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## Importance of clean milk production for farmers and consumers

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### Abstract

Milk is a complete food and nature's most wonderful gift to mankind. The high nutritional content of milk makes it a perfect growth medium for innumerable microorganisms including pathogenic ones and the spoilage microbes cause deterioration of milk quality thereby causing great economic loss to farmers. Over and above this contaminated milk may cause milk-borne infections like typhoid, food poisoning, tuberculosis etc. which negatively impacts public health. The unprecedented use of chemical contaminants such as antibiotics and pesticides in agriculture food system has made milk chain vulnerable. India is the largest milk producer in the world holding first rank, but the quality of milk produced in India is questionable. The export of milk and milk products from India to the international market is far behind than that of developed countries, hence farmers don't get better price. In order to get high quality milk, certain hygienic practices such as appropriate sanitation and disinfections of the animal shed, utensils and equipment, properly good quality feed and water are must to be implemented. The mastitis control measures are essentially required at dairy farms to produce clean milk. The ultimate quality of milk and their products is determined by the complete process starting from animal production till the utilization of milk by consumers.

### Introduction

In India, dairying occupies a special niche and contributes substantially to the national economy as well as in socio-economic development of millions of rural and urban households. India ranks first in the world in milk production with annual milk production of 155.50 million tonnes and contribute about 16% to the world milk production (DAHFI, 2017). Although, India ranks first in milk production, quality of milk produced is not satisfactory due to lack of technical knowledge to the farmer. Milk quality is utmost important factor in dairying today due to consumer's awareness regarding quality. To achieve quality standards clean milk production (CMP) practices at the farmers' level needs to be considered. Clean milk can be defined as milk coming from healthy milch animal possessing normal flavour, devoid of dirt and filth, containing permissible limit of bacteria and essentially free from adulterants, pathogens, various toxins, abnormal residues, pollutants and metabolites. CMP also involves a set of preventative practices that helps in keeping the animal healthy



and free from diseases like mastitis, proper care and monitoring of individual animal to get the best quality milk without compromising with animal's productivity (Ogale, 1999). The most important step in clean milk production is the practice of hygienic milking, yielding milk safe for human consumption, free from disease-producing microorganisms, with high keeping quality, high commercial value and high-quality base suitable for processing, resulting in high-quality finished products. It is necessary to protect milk from all possible sources of microbial contamination like dung, water, utensils, soil, feed, air, milking equipment, animal and the milker. To achieve these milking should be conducted gently, quietly, quickly, cleanly and completely and also farmers should adopt important operations such as cleanliness of animal shed, cleanliness of animals, cleanliness of milkers and milking pails, milking methods, proper transportation of milk from dairy farm to processing units. Clean milk production involves cleanliness at all phases of handling and stringent quality control and hygienic measures have to be adopted at farm level. The adoption of clean milk production practices has great potential for increasing the quality of milk production (Rathod, 2014).

Contaminated milk deteriorates quickly and is a cause of health concerns. Zoonosis constitutes 61% of all known infectious diseases. It may also be noted that out of the 175 diseases considered to be emerging, 75% are zoonotic (Alexander *et al.*, 2015). There are some 45 zoonotic diseases reported to be transmitted from cattle. Dairy farmers are always at risk of acquiring infections from animals, being in close contact with their animals. Therefore, the maintenance of healthy milking animals will subsequently reduce the likelihood of introducing such zoonotic pathogens into the milk through the mammary gland or from the feces (FAO/WHO, 2011). Some of the zoonotic diseases that spread through milk are brucellosis, tuberculosis, salmonellosis, etc. (Pelzer and Currin, 2009). Clean milk production (CMP) involves cleanliness at different phases of handling animals, processing, and transporting of milk and milk products. Stringent quality control and hygienic measures are required at the level of dairy farm to maintain the milk quality, which is determined by aspects of composition and hygiene of milk. There are mainly four factors to be considered in CMP practices viz., animal hygiene, milking hygiene, equipment hygiene, and processing hygiene (Singh and Gupta, 2013). Clean milk production practices also involve proper method of milking, practices for let-down of milk, washing of udder before milking, drying of udder after washing, cleanliness of milkman, removal of hairs near to udder and discarding first stream of milk from each teat (Abdessemed *et al.*, 2016). The first step to clean milk production should be education and training of milk producers on hygiene, housekeeping, sanitation, milking methods and good animal husbandry practices.

### **Health management and hygiene of animal House**

Good animal husbandry practices including regular monitoring of disease such as mastitis should be a part of the routine work. Sick animal shed should be kept away from the milking barn and separated from the healthy ones. The healthy animals must be milked first. Improper use of veterinary



drugs should be avoided. Hygiene of animal house is an important component of clean milk production practices. Concrete floor with well drainage system in the animal shed is very important however if it is not possible bedding materials like sand or sawdust should be provided to the animals during cold weather or in damp or marshy floor. The shed should be comfortable and clean with suitable arrangement to dispose dung, urine, and feed and fodder residues. There should be proper supply of clean drinking water and electricity (Bafanda *et al.*, 2018).

### Handling of milking vessels

The milking vessel should be made of stainless steel or non-rusting and non-absorbent materials (*i.e.* aluminium or galvanized iron), having small mouth mouths to avoid external contamination. All the utensils should be free from dents, cracks and crevices so that washing and cleaning of utensils become easier. It should be scrubbed and cleaned before and after milking with hot water and certified detergents/chemicals and placed in inverted positions for the complete drainage of water, so as to avoid contamination from air, insects and rodents, etc. At farm, washing soda is used for cleaning of utensils followed with exposure to sunlight or use of disinfectants (iodophors) is recommended. The milker should wear clean clothes and maintain personal hygiene. He should wash his hands before milking and should not spit or smoke. Shaving the hair of the hind legs and tail of the cow should be carried out routinely. Also, the fore milk should be discarded in a proper place (Pal and Khadda, 2022).

### Udder Hygiene

From an ethological perspective, the cow rests in a lying position, which inevitably leads to contact of the udder skin with filth on the bedding surface. As much as  $1 \times 10^{10}$  of total microorganisms can be found in one gram of filth from the udder surface. With unsuitable udder hygiene, the microorganisms present on the teat skin can contaminate the milk during milking or through the teat tip will penetrate the teat canal increasing the possibility of mastitis. Bulk milk SSC for all lactating animals should be less than 250000 cells/ml and for first calver, it is less than 100000 cells per ml of milk. The incidence of mastitis in dairy farm should be less 25 percent in a year and whereas the culling of animals due to udder health should be less than 5 percent in a year. Therefore, it is necessary to implement hygienic-prophylactic measures in maintaining cleanliness and udder health before and after milking. This can be achieved by washing of udder and teats, spraying and wiping of teats with a cloth immersed in warm disinfectant solution and drying with a dry cloth; immersing of teats in disinfectant solution and wiping with a paper cloth etc. This procedure removes the milk droplets that are left behind which can serve as a breeding ground for surrounding pathogenic microorganisms. Subsequent drying of the disinfectant creates a thin layer over the teat orifice, mechanically preventing the incursion of microorganisms through the teat canal (Singh, 2018).



## Milking methods

Milking is an art which requires experience and skill. Milking should be done gently, quickly, neatly and completely. Teat is the first line of defense against pathogens of mastitis. The milking process may affect teat's condition, increasing the risk of mastitis. For hygienic milk production milking clothes, buckets, udders and hands should be clean.

1. Hand milking is done using clean and dry hands. It is performed by massaging and pulling down the teats, squirting the milk into milking pail. Hand milking is also done by three methods: (i) stripping (generally for first calvers), (ii) knuckling (not advisable), (iii) full hand milking (best). Whatsoever method of hand milking is followed however at the end, 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.
2. Machine milking works on the principle of vacuum just like the calf sucking its mother. Important consideration has to be considered as any negligence can cause adverse effect on the animals' health and milk production. The operator has to check the milking vacuum, vacuum level, pulsation rate and pulsation ratio. Over-milking can damage teat ends and leads to mastitis (Aslam, 2014).

## Post-milking care of teats

The appropriate use of teat disinfecting products reduces mastitis rates and the need for antibiotic use. As soon as milking is complete, the milking pail must be cleaned by an initial rinse in clean water, followed by scrubbing in a hot detergent/disinfectant solution and finally rinse with fresh water. All equipment must be drained and dry between milking intervals. Post milking disinfection of teat is the most effective way to prevent the spread of mastitis as the teat canals remain open and mastitis causing pathogens can easily enter through teat orifice. Teat dip must be always used after every milking. The animals must be kept in standing position at least 20-30 minutes after milking - by sending them to the feeding area/grazing to prevent the teats coming into contact with dirty floors (Singh, 2018).

## Milk collection and transportation

Hygiene at all stages of milk collection and processing is very important for the quality and shelf life of dairy products. Hygiene at all stages of milk collection and processing is very important for the quality and shelf life of dairy products. Hygiene at all stages of milk collection and processing is very important for the quality and shelf life of dairy products. Hygiene at all stages of milk collection and processing are very important for the quality and shelf life of dairy products. Hygiene at all stages of milk collection and processing is very important for the quality and shelf life of milk and other dairy products. There should be a provision of bulk cooling tanks to reduce the bacteriological load in



the milk immediately after collection. Introducing differential pricing system based on bacteriological quality of milk will help in overall improvement of milk quality reaching the dairy dock. Hygienic norms, good animal husbandry practices and proper handling, storage and transportation of milk are other prerequisites for clean milk production. The milk cans must have tight fitting lids to prevent entry of rain and dust. They should be stored in an inverted condition on stand. Group transport can be arranged for individual supplies of milk. However, it is better if transportation is done using small containers which will avoid mixing of poor-quality milk with good ones. During transportation agitation of milk should be avoided as milk fat is destabilized if agitated which becomes easily oxidized. The milk tanker should have proper insulation. The number of spoilage bacteria in raw milk depends on the level of hygiene during milking and the cleanliness of the vessels used for storing and transporting the milk. During the first 2-3 hours after milking, raw milk is protected from spoilage by inherent natural antibacterial substances that inhibit the growth of spoilage bacteria. However, if the milk is not cooled, these antibacterial substances break down causing bacteria to multiply rapidly. Cooling milk to less than 10°C may prevent spoilage for up to three days. High storage temperatures result in faster microbial growth and hence faster milk spoilage. Group transport can be arranged for individual supplies of milk. However, transport milk in small containers which will avoid mixing of poor-quality milk with good ones (Singh, 2018; Faraz, 2020).

### Conclusion

Clean milk production is the first key step farmer of our country should look at to meet the challenges of globalization as high-quality milk fetches good price in market. Development of skills related to clean milk production, knowledge and application of the above standard procedures will help in reducing spoilage, production of high-quality milk kept for long time and ensuring health of the consumers, farming families and overall prosperity to our dairy farmers.

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