Mastitis: How to Control Clinical Mastitis

A practical and easy to use guide: 2

By Peter Edmondson

CONTEXT

Mastitis: How to control clinical mastitis

A practical and easy to use guide to mastitis: 2

By Peter Edmondson

About the author

Peter Edmondson is a dairy veterinarian who has been specialising in mastitis and milk quality work for the past 35 years. He qualified from Trinity College Dublin in Ireland in 1980. After five years in practice in Ireland, Peter joined Almarai working with large dairy herds in Saudi Arabia and China. From there he was a partner in a large specialist dairy practice in the South West of England.

Peter formed UdderWise in 2015, a company which provides mastitis solutions. UdderWise specialises in providing mastitis technical expertise, milk quality programmes, tailor made training, troubleshooting mastitis, residue and milk quality problems, residue avoidance advice and providing legal expert witness work in all cattle and milk quality related matters.

Peter works for dairy farmers, vets, pharmaceutical, agricultural and dairy processing businesses throughout the world. He has excellent communication skills and is in demand to speak at international conferences.

He is a popular trainer of vets, farmers, technical and sales staff and is renowned for his practical and down to earth approach. He has been running intensive practical hands-on mastitis seminars for dairy vets and others from the dairy industry for over 20 years. Peter carries out referral visits throughout the world using his practical problem solving skills.

Peter is a Fellow of the Royal College of Veterinary Surgeons and a Registered Specialist in Cattle Health and Production.

He is a Diplomat of the European College of Bovine Herd Medicine.

Peter is involved in transferring skills and technology to help the dairy industry in the developing world. He spends time carrying out voluntary work in Africa.

Peter lives in Somerset in the South West of England with his family and a range of animals including dogs, cats, sheep, chickens and horses.

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Introduction

How to control clinical mastitis

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How to control clinical mastitis

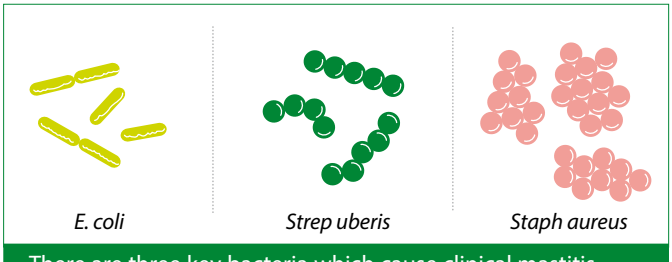
Introduction

Clinical mastitis is the most common disease of dairy cows throughout the world. It has great welfare and economic significance and can be the cause of great stress to farmers.

Mastitis means inflammation of the mammary gland. Clinical mastitis causes visible changes to the milk such as clots, discolouration or a watery secretion. The infected quarter might be swollen and in severe cases, the cow will be ill. The majority of cases of clinical mastitis are mild.

This cow has clinical mastitis in the back right quarter. You can see that it is much more swollen than the left back quarter

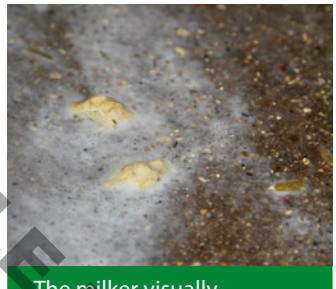
Mastitis is caused by bacteria which enter through the teat canal. The teat canal is between 6 and 10mm long. This is the only way that infection enters the udder. Mastitis infections do not pass from quarter to quarter. They are all totally separate and walled off from each other and have their own independent blood supply. Mastitis does come from animals drinking contaminated water or from the air. All bacteria have to physically enter the udder through the teat end and make their way into the udder.



There are three key bacteria which cause clinical mastitis

FACTS

- Clinical mastitis is the most common disease in dairy cows
- Has great welfare and economic significance
- The majority of cases are mild
- Mastitis bacteria enter through the teat canal
- The bacteria do not pass from one quarter to another



The milker visually detects clinical mastitis from abnormal milk such as clots as shown above

All mastitis infections enter through the teat canal

Economics

How to control clinical mastitis

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Economics of clinical mastitis

Calculating the costs

Mastitis is one of the few diseases where costs can easily be calculated.

These include;

- Discarded milk during treatment
- Medicines
- Labour
- Veterinary fees
- Reduction in yield for the rest of lactation
- Deaths
- Culling and loss of genetic potential

FACTS

- The costs of mastitis are frequently underestimated
- The cost of medicines is low in comparison to the total cost of mastitis
- Clinical mastitis takes time to treat and manage

Discarded milk

The milk discarded is easy to work out. You add the treatment time to the withdrawal period and multiply by the average yield of the cow. For example, a cow giving 40 litres per day is treated with antibiotics for three days followed by a milk withdrawal period of four days.

The milk discarded for this case will be;

Discarded milk = 40 litres/day x 7 days (3 days treatment and 4 days milk withdrawal) = **280 litres**

Discarded milk

Medicines

This will include intramammary tubes together with any injectable antibiotics and other medicines. More herds are now using the hormone oxytocin to help ensure that mastitis cows are milked out fully. The use of non-steroidal anti-inflammatories (NSAID's) for pain relief and to speed up healing is more commonly used. Add on the costs of any other medicines used by you or your vet.

The costs of medicines are a small proportion of the total costs of mastitis

Targets & Monitoring

How to control clinical mastitis

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Record Keeping

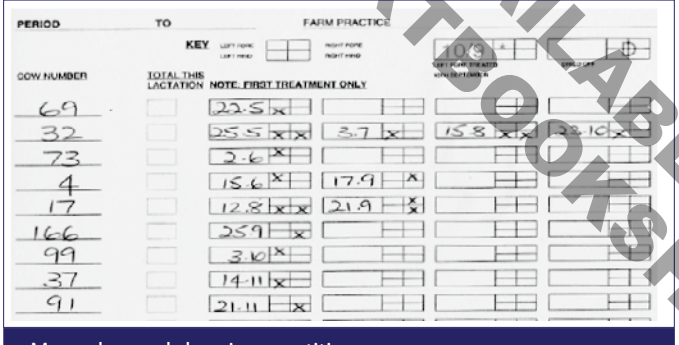
Introduction

Mastitis is one of the few diseases where a detailed analysis of the data is extremely valuable. It can quantify the level of mastitis and to help identify the cause and source of infection. Records allow herds to compare mastitis levels against target figures and other herds. Records are an important part of monitoring the incidence of any disease.

Many farmers keep mastitis records but these are often not analysed and so the incidence of clinical mastitis is often underestimated. It is important to make good use of records otherwise there is little benefit to be gained from keeping the data.

Mastitis records will enable the farmer to do the following:

- Monitor the herd mastitis performance
- Compare incidence with other herds
- Identify the cause of clinical mastitis
- Identify cows whose milk needs to be withheld from the bulk supply
- Identify problem cows that should be considered for culling



Manual record showing mastitis cases

One case of mastitis is defined as one quarter infected once. A cow that calves down with mastitis in all four quarters counts as four cases of mastitis.

Mastitis cases can be recorded in a variety of ways. With manual records, subsequent cases of mastitis should be recorded adjacent to the first so that problem cows are easily identified.

Using the system above, it is clear that cow 32 has had six cases of mastitis and four of these were in the back left (BL) quarter. Although exactly the same information is recorded on the following table (on page 22), it's not so clear that cow 32 is such a problem.

KEY POINTS

- Records allow herds to compare mastitis incidence
- Records can help to establish the cause of mastitis
- Most farmers underestimate clinical mastitis

TOP TIP

When recording cases of mastitis, keep records of the following;

- Cow number
- Date
- Quarter/s infected
- Severity of mastitis
- Treatments administered
- Bacteriology results
- Outcome

FACTS

- A case of mastitis is one quarter affected once
- Simple mastitis records can be very effective in monitoring the disease

Bacteriology

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Introduction

Types of mastitis bacteria

It is important to know which bacteria are responsible for causing mastitis in your herd. This will help you fine tune your control measures and ensure that treatment success will be maximised. All mastitis bacteria are different.

The majority of clinical mastitis is due to environmental organisms such as *E. coli* and *Strep uberis*. With environmental organisms, the reservoir of infection is the environment itself. Environmental bacteria are transferred onto the teats between milkings whenever cows lie down in dirty conditions or from splashing of manure onto the teats. Infection can enter through the teat canal during milking, between milkings and during the dry period.

Infections can enter during milking if the teats have not been properly cleaned and dried before the unit is attached. Infections can occur between milkings if cows lie down immediately after milking or lie down on very dirty beds between milkings. Dry period infections can occur because not all teats fully seal throughout the dry period (see the 'Dry period infections' section).

Staph aureus is another cause of clinical mastitis. This is a contagious mastitis bacteria. Contagious bacteria live in the udder and on the teats and are spread from cow to cow at milking time only. Infections establish on the teat and teat canal and then can penetrate the mammary gland.

FACTS

- The majority of clinical mastitis is due to environmental organisms

Comparison of contagious and environmental infections

	Contagious	Environmental
Bacteria	*Staph aureus* *Strep uberis* *Strep agalactiae* CNS (Coagulase negative Staphylococci) *Corynebacterium bovis* (*C. bovis*)	*E. Coli* *Strep uberis* *Klebsiella* *Pseudomonas* *Strep dysgalactiae*
Source of infection	Udder	Environment
When spread	During milking	Between milkings During milking During the dry period
Type of mastitis seen	Predominantly subclinical Clinical cases from *Staph aureus* and *Strep uberis*	Mainly clinical Subclinical for *Strep uberis*
Effect on herd cell count	Raised	None unless *Strep uberis* problems

Environment

How to control clinical mastitis

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Environmental bacteria

Minimising the risk

The environment is very important from a mastitis point of view as this is the source of the majority of clinical mastitis infections. The aim has to be to keep the udders and teats as clean as possible. If this can be achieved then the risk of clinical mastitis from environmental bacteria will be reduced. There are many herds which have excellent housing and well managed beds which have very low levels of clinical mastitis.

A good environment reduces stress levels and promotes happy and healthy cows which will maximise immunity and help fight off any infections that might be encountered. Adequate housing and comfortable beds will allow maximum lying times and reduce lameness which also helps to reduce mastitis.

Spotless cows on a deep sand cubicle with very low levels of mastitis

Milking Routine

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Milking routine
Introduction

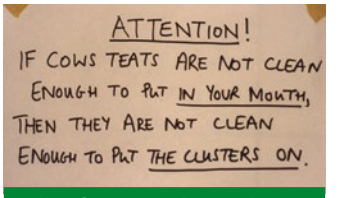
The aim of a good milking routine is to milk cows as swiftly as possible with minimal impact on mastitis. Milk must be extracted in a clean and efficient manner. This means that the milking cluster is attached to a clean dry teat which has been well stimulated to take advantage of the milk let down reflex.

The machine must be well maintained and working efficiently. The cluster should be removed after the cow has been milked out to minimise any teat damage. The cow is then post dipped to help kill any bacteria which have been transferred to the teat during the milking process.

Teats should be clean and dry with maximum milk let down reflex before the milking machine is attached

The clusters must be kept clean throughout milking

A milking parlour is a food factory



This farmer makes it clear what he expects from his milkers

FACTS

- The milking parlour is a food factory
- The milking machine must be well maintained and working efficiently
- A poor milking routine can increase clinical mastitis, cell counts and Bactoscan

The milking parlour is a food factory. The quality of the milk produced cannot be enhanced or improved. A poor milking routine can result in an increase in clinical mastitis, higher cell counts and Bactoscan or TBC (Total bacteria Count) and result in poor quality milk for which the farmer is paid a lower milk price.

Dry Period Infections

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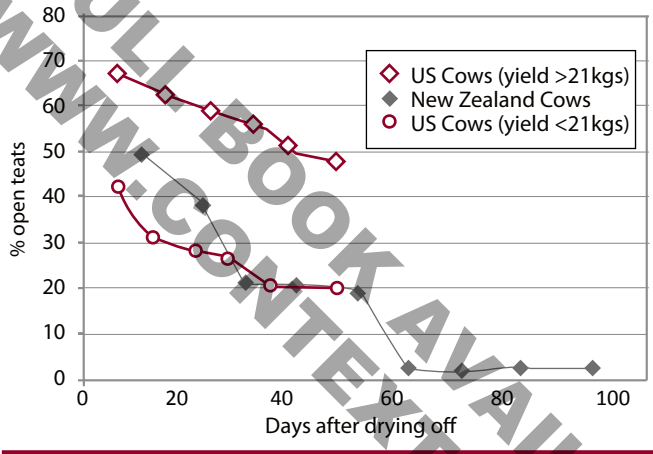
Dry period infections

Are teats always sealed throughout the dry period?

For many years people thought that when cows were dried off the teat canal was sealed throughout the dry period. We now know that this is not the case. There is lots of trial work that shows that many teats remain open throughout the dry period.



Trials to investigate percentage of open teats during dry period

The graph above shows that 50% of teats in New Zealand dairy cows were open 10 days after dry off. 20% of teats were still open 50 days after dry off. This study found that 97% of clinical mastitis cases that occurred in dry period were in quarters that had open teats.

US trial work shows that almost 70% of cows dried off giving more than 21 litres per day had open teats 7 days after dry off. 48% or almost half of these teats were still open at 6 weeks after dry off!

Higher yielding cows have faster milk flow rates and will have a higher risk of having open teats during the dry period. New Zealand cows are not the the highest yielders so this is why the US study showed more open teats.

FACTS

- At least 50% of teats are still open 10 days after dry off
- Half of teats from high yielding cows are open six weeks after dry off
- Bacteria can enter the udder during the dry period
- Always ensure the udders and teats of your dry and calving cows are clean to minimise dry period infections

Other associated factors

How to control clinical mastitis

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Nutrition

Factors which affect the immune system

Nutrition can affect mastitis in two key ways. Firstly if there is inadequate nutrition then this can affect the cows immune system and secondly, if the faecal consistency changes.

There are a number of nutritional factors which can influence mastitis. These include hypocalcaemia (commonly called milk fever), ketosis, Vitamin E or Selenium deficiency etc.

Hypocalcaemia

Hypocalcaemia or milk fever is where the blood level of calcium is low. This most commonly occurs after calving. Jersey and Guernsey animals are very prone to this condition. The animals are unable to get up and remain recumbent. The risk of mastitis will rise further if these cows end up lying in dirty conditions. Cows that are treated with calcium around calving have a 23 fold increased likelihood of developing *E. coli* mastitis. Cows which had an assisted calving will have an eleven fold likelihood of developing *E. coli* mastitis.

A cow with milk fever

FACTS

- A cow with milk fever has a 23x greater risk of *E. coli* mastitis
- Cows that had an assisted calving will have a 11x greater risk of *E. coli* mastitis

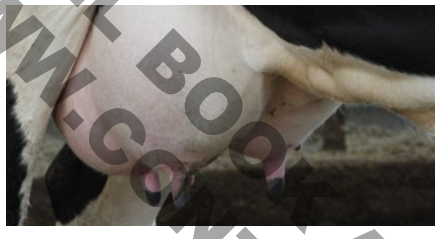
Top tips

How to reduce clinical mastitis

Top tips to minimise clinical mastitis

The successful approach to tackling clinical mastitis includes:

1. **Teats and udders should be clean.** Keep cows on clean and dry beds. If udders and teats are dirty, the beds are not clean enough. Remember to observe the cleanliness of your cows throughout the year.



2. **Always use plenty of clean dry bedding.** Dry bedding absorbs moisture to keep beds dry. Make sure that passageways are scraped every time that cows go for milking.

3. **Calving pens.** These must be kept as clean as possible as freshly calved cows are most prone to toxic mastitis. Make sure that they are cleaned out frequently.

4. **Cubicles.** Ideally you should have 5-10% more cubicles than cows. Cows like choice where they lie. A heifer will not lie beside the dominant cow in the herd.

5. **Straw yards.** Allow adequate lying and loafing space according to the breed and size of cow. Bed up daily with plenty of clean dry straw and clean out every 2-3 weeks.

Appendix

How to control clinical mastitis

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Liner change charts

Two times a day milking

Liner life in days according to average number of cows milked and parlour size and assuming a liner life of 2,500 milkings

2×

Av. no. of milking cows	No. of milking units							
	6	8	10	12	14	16	18	20
50	150	182	182	182	182	182	182	182
60	125	167	182	182	182	182	182	182
70	107	143	179	182	182	182	182	182
80	94	125	156	182	182	182	182	182
90	83	111	139	167	182	182	182	182
100	75	100	125	150	175	182	182	182
110	68	91	114	136	159	182	182	182
120	62	83	104	125	146	167	182	182
130	58	77	96	115	135	154	173	182
140	54	71	89	107	125	143	161	179
150	50	67	83	100	117	133	150	167
160	47	62	78	94	109	125	141	156
170	44	59	74	88	103	118	132	147
180	42	56	69	83	97	111	125	139
190	39	53	66	79	92	105	118	132
200	38	50	62	75	88	100	112	125
210	36	48	60	71	83	95	107	119
220	34	45	57	68	80	91	102	114
230	33	43	54	65	76	87	98	109
240	31	42	52	62	73	83	94	104
250	30	40	50	60	70	80	90	100
260	29	38	48	58	67	77	87	96
270	28	37	46	56	65	74	83	93
280	27	36	45	54	62	71	80	89
290	26	34	43	52	60	69	78	86
300	25	33	42	50	58	67	75	83

Glossary

How to control clinical mastitis

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Glossary

Immune system – The body's defence system against disease

Infection – The presence of infectious organisms in the body

Inflammation – A natural response of white blood cells to try and eliminate infection

Internal teat sealant – A non-antibiotic viscous substance infused into the teat at dry off to prevent bacterial infections entering during the dry period

Intramammary – Within the udder and most commonly refers to treatments which are administered through the teat canal

Keratin – A waxy material produced by the cells lining the teat canal. This helps to reduce bacteria entering the teat canal

Ketosis - A metabolic condition when cows are in a negative energy balance

Klebsiella - An environmental bacteria what is commonly associated with wood products used for bedding

Lactation period infection - An infection that enters the udder when the cow is lactating

Lactose – a sugar present in milk

Lactoferrin - An enzyme that binds with iron that stops bacterial growth in the udder

Let down reflex – A natural process using the hormone oxytocin to squeeze milk out of the udder. The let-down reflex occurs after stimulation of the teats

Liner slip – Occurs when the liner slides down the teat and allows air to enter the milking cluster. This can be due to a variety of factors including milking with wet teats, low vacuum levels, poor design of liners etc

Lipase – An enzyme that breaks down fat in milk

Mastitis – Inflammation of the udder caused by bacterial infections

Mastitis detector - A mesh filter situated in the long milk tube close to the cluster to help pick up clots to aid mastitis detection

Mastitis rate - A measure of the incidence of mastitis. Cases per 100 cows per year

Medicated towels - Towels that have been impregnated with a disinfectant solution to help kill bacteria on the teat before milking

Milk filter or milk sock - A filter to remove any traces of debris such as straw, sand etc.

Mycoplasma - An anaerobic contagious mastitis bacteria

Neutrophil – One form of white blood cell that engulfs bacteria

Oxytocin – The hormone responsible for milk let-down

Partial blitz therapy – Blitz therapy which is carried out on selected cows during lactation

Pasteurisation – Heat treatment of milk to kill bacteria which can spoil milk and also affect humans. Tuberculosis bacteria are killed through pasteurisation

Plasmin – An enzyme that breaks down milk protein and can carry on acting after pasteurisation

Post milking teat disinfection - A solution applied to teats after milking to help kill bacteria that have been transferred onto the teat during the milking process and to optimize teat skin condition

Predipping or premilking teat disinfection - A solution applied to teats before milking to help kill bacteria present when the cow comes into the parlour. This solution is always wiped off the teat before unit attachment.

Prototheca - An algae associated with contaminated water supplies

Proteus - An environmental organism

Pseudomonas - An environmental bacteria causing mastitis that is commonly associated with contaminated water sources

Pulsation – The opening and closing of liners during milking which results in milk flowing from the udder and the teat filling up with milk

Recurrence rate - The percent of quarters that have more than one case of mastitis

RMS - Recycled manure solids, a form of bedding

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