

Producing safe, high quality sheep milk for human consumption

Producing safe, high-quality milk for human consumption requires attention to all that is involved in the process, largely, the ewe and its health status, the milkers and the milking routine and the milking machine and parlour, including the milk tank and all associated components.

The ewe

Each ewe should start its lactation in good body condition score (3-3.5 whenever possible, depending on number of lambs carried) and good general and udder health. Appropriate nutrition should be provided during the dry period to ensure good udder development, metabolic and immunological status. Plane of nutrition should then rise further to ensure no substantial BCS loss at peak milk yield. When on grass, the grass growth and availability should be frequently calculated using a plate meter. Supplementation with Silage and or concentrate feed should be considered and discussed with each farm's nutritional advisor. Clean, fresh water should always be provided in large quantity!

After lambing, leaving lambs with their mothers for a long period of time would reduce the overall volume of milk available for human consumption and will also predispose the ewe to a higher risk of mastitis due to lambs sucking (sometimes aggressively) multiple times a day. Late separation might also cause further stress to the ewe and lambs due to their strong bond. That said, some flocks milk successfully with ewes and lambs running together for long periods (Roquefort sheep flocks in the Roquefort region of France), sometimes until the lambs are weaned. The lambs sold are another income stream to the farm, hence the decision regarding the right time to separate the ewe from her lambs is individual to each farm according to management practices, philosophy, and overall aims.

During lactation, ewes should be kept clean and dry whenever possible as dirty udders and teats can increase the chances of bacteria entering the teat canal during milking. When milked, the udder of each ewe should be checked for any signs of visible, clinical mastitis (see Fig 4).

Milk composition (level of total solids comprised mainly of butterfat, protein, and lactose) will also be negatively affected by subclinical, non-visible mastitis. The way to detect those "hidden" cases would be by monitoring the levels of Somatic Cell Counts (SCC) in each individual ewe's milk. This could be achieved by taking individual milk samples monthly or bi-monthly and submitting them to a laboratory or a veterinary practice for testing but could also be evaluated by the milkers during milking time by using a California Mastitis Test (CMT). The CMT test gives a qualitative evaluation of a small sample from each individual ewe.

Somatic Cell Counts are affected by multiple factors such as age, parity, stage of lactation and others and can be high at times even without an udder infection. When monitoring SCC, the trend is more important than a single measurement, but once an ewe is identified as having repeated high SCC (above 500,000 cells/ml), or when signs of clinical mastitis are obvious, the milk should be cultured to identify the causative bacterium. Results should be interpreted together with the farm's veterinary surgeon to decide on the right course of treatment if applicable.

Some chronic cases will not respond to treatments and there is a risk of further transfer of infection between the infected ewe to others via the milking machine. These chronically infected ewes are better removed from the flock.



Fig 1: CMT showing bloody milk- not always a sign of infection.



Fig 2: Positive, gelatinous cell count sample.

When on grass, ewes should be monitored for the presence of liver fluke (Trematode) and *Haemonchus Contortus*, a gastrointestinal, blood sucking Nematode also called “Barbers Pole” worm. Both will have a negative effect on milk production and the ewe's overall health and could cause death if not detected and treated.

Other common disease conditions, such as lameness, would cause reduction in milk yield and milk quality and should be diagnosed and treated quickly. Chronic, incurable diseases such as Maedi Visna, Ovine Pulmonary Adenomatosis (OPA) and Paratuberculosis, also called “Johnes disease”, are often described as “Hidden” or “Iceberg” diseases due to their vague clinical signs. These diseases would invariably cause a reduction in milk yield and quality.

Effectuated ewes will lose body condition over time, milk for fewer lactations and be culled earlier than their healthy flock members. The role of “Johne’s disease” is also investigated as a possible contributory cause of “Crohn’s disease” in humans. Milking cattle herds are routinely monitored for presence of Johne’s disease in the herd and cows with high levels of antibody test results are culled out. When suspected, these diseases should be investigated, and monitoring and control plans put in place to limit the risk of disease spread, reduced animal welfare and production losses.

Farm staff

Farm staff are the ones in constant contact with the milking flock. They should all be trained to a high level of animal husbandry and management, and always be minded of the animal’s overall needs, their health, and welfare. When in the milking parlour, staff members should act calmly and try to ensure that the parlour and the milking procedure are stress free. Stress will have a negative effect on the animal’s productivity. All who are involved with the milking process should be familiar with the milking routine and be trained to operate the milking parlour.

Milking times should be set, and milking routine should be adhered to. Milkers should wear gloves to reduce the risk of udder infections during milking and gloved hands should be washed and disinfected if they become dirty. The udder of each animal will be inspected for sign of mastitis, teats wiped dry and clean with a clean, disposable, single use cloth or paper towel and a milk strip taken from each half, into a collecting cup, to identify any changes in the milk, such as discoloration and clots.

Some farms would use multiple-use towels which are machine washed, with disinfectant, at a high temperature, between each milking. These multiple use towels should be dried thoroughly before use otherwise they could become a source of udder contamination themselves. Wiping the udder is part of ewe preparation for milking and would aid milk let-down and help shorten milking times, having said that, if ewes are coming in to be milked with dry, clean udders, it would be better to minimise contact with the udder and keep wiping to a minimum.

In flocks with a high level of environmental mastitis, a pre milking “rapid kill” teat dip should be applied first before the teats are wiped dry and the milking cluster attached. Overall, levels of clinical environmental mastitis in sheep flocks are much lower than in cattle so the use of pre milking teat dip is rarely advised.

During the milking process, staff should notice and correct any slipped clusters to avoid pressure drop and injection of bacteria up the teat canal. At the end of milking, if Automatic Cluster removers (ACR’s) are not fitted, the vacuum line should be clamped shut before removing the cluster. Care should be taken to not “overmilk” the ewes. All teats should be dipped with a “post dip” using a dipping cup rather than spray. The dip will travel up the teat canal (by “capillary force”) and reduce the number of bacteria present, thus reducing the risk of mastitis. Few Teat dips are licensed for use in milking sheep in the UK but milking cow teat dips are commonly used.

The current authorised products						
Product name	MA holder	VM number	Active substances ▲	Target species	Distribution category	Territory
Suredip 0.74% w/v Teat Dip/Teat Spray, Solution – Ready to Use	GEA Farm Technologies (UK) Ltd	01808/4006	Chlorhexidine Gluconate	Cattle	AVM-GSL	United Kingdom
				Goats		
				Sheep		
Sensospray 70V 0.74% w/v Teat Dip / Teat Spray, Solution - Ready to Use	GEA Farm Technologies (UK) Ltd	01808/4018	Chlorhexidine Gluconate	Cattle	AVM-GSL	United Kingdom
				Goats		
				Sheep		
Luxspray 50V 0.5% w/v Teat Dip / Teat Spray, Solution - Ready to Use	GEA Farm Technologies (UK) Ltd	01808/4017	Iodine	Cattle	AVM-GSL	United Kingdom
				Goats		
				Sheep		
Silkidip 0.5% w/v Teat Dip/Teat Spray, Solution - Ready to Use	GEA Farm Technologies (UK) Ltd	01808/4009	Iodine	Cattle	AVM-GSL	United Kingdom
				Goats		
				Sheep		
Clinidip L Concentrate 2.0% w/v Concentrate for Teat Dip or Teat Spray Solution	GEA Farm Technologies (UK) Ltd	01808/4010	Iodine	Cattle	AVM-GSL	United Kingdom
				Goats		
				Sheep		
Clinidip 2.5 % w/v Superconcentrate Concentrate for Teat Dip or Teat Spray Solution	GEA Farm Technologies (UK) Ltd	01808/4011	Iodine	Cattle	AVM-GSL	United Kingdom
				Goats		
				Sheep		

Table 1: Post Teat dips licensed for use in sheep (cattle and goats) in the UK.

Animals should be “directed” out of the parlour by milking staff in a calm way to avoid any negative experience to the animals.

Unlike cattle milking parlours, sheep milking parlours remain relatively clean throughout milking. If the floor of the milking ramp, or the milking clusters become heavily soiled, milking staff should clean them in between groups, using as little water as possible to avoid water droplets “mist” in the parlour.

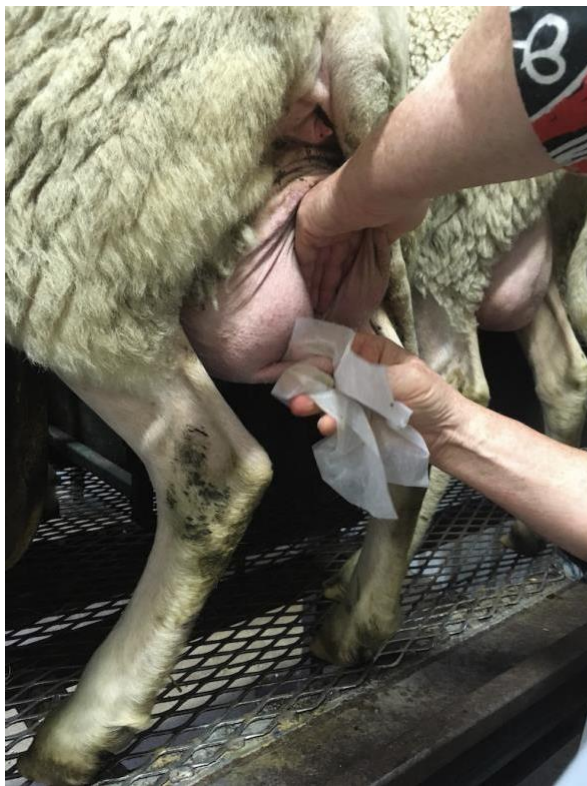


Fig 3: Udder wiped with disposable cloth.



Fig 4: Milk strip taken to inspect milk.



Fig 5: Post milking dip application.



Fig 6: Teat "post dip" cover.



Fig 7: Animals clean and dry in parlour.



Fig 8: Ensuring proper cluster attachment.



Fig 9: Calm, knowledgeable staff working in a clean and tidy milking parlour

Milking parlour

Milking parlours do not necessarily have to be complicated and expensive. There is much to be said for a simple, well-maintained parlour where there is less chance of electrical and mechanical faults or areas where milk residues can deposit and reduce overall milk quality by increasing total bacterial counts.

Monitoring equipment, as simple as milk meters, will allow for better performance monitoring of both flock and individual ewe level and help dairy sheep farmers select the right animals for future breeding.

All parlours should be mechanically maintained at regular intervals, and any fault, found at any time, should be dealt with without delay.

Settings such as vacuum levels and pulsation should be constantly monitored and kept within recommended limits. All equipment should be kept clean and in good working order.

The milking liners (cups) should be regularly changed according to the number of times used as recommended by the manufacturer. If not changed in time, the liners surface will degrade and harbour more bacteria which could find their way into the udder and cause clinical or sub clinical mastitis which will affect milk quality and production and cause the animal pain and suffering.

Cleaning procedure

All equipment with milk contact surfaces should be cleaned after each milking. Components that are difficult to clean should be inspected daily to ensure that their surfaces are clean.

Milking machines (*manual cleaning*)

1. After each milking, scrub all residues from the exterior of the teat cups, claws, drop tubes and rubbers with a warm solution of alkaline detergent and water.
2. Turn off plate cooler water supply.
3. Cold water rinse; draw at least 10 litres of cold or warm water through each cluster into the machine.
4. Remove and clean the milk filter. If a plate cooler is in use, replace the filter for the remainder of the cleaning process.
5. Detergent wash (temperature of water and amount of detergent as recommended by the manufacturer on the label of the detergent container). Draw at least 5 litres through each set of cups. Raise each cluster clear of the liquid and lower it back into the liquid a number of times to obtain a turbulent action during this process.
It is generally recommended that:
acid be used in the morning and alkaline at night,
or alternatively alkaline 12 times and acid twice per week.
6. Final rinse: draw at least 5 litres of water at a temperature of at least 90 ° C through each cluster as a final rinse.
7. After the final rinse, run the machines under vacuum for 2 minutes prior to shutdown to remove moisture from the vacuum pump and to leave it re-oiled.
8. Withdraw all plugs and releaser flaps and open all drain points to permit air drying between milkings
9. Dismantle and manually clean the releaser if required.

Milking Machine (*Automated cleaning*)

Use a low to medium-foaming general-purpose detergent suitable for circulation cleaning. Medium to high-foaming detergents may produce excessive foam during circulation cleaning. The basic cleaning- in-place procedures, variations of which may be required in specific instances, are:

1. Follow the steps set out in paragraphs 1, 2, 3 and 4 of Milking Machines (manual cleaning) procedure.
2. Remove and separately clean those items that cannot be effectively cleaned by circulation cleaning, or that restrict the velocity (flow) of the cleaning solution.
3. After the machines have been arranged for circulation cleaning, circulate with a cold rinse followed by a cleaning-in-place detergent at a temperature:
 - a) of 60-80 ° C when an alkaline general-purpose detergent is used, or
 - b) of 80-90 ° C when an acid detergent is used.

NOTE: Filling the machine will reduce the effect of heat loss and minimise the load on the detergent solution.

4. Circulate the detergent cleaning solution for approx. 3 minutes, allowing the first 10 litres to run to waste. If the temperature of the solution at the outlet of the return line falls below 60 degrees C, circulation should be discontinued as redepositing of milk residues may occur. Maintain sufficient flow and turbulence in the pipeline (e.g. by using a surge valve) to ensure effective cleaning.
5. Discharge the detergent cleaning solution from the circuit, and
6. Draw hot water (at least 90 ° C) from the intake through the machines to waste. Do not recycle this water.

The protocols for the parlour wash cycle and overall cleaning should be clearly displayed and all milking staff should be familiar with the parlour wash procedure.

The chemicals used in the wash cycle should be those recommended by the parlour manufacturing company. Chemicals must be stored safely and only used by staff members who have undergone proper training.

It is important that enough water is always available to complete each cycle and that water temperature, above 90°C at the start of the cycle and 60°C at the end of cycle is maintained.

Milk Tank

The milk tank needs to be cleaned regularly and monitored to ensure the milk can be cooled to 10°C within one hour and reach 4.4°C in two hours. As sheep milk on small and medium sized farms is often stored in the tank for 3-4 days, the milk temperature should be brought down and kept at 2.5°C. The milk temperature should be constantly monitored to ensure it remains within industry target. The system should alert for any changes in milk temperature of above 8-9°C for a period of more than three hours.

Milk collection by the processors should ideally be daily or at least no more than once every couple of days to ensure its quality. Despite the milk being cooled to 2.5°C, certain psychrophilic bacteria, such as *Pseudomonas*, would survive and multiply rapidly in cold temperature, with little competition from other bacteria. Milk processors will send milk samples from each consignment for laboratory analysis, to ensure no pathogenic bacteria such as *Salmonella*, *Listeria Monocytogenes* and *E.coli* 0157 are present in the milk. Aerobic plate counts should also be performed to monitor the overall numbers of bacteria in the milk. Coliform bacterial counts would provide information about possible environmental bacterial contamination indicating possible issues with milking routine hygiene. *Staph. Aureus* counts would be an indication of the level of contagious bacterial udder infection in the flock.

Milk should also be routinely tested for any inhibitory substances such as antibiotics, pain relief medication (NSAIDS), wormers, and others. Animals who are being treated with any medication should be clearly identified and all staff members should be aware of the animal's identification and the treatment given. All treatments must be recorded in the medicine records. Milk with holding periods should be clearly noted and observed. The milk of such animals must be tested on farm (by a "Delvo" or other test kit), or sent for laboratory confirmation, after the withhold period has passed, before it is allowed to go back into the milk tank.



Fig 10: Wash cycle chemicals safely stored Fig 11: Clean parlour and equipment.



Fig 12: Clusters drying post washing.

Fig 13: Clean milk meters.

Good communication between all farm staff, the farm's vet and nutritional advisor, the milk processor and the referent laboratory testing for milk quality will all contribute to better health, welfare, and productivity results. Cleanliness, good hygiene, and attention to detail by all involved in the milking, management and husbandry of the flock will help promote the production of safe, high-quality milk for human consumption.