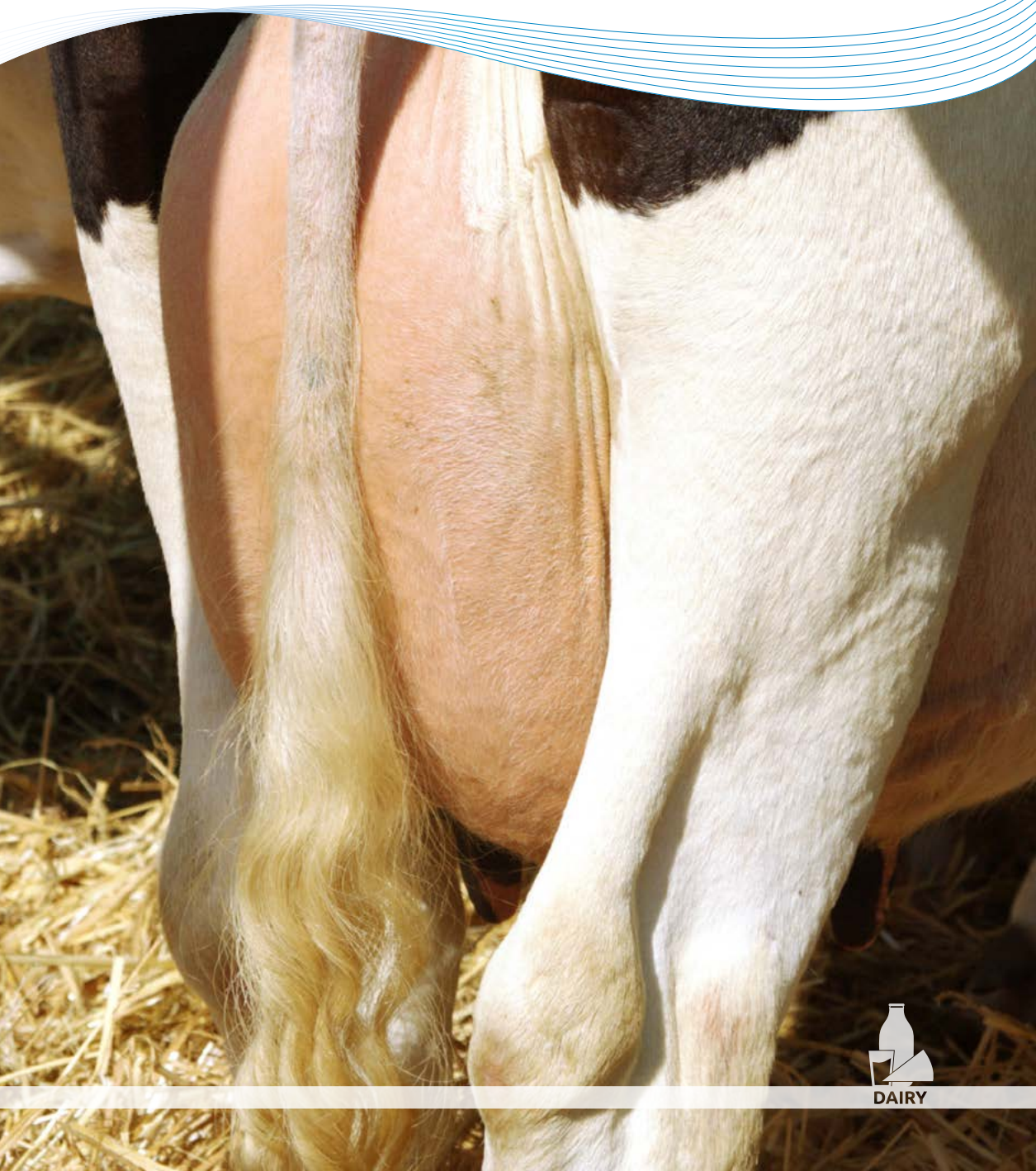


MASTITISCONTROL



# Managing mastitis



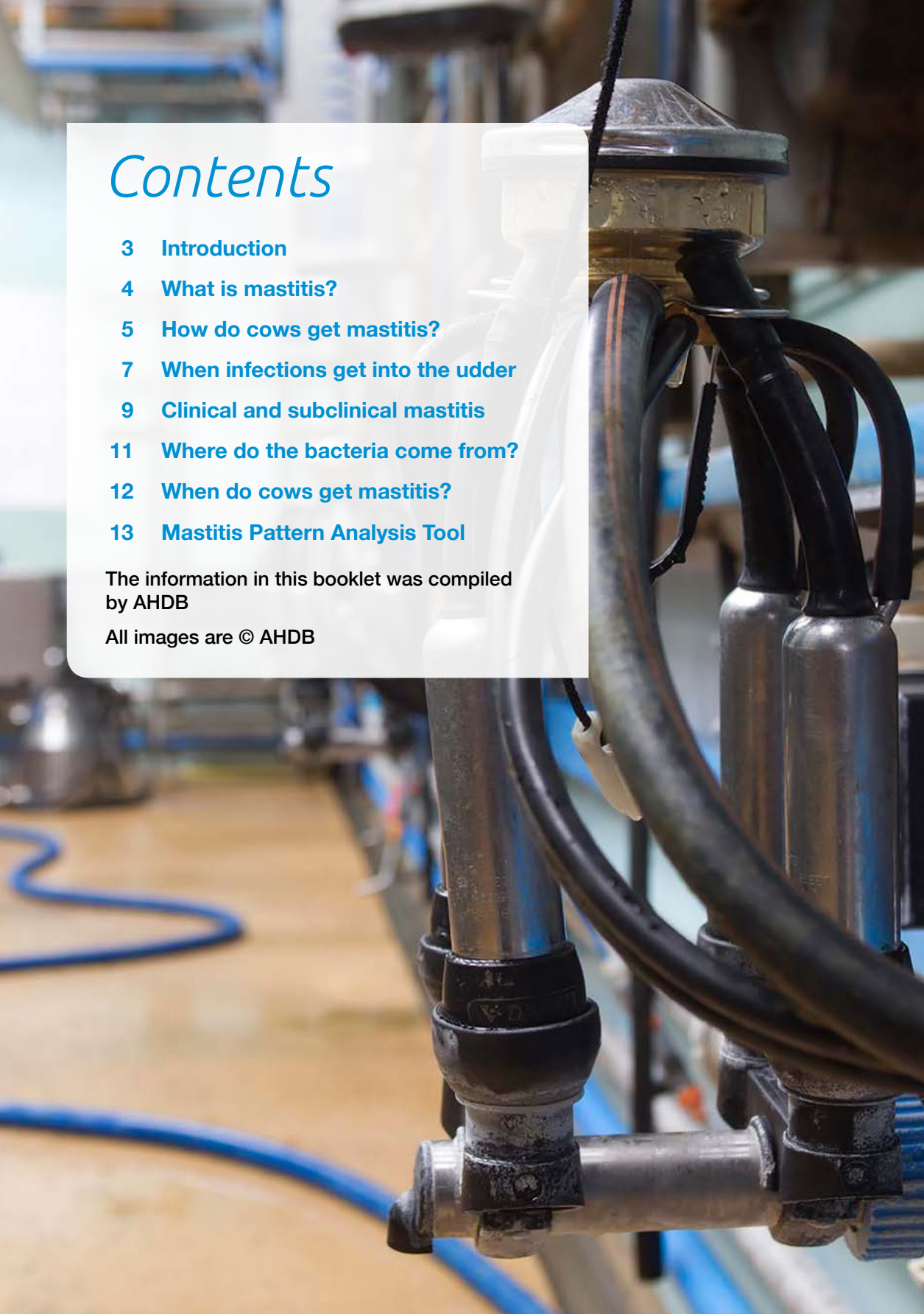
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# Introduction

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Mastitis is a condition that causes a cow's udder tissue to become inflamed and painful. Reducing mastitis will help you produce more high-quality milk and increase your herd's saleable milk yield.

Mastitis can very quickly cause permanent damage and a long-term reduction in milk yield. Treatment may reduce some of these effects, but it often does not fully remove them.

Mastitis is usually a result of bacterial infection. The spread of mastitis from cow to cow during the milking process was historically the most common way mastitis spread between cows. This 'contagious mastitis' is now well controlled in most herds by using the principles of the 'Five Point Plan'.

The most common source of the infections that cause mastitis is now the environment. Cows pick up the bacteria that cause 'environmental mastitis' from manure and dirt.

The best way to control mastitis is to protect cows from getting new infections. Treatment is important but is generally an attempt to close the stable door after the horse has bolted.

New infections can come from the environment or from other infected cows. Working out when cows get infected and where most infections are coming from is a useful first step. You can then focus on what you can do to prevent new cases of mastitis in your herd.

## *In 2017, in the AHDB Dairy 'Sentinel Herds' group:*

- 91% of the herds had mainly environmental mastitis patterns
- Evidence of contagious mastitis patterns in only 10%



# What is mastitis?

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Mastitis is inflammation in the udder. It is usually a result of bacterial infection. The changes to milk quality and the clots in the milk are produced by the cow trying to kill off the infection.

When a cow detects infection, she sends white blood cells into the udder tissue. The response by the cow's immune system may be seen in the milk as flakes or clots, or as watery milk. When the milk from cows with mastitis is tested, increases in somatic cell counts (SCCs) may be seen. The large increase in SCC comes from the white blood cells flowing from blood vessels into milk. The clots in the milk of cows with mastitis are mainly formed of clumps of dead white blood cells.

Blood flow to the udder increases to try to counteract the infection. This may result in heat, swelling, pain and redness. Mastitis is painful and anti-inflammatories should be used to reduce the pain. This will help the cow feel better.

You can culture the milk from cows with mastitis to identify which bacteria are causing the infection. However, if the cow's inflammatory response has been successful, very few live bacteria may be left in the milk. It is often not possible to culture bacteria from these milk samples.

You are more likely to be successful in treating mastitis if you identify and treat cases quickly. Treatment of mastitis is rarely 100% successful, even if the signs of mastitis are cleared at the time. The risk of a cow having another case of mastitis is increased even after one case of mastitis (up to 1.5 times higher risk). Preventing mastitis is therefore critical to mastitis control.

## *Signs of mastitis*

- Udder swelling – hardness, thickening
- Warmth in the udder
- With or without redness
- Pain
- With or without clots in the milk
- The cow may also be sick
- Sometimes fatal

## *What is a somatic cell count?*

Somatic cell count (SCC) is the number of somatic cells found in a millilitre of milk. Somatic cells (or 'body' cells) are a mixture of white blood cells (about 98%) and milk-producing cells from the udder tissue (about 2%). White blood cells identify and kill bacteria.

Somatic cell counts are used to identify cows that have an infection in the udder – an intramammary infection.

High bulk milk tank somatic cell counts are an indication of active mastitis infection in the herd

# How do cows get mastitis

Most cases of mastitis are the result of bacterial infections. Virtually all bacteria get into the udder through the teats. Infections can sometimes pass from the bloodstream into the udder but this is rare, e.g. tuberculosis, leptospirosis.

Teats evolved to allow calves to get milk from the udder. The other important function of the teat is to prevent infection getting into the udder.

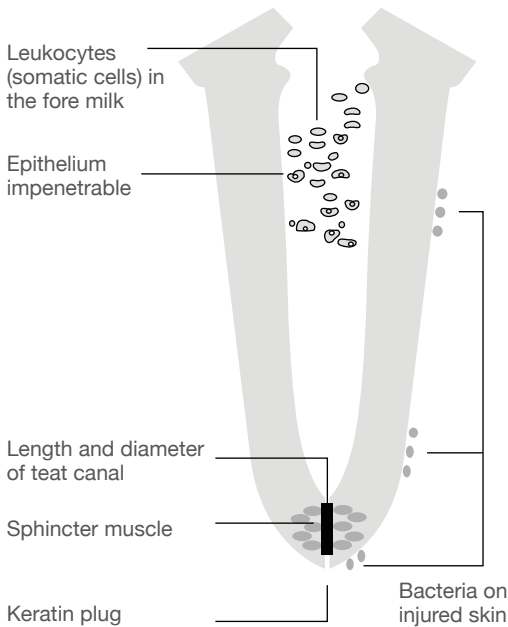


Figure 1. Structural defence of the teat

When bacteria get through the teat end they move up the teat canal into the udder and damage the cells which produce the milk (see Figure 2).

## Teat health

The livelihood of a dairy farmer depends on the milk that flows through the four teats of their dairy cows. The teat canal plays a critical role in the prevention of new cases of mastitis. Any damage to the teat end will affect the quality of the defence mechanisms.

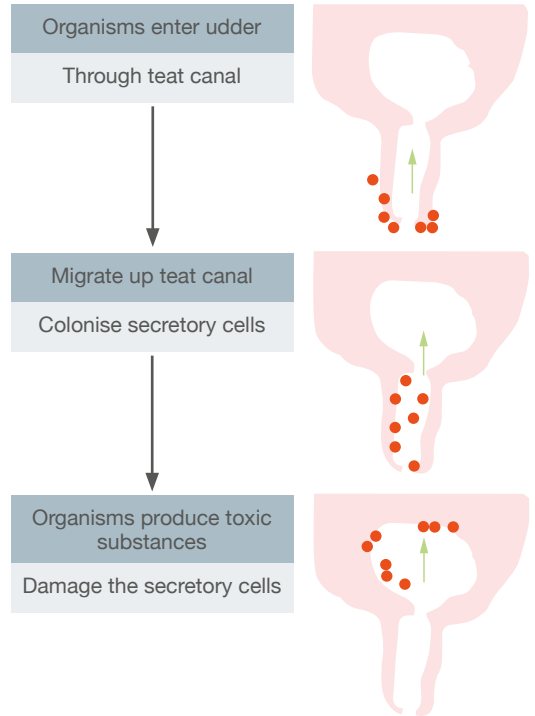


Figure 2. Bacterial passage through the teat

Damage may be the result of:

- Physical trauma (cuts, crushing or bruising)
- Harmful effects of machine milking (hyperkeratosis)
- Secondary infections (e.g. black spot)
- Excessive stretching of the canal (e.g. when administering intramammary antibiotics or inserting a teat cannula)

The teat defences that help to prevent bacteria getting into the udder include:

- Healthy skin reduces bacterial growth and colonisation
- Tight closure of the teat canal sphincter reduces the risk of bacteria getting in between milkings. It can take up to two hours to close fully after milking
- The teat canal is lined with keratin which obstructs the migration of bacteria and blocks the infection

- 
- Any bacteria in the teat canal may be flushed out at the next milking
  - During the dry period, a mixture of wax and keratin accumulates in the teat canal to form a physical plug

It pays to think about teat health and to plan ahead to prevent a costly case of mastitis.

A car's safety depends critically on the condition of the four tyres – the only part of the car which is in contact with the road.

The quality of milk produced on a dairy farm depends critically on the health of the teats of the dairy cows through which all the milk produced on the farm flows.

**KEEP TEATS CLEAN AND HEALTHY**



# When infections get into the udder

Once inside the teat, bacteria must avoid the defence mechanisms of the udder. Cows remove the majority of mild infections quickly and you may not even see any signs of mastitis. However, the bacteria that cause mastitis are often well equipped to counteract the udder defences. If the bacteria are not eliminated, they start multiplying in the udder. They release toxins and cause cells to release chemicals that get the cow's immune system to react.

In a healthy cow, when an infection is detected, the cow increases blood flow to the area and sends white blood cells into the udder tissue to counteract the infection. A lot of milk-producing tissue is damaged once the immune system cells begin to fight the invading bacteria. The chemicals the cells release destroy the bacteria but also some of the cells that make up the udder. Other white blood cells mop up the damage and engulf and ingest the damaged and dying cells.

If the infection carries on, internal swelling within the udder, which you cannot normally detect by feeling the quarter, can occur. The small groups of milk-producing cells (alveoli) become damaged and start to break down. Severe damage will cause a permanent loss of milk production for the lifetime of the cow. The blood–milk barrier breaks down, chemicals leak into the quarter from the bloodstream and mix with the milk. The milk can become watery-looking as a result. If there is a lot of damage to the blood–milk barrier, you may see blood in the milk.

As the cow responds to the infection, you will start to see changes in the udder, such as pain, swelling and reddening of the quarter. There are changes in the milk, including increased pH, increased conductivity, raised water content and the presence of visible clots and flakes.

Cows may also begin to look sick, have fever, dehydration and refuse to eat.

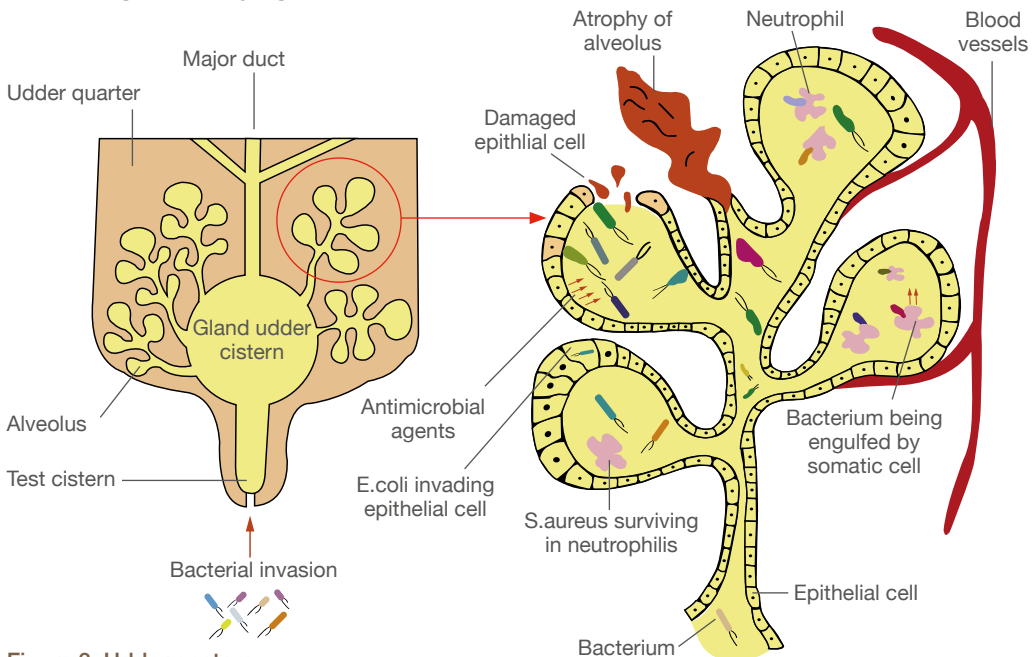


Figure 3. Udder anatomy

Source: Viguier et al, 2009.

Dead udder cells, in addition to the living and dead white blood cells, end up in the milk, resulting in high milk somatic cell counts (SCCS).

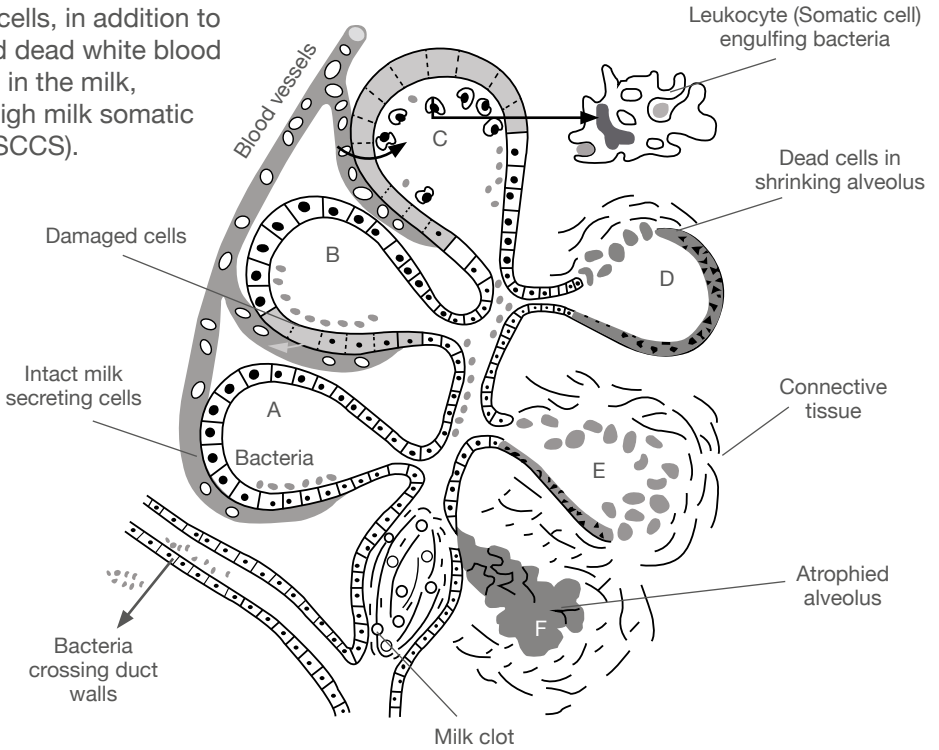
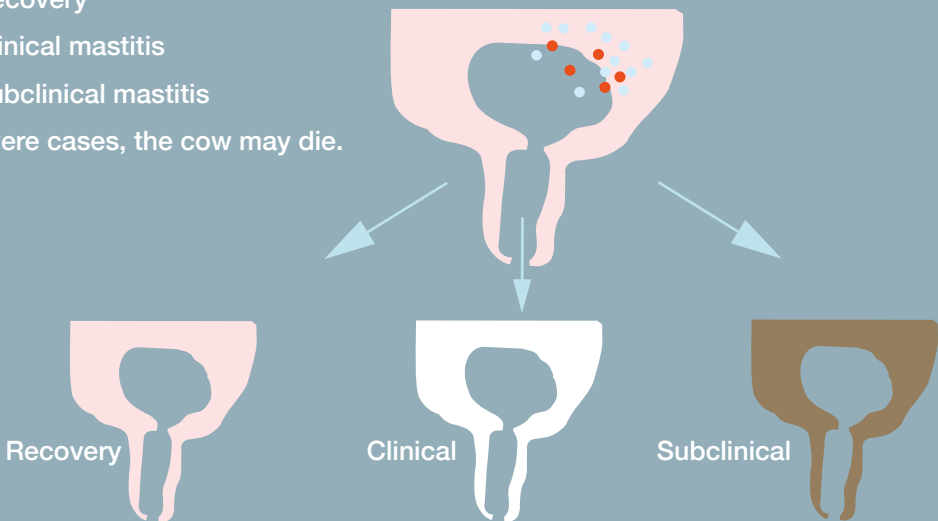


Figure 4. Process by which udder alveoli are lost

With or without treatment, there are three main outcomes of udder infection:

- Recovery
- Clinical mastitis
- Subclinical mastitis

In severe cases, the cow may die.





# Clinical and subclinical mastitis

Mastitis can be either:

- Clinical mastitis, where you can see the signs of an udder infection:
  - Clots in the milk
  - Reduced milk yield
  - Swelling, hardness
  - Pain
  - Redness
- Subclinical mastitis, where there are no visible signs of an udder infection. The udder and the milk look normal. However, milk yield is reduced in 90–95% of subclinical mastitis cases

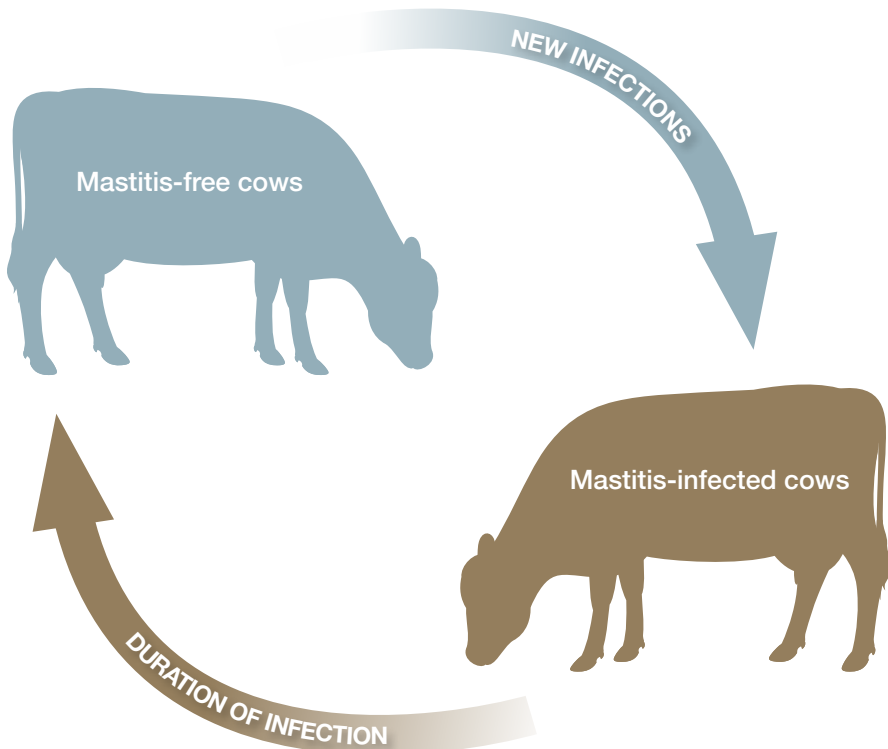
## Clinical mastitis

The most common way to detect clinical mastitis is stripping a few squirts of milk into a strip cup at the beginning of milking to check for abnormalities such as clots and flakes.

Looking at the udder and palpating for signs of inflammation can also help identify clinical mastitis. Looking and palpating are no substitute for stripping.

Clinical mastitis can be acute or chronic:

- Acute mastitis: sudden onset of clinical signs and the cow can show severe signs
- Chronic mastitis: persists for a long time, cow appears healthy but milk quality and yield can be affected



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## Subclinical mastitis

In subclinical mastitis, there is inflammation in the affected quarter but you rarely see changes in the milk or in the udder. Although the milk appears normal, subclinically infected cows will produce less milk. The quality of the milk is also poorer. For example, the milk is not as good for making cheese – the yield of cheese per litre of milk processed is reduced. In addition, infected cows can be a source of infection to other animals in the herd.

As the milk looks normal, you need to use diagnostic tests to identify cows with subclinical mastitis.

- The somatic cell count (SCC) is higher in cows with subclinical mastitis
- The California Milk Test (CMT)
- Conductivity testing with an electronic device

Some milking systems measure electrical conductivity 'in line' to detect subclinical

mastitis. Automation of CMT is increasingly common in robotic milking systems.

Identifying and managing the cows with clinical and subclinical mastitis will help you to control mastitis on your farm. You cannot manage what you do not measure. It will also help you to identify what changes you can make to reduce the number of new cases, reduce the length of time cows are infected, improve milk quality and increase the amount of milk sold off the farm. A regular review of clinical and subclinical mastitis on your farm is part of QuarterPRO.

QuarterPRO is an industry initiative to promote and improve udder health. QuarterPRO is a four-step process:

1. Predict – Analyse data
2. React – Decide what to do
3. Optimise – Take action on farm
4. Review – Check

More information on this can be found in the QuarterPro approach resources.



# Where do the bacteria come from?

There are two main sources of the bacteria that cause mastitis:

- The environment (environmental mastitis)
- Other infected cows (contagious mastitis)

## Environmental mastitis

Cows can pick up bacteria from the environment if teat ends are getting dirty between milkings, e.g. by being splashed with manure or if cows have to lie on contaminated bedding.

## Contagious mastitis

Most of the transfer of bacteria from cow to cow happens during milking. People milking cows may transfer bacteria from cow to cow on their hands or on milking cloths.

A faulty milking machine will spread bacteria from cow to cow. It can also increase the rate at which infections enter the udder.

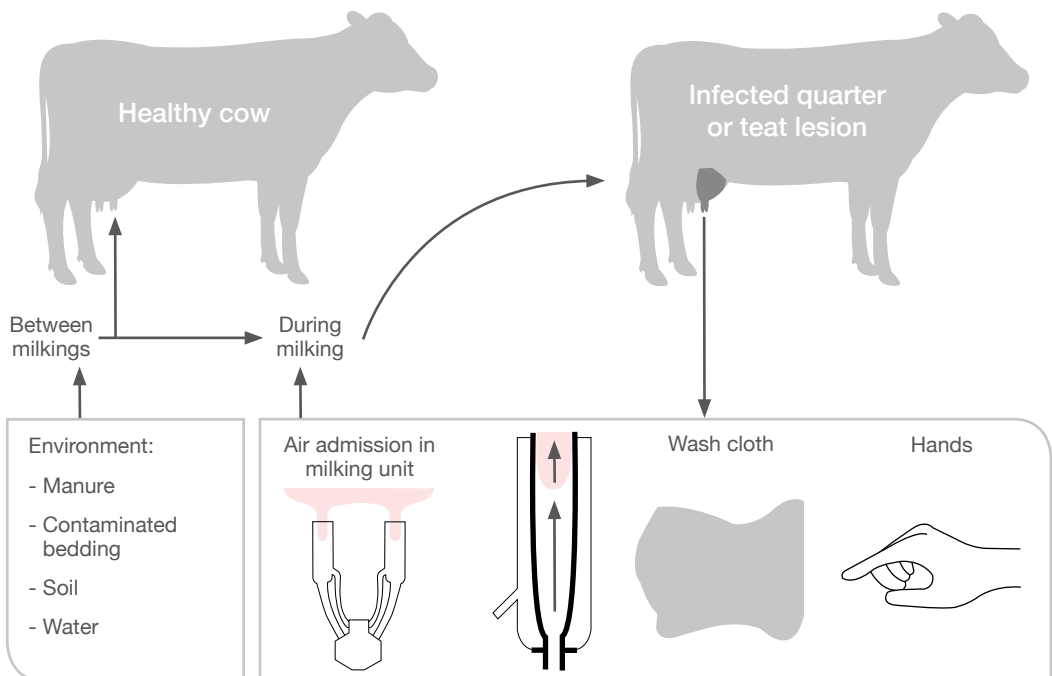
Bacteria from an infected quarter or teat lesion may be fired at the teat end during milking. This may happen because of:

- Poor milking routines
- Air admission into the milking unit
- Poor liner fit or if the teat cup liners have reached the end of their useful life
- Poor maintenance of the milking machine
- Poor pulsation
- Overmilking or incorrect ACR settings (trigger and delay)

More information on this can be found in the AHDB resource *Milking machines and mastitis control*.

## Biosecurity

It is important not to introduce new strains of bacteria (e.g. mycoplasma) when buying in replacements.



# When do cows get mastitis?

Infections can enter the udder through the teat canal at any time during lactation or during the dry period.

Mastitis in the first 30 days of lactation is usually the result of infections in the dry period. Mastitis in cows that are more than 30 days in milk is usually the result of infections picked up during lactation.

## How can I tell when my cows picked up infection?

Good records of clinical mastitis and information from milk recording can be used to help identify when cows are picking up infection.

## Signs that suggest infection during dry period:

- More than 10% of your cows calve in with an SCC > 200,000 cells/ml
- More than 1 in 10 of your cows have a +ve California Milk Test (CMT) test at 4 days post-calving
- More than 1 in 12 (8%) of your cows develop clinical mastitis in the first 30 days of lactation

## Signs that suggest infection during lactation:

- More than 5% of your cows move from below to above 200,000 cells/ml between monthly recordings
- More than 2 in 12 of your cows (16%) develop clinical mastitis when greater than 30 days in milk

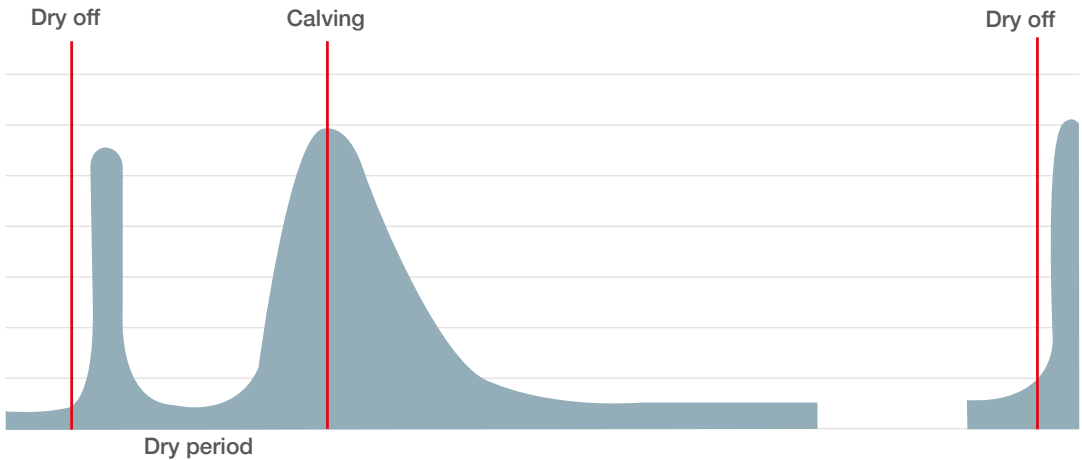


Figure 5. shows mastitis rates of infection



# Mastitis Pattern Analysis Tool

You can work out when most cows are picking up infection by looking at your clinical mastitis records and your information from milk recording. The AHDB Mastitis Pattern Analysis Tool (MPAT) can do this analysis automatically for your herd. It also shows where most of the infections are coming from on your farm.

MPAT takes information directly from milk-recording data. The tool is more accurate when it has both clinical mastitis and somatic cell count records.

The MPAT report can help you decide what you need to do to reduce mastitis cases. It shows whether more of the cases of mastitis in the most recent quarter were picked up during the dry period or during lactation. It will also show whether more of the cases were because of infections picked up from the environment or infections spread from cow to cow.

The tool also assesses mastitis in heifers, seasonal effects and the number of repeat cases of clinical mastitis.

For more information on how to use the MPAT, see our user guides and two short videos at [ahdb.org.uk](http://ahdb.org.uk)

MPAT was developed and validated for AHDB by QMMS Ltd and the University of Nottingham. Conversion software is available to allow milk-recording data in 'CDL' format to be read into the tool.

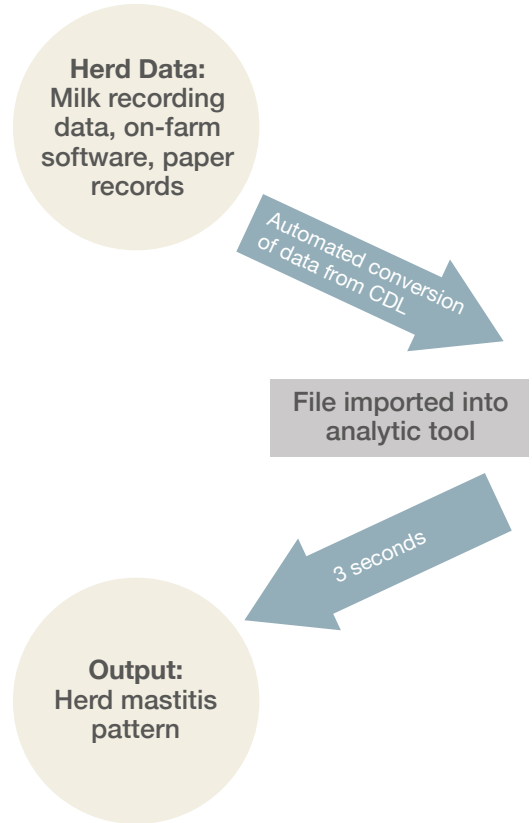


Table 1. Main patterns of mastitis on dairy farms

Mastitis pattern	When most cows get infected	Where most infection was picked up from
Dry period environmental	Dry period	Environment
Lactating period environmental	Lactation	Environment
Lactating period contagious	Lactation	Other cows





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