

MASTITIS MANAGEMENT

Training Handbook for Extension Workers



THE UNIVERSITY of EDINBURGH
Royal (Dick) School of
Veterinary Studies

Supporting
Evidence-based
Interventions

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Foreword

Mastitis is a complex multifactorial disease affecting many farmers in low-income countries. Early detection of mastitis and good management practices are necessary to tackle the disease in the short and long term. Even though dairy farmers are aware of the disease, cultural practices, poor knowledge, lack of money and therefore supplies, manure management and other factors make it difficult to prevent and control mastitis.

This handbook is a tool to help local extension officers facilitate farmer workshops on the causes and prevention of mastitis. If farmers identify the causes of mastitis for themselves and they identify ways of preventing mastitis themselves then they are more likely to implement the changes on a long-term basis. The aim of the farmer workshop is to give the relevant information to dairy farmers and their advisors, but also to bring about change in practices, which will reduce mastitis.

This training package has two parts:

Part I includes the importance of changing practices, improving knowledge of mastitis, causes and prevention, good management practices and diagnostic tests and treatments.

Part II provides guidelines on how to run a farmer workshop, including an example timeplan, activities and the desired outcomes.

In addition, a series of videos on mastitis have been developed to accompany this handbook. These can be used by the extension officers to reinforce the training where deemed appropriate.

It is hoped that this handbook can help others to plan their training on mastitis and the attached materials (videos and infographics) are widely used by all people working in the dairy sector.

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List of Acronyms

DCT	Dry Cow Therapy
CMT	California Mastitis Test
SCC	Somatic Cell Count
GHP	Good Health Practices
GMP	Good Milking Practice
FL	Front Left
FR	Front Right
HL	Hind Left
HR	Hind Right
ID	Identification

Part I.

Part I includes the importance of changing practices, improving knowledge of mastitis, causes and prevention, good management practices and diagnostic tests and treatments.

Mastitis management

1. Bringing about change

The basics of mastitis control are not new, they are well known and documented. However, local application will require local knowledge and willingness to change practices. If farmers can identify what causes mastitis and what they can do to reduce mastitis, then change is more likely.

There are both drivers for change and barriers to change. Both need to be identified in any particular culture or situation. So, in a training course the barriers need to be addressed and the drivers harnessed to bring about long term sustainable change.

Drivers for change:

Drivers may include better payments for milk, improving productivity and milk quality, pride in their product, protecting calves from death, improving shelf life of milk, reducing mastitis infection, preventing spread of infection and improving public health through safe milk.

Barriers to change:

Barriers may include cost of change, lack of motivation, poor access to knowledge and resources, traditions, parental disapproval, peer pressure disapproval, lack of support for change, don't like change, why change, requires work, fear of the unknown/new, past experience of failures with innovation changes, lack of support or leadership for change, practicalities, lack of time or lack of focus.

Why control mastitis?

Mastitis control is important because it can lead to:

- ✓ Reduced household income
- ✓ Reduced milk yield due to cows being ill
- ✓ Discarded milk
- ✓ The biggest loss is the future production of that cow.
- ✓ Treatment cost

- ✓ Poorer milk quality, poorer taste in milk and milk products
- ✓ Reduced shelf life.
- ✓ Reduced confidence of buyers
- ✓ Loss of value of a cow
- ✓ Animal welfare concerns – sore and ill cows
- ✓ More hassle and less job satisfaction for the farmer

2. What is Mastitis

Mastitis is the inflammation of the mammary gland and udder tissues. It usually caused by bacterial infection entering via the teat canal

As the udder responds to the infection, mastitis can be detected in the milk, udder and cow. Changes in the milk quality and composition can be seen as clots, flakes and changes in colour and consistency. If mastitis is severe, the udder is hard, swollen, and the cow may be visibly ill.

Anything that reduces the cow's ability to fight infection will increase mastitis, such as concurrent disease or any other stressor. Making sure cows have good feed, especially approaching calving and for 2 weeks afterwards, will supply the energy needs during lactation. Access to good quality water for rumen fermentation improves the cows ability to fight infection. Minerals are also important for immunity.

Types of Mastitis

Clinical Mastitis: Is characterised by sudden onset and alterations in milk's appearance and composition. It is easily detected because of the presence of inflammation in the infected teats, redness, hardness, heat and pain. Clinical mastitis can be mild, moderate or severe. Cases that only include local signs are referred to as mild and moderate. If the inflammatory response is systematic and includes shock, anorexia, fever, dehydration, then the case is termed severe.

Subclinical Mastitis: Is a form of mastitis where the presence of the infection have not apparent signs of local inflammation. Visually, the udder seems normal and the milk appears normal, although transient episodes of abnormal milk or udder inflammation may appear. This type of mastitis is often asymptomatic and for this reason, the infection is persistent and can be detected by examination of the somatic cell counts using either California Mastitis Test (CMT) or Somatic Cell Counts (SCC).

3. Causes of Mastitis

Mastitis is usually divided into two types;

Contagious mastitis is caused by bacteria that are located on the udder and teat skin. They are transferred from cow-to-cow during milking. They easily adhere to the skin, colonising the teat end and then invade the teat canal.

Environmental mastitis is caused by bacteria present in the farm and surroundings. They can transfer to the teat during milking, when the cow is lying down or eating. They can enter the teat canal specially when is open i.e. after milking.

Also flies feed on dirt, manure and on skin. They will take bacteria from cow teat to cow teat and from manure to cow teat. Fly control is therefore very important.

All dairy farmers need to pay attention to the hygiene that reduce the number of bacteria that are around the teats and the infections they cause:

- ✓ Bacteria like warmth, moist, dark, dirt
- ✓ Bacteria do not like clean (no food), dry, sunlight, or detergents and antiseptics

It is important to recognise the source of the infection, as the prevention and control may vary according to the source and if the cow is in the lactating or in the dry period.

Cells in milk

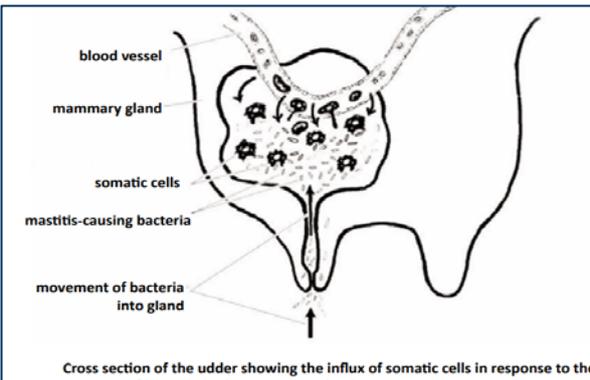
When bacteria invade the teat canal and then enter into the mammary gland, the immune system of the cow responds sending large numbers of white blood cells to the mammary gland, which surround the bacteria and destroy it.

The final concentration of all the cells in milk is called the somatic cell count (SCC).

Bear in mind...

White blood cells:
They are the cells involved in protecting the body against infections.

Somatic cells:
They are mainly white blood cells that increase in number in response to the bacteria that cause mastitis.



The diagram illustrates a cross-section of the udder. It shows a blood vessel at the top, a mammary gland in the center, and somatic cells (represented by small black dots) moving from the blood vessel into the mammary gland. Mastitis-causing bacteria (represented by larger black shapes) are shown entering the mammary gland from the teat canal. An arrow points to the teat canal with the label 'movement of bacteria into gland'. Below the diagram, a caption reads: 'Cross section of the udder showing the influx of somatic cells in response to the presence of bacteria in the mammary gland.'

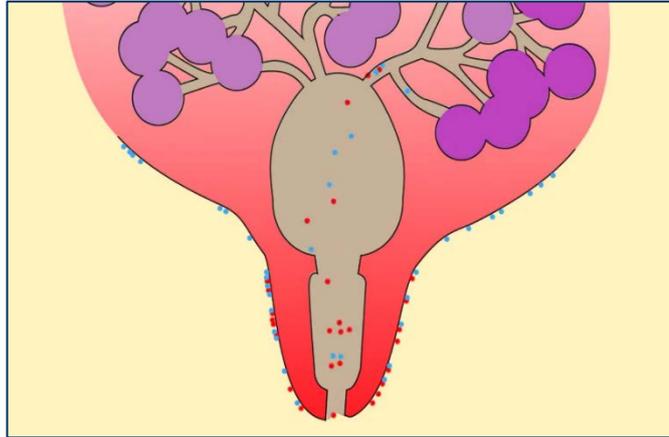
Source: CellCheck

The concentration of somatic cells is important because is an indicator of mastitis. The higher the number of somatic cells the worse is the infection.

When collecting milk samples for analysis, bear in mind that the concentration of cells in milk will vary from day to day, so it is important that an average is used. For small numbers of cows this should be done over several different days.

Video 1 Introduction:

In this video, you will find the definition of mastitis, its causes, types and how the immune system fight against pathogens (bacteria).



Key take away message: Keep bacteria at the teat end low. Bacteria like warm, moist, dark, dirty conditions. Bacteria do not like clean environment, as there is no food for them. They do not like dry, sunlight, or detergent or antiseptics.

Mastitis Diagnosis

California Mastitis Test

This is a simple indicator of the level of somatic cell counts in milk and it is a very useful cow-side technique for detecting sub-clinical mastitis, providing an immediate result that can be interpreted by any person on farm.

The test works on the basis that mixing milk with a reagent causes the rupture of somatic cells. When the DNA is released from the cells it coagulates and form a “jelly” - the more cells are in the milk the more “jelly like” reaction, indicating the presence of mastitis pathogens. The reaction is scored on a scale from 0 to 3, with a score of 2 and 3 being a positive result. This result is not a numerical result but an indication of the amount of somatic cells; these could be high or low. The CMT will only show changes in cell counts above 400.000 cell/mL. The table below show how to interpret the reaction:

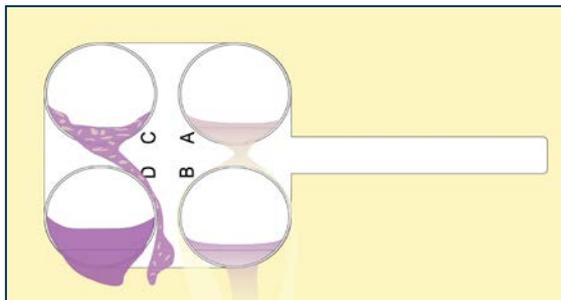
Descriptions of the reactions observed in the CMT used to allocate the milk samples to the four categories and scores.

Category	Score	Description of reaction
Negative	0	Mixture of milk and test fluid stays unchanged and can easily be shaken
Weakly positive	1	Mixture is slightly mucous but can still be shaken
Positive	2	With movement of the mixture an unmistakable mucous formation can be seen. It is still possible to tip a small portion of the mixture out
Strongly positive	3	Jelly-like, mucous consistency is formed and it is difficult to shake the mixture. It is no longer possible to tip out any surplus liquid

Source: Leach et al. 2008

Video 2. California Mastitis Test

This video shows how to perform the CMT Test step by step



What do you need in order to perform a California Mastitis test on farm?

1. Materials

- Milk Sample
- CMT Reagent
- CMT Paddle
- Gloves

2. Methods

See the infographic below

3. Video

See the video



California Mastitis Test – CMT

Materials

- Milk Sample
- Four well paddle
- Reagent
- Gloves



Results

Score	Description of reaction	Mastitis Category
0	Mixture stays unchanged and can easily be shaken	Negative
1	Mixture is slightly mucous but can still be shaken	Weakly positive
2	With movement of the mixture an unmistakable mucous formation can be seen.	Positive
3	Jelly-like, mucous consistency is formed and it is difficult to shake the mixture.	Strongly positive

Method

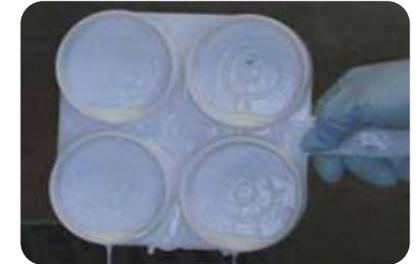
1. Clean Udders and strip the teats to remove the first milk



2. Use the paddle always in the same orientation and take the milk sample



3. Tilt the paddle so equal amounts of milk are in each well



4. Add equal volume (3ml) of reagent to the milk



5. Shake the paddle to ensure mixing of the milk and reagent



6. After 20 sec try to pour out the sample and score the reaction in each well from 0 to 3



! Remember the quarters: FL: Front Left, FR: Front Right, HL: Hind Left and HR: Hind Right

Somatic Cell Counts - SCC

The somatic cell count is a main indicator of milk quality. The infection of bacteria in the teat and in the canal may increase the numbers of somatic cells as a response to the infection.

Uninfected cows general have SCC levels below 100.000 cells/mL. A rise above 200.000 cell/mL could indicated that an infection has occurred. The importance of individual cow monitoring of cell counts is important to determine how many cows in the herd are affected and to what extent. In small herds, a high SCC from an individual cow will have a huge impact, while in large herds milk from a sick cow can be diluted with the others. The following table shows can be used as a guide to interpret the SCC results at the bulk level

Guides on bulk tank SCC levels (cells/mL)

Somatic Cell Count (cell/mL)	Interpretation
<150.000	Excellent mastitis and SCC control
150.001 – 200.000	Good control of mastitis and SCC
200.001 – 400.000	Unstable control of mastitis and SCC review mastitis control
>400.001	Indicates little/no control of mastitis in herd and urgent action is needed.

Source: Cell check - Farm guidelines for mastitis control (on-line).

SCC monitoring is important to prevent economical losses as the number of somatic cells increases; milk yield is likely to decrease. SCC cannot be performed on farm, which means, samples must be taken and send it to a laboratory.

What do you need in order to collect milk samples for laboratory analysis?

1. Materials

- Disposable gloves
- Alcohol or surgical spirit
- Cotton ball or gauze pad
- Sterile sample pot
- Pen or marker

2. Methods

See the infographic below

Total Bacteriology Counts

Sampling for microbiological analysis allow us to identify the bacteria that is causing mastitis. Having a bacterial count of each type of bacteria present in milk, can help in diagnosis and lead us to a better treatment. A single milk sample should be collected for both SCC and TBC.



Collecting Milk Samples

Objective

To obtain clean samples and identify the types of bacteria present on the milk.

Materials

- ✓ Disposable gloves
- ✓ Alcohol or surgical spirit
- ✓ Cotton ball or gauze pad
- ✓ Sterile sample pot
- ✓ Pen or marker

Method

1. Wash your hands and put on new disposable gloves.
2. Using a permanent marker, label a new sample tube with the **date**, **cow ID**, and the **quarter** that the milk will be collected from (**FL** for front left, **FR** for front right, **HL** for hind left and **HR** for hind right).
3. Pre-dip the teats with an effective germicidal teat dip and leave the dip on for 30 seconds.
4. Wipe each teat dry with a single-use paper or cloth towel.
5. Discard 3 to 4 streams of milk to minimize risk of contamination of the sample with bacteria in the teat canal.
6. Scrub teat ends with a cotton ball or gauze pad soaked in alcohol.

Do not touch the teats with dirty hands after this stage; if any dirt is splashed onto the udder repeat the above steps before taking a sample.

7. Open the sample tube immediately before the sample is taken. Collect milk until the sample tube is 1/3 to 1/2 full, holding the tube at an angle to prevent loose dirt or hair from falling into it. Immediately close the tube once filled.
8. Immediately put the sample tube in the refrigerator or on ice.



Photos:
<http://extension.msstate.edu/publications/publications/collecting-milk-samples-for-microbiological-analysis>

4. Mastitis Control

Prevention is the key to reduce the occurrence of mastitis in the herd, but it is important to understand it as a multifactorial disease involving many elements. The diagram below shows key areas where improvements could be made.



Good Milking Practice - GMP

So how do farmers- Reduce the number of bacteria on the teats and reduce mastitis?

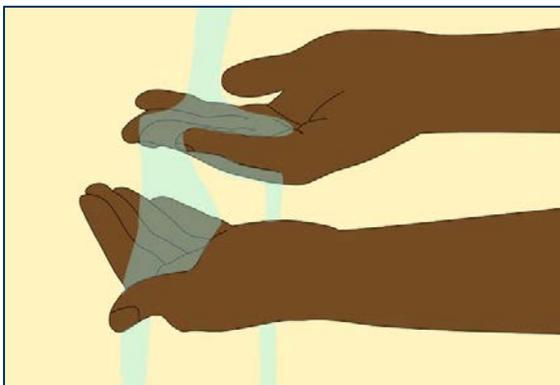
Best practice is to have a good milking routine that is carried out every time the cows are milked. Good milking practice can prevent the occurrence of mastitis and help farmers to attain better milk production and quality.

Good Milking Practice Checklist	
✓	Clean milking person
✓	Clean udder
✓	Clean milk
✓	Good Milking Routine
✓	Teat dipping post-milking
✓	Clean cows
✓	Clean equipment

Clean Milking person

The Hygiene and cleanliness of the person milking the cows is important in producing clean and healthy milk. They should milk the cow paying full attention to the task and not smoke, spit or cough while milking. People with illness should not milk the animals.

- ✓ Hand should be washed with soap and dried with a clean cloth before starting to milk and in between cows.
- ✓ Best practice is to wear nitrile gloves that are easily cleaned.
- ✓ Trimming fingernails is important, as long fingernails can cause cuts in the teats or the udder and favour the appearance of bacteria.
- ✓ Bacteria live in the cracks and sores of skin. Using “salve” or “milking jelly” in hands and teats will help to keep skin healthy with a low bacteria content.



Video 3. Good Milking Practice II: Preparing for milking

This video shows the importance of having a good hygiene previous to milk the cows.

*Key take away message: It is important not to take contagious mastitis bacteria from cow to cow.
Keep hands clean and dry.*

Clean Udder

The udder should be cleaned before milking to remove dust and dirt that may otherwise contaminate the milk. It also stimulates the cow to let down her milk.

To ensure proper hygiene of the udder the following steps should be taken:

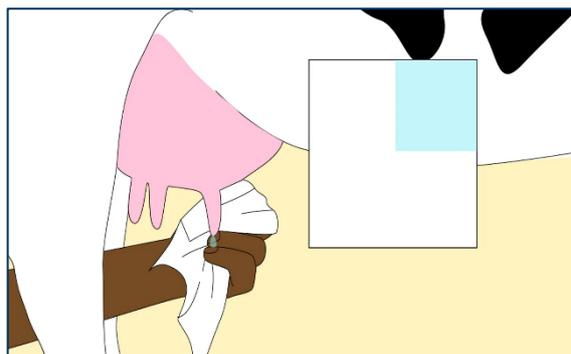
1. Before milking, the udder and teats should be thoroughly cleaned. Use either a pre-dip cleaner or four corners of a damp cloth to clean the four teats. The cloth should NOT be returned to the bucket.
2. Use paper towels or reusable cloth towels to dry the teats. One paper or cloth towel should be used for each cow to wipe the teats clean and dry before the milking. Not drying can leave a drip on the teat end that will either end up in the teat causing mastitis or in the milk resulting a shortened shelf life.

If cloths are used, it is easy to take bacteria from cow to cow, therefore there should be two colour co-ordinated or labelled cloths for each cow. One cloth for washing and one cloth for drying. Each cow has its own cloths. Two labelled cloths per cow are needed for each milking. The cloths must be washed and dried between milking, so a minimum of four cloths per cow is required. For larger herds where labelling or co ordinating is not possible then cloths should be washed at a minimum of 60 degrees for minimum of 20 mins.

Research has shown that when cleaning the udder before milking: Dry wiping without water is better than washing without drying. So if you wash you MUST dry.

Video 4. Good Milking Practice II

This video shows how to clean the udder effectively.



Key take away message: The udder needs to be clean before milking. But if you wash you MUST dry.

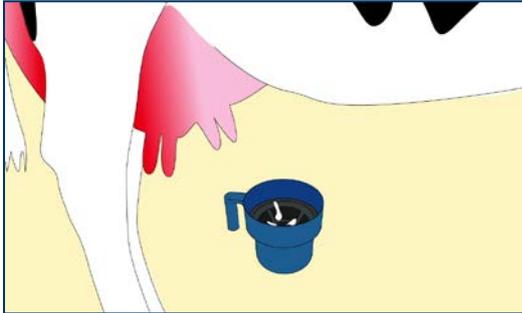
Good Milking Routine

Good milking routine is important. Repeating same activities everyday can create a good habit and therefore a consistent routine.

After hands and udder are clean and dry, the following steps should be taken:

1. Ensure the cow is calm by gentle handling, touching her, talking to her and maintaining routine actions during milking.
2. Before starting look and feel all four quarters for changes in the udder. Feeling or massaging the udder will help with milk let down
3. Strip first milk from each quarter into a strip cup to check for clots or mastitis. Stripping also stimulates milk let-down and increases milk flow rate.
4. If there is a case of mastitis, keep the mastitis milk separate from the good milk.
5. Milk the cow completely and evenly as possible. Milk left in the udder contributes to the flare-up of mastitis. Do not over-milk the cow. Over-milking could increase the risk of teat end damage, therefore cows are more likely to get mastitis.
6. Use post-milking teat dip.
7. Encourage the cow to stand for about 30 - 45 minutes (e.g. by giving feed) to allow the teat canal to fully close. If cows lie down after milking and the open teat is in contact with the ground or manure, bacteria can more easily invade the teat end.

Key take away message: Milking should be performed by the same person every day, milk the cow completely and evenly as possible. For tips on how to hand milk a cow, see the video below:



Video 5. Good Milking Practice I: Hand milking

This video shows a good milking routine as recommended by SNV.

Teat Dipping

After milking, the teat canal remains open for about 30 - 45 minutes allowing bacteria to enter. Using a teat dip after milking can help prevent infections by killing the bacteria on the teat end and helps to keep the skin supple and healthy. Commercial teat dips contain disinfectant (such as iodine) to kill bacteria, and emollient to promote healthy skin. Mastitis can be prevented with regular teat dipping. In fact, teat dipping could reduce the occurrence of mastitis by 50% (Nickerson, 2001).

Key take away message: Teat dipping is the most effective mastitis control measure available, but it only works if it is done after each milking.

How to perform the teat dipping?

1. Materials

- Dip cup or any cup/glass
- Commercial teat dip

2. Methods

- Follow the label instructions

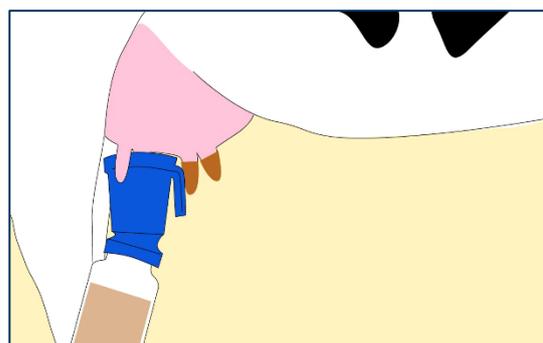
3. Application

After milking the animals, immerse at least $\frac{3}{4}$ of the teat into the post dip disinfectant. Make sure all four teats are covered.

For further information, see the video

Video 6. Good Milking Practice I: Hand milking

This video shows how to perform a teat dipping and why is important to include it into the daily milking routine.



If the calf is still suckling it should be allowed to drink before teat dipping as the bitter iodine taste will dissuade the calf from suckling. This means the cow will need to be restrained for longer.

Clean equipment

Good standards of hygiene are of the utmost importance for the quality of the milk and its products, as well as for the producer since the milk price often depends on quality.

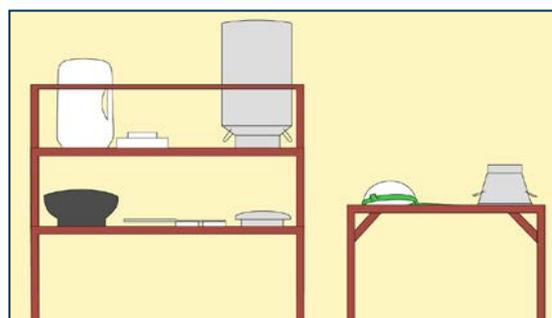
Utensils and containers used for milking need to be properly cleaned. To ensure all the residues are removed, please follow the next steps:

1. Separate the utensils in two different groups:
 - i) Those only used in the dairy
 - ii) Those that have been used where the cows are
2. Clean first the dairy utensils used in the dairy, as it will only have been in touch with milk. Rinse them first with clear water and then washed them with hot water and detergent. Scrub all the utensils in hot water, then rinsed them again with clear water.
3. After the utensils are clean, immerse them into a bucket previously filled with water and disinfectant. Make sure all the surfaces are in contact with the disinfectant.
4. Finally, allow the utensils to dry upside down and well ventilated.
5. Follow the same procedure for the utensils used where the cows are. Make sure the buckets are free from cow manure.

Key take away message: Clean equipment not only helps to prevent mastitis but also keeps the milk safe and hygienic.

Video 7. Cleaning and disinfecting milking equipment.

This video shows how to clean properly the utensils used in milking.



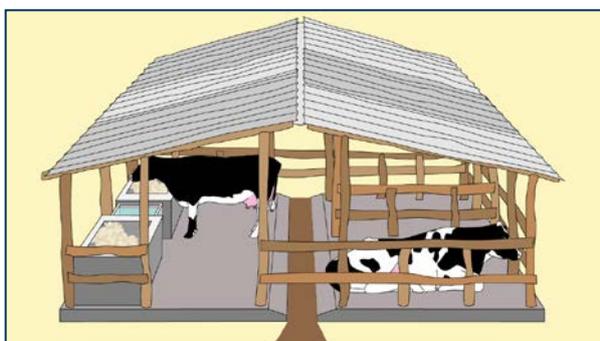
Clean environment

Hygiene in the shed is important to avoid reduce environmental mastitis. Good practices include: cleaning the shed, separate areas for feeding and dung, and good ventilation.

The shed should be constructed so that is easy to clean and kept dry. It should also be well-ventilated. Do establish a daily and weekly cleaning routine, so the shed is always clean.

To ensure the shed is managed properly, the following steps can be follow:

- ✓ Ensure manure is removed from lying areas
- ✓ Check the length of the beds or standing alley so that dung should go to the dung alley or compost pit.
- ✓ Floors should be slope so manure, urine and water drain away from cow areas.
- ✓ Ensure there is a good drainage from the cow and dairy areas
- ✓ Flooring should be appropriate to the number of animals and conditions
- ✓ Make sure there are not wet or muddy patches for people or cows to walk through
- ✓ Ensure broken concrete and damp areas are addressed



Video 8. Hygiene in the shed

This video shows a correct shed management.

Key take away message: Keeping the shed clean helps to reduce the number of bacteria and therefore decreases the risk of environmental mastitis.

Hygiene Score

Hygiene score is a system created to help farmers to score cows based in how much dirt adheres to their flank, tail, back legs and udder. The score not only helps to monitor how clean is the housing in which the cows are being kept but also, measures nutritional and health issues i.e. diarrhoea.

Key take away message: Clean cows mean less mastitis. As cows becomes dirtier, the risk of infection increases rapidly.

Scores will include the cleanliness of three zones: lower hind leg, udder, and flank zones, including the tail. Each zone will be scored separately for the same person every time to maintain accuracy and scores will be recorded. The table below gives guidance on scoring cleanliness and the infographic 3 shows the method to score cleanliness.

Scoring cleanliness in dairy cows

Score	Level of cleanliness
0	No dirt or only minor fresh or dried splashing present
1	An area of dirtiness at least palm size (10 x 15cm)
2	An area of dirtiness amounting to at least forearm length (40cm) in any dimension

Adapted from: http://dairy.ahdb.org.uk/resources-library/technical-information/health-welfare/cleanliness-score-card/#.XUeKM_ZFzIU

Video 9. Hygiene in the shed, let the cows tell you

This video shows how to score for hygiene and the causes of dirtiness.



Clean cows means the system is working, dirty cows means it needs attention. The cows will tell you where the problem is, for example:

Farm 1

Cow: Martina	Hygiene Score
Flank including tail	0
Udder	2
Lower hind leg	2

If the udder and lower part of cows are dirty, there is a problem with where the cows are lying

Farm 2

Cow: Martina	Hygiene Score
Flank including tail	0
Udder	0
Lower hind leg	2

If only the lower part of cows are dirty, there is a problem likely to be cleaning of the passageways

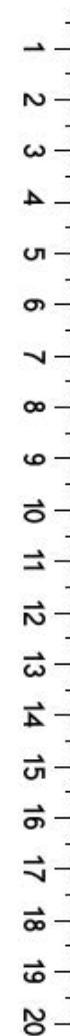
Infographic 3. Hygiene Score.

OPTIMAL DAIRY SYSTEMS



Scoring cleanliness

Score	Clean	Flank (including tail)	Lower hind leg	Udder
0	<ul style="list-style-type: none"> No dirt or only minor fresh or dried splashing present 			
1	<ul style="list-style-type: none"> An area of dirtiness (ie layer or plaques of fresh or dried dirt) at least palm size (10 x 15cm) 			
2	<ul style="list-style-type: none"> An area of dirtiness (ie layer or plaques of dried dirt) amounting to at least forearm length (40cm) in any dimension 			
Factors that may affect cleanliness		<ul style="list-style-type: none"> Cubicle cleanliness Cubicle comfort Amount and type of bedding Manure consistency and health of the herd 	<ul style="list-style-type: none"> Frequency of: <ul style="list-style-type: none"> – alley cleaning – running of automatic scrapers – cleaning of crossover alleys – cleaning of collecting yard Space allowance per cow 	<ul style="list-style-type: none"> Cubicle cleanliness Cubicle comfort Amount and type of bedding Cleanliness of alleys Amount of hair on udder Manure consistency and health of the herd



Source: <https://dairy.ahdb.org.uk/resources-library/technical-information/health-welfare/cleanliness-score-card/#.XcKbyTP7TIU>

Infographic 3. Hygiene Score (continued)

Why score cleanliness?

The cleanliness of a cow's coat is an important indicator of cow comfort. In general, given the choice, cows will choose to lie in clean, dry areas, and dirt on a cow's coat can have various causes.

Excessive layers of dried dirt provide optimal conditions for ectoparasites and can irritate the skin, increase cold stress and the risk of disease and may cause issues at or prior to slaughter. This layering of dried dirt indicates a long-term build-up and highlights weaknesses in the cleaning routine of the alleys and/or cubicles or lack of grooming facilities.

A high level of dirtiness on the legs and flank is associated with increased risk of lameness, digital dermatitis, interdigital dermatitis, slurry heel and mastitis. It can also obscure skin damage and foot lesions, preventing early detection and increasing recovery times. Dirtiness can be caused by poor slurry systems, lack of bedding, overstocking, or poached paddocks.

A high level of dirtiness on the udder is strongly associated with the development of mastitis, adds to pre-milking cleaning and increases the risk of poor milk quality. Frequent and strategic cleaning of the alleys and cubicles will reduce the amount of manure on cows and the amount of manure tracked into the cubicle.

How to score your herd

1. Scoring the entire herd is best practice. However, the table below gives guidance on the minimum number of cows you should score to get an accurate picture of your herd. For example, if you have a herd size of 125 cows, you need to score 65 cows.

Herd size	Minimum sample size
Up to 50	30 (or all cows if < 30 in herd)
50-100	50
101-200	65
201+	73

2. Visually assess the entire cow according to the following areas:
 - Flank (including tail)
 - Hind leg
 - Udder
3. Choose a time and place that will allow you to observe cows, for example, legs and udder can easily be observed in the milking parlour. Alternatively, observe

cows when doing routine management procedures such as hoof trimming, AI, PD checks, routine vaccinations, etc.

4. Tally the scores for each body part.

Using the information

- Investigate the causes of very dirty cows (score 2) in the cow's environment
- Manage necessary changes to assist with reducing the number of 'score 2' cows
- Regularly score the herd and monitor the number of very dirty cows to determine if changes have had the desired effect

Key benefits of scoring

- Use as a troubleshooting tool to measure cleanliness of your cows and as a way to assess improvements in hygiene management
- Observing cows and noting body parts that are too dirty can help identify places in the cow's environment that may need action in order to help reduce the risk of disease
- Clean cows have clean udders and are healthier
- Motivates farm staff to improve cleanliness and, therefore, overall herd health and performance
- Use to meet the recommendations or requirements of assurance schemes

Further information

Information and a short film to help understand the score system can be viewed on the AHDB Dairy website at dairy.ahdb.org.uk

HEALTHYFEET MASTITIS CONTROL PLAN

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AHDB

Source: <https://dairy.ahdb.org.uk/resources-library/technical-information/health-welfare/cleanliness-score-card/#.XcKbyTP7TIU>

Treatment of mastitis

The early detection and treatment of mastitis is important to reduce damage to the glands that produce the milk and to stop the bacteria spreading from cow to cow.

The first step in treatment of mastitis is the complete milking of the affected cow. The milk should be discarded properly.

The most common treatment for mastitis are antibiotics, but the use of antibiotics is under the direction of your local veterinary surgeon and advice must be obtained. On the other hand, the adoption of alternative therapies by farmers could help to decrease the flare up of mastitis (e.g application of udder creams and ointments and milking more often).

Appropriate drug treatment is usually direct intra-mammary infusion of the special antibiotic tubes prepared for the treatment of mastitis, twice a day for three consecutive milkings (or as the directions on the tubes being used advise)

How to use intra-mammary infusions?	Remember!
<ol style="list-style-type: none">1. After milking the mastitis-affected cow, teats should be cleaned and disinfected,2. Remove the tube cap and insert the tip into the teat and then infused the drug,3. Teat dip the teat after treatment	<p>Milk cannot be used for human consumption for several days after treatment. Read the leaflet for withdrawal periods.</p> <p>Do not mix the milk from treated cows with milk from healthy cows.</p>

Where a cow is visibly ill, consult a veterinarian for additional treatments like antibiotic injection or anti-inflammatory drugs to stop inflammation and reduce the pain.

Record the date, the cow name or number, and which teat is affected (e.g. FL for Front left), so that if the mastitis happens again you will then know whether it is a repeat problem and how many cases you are getting per year, so that you can compare with other farmers in your area or cooperative.

Preventing mastitis post-treatment

Cows that have mastitis will have high numbers of bacteria in their milk and on their teats. To stop the transfer of these on to hands and equipment and then on to other cows, wherever possible infected cows and infected quarters should be milked last.

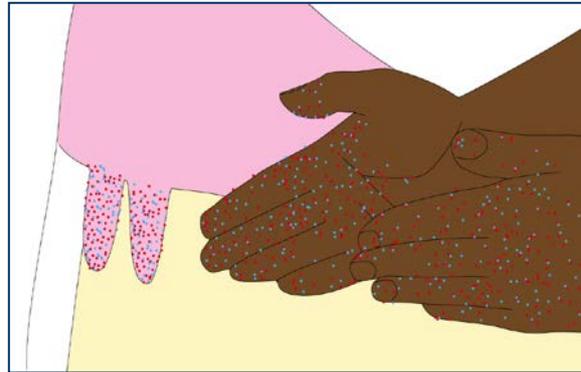
Cows that have mastitis where treatment does not work, or mastitis that keeps recurring will have high numbers of bacteria in their milk and on their teats. To stop the transfer of these

bacteria on to hands and equipment and then on to other cows, wherever possible these cows should be culled or used to rear calves away from the dairy cows.

Flies are attracted to teat ends, to manure and rotting material, and will transfer bacteria from whatever they have been feeding on to the teat ends causing mastitis. Use local fly control methods to stop flies transferring bacteria to the teats.

Video 10. Mastitis management

This video shows how to prevent mastitis and how to record mastitis cases to follow up.



Dry period

All cows should be dry (meaning not milked) before the cow calves again. This allows the udder to repair and restore for the next lactation. A dry period of at least 30 days is needed so the cow will produce more milk.

The dry period has three stages:

- 1) Involution - after daily milking stops, milk secretions change and finally dry up. The udder reduces its activity and gets smaller and the teat canal is sealed with keratin. This period lasts approximately two weeks.
- 2) Steady state - after involution the udder stops changing and there is no active secretion of any product. During this steady state period the recovery occurs, which allows maximal future production of milk. Shortening it to <2 weeks will reduce milk production.
- 3) Colostrum production and start of lactation - the udder starts again to produce milk and starts to enlarge and the lining becomes active. This period lasts around two weeks.

Dry cow treatment procedure

If done badly, dry cow treatment can result in udder infections and mastitis. Good hygiene and good dry practices are key to prevent infections. There are ranges of products available to dry cows. Talk with your vet and found out, which is the best option for your cows.

Using dry cow tubes to dry

Dry cow tubes are an intra-mammary antibiotic treatment at the end of lactation. They will help eliminate existing infections and help prevent new infections in the dry period. Dry Cow tubes are a long acting preparation and are different to the tubes used to treat mastitis.

Key take away message: When using dry cow tubes hygiene is very important so that no bacteria get into the teat.

How to use dry cow tubes?

1. After milking for the last time, separate the cow off and dry her off after that milking has finished
2. Wash and dry your hands and clean the teat ends with the four corners of a cloth. Focus on the teat end not the udder
3. Dry the quarters with a dry cloth or paper
4. Insert the tip of the dry cow tube into the teat. Infuse each quarter with antibiotic.
5. Massage the treatment up into each quarter
6. Immediately following treatment, dip all teats in an effective teat dip
7. Record the cow number or name and the date of treatment.

When the cow calves, the milk cannot be used for human consumption for several milkings. Read the manufacturers leaflets for veterinary drugs for the milk withdrawal. If cows calve early, within a month of treatment, then the withdrawal time may be different.

Part II

Part II includes guidance on how to run farmer workshops on mastitis, and includes a workshop timetable and details on how to run each of the sessions in the workshop.

On Farm Workshop Guidance

The training days should be run on farm as it is a comfortable environment for the farmers whose literacy and education experience may be varied.

The aim is to bring about change. Learning by **seeing and doing** is much more likely to bring about change than formal teaching.

The idea is to facilitate discussions, give information when required, and let the farmers come up with their own solutions. That way they are then more likely to adopt.

While the videos *can* be used in the training, they are aimed at re-enforcement of the training.

Workshop Timetable

This example timetable is provided as a guide only. The trainer can modify the timetable as necessary to meet with local requirements and available resources.

	<u>Session</u>	<u>Duration (min)</u>
1	Introductions	
1.1	Introductions & Spreading the bugs	20
	Total	20 min
2	Mastitis	
2.1	Why control mastitis?	20
2.2	What is mastitis?	35
2.3	Bacteria invading.	15
	Total	1 h 10 min
3	Mastitis Control	
3.1	Milking Practice. Ask farmers what they do.	10
3.2	How do farmers reduce numbers of bacteria?	15
3.3	Udder Washing demonstration.	25
3.4	Teat dipping demonstration.	20
3.5	Milking Equipment hygiene demonstration.	20
	Total	1 h 30 min
4	Hygiene Score	
4.1	Discuss cow hygiene.	5
4.2	Scoring sheets using photographs.	20
4.3	What do hygiene scores tell us?	10
	Total	35 min
5	Treatments	
5.1	Ask farmers what treatment they use for mastitis.	10
5.2	Treatment presentation.	15
5.3	Dry cow therapy.	10
	Total	35 min
6	Review	
6.1	Facilitate a discussion with farmers. What they would do differently and why?	20 min
6.2	Record on to flip chart	

Workshop Sessions

Session 1 – Introductions

Total 20 min

Welcome the participants and ask everyone to introduce himself or herself briefly.

As people are arriving and in the general welcoming, the *Trainer* should secretly spray their hand with a cheap perfume before shaking as many people by the hand as possible. At the very start of the session the *Trainer* should ask everyone to smell their hands. Most of which will have the smell of the perfume on them.

Ask the delegates to hold that idea about how easy it is to spread perfume from hand to hand. Or in what we are thinking about how easy it is to spread bacteria from hands to cows' teats.

Session 2 –Mastitis

Total 1 h 10 min

2.1 Why control mastitis? (20 min)

The farmers are here to learn about mastitis. Ask why they want to control mastitis?

Make a list of the reasons on a flip chart or paper.

2.2 What is mastitis? (35 min)

Explain the types of mastitis; clinical and subclinical

Explain and discuss the causes of mastitis and explain that mastitis can be divided in to two main causes:

- Contagious mastitis-caused by specialist bacteria that colonise the udder and skin.
- Environmental mastitis caused by bacteria from manure, dirty cows, dirty sheds and damp unhygienic conditions.

Explain that mastitis is a fight between bacteria invading the udder and the cow fighting the infection. Anything that reduces the cows ability to fight infection will increase mastitis.

Use the 'push across the line' demonstration as follows:

One volunteer is the cow and if the volunteer is pushed across the line then it gets mastitis. Another volunteer is the bacteria. By increasing the number of bacteria volunteers the more likely the cow gets pushed across the line.

Use the 'ping pong ball' demonstration of immunity.

Mastitis can be seen as a constant battle between the bacteria invading the teat end and the cow fighting it off. Using ping pong balls or screwed up paper balls the trainer throws one to a volunteer. If the ball hits the ground the cow gets mastitis. If one ball is thrown then the incidence of the ball hitting the ground is low. If the trainer then throws 2 or 3 balls to the volunteer then the incidence is high. So mastitis prevention is all about reducing the number of bacteria on the teat end.

Show INTRODUCTION video:

https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_vkiclf5v

2.3 Bacteria invading (15min)

Ask the farmers what things make it more likely that bacteria will invade the teat end and cause mastitis?

Make a list of the things on a flip chart or paper.

This will hopefully emphasise:

- Teat end damage- cuts, abrasions, FMD, rough milking.
- High levels of bacteria on the teat end- dirt, manure, dirty cloths, poor cleaning, transfer of bacteria, Spread from cow to cow via hands & milking equipment.
- Plus some of the preventative issues.

Session 3 - Mastitis Control

Total 1 h 30 min

3.1 Milking Practice (10min)

Facilitate a discussion on current practices.

Ask the farmers what they currently do before, during and after milking?

3.2 How do farmers reduce numbers of bacteria? (15 min)

Break in to groups of twos or threes and discuss;

How do farmers reduce the number of bacteria on the teats and reduce mastitis?

Feedback as a whole group on to the flip chart or paper and this should bring out:

- The earlier demonstration of the spread of perfume by shaking hands
- Starting with the milker- healthy personnel, clean clothes, wash and dry hands, gloves etc
- Research has shown that when cleaning the udder before milking: Dry wiping without water is better than washing without drying. So if you wash you **MUST** dry.
- Post milking teat dipping
- Udder salve or jelly for healthy skin on hands and udder
- Fly control. Flies may be one of the more significant causes of mastitis in hand milking situations. So emphasis on the local methods of fly control should be discussed.

Then ask for feedback to list the barriers that prevent farmers from carrying out these.

3.3 Udder Washing Demonstration (25 min)

Show the udder washing demonstration as follows;

- Using a hand as an udder put food colouring on two fingers.
- Ask some one to wash the two fingers with just water from a white or clear bucket.
- Use a piece of paper brought up under the 'udder' to show damp on the ends which should still be coloured!
- Repeat but put a cloth in the bucket and ask them to use a cloth from the bucket to wash.
- They will probably return the cloth to the water. Show the colour in the water

Show GOOD MILKING PRACTICE II video:

https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_eqebqo46

Get several people to repeat the washing demo now correctly;

3.4 Teat Dipping Demonstration (20 min)

Show GOOD MILKING PRACTICE IV-Teat Dipping video:

https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_6j7rdx10

Demonstrate the teat dipper and in pairs use it on *udder hands*, then get several farmers to use on one of the cows in the barn.

Talk about the importance of reducing the levels of bacteria on the teats to reduce mastitis and how the teat dip antiseptic kills the bacteria present.

On a flip chart ask farmers to list positives and barriers to the use of teat dip.

Emphasise how using teat dip:

- Reduces number of bacteria especially when teat end is open after milking.
- Reduces both contagious and environmental mastitis.
- Iodine also dissuades flies from feeding on teat end.

Barriers may include:

- Dissuades from suckling so need to restrain cows until calves have fed
- Cost and availability

3.5 Milking Equipment Hygiene Demonstration (20 min)

Show CLEANING AND DISINFECTING MILKING EQUIPEMENT video:

https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_pkvanpda

Discuss and feedback on how good the farmers are on this.

4.1 Discuss Cow Hygiene (5 min)

Discuss as a group how dirty cows mean a much higher incidence of environmental mastitis.

Emphasise:

- Clean cows means the system is working
- Dirty cows means it needs attention.
- Clean cows will have less mastitis.

4.2 Scoring sheets using photographs (20 min)

Show the images of the clean and dirty cows, with scores of 0, 1 and 2.

Look at different cows in the barn, and give them hygiene scores of 0, 1 or 2. Use the images as guidance.

4.3 What do hygiene scores tell us? (10 min)

Scores of 2 mean that there is a problem.

Depending on the number of cows it is possible to use multiple scores of 1 as indicating there could be improvement.

- If only the lower hind legs are dirty then the problem is likely to be cleaning of passageways or poor drainage where cows are walking
- If the udder and lower part of cows are dirty then is it a problem with where the cows are lying?
- If it is around the tail and flank where the tail swishes, is it a problem of diarrhoea? Is there a problem with the diet?
- If the dirtiness is all over, is there a problem of overcrowding or manure removal? Or are the cows trailing manure in to the beds?

Show HYGIENE IN THE SHED. LET THE COWS TELL YOU! SCORING SYSTEM video:

https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_dqrb4jrx

5.1 Ask farmers what treatment they use for mastitis (10 min)

Facilitate a discussion on current treatment practices

5.2 Treatment Presentation(15 min)

Identifying Mastitis

Explain that early detection and treatment of mastitis is important to reduce damage to the glands that produce the milk and to stop the bacteria spreading from cow to cow.

Before starting the milker should look and feel all four quarters for changes in the udder

A strip cup should be used to check for mastitis in each quarter before milking starts. The first milk should be stripped into strip cup to check for clots or mastitis.

Treatment

In case of mastitis, the milker can keep the mastitis milk separated from the good milk.

Treatment measures to be followed during treatment of mastitis

- Complete milking of affected cow. The milk must be discarded properly.
By milking the cow as often as possible, preferably every two hours; at least three times a day bacteria and dead cells are removed from the udder. This removes the infection away.
- The use of medicines is a veterinary decision and the prescription of antibiotics requires local veterinary advice.

Appropriate drug treatment

This is usually direct intra-mammary infusion of the special antibiotic tubes prepared for the treatment of mastitis twice a day for three consecutive milkings. (or as the directions on the tubes being used advise)
After milking the mastitis affected cows, their teat should be cleaned and disinfected. The tube cap removed and the tip inserted into the teat and the drugs infused.

Where the cow is ill, consult a veterinarian for additional treatments like antibiotic injection or anti-inflammatory drugs to stop inflammation and reduce the pain.

Read the manufacturers leaflets for all veterinary drugs used in dairy cattle concerning withdrawal periods for human consumption. Milk cannot be used for human consumption for several days after treatment. Do not mix such milk with milk from healthy cows.

Record the date, the cow name or number, and which teat eg FL(Front left). So that if the mastitis happens again you know whether it is a repeat problem and how many cases you are getting per year, so that you can compare with other farmers in your co operative.

Show GOOD MILKING PRACTICE III – CHECKING AND TREATING MASTITIS video:

https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_tyhsceb6

5.3 Dry Cow Therapy (10 min)

The use of dry cow tubes is a veterinary decision and the prescription of antibiotics requires local veterinary advice.

Show DRY COW THERAPY video:

https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_s9e56d6g

Facilitate a discussion on possibilities of use, identifying quarters to use on if cost is an issue.

Session 6 – Review

Total 20 min

At the end of the training day, facilitate a discussion with farmers on what they would do differently and why?

Record on to a flip chart or paper.

References

AHI – Animal Health for Ireland. Cell Check – Farm Guidelines for mastitis control. On-line
<http://animalhealthireland.ie/?product=cellcheck-farm-guidelines-for-mastitis-control>

Nickerson, S. (2001) Choosing the best teat dip for mastitis control and milk quality. NMC-PDPW
Milk quality Conference Proceedings. On-Line:
<http://www.dairyweb.ca/Resources/USWebDocs/TeatDips.pdf>

Annexes

Annex 1. List of Videos with Links

There are 11 videos available to download, reuse and share. All these resources are Copyright ©The University of Edinburgh, but openly licensed under a Creative Commons Attribution 4.0 International License. They can be accessed via the UoE Media Hopper channel and YouTube. Video titles and links are provided below;

1. [Introduction](#)

- https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_vkjclf5v
- <https://www.youtube.com/watch?v=kieKaRZWQis&list=PLXylvxVdtVI7yYj4Tcv4tBOY7KOXqQx90>

2. [Good milking practice I - Hand milking](#)

- https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_mb3r8ew
- <https://www.youtube.com/watch?v=fhabl9vtb4U&list=PLXylvxVdtVI7yYj4Tcv4tBOY7KOXqQx90&index=2>

3. [Good milking practice II - Preparing for milking](#)

- https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_eqebqo46
- https://www.youtube.com/watch?v=gc7vtWH_ybA&list=PLXylvxVdtVI7yYj4Tcv4tBOY7KOXqQx90&index=3

4. [Good milking practice III - Checking for and treating mastitis](#)

- https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_tyhsceb6
- <https://www.youtube.com/watch?v=vysmEpfDPjI&list=PLXylvxVdtVI7yYj4Tcv4tBOY7KOXqQx90&index=4>

5. [Good milking practice IV - Teat dipping](#)

- https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_6j7rdx10
- <https://www.youtube.com/watch?v=XWW-Pwe8Ac4&list=PLXylvxVdtVI7yYj4Tcv4tBOY7KOXqQx90&index=5>

6. [Milking management](#)

- https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_8dz1hqvi
- <https://www.youtube.com/watch?v=V8qyiTxMRaQ&list=PLXylvxVdtVI7yYj4Tcv4tBOY7KOXqQx90&index=6>

7. [Dry cow therapy](#)

- https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_s9e56d6g
- <https://www.youtube.com/watch?v=VK5JXHrn7WQ&list=PLXylvxVdtVI7yYj4Tcv4tBOY7KOXqQx90&index=7>

8. [Cleaning and disinfecting milking equipment](#)

- https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_pkvanpda
- <https://www.youtube.com/watch?v=CU0SPReiins&list=PLXylvxVdtVI7yYj4Tcv4tBOY7KOXqQx90&index=8>

9. [Hygiene in the shed? Let the cows tell you!](#)

- https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_6wztm24s
- <https://www.youtube.com/watch?v=S1GGoiNAmnE&list=PLXylvxVdtVI7yYj4Tcv4tBOY7KOXqQx90&index=9>

10. [Hygiene in the shed? Let the cows tell you! Scoring system](#)

- https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_dqrb4jrx
- <https://www.youtube.com/watch?v=sAlyB5E5kOU&list=PLXylvxVdtVI7yYj4Tcv4tBOY7KOXqQx90&index=10>

11. [California Milk Test \(CMT\)](#)

- https://media.ed.ac.uk/playlist/dedicated/133454541/1_1biwi1m7/1_g9t1k5I7
- <https://www.youtube.com/watch?v=72-vEonMfFs&list=PLXylvxVdtVI7yYj4Tcv4tBOY7KOXqQx90&index=11>

Translation

For information on translating the audio and sub title files then please see the Mastitis animations technical handbook (PDF) <https://edin.ac/2mtiHkw>

Annex 2. Additional Resources

For more information SNV & Wageningen University have produced a set of open source Dairy Extension Training Manuals. See the SNV online library: <https://snv.org/explore-more>

[Breed Improvement and Fertility Management training manual and guideline.pdf](#)

[Dairy Cattle Feeding and Nutrition management training manual and guideline.pdf](#)

[Dairy Cattle Health Management Training Manual and guideline.pdf](#)

[Dairy Farm Management training manual and guideline.pdf](#)

[Dairy Housing and Manure Management training manual and guide.pdf](#)

[Farm Economics training manual and guideline.pdf](#)

[Forage Production and Management training manual and guideline.pdf](#)

[Hygienic and Quality Milk Production training manual and guideline.pdf](#)

[Young Stock Management training manual and guideline.pdf](#)