SWAZILAND DAIRY BORD

(Established in terms of the Dairy Act 28/1968)

OPERATING AS SWAZILAND DAIRY DEVELOPMENT BOARD
TO PROVIDE DEVELOPMENTAL AND REGULATORY SERVICES
TO THE DAIRY INDUSTRY

CLEAN MILK PRODUCTION







1. Basic elements of good hygiene practices

A dairy must fulfill hygienic conditions with regard to the following.

Buildings: Dairy buildings must be located on well – drained sites away from animal and human activities. They must be constructed using durable and cleanable material with adequate provision for ventilation lighting, sanitation and waste disposal.

Water : There must be adequate potable water.

Personnel: All persons involved in handling of milk and dairy products must be well- trained in milk hygiene and should not handle milk if suffering from infectious diseases.

2. Why is milk hygiene important?

Anyone dealing with milk on day-to-day basis knows very well how quickly it become sour when stored for long periods at high ambient temperatures. The number of spoilage bacteria in raw milk depends on the level of hygiene during milking and the cleanliness of the containers used for storing and transporting the milk.

Raw milk is also associated with pathogenic bacteria, which nausea milk – bone disease such as tuberculosis or typhoid fever, among others. Hygienic milk production, proper handling and storage of milk, and appropriate heat treatment can reduce or eliminate pathogens in milk. Cooling milk to less than 4c may prevent spoilage for up to three days.

Hygienic milk handling includes using clean equipment, maintaining a clean milking environment, observing good personal hygiene and preserving the quality of milk during storage and transportation to the consumer or processing plant.

In this notes, you will learn how to produce milk hygienically and handle it properly during storage and transportation so that it stays clean and fresh.

3. Clean milk production on the farm

Good hygiene practice is very important in the production of clean milk. Clean milk has the following characteristics:

- Low bacterial count
- Pleasant creamy smell and colour
- No obnoxious odours
- No dirt and extraneous matter
- No residues of antibiotics, sanitizers or pesticides

4. Sources of milk contamination

Raw milk may be contaminated by bacteria from several sources. These include:

- Udder and udder flanks
- Milker
- Milking environment
- Milking equipment
- Containers used for milk storage and transportation

1.1 Conditions for clean milk production

Here are some important points to observe in order to produce clean milk:

- Milking should be carried out in a well- ventilated barn with adequate lighting
- The floor of the milk house must be durable and easy to clean, preferably made of concrete.
- After use, milking containers and equipment must be cleaned with potable water, sanitized and dried in the sun on a drying rack. Suitable disinfectants, such as hypochlorite solution, should be used at the recommended concentrations.
- Milkers might be healthy and not suffering from contagious diseases or ulcers.
- Only health cows should be milked. Cows suffering from mastitis should be milked last and their milk discarded. Milk from cows on antibiotics treatment should not be sold until the specified withdrawal period has elapsed.
- Colostrums (the milk produced in the first five days after calving) should not be mixed with normal milk. Calves must be allowed to suckle their dams and excess colostrums may be given to other calves or fed to pets (cats and dogs).
- During milking, the first strips of milk (fore milk) should be milked into a separate, black- coated sup (strip cup) to check for mastitis. The fore milk should then be discarded.

1.2 Good milking procedure

It is important to follow proper milking procedures in order to obtain milk of good quality. A properly executed routine milking procedure is part and parcel of clean milk production.

1. Milk at the same time everyday	Ensures consistent butterfat content. Usually, the longer the milking interval the higher the butterfat content and Volume of milk. The reverse is true for Shorter intervals.
2. Wash the udder with a clean towel	stimulates milk let-down and release of the hormone oxytocin which acts on the milk secretary (alveolar) cells, causing release of milk
3.Remove the fore milk into a strip cup	Helps to check for abnormal colour or Presence of blood clots. This may Indicate infections like mastitis. The Foremilk should be discarded.
4. complete milking within 4-5 minutes	After 5 minutes, the stimulation effect of Release of oxytocin wanes away.
5.Dip teats in a post teat dip disinfectant (iodophor or hypochlorite)	Prevents infections of the udder.
6.Test cows regularly using the California mastitis test (CMT)	Enables early detection and treatment of Mastitis.

1.3 Use of appropriate equipment

One of the major sources of contamination of milk is the use of equipment and storage containers which cannot be easily cleaned and sanitized. These include jerry cans and buckets made on non-food-grade plastic. Metal containers such as aluminium and stainless steel cans are recommended under the code of hygienic practices. In addition to milk containers being made of the right material they should:

- Have smooth finishes free from open seams, cracks and rust
- Have wide openings such that every surface that comes into contact with milk can be accessed easily for cleaning and sanitation. In this regard, both metal and plastic containers with dead ends should not be used for handling and storage of milk
- Be used only for handling and storing milk.

5. Hygienic cleaning and sanitation procedures

In addition, all milk handling containers should be washed and disinfected immediately after use as follows:

- Pre-rinse with clean potable water
- Thoroughly scrub the container with warm water and detergent/ soap using a suitable brush or scouring pad (do not use steel wool or sand).
- Rinse the container with clean running water
- Immense the container in boiling water for at least one minute.
- Sundry the container upside down on a drying rack.

6. Personal Hygiene

All persons handling milk should maintain high level of personal hygiene. A milk handler should:

- Wash hands and nails with clean water and soap before handling milk.
- Wear clean overalls/dust coat and gum boots while handling milk
- Not be suffering from a communicable disease or have open sores abscess on the arms, hands or neck.
- No cough or sneeze over containers
- Bath or shower regularly

7. Quality assurance in milk collection by farmer groups

- Understanding the nature of milk
  It is important for milk procedures to understand the factors that influence the difference in milk composition and quality so that measures can be taken at the farm level minimize these variations

- Effect of milking practices
  Incomplete milking results in low-ilk yield and low fat content because the fat milk (stripping's) contains more fat than the foremilk. Changing the milking

interval will also interfere with the composition and yield of the milk. Poor hygiene will result in milk with high numbers of spoilage microbes.

- Stage of Lactation
  Immediately after calving, a cow produces colostrums during the first five days after which the milk reverts to its normal composition. Colostrum is heavier than normal milk and contains 10 times more whey proteins. Colostrums is also more alkaline (ph 6.8 – 6.9) than normal milk. Hence, only the milk produced after five days from calving should be sold.

- Effect of Mastitis
  On farms practicing good husbandry, 20 – 30 per cent of lactating cows have one or more quarters infected with sub –clinical mastitis. With poor hygiene the composition of mastitis milk approaches that of blood. It has more whey proteins, less casein and less water – chloride content than normal milk, and tastes salty like the milk of very old cows (more than six lactations) or milk of cows in late lactation (near drying off).

- Effect of Feeding
  Cows have to be properly fed to produce a high volume of milk of goo composition. If cows are fed a diet low in forages and high in starch, the butterfat content of the milk may fall below 2.5 per cent. A good for age – to - concentrate ration is important to enable cow produce good quality milk to their potential.

- Effect of Storage temperature
  If raw milk is not cooled soon after milking, the inherent lactic bacteria will multiply with two to three hours, concerting lactose into lactic acid and causing the milk to start souring. Such milk is unsuitable for processing and should be rejected at milk collection centres. If milk is kept chilled at 4c for more than 72 hours, the cold tolerant bacteria will multiply and produce lipase and protease enzymes that, respectively, break down milk fat and proteins.

- Effects of Adulteration
  Adulteration of milk is the addition of water or other substances (e.g. margarine) in milk. Adulteration is illegal because it alters the natural composition of milk and can introduce harmful bacteria and other dangerous substances into milk. Water adulteration lowers the specific gravity range of 1.026 to 1.032 while its freezing point is minus 0.54c. Hence, milk collection centres and processors routinely determine the specific gravity of raw milk and reject milk suspended of having been adulterated.

- Effect of treatment of cows with antibiotics
  When cows suffer from mastitis they are treated with antibiotics by
  Intra – mammary or intramuscular injection. The antibiotics circulate in the blood and are secreted in the milk for up to 72 hours. Longer acting (slow release) antibiotics, such as those used in dry cow therapy against mastitis, remain in the blo9od longer. Drug residues in milk are undesirable because they can trigger allergies and drug resistance in humans, and inhibit the lactic

acid starter cultures used in the manufacture of fermented milk products. It is important for farmers to adhere to the specific withdrawal periods and follow the advice of a qualified veterinarian on when to resume sale of milk after antibiotic treatment of cows.

8. Quality test at milk collection centres

Farmer groups and operators of milk collection points and centres need systems of quality control for the milk they receive from individual farmers. This enables segregation of poor quality milk at collection centres. The following tests can be carried out at the collection centres. The following tests can be carried out at the collection centre.

8.1 Organoleptic test

This is the simplest test, as it requires only the use of the senses of smell and sight. Milk which contains objectionable smells or particles or has an abnormal colour can easily be detected. The milk grader must have a good sense of sight, smell and taste. The Organoleptic test should be the first test to be carried out on all milk received at the collection centre and poor quality milk should be immediately rejected, obviating the need to proceed with other quality control tests.

Procedure

- Open a can of milk
- Immediately smell the milk and establish the nature and intensity of smell, if any. If the milk has foreign odours (e.g. smoky, burnt, weedy, chemical/drug smell) or smells sour, it should be rejected.
- Observe the appearance of the milk (colour of the milk, any marked separation of fat, colour and physical state of the fat, foreign particles or physical dirt)
- Check the cleanliness of the milk can and lid
- If still unable to make a clear judgment, taste the milk but do not swallow it.
- Spit out the milk you have tasted into a bucket provided for that purpose or drain basin and flush with water.
- Touch the milk container to feel whether it is warm or cold. This will enable you to know whether or not the milk has been cooled since this will also influence the lactometer reading

Interpretation of results

Abnormal appearance or smell in the milk may be caused by:

- Advanced acidification or souring
- Chemical or drug taints or discolouration
- Type of feed or atmospheric taint
- Boiling of milk
- Presence of smoke
- Bacterial taints
- Spontaneous rancidity of milk cows in late lactation

Marked separation of milk fat may be caused by:

- Milk previously chilled and subjected to excessive agitation during transportation
- Previous freezing and thawing of the milk (check temperature as well)
- Adulteration by other solids (may also show as sediments or particles)
- Boiling, if milk fat is hardened.

8.2 Clot – On – Boiling test

Procedure and judgment

- Boil a small amount of milk for a few seconds in a spoon or other suitable container.
- Observe immediately for clotting
- The milk will be rejected if there is visible clotting, coagulation or precipitation.

8.3 Alcohol test

Procedure and judgment

- Use a syringe to draw equal amounts of milk and 70% alcohol solution into a small tube or glass cup (such as those used to administer medicine to children).
- Mix 2 ml with 2 ml 70% alcohol and observe for clotting or coagulation.
- If the tested milk sample coagulates, clots or precipitates, the milk will be rejected.

8.4 Lactometer test

This test is used to determine if the milk has been adulterated with added water or solids. Addition of anything to milk can introduce bacteria that will make it spoil quickly. Adulteration of milk is dishonest to consumers and is therefore illegal. The lactometer test is based on the fact that milk has a heavier weight or density (1.026 – 1.032g/ml) compared to water (1.000g/ml). When milk is adulterated with water or other solids are added, the density either decreases (if water is added) or increases (if solids are added). If the milk fat (cream is added to milk, the density decreases. The equipment used to measure the milk density is called a lactometer.

Remember

- Quality assurance begins at the farm
- Good hygiene practice in milk production and handling is the key to milk quality and safety.
- Cooling milk will slow down the growth of spoilage bacteria and prolong the milk's shelf life.
- But milk that already has many bacteria in it will not keep for long, even when cooled.
- Good milk quality means good profits for your farm.

9. Milk Collection and Storage

9.1 Milk Collection, Storage and Marketing

Raw milk production locally is still not sufficient to satisfy local dairy manufacturers, as a result, milk manufacturers are forced to import most of their milk and milk additives to supplement the deficit. For this reason, the increase in milk production is encouraged bearing in mind that good maintenance and facilitative procedures are practiced. Some of these include milk collection, storage and marketing. These practices are required as an aid to provide good quality milk as would be required by processors such as Parmalat. By good quality we refer to the conformance of one's product to the customer's requirement, which is what the customer wants.

9.1.1 Milk Collection

Milk collection is the consolidation of milk from various individual farms or farmers to one central point.

Forms of Milk Collection

- Farm to processing plant
- Farm to milk collection centre then to processing

Milk Collection Directly to Processing Plant

This involves processor – collecting milk using tankers to collect the milk from the farm to the processing plant. There are certain basic tests carried out on the farm

- Milk is weighed electronically and transported to the factory factors of consideration
- Volume of milk produced daily
- Road condition must be good
- Distance from plant is considered
- Electricity access
- Communication mode

Collection through MCC

Milk collection centre can be owned by a farmer group or by a resource agent. There are certain factors that determine the need for a milk collection centre. These are:

- Volume of milk produced by farmers
- Market need
- Bargaining power

Requirements for MCC

In order to make a viable milk collection centre, it has to have the following

- Water
- Electricity
- Road accessibility or good condition
- Dairy farm units proximity must be close to MCC
- Organization of farmers for MCC
- Finance

MCC Operation

A milk collection centre can operate in the following ways:

- Farmer group
- MCC construction
- Purchase of all equipments
- Hire MCC attendants
- Milk reception

Milk Reception

- Milk is bought by farmers
- Milk reception tests are performed
- Volume is measured
- Milk is recorded
- Milk is stored in a cooling tank
- Milk is sold at the collected at the plant
- Farmers are paid monthly

Milk Reception Tests

Milk is tested for the following:

- Freshness
- Hygiene
- Composition

Organoleptic Test

- Taste
- Smell
- Visual appearance

Acidity Tests

Equal amount of milk an alcohol, if milk has lost freshness and has become sour, it will coagulate (form cuddles) whereas fresh milk will not.

Adulteration Tests

A test that is used to check foreign material in the milk

- For water added, use a lactodensimeter or lactometer
- Specific gravity of milk ranges from 1.028 to 1.032
- Specific gravity of water is 1

Advantages of MCC

- Group marketing
- Easy access to services
- Breeding services
- Health services
- Supply of inputs
- Agricultural credits
- Investment priorities

9.1.2 Milk Storage

- On farm milk is stored in a milk cooler
- At MCC milk is also stored in cooler
- Cooling temperature ranges from 0 to 4 degrees Celsius

Each day's milk should not be mixed with the following day’s milk.