of HACCP (Hazard Analysis and Critical Control Point)

### **Hygienic production of milk and milk products**

#### **1. Areas and premises for milk production**

Areas including premises used for the production of milk should be designed, situated, maintained and, to the extent practicable, used in a manner that minimizes the introduction of hazards into milk.

#### **2. Animal health**

The health status of milking animals and herds should be managed in a manner that addresses the hazards of concern for human health.

Milk should come from animals in good health so that, considering the end use, it does not adversely affect the safety and suitability of the end product.

#### **3. Environmental contamination**

Milking operations should minimize the introduction of food-borne pathogens and foreign matter from the skin and general milking environment as well as chemical residues from cleaning and disinfection routine

#### **4. Feeding**

With consideration given to the end use of the milk, forage and feed for lactating animals should not introduce, directly or indirectly, contaminants into milk in amounts that present an unacceptable health risk to the consumer or adversely affect the suitability of milk or milk products.

## 5. Pest control

Pests should be controlled, and in a way that does not result in unacceptable levels of residues, such as pesticides, in the milk.

## 6. Veterinary drugs

Animals should only be treated with veterinary drugs authorized by the competent authority for the specific use and in a manner that will not adversely impact on the safety and suitability of the milk, including adherence to the withdrawal period specified.

## 7. Hygienic milking

Minimizing contamination during milking requires that effective hygienic practices be applied in respect of the skin of the animal, the milking equipment (whenever used), the handler and the general environment e.g. faecal sources of contamination.

Milking should be carried out under hygienic conditions, including:

- 1- good personal hygiene of the milking personnel;
- 2- clean udders, teats, groins, flanks and abdomens of the animal;
- 3- clean and disinfected milking vessels/equipment; and
- 4- avoidance of any damage to the tissue of the teat/udder.

## 8. Milking equipment cleaning and disinfection

- Milking equipment and storage tanks (and other vessels) should be thoroughly cleaned and disinfected following each milking, and dried when appropriate.
- Rinsing of equipment and storage tanks following cleaning and disinfection should remove all detergents and disinfectants, except in those circumstances where the manufacturer instructions indicate that rinsing is not required.
- Water used for cleaning and rinsing should be appropriate for the purpose, such that it will not result in contamination of the milk.

## 9. Handling, storage and transport of milk

Time and temperature control is important during storage and transport of milk and depends highly on the type and effectiveness of the control measures applied during and after processing. Therefore, the needs for time/temperature control at farm level should be clearly communicated by the manufacturer of the milk products.

## Main Steps in Milk Processing

### 1) Reception & Preliminary Testing

Raw milk is received and tested for temperature, pH, smell, antibiotics, adulterants, and microbial load.

- Purpose: To ensure milk quality and safety before processing begins.

## 2) Clarification & Filtration

Milk is passed through centrifugal clarifiers and filters to remove dirt, somatic cells, and visible particles.

- Purpose: Physical purification.

## 3) Standardization

Milk fat and solids-not-fat (SNF) levels are adjusted to meet legal/commercial standards (e.g., whole, toned, skim milk).

- Purpose: Consistency in nutritional content.

## 4) Pasteurization

Milk is heated to a specific temperature for a defined time (e.g., 72°C for 15 sec – HTST method).

- Purpose: Kill pathogenic microbes while preserving nutrients and flavor.

## 5) Homogenization

Milk is forced through narrow orifices under pressure (about 2,000–2,500 psi).

- Purpose: Break fat globules for uniform texture and prevent cream separation.

## 6) Cooling

Pasteurized milk is rapidly cooled to 4°C or lower.

- Purpose: Prevent microbial growth and preserve quality.

## 7) Packaging

Milk is filled into sterile containers (pouches, bottles, tetra packs) using aseptic conditions.

- Purpose: Protect from contamination and oxidation.

## 8) Storage & Distribution

Milk is stored in cold rooms before transportation to retailers.

- Purpose: Maintain cold chain and freshness.

## **Objectives of Milk Processing**

- 1) Ensure microbial safety
- 2) Improve shelf-life
- 3) Maintain or enhance nutritional value
- 4) Standardize quality and consistency
- 5) Enable safe transportation and storage

**Pasteurization** is a process by which milk is heated to a specific temperature for a set period of time to kill harmful bacteria that can lead to diseases like listeriosis, typhoid fever, tuberculosis, diphtheria and brucellosis.

**Objectives of pasteurization:**

- To make the product safe for human consumption by destroying the pathogenic organism, which may be present.
- Improves preservation quality by destroying almost all spoilage organisms.
- Helps to retain good flavor over a longer period of time

**Methods of pasteurization for milk**

- 1-Long hold batch type / Vat pasteurization (63°C-30 min)
- 2- High temperature short time (HTST) pasteurization (72°C-15 second)
- 3-Ultra-high temperature (UHT) pasteurization (88°C-3 second)

**Cleaning and Sanitizing of Milk Utensils and Dairy Equipment**

-Why It's Important

- Prevents bacterial growth (e.g., *E. coli*, *Listeria*, *Salmonella*).
- Avoids biofilm formation, which is difficult to remove and can spoil milk.
- Maintains equipment life and product safety.
- Complies with regulations (e.g., Codex, ISO, GMP, HACCP).

**Cleaning Milk Utensils and Dairy Equipment including two steps:**

1. Cleaning (Removal of Physical & Organic Dirt)

*A. Manual Cleaning (for small-scale settings):*

- Rinse all equipment with lukewarm water (35–45°C) immediately after use.
- Scrub with alkaline detergent solution using brushes (removes fats/proteins).
  - Common detergents: Sodium carbonate, Sodium metasilicate.
- Hot water rinse ( $\geq 60^{\circ}\text{C}$ ) to remove detergent residues.

*B. CIP – Clean-in-Place (for large-scale equipment like pipelines, tanks):*

- Pre-rinse: Warm water to remove loose milk residues.
- Circulate alkaline detergent (60–80°C for 10–15 minutes).
- Intermediate rinse: With clean water.
- Acid wash (every 1–2 days): Circulate acidic detergent to remove mineral (milk stone) deposits.
  - Common: Nitric acid (0.5–1%), Phosphoric acid.
- Final rinse: With potable water or soft water.

## 2. Sanitizing (Destruction of Microorganisms)

Done after cleaning, just before the next use.

### A. Chemical Sanitizers:

- Chlorine-based (Sodium hypochlorite): 100–200 ppm, contact time: 1–2 minutes.
- Peracetic acid: Fast-acting and effective against biofilms.
- Iodophors: Used for milking machines and teat cups.

### B. Hot Water Sanitization:

- Immersion in hot water at 80–85°C for 2–5 minutes.
- Often used when chemical residues are undesirable (e.g., artisanal cheese making).

## Classification of Cleaning Compounds for Milk Utensils & Equipment

### 1. Alkaline Cleaners

Used daily to remove milk fats, proteins, and other organic residues from surfaces.

### 2. Acid Cleaners

Used every 1–2 days to remove milk stone (calcium & magnesium deposits) and neutralize alkaline residues.

### 3. Sanitizers (Used after Cleaning, before Use)

A-Chlorine-based

B- Iodophor

C- Peracetic acid (PAA)

D- Hot water (thermal) >80°C hot water

**Table 1:** Indicate type cleaners for each type of equipment in milk processing.

Equipment/Utensil	Alkaline Cleaner	Acid Cleaner	Sanitizer
Milking cans	Sodium carbonate	Nitric acid	NaOCl (chlorine)
Milk buckets	Mild alkali + brush	Citric acid	Hot water / chlorine
Milk strainers	Mild detergent	Citric acid	Iodophor
Pipelines/CIP	Caustic soda	Acid detergent	Peracetic acid
Bulk milk coolers	Alkaline CIP	Acid rinse	Chlorine/PAA