Chapter 4

Clean Milk Production

Objective: *To acquaint with milking management and concept of clean milk production*

Introduction

Clean Milk production is very important for dairy farms maintained on commercial lines. Milk is highly perishable commodity. Unclean milk deteriorates quickly and produces diseases if consumed. Therefore utmost care has to be taken in production, storage and transport of milk. The animals should be maintained in hygienic environment for production of quality milk. Without production of clean milk, there is no use of maintaining high yielding cows and good feeding practices. Several practices should be followed for production of clean milk.

Pre-requisites for Good Milking

Milking is an art requiring experience and skill. Milking should be conducted gently, quietly, quickly and completely. Cows remaining comfortable, yield more milk than a roughly handled and excited cow. Maintenance of clean condition in the milking barn results both in better udder health and production of milk that remains wholesome for longer time. The act of milking should be finished within 5 to 7 minutes, so that the udder can be emptied completely so long as the effect of oxytocin is available. Complete

milking has to be done, lest the residual milk may act an inducer for mastitis causing organisms and the overall yield may also be less.

Cattle Shed

The farmer should have his cattle shed at a well-elevated place with good drainage. It should be properly ventilated, with provision for admitting daylight. The shed should be fitted with fly-proof wire mesh wherever possible. Floor and gutters should have adequate slope for easy drainage and removal of dung. The cattle shed should be properly illuminated with shatter proof lights. It is equally important to clean the cattle shed from time to time. It is recommended to clean (sweep) the cattle shed an hour before actual milking to prevent dust and dirt entry into milk vessels. Sweeping the cattle shed and removal of dung from time to time will control the flies which are a major menace and source of infection. Similarly, the farmer has to keep the feed materials having off-flavours away from the milking area since these flavours can be absorbed by milk.

Cleaning of the Animals

At the time of milking, the animals should be cleaned thoroughly to remove any dirt and dung sticking on the thigh and udder. Permanganate solution can be used to clean the udder. After cleaning, the thigh, udder and teats should be dried with a clean towel. The animals should be kept quiet during the milking process. A soft music in the shed can be played to keep the atmosphere serene and quiet. Further the milking should be practiced at fixed hours every day so that the animals get accustomed for milking at that time. Feeding concentrates at the time of feeding also help to make the animals quiet and cooperate with the milking people.

Cleanliness of the Milking Pails

The milking pails used for milking should be cleaned well with warm water and washing soda. After washing they are again washed with plain water thoroughly and dried by keeping upside down. The mouths should be closed with lids and kept ready for the next milking. While transferring the milk into the transport cans, the milk should be strained through a clean cloth to remove any particles. After milking, the milk pails should be kept in a cool place and should not be exposed to direct sunlight. If the milk is to be transported to long distance, it is cooled in a refrigerated room to prevent spoilage.

Proper cleaning of the milking utensils immediately after milking and Cleaned utensils inverted on a drying rack

Health Coverage to the Animals

Sick animals should be identified promptly and treated. The milch animals should be protected against contagious diseases regularly. Mastitis (inflammation of mammary gland) is a common disease in milch animals. Mastitis causes great economic loss in the farm all over the world. Mastitis if controlled properly, almost half of the battle is won. Such is the correlation between mastitis and clean milk production. In absence of any control programme, milch animals may have incidences of increased mastitis.

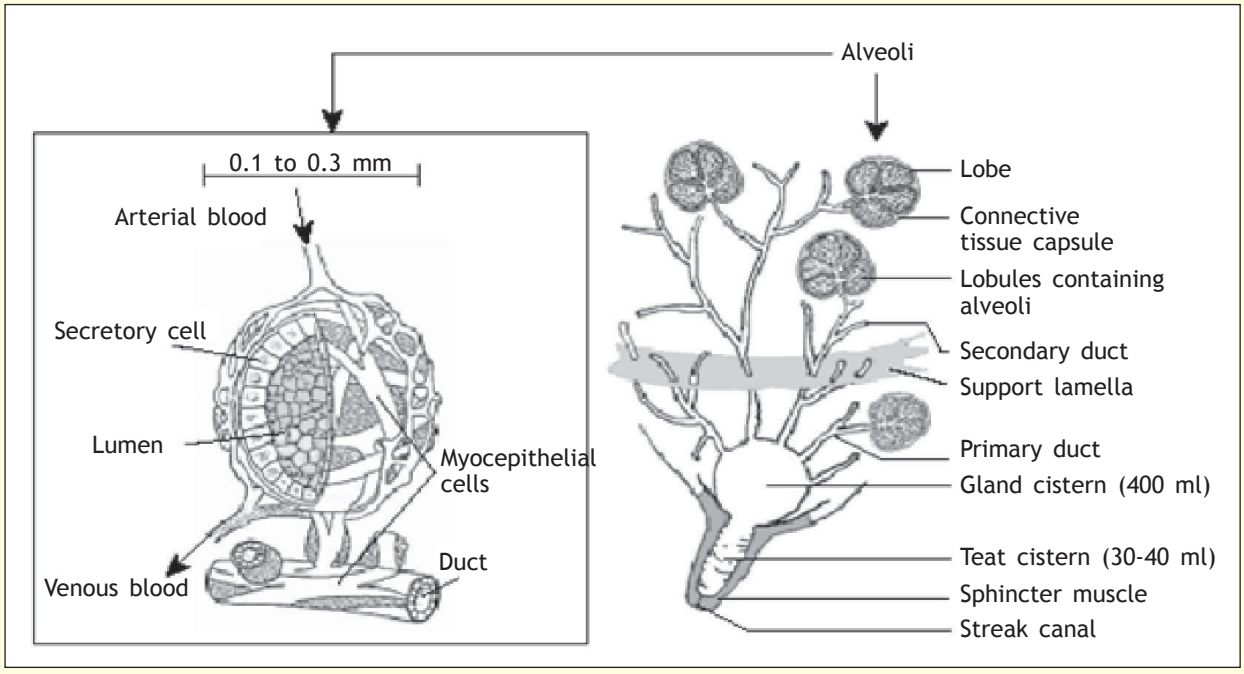
Storage and Transport of Milk

Milk at the time of milking will be at the body temperature. Preserving the milk at that temperature causes deterioration quickly. As such the milk should be chilled and stored. Chilling of milk enhances the storage time without spoiling. While transporting milk, the cold chain should be maintained for preventing deterioration.

4.3 Udder Structure and Physiology of Milk Secretion

Structure of udder: The udder is located outside the body wall and attached to it by means of its skin and connective tissue supports.The secretory portion of the udder consists of countless alveoli or chambers lined with individual cells. Each of these alveoli is drained by a small duct which leads to larger ducts. Clusters of alveoli resembling a bunch of grapes are drained by ducts of increasing size until some 10 to 20 ducts

conduct milk into the gland cistern. The gland cisterns continue into the teat sinus or cistern. Each alveolus is-supplied by blood through tiny capillaries which lie outside the secretory cells. Small muscle fibers also surround each alveolus and are important in the removal of milk from the gland. The individual secretory cell is the primary factor in milk production. It extracts all of the components of milk from blood stream and either arranges them into new compounds or passes them through directly into the alveolus.



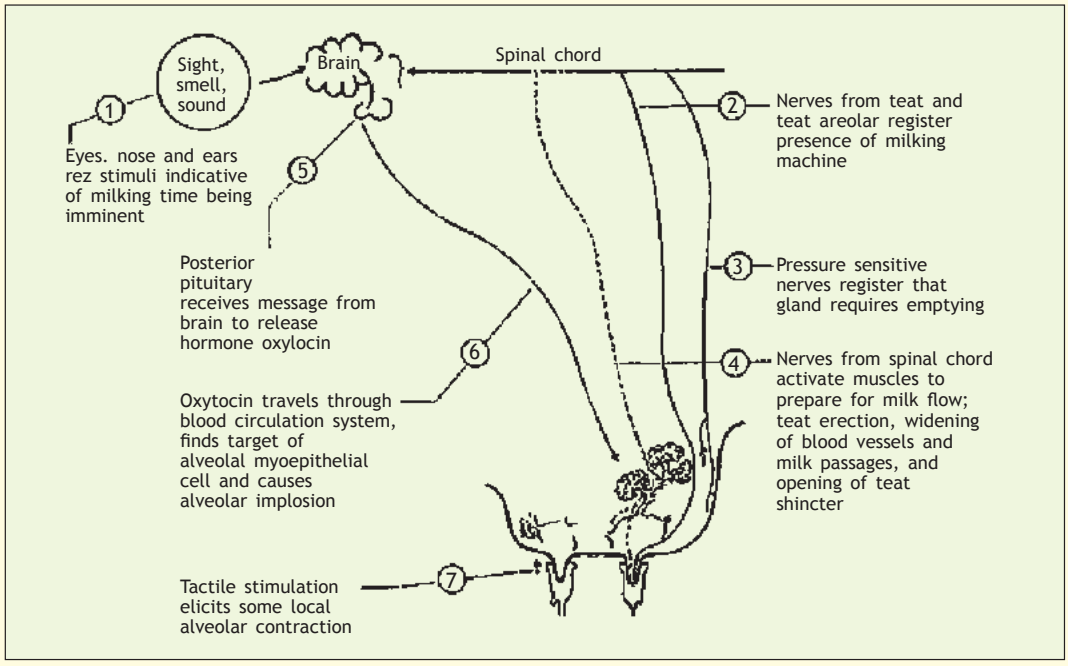
Internal Structure of Udder

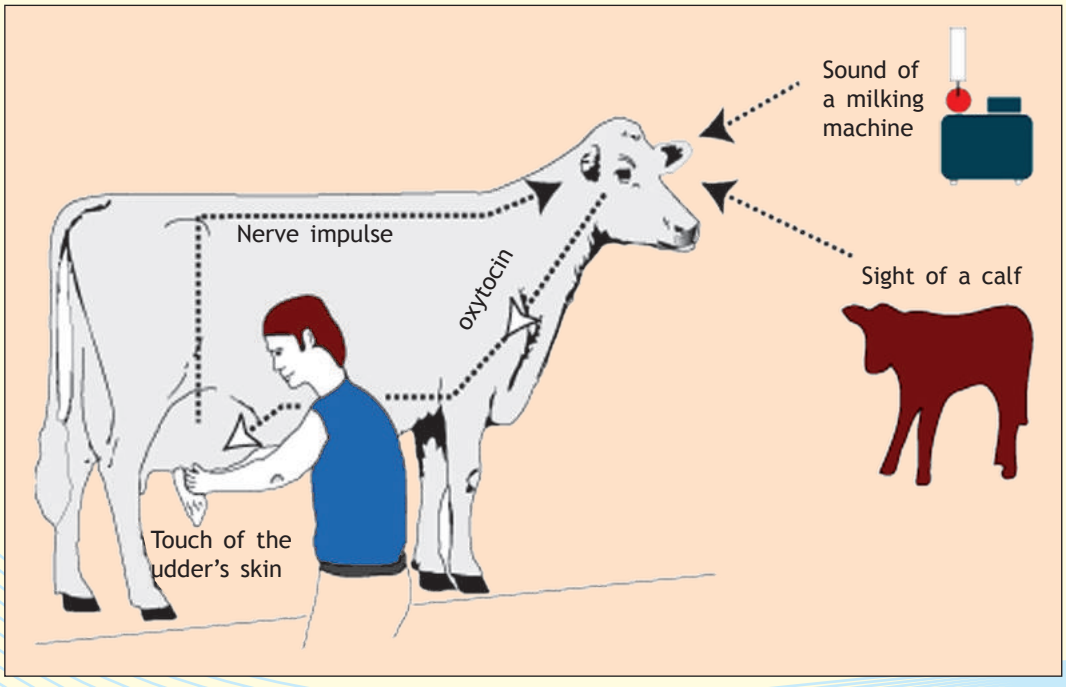
The Milk Letdown Mechanism

When milk secretion has continued for a considerable time after milking, the alveoli, ducts and gland, and teat cisterns are filled with milk. Milk in the cisterns and larger ducts can be removed readily. Milk in the smaller ducts and alveoli does not flow out easily. However, the cow and other mammals have developed a mechanism for releasing milk from the mammary gland. Stimulation of the central nervous system by something associated with the milking process is necessary to initiate the read ion. Stimulation of nerve endings in the teats that are sensitive to touch, pressure, or warmth is the usual mechanism. The suckling action of the calf is ideal for this. However, massaging the udder or washing with warm water is also equally effective. Stimulation is carried by the nerves to the brain which is connected with the pituitary gland located at its base. Mechanisms are activated in the pituitary gland which causes the liberation of a hormone oxytocin from its posterior lobe. Oxytocin is carried by the blood stream to

the udder where it acts on the small muscle rolls surrounding the alveoli, causing them to contract. The pressure thus created forces the milk out of the alveoli and smaller ducts as fast as it can be removed from the teat.

The letting down process can be stimulated within half to one minute's time. The effective time of the hormone is limited and milking should be completed within seven minutes if all the milk is to be obtained.





Milking Procedure

Cows are milked from left side. After let down of milk, the milker starts milking teats either cross wise or fore quarters together and then hind quarters together or teats appearing most distended milked first. Few streams of fore milk from each teat be let on to a strip cup. This removes any dirt from the teat canal and gives the operator a chance to detect mastitis. Stripping and full-hand milking are the two commonly used methods of milking.

Stripping Milking

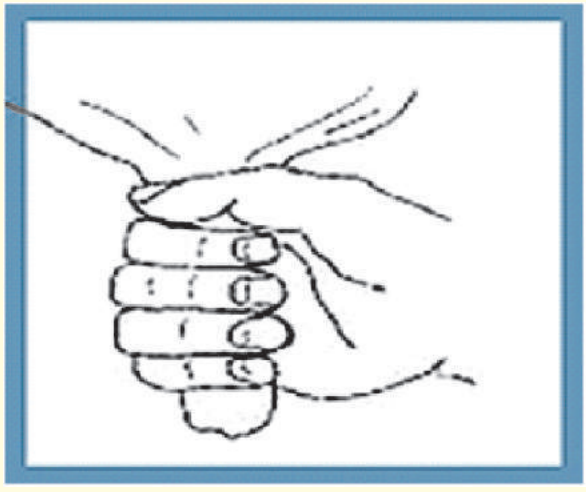
Stripping consists of firmly seizing the teat at its base between the thumb and forefinger and drawing them down the entire length of the teat pressing it simultaneously to cause the milk to flow down in a stream. The process is repeated in quick succession. Both hands may be used, each holding different teat, stripping alternately.

Full Hand Milking

The full hand method comprises of holding the whole teat in the first finger encircling the teat. The base of the teat is closed in the ring formed by the thumb and forefinger. Simultaneously, teat is squeezed between the middle, ring and little fingers and the hollow of palm, thus, forcing the milk out. This process should be repeated in quick succession. By maintaining a quick succession of alternate compressions and relaxations the alternate streams of milk from the two teats sound like one continuous stream. Many milkers tend to bend their thumb in, against the teat while milking. This practice should be-avoided as it injures the teat tissues.

Full hand milking removes milk quicker than stripping, because of no loss of time in changing the position of the hand, Cows with large teats and she-buffaloes are milked by full-hand method; but stripping has to be adopted for cows with smaller teats for obvious reasons. Full-hand method is superior to stripping as it simulates the natural suckling process by calf. Stripping causes more irritation to teats due to repeated sliding of fingers on teats; and so discomfort to cows. In spite of these drawbacks when all milk that is available is drawn out by full-hand method, stripping should be resorted to with a view to milk the animal completely; the last drawn milk is called stripping and is richer in fat.

Milkers are mostly accustomed to meet hand milking. They moisten their fingers with milk, water or even saliva, while milking. This should be avoided for the sake of cleanliness. Wet-hand milking makes the teats look harsh and dry chafes, cracks and sores appear which are painful to animal. The hands should be perfectly dry while milking.When cracks and sores are noticed on teats, some antiseptic ointment or cream should be smeared over them after milking.



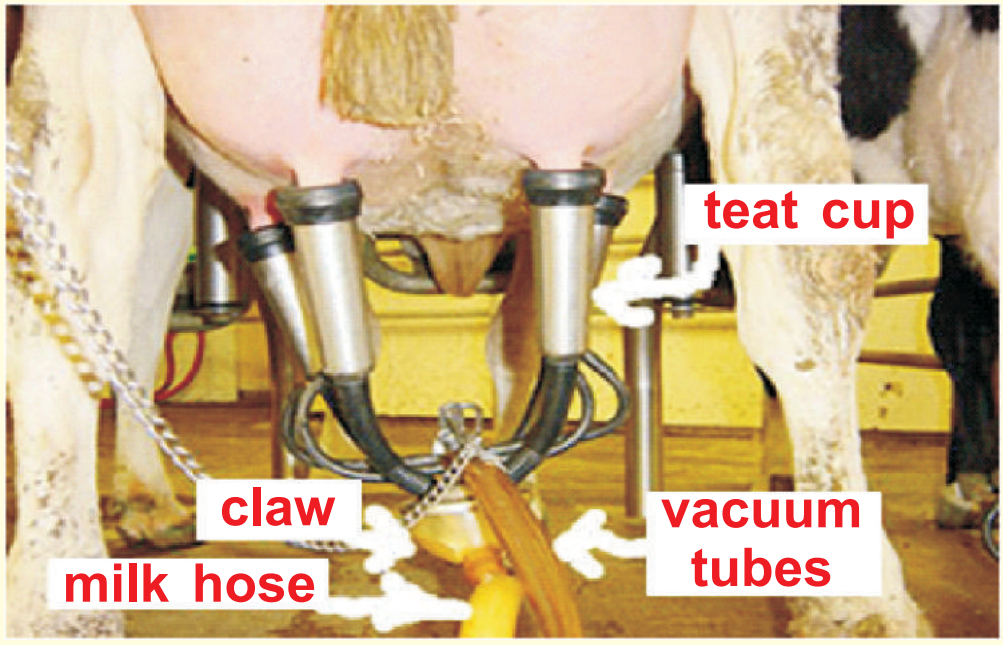
Machine Milking

Modern milking machines are capable of milking cows quickly and efficiently, without injuring the udder, if they are properly installed, maintained in excellent operating conditions, and used properly. The milking machine performs two basic functions.

1. It opens the streak canal through the use of a partial vacuum, allowing the milk to flow out of the teat cistern through a line to a receiving container.

2. It massages the teat, which prevents congestion of blood and lymph in the teat.

The advantages of this milking machine are manifold. It is easy to operate, costs low, saves time as it milks 1.5 litre to 2 litres per minute. It is also very hygienic and energy-conserving. All the milk from the udder can be removed. The machine is also easily adaptable and gives a suckling feeling to the cow and avoids pain in the udder as well as leakage of milk.



The Concept of Clean Milk Production

Micro-organisms are found everywhere, on animals and people, in the air, the soil, in water and in milk. Good sanitary practices throughout the entire milk chain, from milking through processing to packaging, result in safe milk of a good quality. The main sources of contamination by microorganisms in raw milk are the surfaces which it contacts. These include the udder, the hands of the milker and the utensils. This means that it is very important to clean hands and surfaces carefully with clean water. Once micro-organisms have found their way into milk, they develop easily and multiply rapidly. Microorganisms grow best at room temperature, so keeping milk cool will slow down their growth. Heating the milk, like pasteurization, destroys a large number of microorganisms. Increasing the acidity of the milk by fermentation suppresses the growth of harmful organisms as well. The status of raw milk is determined by its bacterial quality and the somatic cell count. With simple and low-cost husbandry practices it is possible to produce milk with a count of less than 50,000 bacteria per ml.

Advantages of Clean Milk Production

(a) Safe for human consumption

(b) Better keeping quality

(c) High commercial value

(d) Protection against diseases like typhoid, dysentry, diptheria, septic sore throat etc.

(e) Helps to produce good quality dairy products

(f) Transportation over long distance

Significance of Clean Milk Production

Maintaining a high standard of hygiene is one of today's most important milk production objectives. The hygiene level directly influences the production's economical result and dairies are enforcing this by steadily raising their quality requirements for raw milk. More importantly though, consumers are concerned about the safety of dairy products and the conditions under which these are produced. It is therefore critically important to ensure that high quality raw milk can be produced from healthy animals under good hygienic conditions and that control measures are applied to protect human health.

Agriculture is the base of Indian economy. Agriculture forms 31% of the national GDP and approximately 75% of India's population live in villages and depend on crop and livestock farming for their livelihood. Livestock production, including dairying, plays a multipurpose role in the agriculture systems of India. Milk is a cheap but high value source of nutrients for the rural population. If milk is not produced hygienically, it can affect the health of many people. Besides being a health hazard, contamination of milk can lead to huge economic losses. Contamination occurs at different levels: at farm level, during collection and storage, and at processing centres. Milk contains many essential nutrients, such as carbohydrates, proteins, lipids, minerals and vitamins and therefore acts as an ideal medium for rapid proliferation of harmful microorganisms. Milk needs to be protected from all possible sources of microbial contamination and various types of disease organisms. When the milk is secreted from the udder, it is almost sterile. The employment of hygienic practices at the time of milking is therefore one of the first and most important steps in clean milk production.

Important Measure for Clean Milk Production

1. Healthy herd: routine examination of cattle is necessary to assure that they are disease free. Otherwise this can infect human beings and is transmittable via milk.
2. Housing: milking area must be free from flies, rodents, vermin, dust, smoking, all manure dung and dust particles.
3. Cow stalls and other quarters must be surfed with disinfectants consisting of quarternary ammonium compounds diluted with only 60% water for sanitizing purpose.
4. Ensure that feeds and fodders are free of pesticides and feed ingredients must be stored in moisture free conditions to inhibit the production of aflatoxins.
5. Milking utensils should be made up of aluminum or galvanized iron. Properly clean and sundry the vessels before and after milking.
6. Chemicals like sodium hypochlorite in liquid form or iodophore, quarternary ammonium compounds, detergents like Teepol can also be used. Never use ash or mud for cleansing the utensils.
7. Udder and teats of the cow should be washed with warm water adding a pinch of potassium permanganate or sodium hypochlorite before and after milking. After washing the udder should be dried.

8. Pre milking: Two or three drops of milk from each quarter should be stripped. This also removes the first milk which is usually high in bacterial count.

9. Ensure the milker is free from any diseases, wounds and he should keep proper personal hygiene. Wearing of hand gloves by milker is highly recommended.

10. Teats should also be dipped with iodophore solution after milking to prevent mastitis.

11. The milk has to be cooled to a temperature below 5°C by using household refrigerators/water coolers/bulk milk coolers preferably within 2 hours after milking.

Activity

Visit any dairy farm and record the clean milk production practices followed in that farm.

REVIEW QUESTIONS

1. Describe the structure of udder in relation to milk production.
2. Discuss the mechanism of milk let down.
3. Describe different methods of milking.
4. What are the different measures to be taken for clean milk production?