Managing Mastitis
tech guide

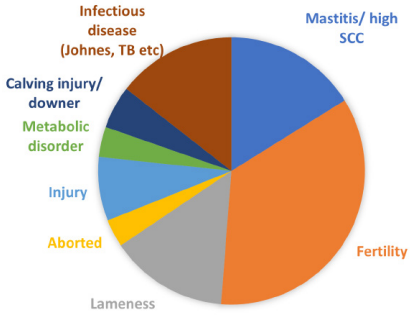
170 years of innovation

FOCUSING ON MASTITIS, LOOKING AT WHAT MASTITIS IS, HOW IT IS SPREAD AND WAYS TO CONTROL THE SPREAD.

Dugdale Nutrition

Introduction

Mastitis is a common disease on dairy farms. From a disease perspective, mastitis has the second largest economic impact on a dairy farm. This tech guide will cover what mastitis is, how mastitis is spread and ways to control the spread.



Contents

Udder Health

Mastitis

Mastitis is inflammation of the mammary gland. Most common cause is a bacterial infection, but trauma can also be involved. Clinical signs include changes in the milk, in the udder, and less frequently in the cow herself. Most infections are subclinical, especially for contagious organisms.

Cost

In the UK the average cost per mastitis case is £250-£300. More severe cases can result in much higher costs such as E-coli infections.

Costs include:

£ Milk discarded during treatment
£ Reduction in yield for current and subsequent lactations
£ Reduced milk quality with increased cell counts and bacterial counts
£ Treatment costs
£ Farm labour costs in tubing, discarding milk and caring for sick cows
£ Veterinary fees

Control

Mastitis cannot be eliminated but it is possible to reduce all the reservoirs of infection and vaccines may help modulate the incidence and severity of clinical signs.
Control must be by management:

Reduce the reservoirs of infection

- Major reservoirs are mammary gland, primarily within the udder, but also on teat skin, and the environment.
- Mammary reservoirs are reduced by treatment, dry cow therapy and culling.
- Environmental reservoirs are reduced by improving the hygiene of the environment and the adaptation of the cow to that environment.

Udder Health

Contol

Control spread of infection by vectors

- Potential vectors include milking machine liners, hands, cloths and paper towels and transfer infection from one cow to the next.

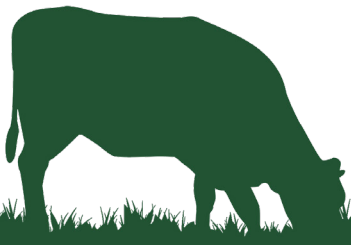
Improve the defence mechanisms of the teat and udder

- Quality and integrity of both the teat skin and the teat canal orifice have a vital impact on the establishment of new intramammary infections.
- Appearance of the teat provides much information on the efficiency of the milking process.
- Once infection has penetrated the teat canal and entered the udder, then the response of the immune system will determine whether the infection is eliminated, establishes itself as a subclinical infection or is seen as a clinical case of mastitis.

5 Point Plan

Five Point Plan:

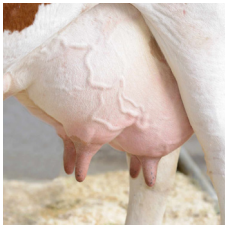
- Hygiene during milking (gloves, cloths etc)
- Correct machine function
- Post-milking teat disinfection
- Prompt identification of clinical cases, thorough treatment and the culling of chronic recurrent cases
- Dry cow therapy



Epidemiology

Mastitis can be casued by contagious pathogens or environmental pathogens.

Contagious Pathogens



- The cow is the reservoir of infection, within the udder or on the teat skin.
- Infection is transmitted from cow to cow during the milking process.
- The bacteria involved have strong adhesive properties, facilitating transfer from cow to cow.
- Control is by milking hygiene (reducing spread by vectors), post-dipping and dry cow therapy.

Environmental Pathogens

- The environment is the reservoir of infection.
- Infection is transferred from 'the reservoir' to the cow between milkings.
- The bacteria involved generally do not have adhesive properties.
- Control is by environmental hygiene, predipping, optimising teat end defences and maximising the immune response.

Typical Examples

Contagious	Environmental
Staphylococcus aureus	*Enterobacteriaceae including Escherichia coli*
Streptococcus agalactiae	*Streptococcus uberis*
Streptococcus uberis	*Yeasts and moulds*
Mycoplasma	*Pasteurella*
Corynebacterium bovis	
Coagulase negative staphylococci	

Epidemiology

Mastitis Causing Bacteria

Classification	Bacteria	Contagious/ Environmental	Source	Spread
Staphylococcuspp	Straph. aureus	Contagious	Infected udders, hands of milkers	Milking time
	Coagulase (-) staph. & S.hyieus	Neither	Skin flora and occasionally environment	Infect teat canal fro sources
Streptococcus spp. & Enterococcus spp.	Strep. agalactiae	Contagious	Infected udders	Milking time
	Strep. dysgalactiae	Contagious & Environmental	Infected udders & environment	Milking time & environmental cont
	Strep. uberis	Environmental	Environment: early dry period	New IMI during ear period
	Environmental strep & Enterococcus spp.	Environmental	Environment	Environmental cont
Coliform	Environmental strep & Enterococcus spp.	Environmental	Bedding, manure, soil	Environmental cont
	Klebsiella spp.	Environmental	Organic bedding	Environmental cont
	Enterobacter spp.	Environmental	Bedding, manure, soil	Environmental cont
	Serratia spp.	Environmental	Soil & plants	Environmental cont
	Pseudomonas spp	Environmental	Water & wet bedding	Environmental cont
	Proteus spp.	Environmental	Bedding, feed, water	Environmental cont
	Pasteurella spp.	Probably contagious	Upper respiratory tract of mammals & birds	Unknown, likely cov
Other	Yeast & mould	Environmental	Soil, plants, water	Dirty infusions
	Corynebacterium bovis & other coryneform	Contagious	Infected udders	Cow to cow
	Prototheca	Environmental	Soil, plants, water	Dirty infusions, infected udders
	Bacillus spp.	Environmental	Soil, water, air	Dirty infusions
	Arcanobacterium pyogenes	Environmental	Teat injuries	Flies

Epidemiology

DCT = Dry Cow Therapy
IMI = Intramammary Infection

	Control	Treatment
	Postdip, DCT, segregate and cull if necessary	Early lactation: 5-7 days pirlimycin, do not treat chronic infections
m skin	Postdip, DCT	Treat clinical cases (broad spectrum), DCT
	Milking-time hygiene, postdip, DCT	Label recommendations for broad spectrum antibiotics
tact	Milking-time hygiene, postdip, DCT, teat seal	Label recommendations for broad spectrum antibiotics
ly dry	Milking-time hygiene, postdip, DCT, teat seal	IMM therapy or 4-5 days penicillin systemically
act	Milking-time hygiene, postdip, DCT, teat seal	
act	Cows clean & dry, use of sand bedding, predip, J5 vaccine	Do not treat local cases. Systemic cased 2-3L hypertonic saline IV, followed by oral fluid therapy, NSAID and injectable antibiotics
act	Avoid sawdust & recycled manure, predip, J5 vaccine	
act	Cows clean & dry, use of sand bedding, predip, J5 vaccine	
act	Cows clean & dry, predip, no chlorhexidine products	180-330 ml hypertonic saline IMM infusion
act	No water use in parlour, no cooling ponds, sand bedding, J5 vaccine	
act	Not much known, use of sand bedding, J5 vaccine	
w tcow	Prevent teat injuries, remove affected cows from herd	Do not respond to IMM treatment
	Aseptic infusions	No treatment
	Postdip	Treat clinical cases and DCT
	Aseptic infusions, eliminate infected cow	No treatment, cull cow
	Aseptic infusions	Broad spectrum antibiotic
	Fly control	Kill affected quarter or remove from the herd

Peripartuient Cow

Immune Suppression

Clinical coliform mastitis is thought to be at least partly associated with the immune suppression that occurs in every periparturient cow. 60% of all clinical coliform cases occur in the first 8 weeks of lactation. Many dry period infections do not develop into clinical mastitis. It is likely that a range of management factors will lead to periparturient stress which will exacerbate the immune suppression. This can increase the number of dormant infections that become clinical and is likely to increase the severity of the individual clinical case.

Management Problems

Management problems of the periparturient cow include:

- Transition feeding, i.e. the difficulty of getting a sufficient dry matter intake of the correct forage:concentrate ratio, for the periparturient cow when her appetite is naturally depressed
- The inherent immune suppression that occurs in all periparturient cows
- Heifer integration is often poor, heifers may be introduced into the dairy herd without any cubicle training, when they are of insufficient size to compete, and into a system where there is inadequate feeding and loafing area
- Inadequate vaccination against endemic diseases

Milking Routine

Aim is to remove milk efficiently from the cow with minimal risk to udder health. Routine must be practical and labour efficient with the milker understanding the scientific reasoning for each step in the process in order to achieve these aims. Routine must include practices that limit the spread of contagious mastitis in the parlour.

Ideal Milking Routine

- Foremilk cows
- Dry wipe clean teats
- Wash and dry dirty teats
- Pre-dip, allowing a 30 second contact time and wipe off
- Attach the milking unit within one minute of teat preparation
- Check machine sits squarely on the udder
- When milked out, shut off vacuum and remove cluster
- Teat dip once cluster is removed
- Cows to remain standing for 30 minutes

Why Foremilk?

- Early detection mastitis
- Stimulates the milk let down reflex
- Removes bacteria that may have entered the teat canal since the last milking

Teat Preparation

- Goal is for clean dry teats
- Dry wipe clean teats
- Wash and dry dirty teats
- Avoid communal udder cloth
- Predipping is the gold standard

Milking Routine

If water is used to wash teats it should be sanitised as contaminated water can be a source of Pseudomonas and Nocardia mastitis infections.

Ensure only teats are washed and not the udder. When the udder gets wet, water drains back down onto the teats after they have been dried = 'magic water'.

This increases the risk of liner slip and if sucked in through the top of the liner can contaminate milk or create impact forces which will increase the risk of new environmental infections.

Disinfection with 60ppm Iodine or 200ppm sodium hypochlorite is beneficial.
In no circumstances should a communal udder cloth be used as this only spreads infection from cow to cow.

Disinfectant in water for washing + dried with paper towel will keep TBC (total bacteria count) lower than washing alone.

Milkers Hands

Milkers hands can spread mastitis bacteria from cow to cow. Hands cannot be disinfected so it is advisable to wear gloves.

- 50% of milker hands infected before milking
- 100% of hands infected during milking
- Gloves reduce risk of transferring infection
- Gloves must be rinsed throughout milking

Predipping

- Disinfects the teat
- Reducing the number of bacteria in bulk milk
- Reduces the incidence of environmental mastitis
- Minimum contact of 20-30 seconds is allowed
- Thoroughly wipe off the teat before the milking unit is applied to avoid any chemical contamination of milk.

Mastitis Detection

- Foremilking
- Change in the behaviour of the cow
- Palpation of the udder
- Observation of quarter swelling
- In-line mastitis detectors
- Checking the milk sock or filter at the end of milking

Udder examination is one way to check for subclinical mastitis cases

Palpation of the udder

- Palpate the udder immediately after milking when it is soft

Skin

- Grasp the skin between the thumb and forefinger– it should be pliable and easily separated from the underlying tissue. If not, it suggests there is an oedema of the udder associated with infection or recent calving.

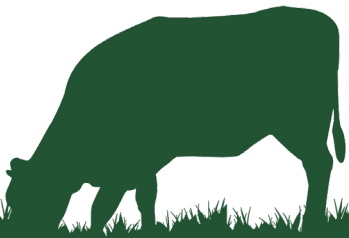
Udder tissue

- Palpate each quarter with both hands, one either side of the quarter. The udder should have a fine grain feel, if there are lumps, coarse grain or hard udder then it suggests a sub-clinical case.

Lymph nodes

- The mammary lymph nodes lie in-between the hind quarters known as the perineal region. Normally the lymph nodes are inapparent but will enlarge and feel nodular when infected.

In all cases of clinical mastitis it is advisable to collect sterile pre-treatment milk samples for bacterial identification. This will allow the identification of pathogens causing clinical mastitis so that specific control measures can be implemented. It is preferable to process fresh samples, but they can be stored in the fridge for up to 5 days or frozen before going to the lab.



Milking Routine

Mastitis Cows

Ideally, mastitis cows should be milked last to avoid the risk of residues entering bulk supply and eliminating any spread of infection. Often there are no facilities to separate, so if milked during milking process, they should be milked into a dump bucket or dump line. Cluster used for dump line should be disinfected between use.

Post Milking

Post milking teat disinfection:

- Kills bacteria on teat after milking
- Reduces new infection rate
- Allows for inadequacy in the milking routine
- Improves teat skin condition
- No effect on existing udder infections
- Must be carried out after every milkin

Dipping – fully immerse in the solution using 10ml per cow per milking

Spraying – need 2 rotations around the udder, one clockwise and the other anti-clockwise, 15mls solution used

Automatic teat spray systems – can be unreliable and provide poor coverage of the teat and use high volumes of teat dip.

Milking Order

Preferable milking order:

- Fresh calvers
- High yielders
- Medium yielders
- Low yielders
- High cell count cows
- Mastitis and other treated cows

Milking Routine

Bactoscan

Bactoscan and Total Bacteria Count (TBC):

Bactoscan is more accurate and faster, with results 3-4 times higher than the TBC Psychrotrophs are bacteria which grow under refrigerated conditions and are picked up by Bactoscan but not TBC. These are dust organisms and can be associated with poor or damp bedding.

Sources of bacteria in milk are: mastitis organisms from the udder, environmental contamination and dirty milking plant.

Environmental contamination can be measured with the Coliform count, >20/ml requires better udder preparation.

Milking Equipment

If not washed and disinfected correctly milk films may build up inside the system. This allows thermoduric bacteria to multiply. These bacteria withstand pasteurisation, i.e. temperatures over 63°C. Levels over 175/ml suggest a wash-out problem.

Somatic Cell Count (SCC)

Somatic Cell Count is an indicator of udder infection. It is a combination of white blood cells and epithelial cells shed from the lining of the mammary gland. White blood cells enter milk in response to inflammation, as the cell count rises, the proportion of white blood cells increases.

Factors Affecting SCC

SCC is affected by:

- Clinical and subclinical mastitis – most important factor
- Mastitis organism – contagious organisms more likely to result in raised cell counts
- Testing methods – Foss test 15% accurate so better to look at trends rather than one result. Count may be higher if bulk milk not properly agitated as somatic cells concentrate in butterfat.
- Age of animal – older animals tend to have higher cell counts
- Stage of lactation – SCC in subclinical cases rise towards the end of lactation due to concentration effect
- Seasonal and diurnal variations – seasonal calving herds may see a rise during months when majority of cows are dry and the rest are only producing small amounts of milk. SCC tend to be higher in afternoon milking.
- Milking frequency – less build up of bacteria with three times a day milking so lower SCC. Increases in once a day milking.
- Other factors – events that cause stress, such as, oestrus, sickness, TB testing. Also affected by nutrition, calving patterns and sources of replacement cattle.

Individual Cow Cell Counts

Regular recording will identify persistent high cell count cows

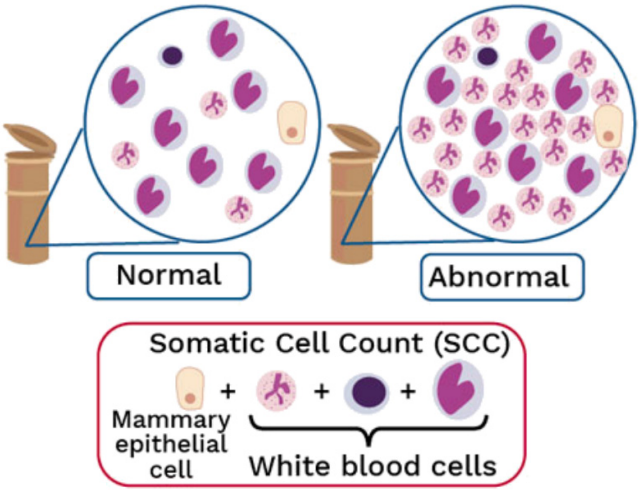
- Percent contribution to bulk tank count is very useful
- Average all four quarters (does not identify infected quarters)
- High result indicates infection
- Look at averages and individual results
- <100,000/ml = healthy quarter
- 100-250,000/ml = mild infection
- >250,000/ml = subclinical problem

Action For High SCC Cows

- Obtain bacteriology from 6-10 high SCC cows, the bulk tank and 6 pre-treatment clinical cases
- Review farm to advise on control measures

Specific action for high ICSCC cows

- Early dry cow therapy
- Culling
- Treatment during lactation
- Milking order
- Discarding milk



Environment & Housing

Environment

The 2 major environmental factors contributing to an increased incidence of mastitis are:

Housing: confinement increases cow to cow contact, causing greater risk of faecal contamination of the teats and of traumatic teat damage

Damp: high humidity leads to increased bacterial multiplication and an increased risk of faecal spread.

Environment can also influence with:

- Overcrowded buildings or poor cubicle design which could produce traumatic teat injuries and increases humidity.
- Diets producing loose faeces will increase contamination of the teats
- Exposure to cold and windy conditions, especially when teats are damp, could lead to poor teat skin condition and the development of cracks and chaps. This increases the risk of Staphylococcus aureus and Streptococcus dysgalactiae infections
- A harsh environment, for example, a heifer introduced into overcrowded yards, or a building where cubicle comfort is poor, will lead to severe stress, thus exacerbating the natural periparturient immunosuppression and indirectly predisposing to mastitis

Reduce Environmental Mastitis

General considerations to help reduce environmental mastitis:

- Passageways should be scraped at every milking, ensuring that cows exit the parlour onto clean walkways. This reduces both teat end contamination and soiling of the bedding by dirty feet
- Keep cows standing for 20-30 minutes after milking, to allow the teat ends to close – but not in a windy yard which could lead to damaged teat skin
- If straw or any other organic material is used for bedding, it must be both clean and dry before use. Storing bales outside without cover is far from ideal. Outer layers are wet and therefore non-absorbent which predisposes to fungal and yeast mastitis.
- Damp sawdust or wood shavings are a well known source of Klebsiella.
- Keep water troughs clean.

Environment & Housing

Cubicles

- Design and management are important in the aetiology of both mastitis and lameness.
- Need to be comfortable to encourage use.
- Sufficient cubicles should be available to allow at least one per cow.
- Heifers should be trained to use cubicles well before calving.
- Cubicle houses should be light, open and well-ventilated buildings with ample cross-passages for escape routes.
- The rear end of the cubicle should be kept clean and dry. Wet areas and faeces removed at least twice daily, or every time the herdsman walks through. Apply a handful of lime twice weekly and cover with bedding.
- Sand is excellent bedding material as it is inorganic and therefore does not support bacterial growth. It is a challenge for slurry systems though. Needs to be 3-4 inches deep to be comfortable.
- Straw yards need managing well with water trough sited at the front with access only from the feed passage. Minimising stocking density and maximising ventilation are both essential. Frequent changing of the bedding is vital. The frequency depends on stocking density, diet, faecal consistency, environmental temperature and humidity, ventilation, quantity of straw used and effectiveness of drainage and frequency of scraping passage.

Environment & Dry Cow

- Maintain a clean, hygienic environment, especially during the critical first and last 2 weeks of the dry period. Especially important to avoid dirty/slurry areas around water troughs and feed bunkers.
- Handle dry cows gently to avoid trauma to the teats.
- During hot weather, rotate dry cows around a variety of dry cow paddocks. Provide fans in buildings.
- Milk out cows within 24 hours of calving. Leaving the calf with the cow does not achieve this and increases the risk of mastitis.
- Avoid udder oedema, especially in heifers, as this is painful, suppresses let-down and predisposes to teat trauma and mastitis.

Selective Dry Cow Therapy (DCT)

Decision Making

A key element to controlling mastitis is dry cow treatment and selecting the appropriate treatment. The most suitable regime will vary between herds and between individual cows depending on the somatic cell count and individual infections.

Teat Sealant

- Teat sealants have shown to significantly reduce the risk of new infections whilst the cow is dry and should be used for all cows at drying off. Either internal or external teat sealants can be used
- Internal teat sealants
- In combination with antibiotic for infected cows
- Alone in uninfected cows
- External teat sealants
- Use only if an internal sealant cannot be used
- Has to be regularly reapplied in the dry period
- Effectiveness is less well-proven
- Ensure yield <15L at dry off if sealant only

Antibiotics

For high SCC, infected cows, the antibiotic used must have an appropriate spectrum of activity against the most important bacterial causes that lead to increased SCC in the herd.

If antibiotics are given incorrectly, especially if given to low SCC, uninfected cows, can increase the risk of developing mastitis in the next lactation.

Avoid using Highest Priority Critically Important antibiotics.

Speak to your Vet for advice.

Selective Dry Cow Therapy (DCT)

Vaccination

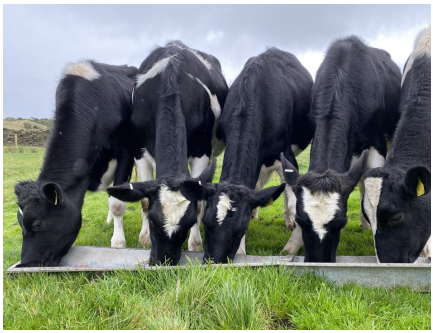
Low-SCC herds could consider mastitis vaccination to reduce severe clinical mastitis

Selective Dry Cow Therapy

Have a drying off list and look at cows which are due to be dried off.

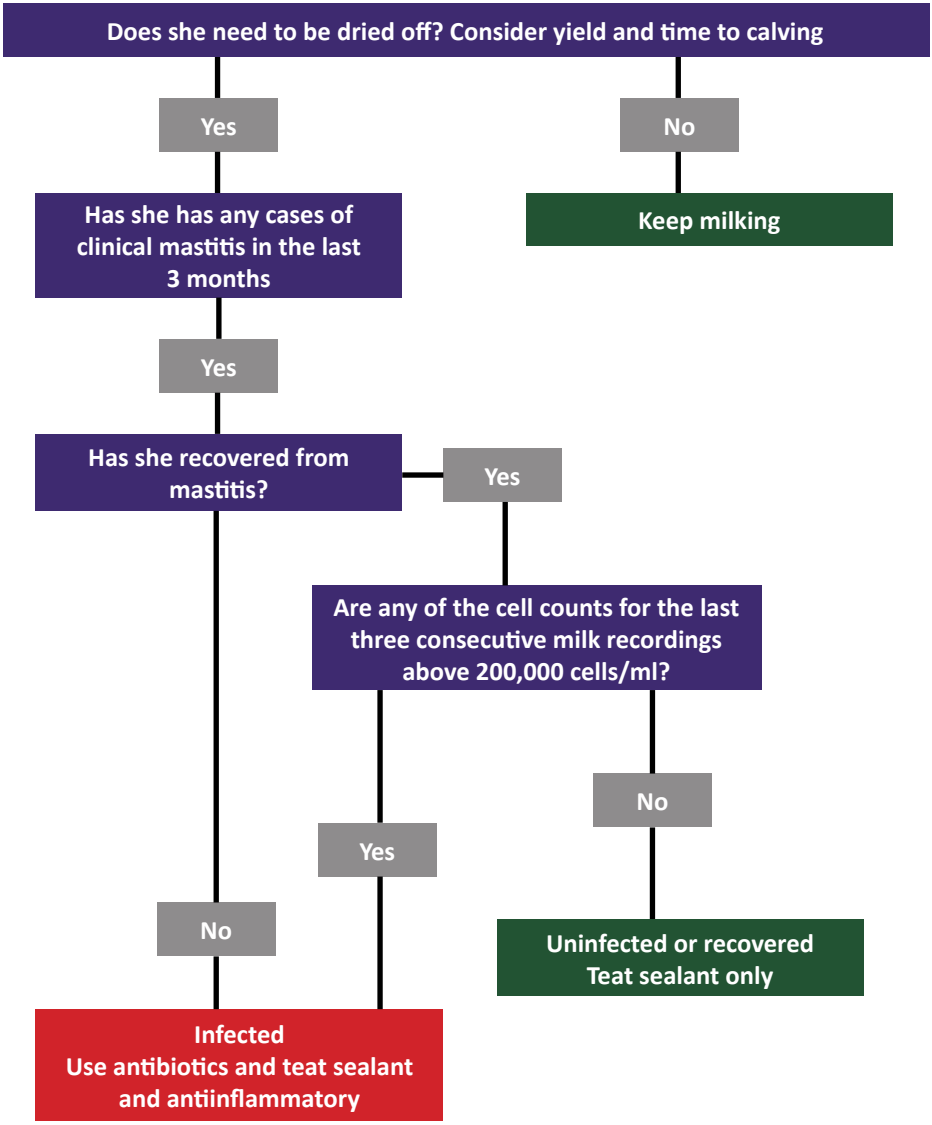
Use individual cow somatic cell counts from three consecutive milk recordings alongside clinical mastitis history for the last three months to determine individual cow infection status.

Classify each cow as uninfected, recovered or chronically infected.



Selective Dry Cow Therapy (DCT)

Decision Making Tree



Selective Dry Cow Therapy (DCT)

Protocol

1. Wear blue nitrile gloves while dry cow treating.

2. Predip all quarters beginning with front teats.

3. Wipe predip off after at least a 30 second contact time. Once again wipe front teats off first.

4. Strip and CMT score quarters.

5. Take sample for culturing.

6. Predip as with step 2.

7. Dry teats paying close attention to teat ends, front to back. If teat ends not thoroughly clean, use alcohol pads or cotton wool soaked in surgical spirit to remove dirt. Ensure the teats are dry and clean before continuing with the next step.

8. Insert dry cow tube and massage quarter. This time start with back teats first.
- Only insert the tip of the tube into the teat so that the Keratin lining is not bypassed and still acts as a barrier against bacteria. This technique has shown to reduce mastitis in the dry period.
- Another reason for only inserting the tip of the tube is so that the teat canal is not excessively dilated. A smaller teat canal will reduce the chance of bacteria entering the mammary gland.

9. Insert INTERNAL TEAT SEALANT starting with back teats first.

10. Post dip all the teats with lactating cow dip.

7 Point Approach

High SCC and mastitis impact many areas of a dairy farm. Management, control and treatment of mastitis is best done by using a 7 point approach.

1. Milk clean teats

- Regularly evaluate udder and teat end cleanliness on farm.

2. Disinfect all teats

- Ensure complete coverage of every teat on every cow.

3. Treat cases of mastitis quickly and correctly

- Identify pathogens to better understand the cause and determine appropriate treatment options.

4. Use teat sealants and selective dry cow therapy

- Dry-off and calving are the highest risk periods for mastitis. Make the process clean!

5. Cull chronic cows

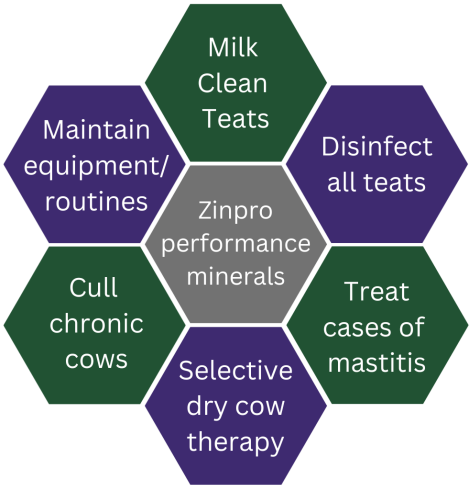
- Use records to determine eligible cull candidates.

6. Maintain equipment and milking routines

- Faulty equipment lack of commitment to the milking routine can damage teat ends and increase mastitis risk.

7. Use nutritional technology

- Zinpro Performance Minerals have show to consistently reduce SCC and improve immune response in dairy cattle.



Zinpro & Udder Health

6 reasons to feed Zinpro for udder health

1. Zinpro trace minerals increase teat keratin production between milking helping to prevent the entry of pathogenic bacteria.

2. Within the udder, Zinpro performance minerals improve the health integrity of secretory tissue.

3. Zinpro performance minerals influence the killing capacity of immune cells.

4. Cows fed Zinpro performance minerals respond to challenges quicker.

5. Healthier udders mean more milk per cow and saleable milk.

6. Lower SCC means more cows are eligible for selective dry cow therapy which means less antibiotics are used.

Availa Minerals

Availa provides optimal trace minerals which support udder health and production, these include copper, selenium and zinc etc.

Benefits:

- Reduces SCC
- Increase in feed efficiency - increase milk production
- Improves ruminant digestion
- Improvement in fertility
- Supports healthy udders

Dugdale Nutrition

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