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Milk cultures

What is milk culturing?

It is not possible to tell which bacteria are responsible for infections by looking at milk, udders or somatic cell counts - you have to actually grow the bacteria to know for sure.

A milk sample can be processed in microbiology labs so that the bacteria that are present can be identified. This involves the lab spreading some of the milk on sterile plates covered with particular growth factors, incubating the plates for defined periods and assessing the bacterial colonies that grow. This is called milk culturing.

The lab can also check if the bacteria are resistant or sensitive to a predetermined list of antibiotics (called 'sensitivity testing'). However, these tests only provide a guide as conditions on the lab plate aren't always exactly the same as in the cow's udder. Other factors such as duration of infection, lactation number etc. will also influence treatment outcomes.

PCR tests are now available. These detect the presence of bacterial DNA and therefore do not rely on the viability of bacteria for results. Sometimes milk culture samples will yield no significant growth which can be frustrating. The most common reason is a decline in the number of live bacteria in the sample or where the sample contains a mixture of contaminants due to a poorly taken sample. PCR testing may reduce the incidence of "no growths".

When is it worthwhile culturing milk samples from cows?

Milk cultures are recommended whenever a herd problem emerges - either more clinical cases than acceptable, or rising somatic cell counts. They are used to indicate which bacteria are present within the herd, so samples from a number of cows (a minimum of 10) are required to give a representative picture.

Virtually all mastitis is caused by bacterial infection. It is essential to know which bacteria (e.g. *Staph. aureus, Strep. agalactiae, Strep. uberis*) are present to decide where to look for problems and select appropriate management strategies.

Cost is important but if a herd mastitis problem is emerging, the cost of the cultures is likely to only be a small issue. Cultures vary from about €15 to €25 per sample depending on factors such as the number submitted at the same time and transport costs etc. PCR is more expensive at €25 - 30 per sample but results will be available quicker and the tests have an increased sensitivity.

Is it important to sample quarters with clinical mastitis?

Yes, in most cases it is a good insurance policy to take samples - but you won't necessarily choose to have them all cultured. You can collect them from all clinical cases before treatment (any antibiotic in the sample will make it very difficult to culture), store them frozen and only submit them if a cow fails to respond to treatment, or if there are a higher number of cases than you expected (e.g. more than five clinical cases per 100 cows in the first month of lactation).

If you only end up having a couple of cases and they respond to treatment, you don't need to send the samples for culture. However, if you do wish to investigate further, you've got valuable material to start with.



What about cows with high cell counts?

To investigate a herd cell count problem, it is sensible to sample some of the individual cows with high cell counts. Here the sample is often a composite one (some milk from all four quarters) and some infections will be missed because the bacteria from an infected quarter are diluted by milk from the other quarters. To avoid this, use your CMT to detect which quarter is infected and then sample from this quarter. To ensure you get results from at least 10 cows, it is worth taking samples from at least 12 - 14 cows. The ideal is to sample 10% of the highest cell count cows ensuring a mixture of age and infection duration. Talk with your CellCheck Advisor about which are the best cows to include, to get the most informative results.

Are there any traps in milk culturing?

The main problems are associated with collection and transport of samples. Milk can become contaminated with bacteria during or after collection. Most of these bacteria can also cause mastitis, so results can be very confusing (and difficult to interpret) if any contamination occurs even with PCR testing. Gloves and disinfectant should be used when collecting milk samples, both to avoid contamination and to limit any spread of bacteria between cows.

There is a specific procedure to follow to collect good quality milk samples. Bottles must be sterile (not just clean) and teat ends must be scrubbed with 70% alcohol or methylated spirits to disinfect them adequately. You can get sterile containers from your vet clinic, lab or milk processor. The step-by-step guide below tells you how to collect the milk.

Ideally samples should be kept cool and arrive at the lab within 24 hours. If this isn't possible, most mastitis bacteria survive freezing, so you can store them in the freezer until delivery. Samples can be stored by freezing for up to four months without any negative effect on most major mastitis pathogens.

Collecting milk samples

Sterile collection is the most important step for successful culturing of milk samples. Poor technique will give misleading results and resampling will be required. A good technique involves planning and some patience.

- Have the following ready in the dairy:
 - sterile sample bottles. You can obtain these from your vet clinic, lab or milk processor. Sterile collection requires using only sterile bottles. It doesn't matter how well washed a jam jar is - it won't do
 - a marker to label the bottle
 - disposable gloves
 - disinfectant/cleaning solution
 - paper towels
 - cotton balls or medicated wipes
 - a mixture of 70% alcohol or disinfecting teat wipes
 - a cool dry place to store samples before delivery or freezing.



Medicated teat wipes are excellent for disinfecting teat ends.

Label the bottle.

- Unlabelled samples are useless, so make sure you identify the sample.
- Do this before sample collection as it can be difficult to write on a label with milk sprayed on it.
- Use the marker pen to clearly label details of the sample - the date, your name, the cow's ID, the quarter sampled, and why the sample was collected i.e. clinical case, high SCC etc.

• Restrain the cow so she can't move around too much.

- Sometimes this is difficult on a platform, but do what is possible.
- Another person holding the cow's tail as a 'tail jack' can be helpful.
- Put on disposable gloves.
- Wash and dry the teats.
 - Wash the teats with running water and disinfectant/cleaning solution. Avoid getting water on the udder - the udder is hard to dry, and drops of contaminated water can easily fall in the sample.
 - Dry with a paper towel.

Completely disinfect the end of the teats to be sampled. This step is <u>critical</u>.

 If you are sampling more than one teat, disinfect the ones furthest away first. This reduces the risk of unintentionally contaminating an already disinfected teat.



Correctly labelled and sealed bottles are essential.



Disinfect vigorously with cotton wool or teat wipes.



Check that the teat is fully clean.

- Disinfect by vigorously scrubbing the teat opening with a cotton ball and alcohol (or teat wipes) for a minimum of 10 seconds.
- Check the cotton ball/wipe. If it is dirty, repeat the scrub using a clean cotton ball until there is no more dirt seen.



• Get the sterile bottle ready.

- Remove the cap and place upside down in a place not likely to be contaminated.
- Do not touch the inside surface of the cap or bottle.

• Establish the direction of flow from the teat.

- Squeeze the first couple of squirts of milk onto the ground.
- This also helps to remove any contaminants that might be just inside the opening of the teat.

• Collect the sample in the bottle.

- Hold the bottle at an angle (to avoid anything falling into it) at least 3 4 cm from the end of the teat.
- Squirt 2 4 mL of milk into the bottle. Only a small amount of milk is required for culture trying to get a large sample increases the chance of contamination.
- If you are collecting a combined sample from all quarters, move the bottle away from the first teat and repeat the initial squirts of the next teat before moving the bottle back. Take the first samples from the teats closest to you. Try to get the same amount from each teat. (Note: a combined sample from all quarters may be less likely to grow bacteria because milk from one infected quarter is diluted by milk from the uninfected quarters.)

Replace the cap and secure it tightly and keep in a cool dry place until it can be refrigerated, delivered or frozen.

 If there are any obvious contaminants or for example the lid was dropped, then take the sample again starting with sterilising the teats.

• Wash your hands.

- Use running water and dry on paper towel.
- Wash your hands after each cow, including the last cow.

• Sample handling and storage.

- Ensure that the bottle is labelled correctly with farm and animal details.
- Deliver the sample to the vet or lab that day, or freeze.
- Samples for mastitis culture can be frozen and stored before being sent to the laboratory.
- Samples can be stored for up to 4 months without any negative effect on most major mastitis pathogens.









Management Note

The correct way to give lactating cow intramammary treatments

Infection with environmental bacteria can cause severe mastitis and it is easy to introduce bacteria into the teat with a treatment nozzle if the teat end is not disinfected properly. Before any material is infused into a quarter, the teat end must be disinfected very carefully.

Operators can be injured by cows during administration of intramammary treatments. It is important to take time and have help. More than one person is often needed to do the job well, especially if cows are not used to having their teats handled.

• Have the following ready in the dairy:

- paint, tail tape to mark cow
- disposable gloves
- cotton balls
- a mixture of 70% alcohol or disinfecting teat wipes
- intramammary antibiotic tube(s). Keep the tube sterile; do not warm tubes by putting them in a bucket of warm water (this increases the chance of contamination); do not remove the tube cap until ready for use.
- Restrain the cow so she can't move around too much.
 - Sometimes this is difficult on a platform, but do what is possible.
 - Another person holding the cow's tail as a 'tail jack' can be helpful.
- Before infusing any antibiotic into a quarter, ensure the quarter is completely milked out.
- Clearly mark the cow for treatment.
- Ensure that your hands and the teats are clean and dry.
- Put on clean disposable gloves.









• Completely disinfect the teat ends of the quarters to be treated. This step is critical.

- If you are treating more than one teat, scrub the ones furthest away first. This reduces the risk of unintentionally contaminating an already disinfected teat.
- Disinfect by vigorously scrubbing the teat opening with a cotton ball and alcohol (or teat wipes) for a minimum of 10 seconds.
- Check the cotton ball. If it is dirty, repeat the scrub using a clean cotton ball until there is no more dirt seen.

• Insert the antibiotic tube into the teat canal.

- Remove the cap of the tube and, without touching its tip with your hand, gently insert the nozzle into the teat canal.
- It is not necessary or recommended to insert the nozzle to its full depth - this can dilate the teat canal excessively and predispose the cow to mastitis.
- Infuse the contents of the syringe into the teat. Massage it up the teat into the udder.
- Teat dip treated quarters with freshly made up teat dip immediately after treatment.

Refer to Management Note I.

- Check that you have clearly marked the treated cow and treated quarter.
- Record all treatments on mastitis record sheet and on whiteboard in parlour so all milkers see treated cows.

Update your ICBF treatment records www.icbf.com









Management Note

Guide to the choice of selective or blanket dry cow treatment

Antibiotic dry cow treatment (DCT) is used to treat any existing infections at the end of lactation, and to protect against new infections in the early dry period. You can use choose either blanket or selective dry cow treatment.

Blanket dry cow treatment (DCT) means treating all cows in the herd with intramammary antibiotic. Selective DCT means treating only selected cows with intramammary antibiotic.

Use the information here and consult your vet for advice.

- If you are milk recording, proceed down this chart. If you are not milk recording, use blanket antibiotic DCT.
- If milk culturing is not carried out on-farm it is recommended that blanket DCT is used.
- Performing a CMT on cows will increase your confidence that cows don't need antibiotic treatment.

Choosing a strategy for dry cow treatment



Management Note C

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CellCheck Farm Guidelines for Mastitis Control

The correct way to give dry cow intramammary treatments

Infection with environmental bacteria can cause severe mastitis and it is easy to introduce bacteria into the teat with a treatment nozzle if the teat end is not disinfected properly. Before any material is infused into a quarter, the teat end must be disinfected very carefully.

- Plan for the time and labour that treatment takes:
 - more than one person is often needed to do the job well, especially if cows are not used to having their teats handled
 - ensure operators are trained adequately in the procedure and supervised well
 - in seasonal herds, keep the number of cows to be treated after any one milking to a manageable number i.e. approx. 20 per person.
- Have the following ready in the dairy:
 - disposable gloves
 - a mixture of 70% alcohol or disinfecting teat wipes
 - intramammary antibiotic tubes. Keep the tubes sterile; do not warm tubes by putting them in a bucket of warm water (this increases the chance of contamination); do not remove the tube cap until ready for use.
- Use dry cow treatment (DCT) only at the cow's last milking for the current lactation.
 - DCT is registered only for use immediately after a cow's last milking for a lactation.
 - Off-label use is strongly discouraged because drug residue risks increase and cure rates are likely to be reduced.
- Restrain the cow so she can't move around too much.
 - Sometimes this is difficult on a platform.
 - Another person holding the cow's tail as a 'tail jack' can be helpful.
- Clearly mark the cows for treatment.
- Before infusing antibiotic into a quarter, ensure the quarter is completely milked out.





Management Note D

The correct way to give dry cow intramammary treatments

- Ensure that your hands and the teats are clean and dry.
- Put on disposable gloves.



• Treat all quarters of cows if they are to receive DCT (except quarters that have been dried off for some time i.e. cows milked as 'three teaters').

If a quarter is dry, absorption of the antibiotic DCT will be changed. Administering DCT treatment into these quarters is off-label use. Off-label use is strongly discouraged because drug residue risk increases and cure rates are likely to be reduced.

• Completely disinfect the end of the teats. This step is critical.

- Disinfect the teats furthest away first.
- Disinfect by vigorously rubbing the teat opening with a teat wipe or cotton ball and alcohol for a minimum of ten seconds.
- Check the teat wipe or cotton ball if there is any dirty colour, repeat the scrub using a new teat wipe or clean cotton ball until no more dirt is seen.





Disinfect vigorously with cotton wool or teat wipes.

Check that the teat is fully clean.



- Treat the teats nearest you first, followed by treatment of the more distant teats.
- Insert the antibiotic tube into the teat canal.
 - Remove the cap of the tube and, without touching its tip with your hand, gently insert the nozzle into the teat canal.
 - It is not necessary or recommended to insert the nozzle to its full depth this can dilate the teat canal excessively and predispose the cow to mastitis.



- The technique of only partially inserting the nozzle into the teat canal reduces teat end damage and has been shown in some trials to reduce the incidence of new infections at calving.
- Infuse the contents of the syringe into the teat. Massage it up the teat into the udder.
- Teat dip treated quarters with freshly made up teat dip immediately after treatment.

Refer Management Note I: The correct way to mix and store teat disinfectant.



- Check you have correctly marked the cows and their udders (e.g. with a spray paint) so that cows that have received DCT can be easily recognised.
 - This allows easy recognition if cows re-join the herd in error.
- Record cow ID, date and product details of all DCT.
 - If cows calve early, or a decision to cull them during the dry period is made, the date of treatment and the withholding period of the particular product must be known.
 - Update your ICBF treatment records <u>www.icbf.com</u>.
- Keep cows standing directly after DCT (first two hours).

Don't allow cows to lie down in dirty yards, roadways, fields or housing.



Using teat sealers in your herd

The 3 key steps for the proper use of internal teat sealers:

1. Administer teat sealers correctly

The techniques required are very different to those used with antibiotic dry cow treatment. It's important that you and your staff know how to administer the product correctly.

• Administer teat sealers LAST.

If a cow is to receive antibiotic dry cow treatment (DCT) in conjunction with teat sealer, make sure that the teat sealer is the final product administered.

• Keep the tubes sterile.

Cold temperatures can make the product hard to instill into the teat. However, do not warm tubes by putting them directly into warm water. Instead, place the tubes in a warm room prior to use or keep in your clean gloved hands.

• Completely disinfect the teat ends.

Disinfect by vigorously scrubbing the teat opening with a cotton ball and 70% alcohol (or teat wipes) for a minimum of 10 seconds. Check the cotton ball. If it is dirty, repeat the scrub using a clean cotton ball until there is no more dirt seen.

• Gently close off the top of the teat (closest to the udder) and insert the tube nozzle

To encourage the product to remain within the teat cistern and canal (rather than in the udder) gently squeeze closed the top of the teat. Remove the tube cap (without touching the tip), gently insert the nozzle into the teat canal and infuse the product. Do not insert the nozzle to its full depth - this can damage the teat end.

2. Do not massage the udder after infusing teat sealant

Unlike antibiotic treatments, the infused product must sit in the lower part of the teat.



X-ray of a teat showing the position of correctly administered internal teat sealer in the teat cistern and canal.



3. Remove teat sealers from freshly calved cows

• It is very important to stop teat sealer entering the bulk tank from fresh cows.

This can be time consuming especially if you have large batches of cows calving, so make sure you have enough staff available.

• At the first milking, strip each treated quarter at least 10 - 12 times.

This removes the bulk of the teat sealer so that it does not come in contact with the milk lines or rubberware - remember to wear gloves! This step is necessary even if calves have sucked prior to the first milking.

• Keep milk from fresh cows out of the bulk tank for at least 8 - 10 milkings after calving.

Small amounts of residual teat sealer will still be present in the milk for the first few days after calving, so it is important that all cows have a minimum period of 8 milkings before milk is included in the bulk tank.



Strip each teat 10 - 12 times at the first milking.



• Preferably use designated clusters and test buckets.

Teat sealers stick to milk lines and rubberware. Where possible, avoid running milk from treated animals through normal milk lines during the first eight milkings. Milk these cows last and use a test bucket to keep their milk out of the tank.

• Clean milking equipment carefully.

Residual teat sealer can stick to and form clumps (seen as a greasy white substance) in areas of reduced milk flow, such as milk claws and plate coolers.

Carefully clean the milking plant to ensure that every effort has been made to prevent residual product from entering the bulk tank.

• Review the cleaning routine in your parlour and update milking staff.

Take extra care to follow label directions on the cleaning products used. Ensure that the water temperature, chemical concentration, and volume used is according to label directions.

• Change filter socks regularly.

Effective filters are crucial to limiting the amount of residual teat sealer entering the bulk tank. Change filter socks regularly, especially if there is visible teat sealer present and leave filters in place during the cleaning phase to stop any product coming in contact with the plate cooler.

For more information or to discuss which animals to treat, contact your CellCheck Advisor.



Guide to withholding periods after use of dry cow treatment

Antibiotic dry cow treatment is infused into each quarter immediately after the last milking of a cow's lactation. It is an important management procedure for treating existing udder infections and preventing new infections during the dry period.

All DCT products are registered with the Irish Medicines Board (IMB), and have a specified Minimum Dry Period (MDP) after treatment. If a cow calves before this time has expired, withholding periods for milk may be longer than usual. Withholding periods (WHP) are shown on the product labels, and also on the IMB website <u>www.imb.ie</u>.

Follow these guides to minimise risk of antibiotic residues in meat or milk after use of DCT:

- Ensure all cows to be culled have passed their recommended withholding period for meat.
 - Withholding periods for meat are counted from the date the DCT is administered.
- Check each cow that received DCT has passed her Minimum Dry Period when she calves.
 - If not, mark her clearly and withhold milk from the bulk tank.
- Keep colostrum and transition milk from all freshly calved cows out of the bulk tank.
 - For milk quality reasons, all cows should have their colostrum and transition milk withheld from the bulk tank for at least the first eight milkings after calving. This applies to all cows, whether they received DCT or not.
 - For cows that did receive DCT (and their Minimum Dry Period has elapsed), a withholding period for milk after calving is specified for each product (see product labels or IMB website <u>www.imb.ie</u>).

• If you suspect an error in cow identity, or treatment or calving date records, do not put the milk in the bulk tank until the issue is resolved. Consult your milk processor.

There may be cases where a milk antibiotic check test may help avoid the possibility of an inadvertent inclusion of residue positive milk. You should immediately contact your milk processor representative to discuss appropriate action.



Records to keep on clinical cases of mastitis

Keep a temporary record of all current clinical cases of mastitis. The record should be clear and easy to see and located in the milking parlour for quick reference during milking. A whiteboard, for example, displays information about cows for special handling (such as withholding milk).

It is also essential to keep permanent records of clinical mastitis cases. This record should include information about the cow and the drug used. This record allows you:

- to make better decisions for individual cows at drying-off and culling times
- to assess numbers of cases and responses to treatment for the whole herd. This is an important part of monitoring udder health and mastitis control.

ICBF has a section for recording details of mastitis cases in its database. This means it is possible to permanently record details of clinical cases and treatments, and reports can be generated which combine this with individual cow SCC data. Further information is available from ICBF (phone 1850 600 900; www.icbf.com).

- Use the CellCheck recording chart in the milking parlour, and/or the ICBF CellCheck mastitis record page to record the following for each case.
 - cow ID
 - date
 - quarter (or quarters) affected
 - treatment (drug used)
 - number of tubes given (mark a stroke for each as given e.g. III)
 - comment (e.g. severity/sample taken (yes or no).

Mastitis Recording Chart HerdPlus

Cow ID	Date	Quarter Affected	Drug Treatment	Num of Tubes	Comments
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- Record these details on-farm when you first detect a case of clinical mastitis.
- If you are milk recording, record cases and details regularly on the ICBF system to help monitor and analyse udder health on your farm.



Cell Check

IMQCS milking machine test reports

CellCheck recommends that your machine is serviced at least every six months by an IMQCS certified technician. IMQCS website www.milkguality.ie hosts a register of all IMQCS qualified milking machine technicians. All of these will give you full written reports such as the samples provided below when they test your machine.

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MQCS - www.milliquality.ie



Management Note H

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Milk Quality Tips: Estrice equipment regularly • Change liners on time • Maintain excellent hygiene of cows and equipment • Always teat dip all cows • Ensure proper milk filtration and cooling



The correct way to mix and store teat disinfectant

Teat disinfection after milking is one of the most effective cell count and mastitis control measures available. However, it only works if it is done correctly.

CellCheck recommends that premixed (ready to use (RTU)) teat disinfectants are used as they avoid any room for error with mixing and concentration of products being combined or any quality issues with water supply.

Teat disinfectant concentrate must be diluted to the correct concentration for use. After mixing, the active ingredients often lose their disinfectant ability with time. Disinfectant activity may be reduced if you include additives to improve skin condition (emollients), or if the dip is contaminated with milk and other organic material.

Correct mixing each day is best to get maximum performance.

- Each time you buy a new stock of teat disinfectant:
 - read the label on the teat disinfectant container
 - familiarise yourself with the mixing instructions and any necessary safety precautions.
- Calculate the approximate amount of diluted teat disinfectant needed for one day or, for large herds, one milking.
 - If applying the disinfectant with a dip cup, you will need at least 10 mL of solution for each cow in the milking. Therefore, you will need 1 L of disinfectant solution for each milking if you are milking 100 cows.
 - If applying the disinfectant by spray, you will need at least 15 mL of solution for each cow in the milking to achieve complete coverage of the teats. Therefore, you will need 1.5 L of disinfectant solution for each milking if you are milking 100 cows.







Management Note I The correct way to mix and store teat disinfectant

- Select a clean container which is large enough to hold the volume of disinfectant solution you will need for one day or, for large herds, one milking.
 - This can be reused as your teat disinfectant measuring container in the future. Label this bottle '**POISON'** to ensure no one uses it for any other purpose.
 - A clear plastic container (such as a clean, empty drink bottle) is ideal so you can see how much of each ingredient you are adding to the mix.
- Calculate how much stock disinfectant solution, clean water and emollient (if required) you will need to make up a day's volume of disinfectant solution.
 - Read the label of the product you are using for the mixing ratio an example is worked below

Example: Using iodine 10% in teat spray for a 100 cow herd

Label instructions: "Mix one part iodine disinfectant to three parts water"

TOTAL SOLUTION REQUIRED:

15 mL per cow x 100 cows x 2 milkings = 3000 mL => You will need 3 litres of solution each day.

DISINFECTANT AND CLEAN WATER:

1 part iodine to 3 parts water (1 + 3 = 4) 3 litres divided by 4 = 0.75 L; 0.75 x 3 = 2.25 L => You will need 0.75 L iodine and 2.25 L water.

IF YOU WANT THE SOLUTION TO CONTAIN 10% GLYCERINE:

10% of 3 L = 300 mL

Glycerine is taken from the water volume.

2.25 L minus 300 mL is 1.95 L

=> You will need 0.75 L iodine, 1.95 L water and 300 mL of glycerine.

- Accurately measure the volume for each ingredient and add consecutively to the plastic container.
- Clearly mark on the outside of the container (with a permanent marker pen) the fluid level and the name of each ingredient, before adding the next one.

This can be used as the mixing container for all future mixing.



• Each day as you make up the teat disinfectant required:

- use water of very high quality
- water from the hot water source in the parlour is recommended over other water sources including town water and rainwater
- cool and store the water in a clean container ready for use
- make up the disinfectant solution by adding the disinfectant concentrate, water and emollient according to the levels marked on the plastic container
- ensure that the correct dilution is made each time
- wash out the plastic mixing container after each use
- wash and clean all teat dip cups before each milking
- all teat spray containers should be washed and cleaned each day
- tip out all teat disinfectant solution not used at the end of the day.



The impact of genetics on mastitis and SCC

With the spotlight focused on cell counts and udder health, do genetics have a part to play in achieving the best results?

Nearly all udder infections are caused by bacteria that enter the quarter through the end of the teat. The likelihood of an infection occurring is a balance between the number and type of bacteria present, and the cow's natural defences designed to stop bacteria entering the teat or multiplying in the quarter. Although the end of the teat is marvellously set up to reduce entry of bacteria, it still sometimes occurs.

Most of the factors that affect the balance of infection and defence are influenced very significantly by the cow's environment. For example, the number of bacteria present and 'challenging' a cow may be greatly increased if she has sores and cracks on her teat skin, and these may have occurred for many reasons. Perhaps the roadways are wet and muddy or the teat spray may have been made up to the wrong concentration? These are factors in the cow's environment which are influenced by management.

Generally, the greatest impact on udder health is achieved by activities to do with managing cows before, during and after the milking process. However, genetics play a part, too. For example, the cow with teat sores may have a genetic tendency for poor teat skin health, or may have longer than average teats which are more prone to damage.

There is a slight tendency for higher production bulls to leave daughters with higher mastitis levels. Currently selection for production also leads to a small increase in the genetic susceptibility of cows to mastitis. The level of mastitis inheritance is low (clinical mastitis is about 3% and cell count level about 13%). Despite this and the fact that genetic changes take many years, improved udder health from genetics should not be ignored. Indeed it would be a mistake to underestimate the potential impact that genetics can have on mastitis incidence/resistance. Similar to mastitis, fertility also has a heritability of approximately 3%. Yet it is widely acknowledged that breeding is an effective way of improving a fertility problem at herd level.

How could an improved genetic component to udder health be achieved?

Logically, it would be sensible to measure the occurrence rate of cases for every progeny test daughter of each bull. All milk recorded cows in Ireland receive a regular somatic cell count result. This means there is a considerable bank of data which can be used to evaluate bulls. The genetic association between mastitis and somatic cell count is 70% which is high. Thus additional genetic gain in breeding for mastitis resistance could be achieved by recording cases of clinical mastitis as they occurred on dairy farms and directly selecting bulls and cows on their resistance to clinical mastitis. Genomic selection could also be used to help circumvent some of these hindrances.

When selecting AI sires, select sires that are positive for the Health sub-index which is principally based on the sires' daughters genetic resistance to mastitis when wishing to improve a herd's resistance to mastitis.



The impact of nutrition on mastitis and SCC

Can the incidence and severity of mastitis be affected by nutrition?

Malnutrition and imbalance of the major dietary nutrients can increase stress and thus susceptibility to all infections, including mastitis.

Cows at risk of milk fever (hypocalcaemia), both clinical and subclinical, have a higher incidence of mastitis at calving. Negative energy balance particularly in early lactation, can lead to increases in clinical cases of mastitis, and higher SCC levels.

Mammary white blood cell (leucocyte) function, the important defence mechanism against bacterial infection of the udder, is modulated by antioxidants and other nutrients in the diet. Antioxidants believed to have an effect on the intramammary infection rate include vitamin E (alphatocopherol), vitamin A (beta-carotene), caeruloplasmin (a copper plasma protein) and vitamin C. Copper, zinc and selenium are three micronutrients that are also required for leucocyte antioxidant activity.

Deficiency of these trace elements and vitamins in the diet of dairy cows may predispose these animals to increased occurrence and/or severity of mastitis. In situations of deficiency, supplementation can reduce both occurrence and severity of mastitis cases.

Under normal conditions in Ireland, vitamin A and E supplements are not required for cattle on pasture. However, during winter feeding, supplements are recommended if the ration consists essentially of grain and conserved fodder.

• The following suggestions may contribute to mastitis management:

- Ensure that lactating dairy cow rations are adequate and balanced in major nutrients of water, energy, protein and fibre.
- Throughout lactation ensure the cow is being fed a ration that includes essential minerals (macro minerals such as calcium and phosphorous and also micro minerals such as selenium, copper and zinc) and vitamins.
- Use dry cow and transition period rations that will reduce incidence of milk fever.
- Dry cow and heifer rations should contain sufficient levels of minerals in order to ensure the cow is getting adequate supplementation for late pregnancy.
- Minerals such as copper, selenium and manganese fed throughout the lactation cycle are reported to have benefits on SCC management. Biotin has also been shown to improve SCC in some herds.

It is important to note that mineral supplementation on its own is not enough to counter poor hygiene and environmental management and their impact on mastitis incidence.



The impact of housing on mastitis and SCC

Mastitis in cows is almost always caused by bacteria which have gained access to the udder through the teat canal. These bacteria may have spread from other cows (contagious) or may be picked up in the cow's environment i.e. from soil, manure, bedding, calving areas etc. Bacteria such as *E. coli* and *Strep. uberis*, which survive in the cow's environment, can cause severe cases of mastitis. Anything that will reduce the numbers of bacteria in the cow's environment or minimise the exposure of teats to these bacteria will reduce the mastitis risk.

How cow housing is managed on a day-to-day basis has an impact on the mastitis risk for the herd:

1. Keep housing clean to reduce the bacterial challenge at the teat end.

- Scrape passageways, cubicles and collecting yards at least twice a day if manual automatic scrapers should be run more frequently i.e. 6 8 times a day.
- Cubicle mats can be used on their own or used in conjunction with a bedding material such as straw, sand, sawdust, shavings, shredded paper and ground limestone all of which can be successfully used for bedding. The important thing is to keep cubicles and any bedding clean and dry.



Clean, disinfected housing is essential.

- In straw bedded houses, bedding should be refreshed daily. When in milk, approximately 30 kg of straw per cow per week are recommended. A straw bedded area of 4m² per cow is recommended.
- A concrete feeding area of $2m^2$ per cow is recommended.
- Power hose and disinfect all housing immediately following turn-out to grass.

2. Make sure housing is dry as it is more difficult for bacteria to survive and multiply under dry conditions.

- Make sure housing is well ventilated the presence of cobwebs can indicate poor ventilation.
- Liming of cubicles regularly (twice daily) will help to keep them dry.
- Ensure straw bedding is not damp if your knees are wet after kneeling down in it, then it is damp.



3. If cubicles are comfortable, cows will use them more often and udders and teats will stay cleaner.

- Cubicle bedding should provide comfort, and be fresh and clean.
- Ensure you have enough cubicles the minimum is one cubicle per cow, the ideal is 10% more cubicles than cows to allow for normal cow behaviour and movement. If cubicle usage is poor, seek advice, and critically assess the current design and dimension and make appropriate changes. Properly sized cubicles are important for cow comfort.

The layout of the housing areas, and cubicle design and dimensions are all important in ensuring a clean, comfortable and well-utilised environment for cows.

Well planned housing will eliminate many potential mastitis problems - Seek advice before you start to build.



Housing should be comfortable.



Seek advice before you start to build.





Dealing with high SCC cows

Cows with an individual SCC > 200,000 cells/mL are likely to have at least one infected quarter. These cows are not only contributing to the bulk tank SCC, but they are also a potential source of infection for other cows in the herd.

Very often these cows will have no clinical signs, yet pose a significant, and silent, threat to the herd. Bacteria from the quarters of these cows can be spread to other cows. Spread most frequently occurs during milking, through routes including cluster liners, milkers' gloves and poor forestripping technique.

Withholding the milk from these cows from the bulk tank will provide a short term solution to an elevated bulk tank SCC, but will do nothing to address the potential for spread of infection in the longer term.

What are the options for dealing with these cows?

1. Cure the existing infection

Treating cows with a high SCC in order to cure the existing infection may appear the most logical step to take. However, consider what cure rates can be achieved in these situations.

Various studies show that cure rates can range from 20 - 80%, depending on various factors:

- what pathogen is the cow infected with?
- what's the duration of infection?
- what lactation number is the cow?
- how many quarters are infected?
- is the cow being treated during lactation or at drying-off?



2. Remove them as a potential source

Cows with a high SCC are a potential source of infection for the other cows in the herd. They may be a source of contagious bacteria e.g. *Staph aureus*, that can be spread from cow to cow. Removing these infected cows (or quarters) from the herd will reduce the risk of spreading infection.

High SCC cows can be dried off early and treated with antibiotic DCT. Although they will not contribute milk for the remainder of the season, cure rates are higher during the dry period compared to lactation, which increases the likelihood of these animals remaining productive for future lactations. This may be the best option for 1st lactation animals, and for cows nearing the end of their lactation that have had low cell counts in previous lactations.

Drying-off quarters

If a cow has a high SCC, identifying the infected quarter(s) can help in the decision making. If a cow has only one infected quarter, then drying-off that quarter is often a workable and practical strategy.

- Use a CMT to identify the quarter with the high SCC (the infected quarter).
- Don't dry-off quarters while they exhibit signs of clinical mastitis.
- Do not use any antibiotic/ intramammary tubes, simply cease milking the quarter.
- Mark the cow and the quarter, to avoid accidental milking of the dry quarter for the rest of the lactation.
- Check/feel the quarter at every milking for the next 10 days, for any signs of heat or pain.



CMT is useful to identify the quarter with the high SCC.

When the cow reaches her drying-off date, do not use antibiotic DCT in the dry quarter as absorption will be affected, presenting an antibiotic residue risk when she calves. Discuss the alternative of using injectable antibiotic treatment with your vet.

There is a lack of available data to predict the likelihood of that quarter still being infected at the next lactation. However, it is likely that the self cure rates for dried off quarters are influenced by the same factors that influence antibiotic therapy cure rates i.e. duration of infection, age of animal etc.

Culling

Cows that have had high SCC in 2 consecutive lactations, despite antibiotic DCT, should be considered for culling.

Culling may seem an expensive option, but there are times when it is the most logical and effective strategy. Culling should be considered for chronically infected cows that are unlikely to be cured. Discuss options with your CellCheck Advisor.

However, remember that culling will not cure herd-level SCC problems if measures are not taken at the same time to prevent new infections.



3. Reduce their risk of spreading infection

In order to reduce the risk of spreading infection, the goal must be to attach a clean cluster to a clean cow. Various practices are employed in order to achieve this, some with more supporting scientific evidence than others.

Superior hygiene and milking routine

Bacteria can be transferred from cow to cow by the milker as well as the milking equipment. Ensuring the hygiene is optimal, and that the way the milking machine is managed helps reduce the risk of spreading infection.

- Wear gloves when milking.
- Disinfect gloves regularly throughout milking, especially after dealing with high SCC cows.
- Avoid getting milk on gloves when forestripping.
- **Never** use communal rags when cleaning cow's teats.
- Take care when removing clusters from cows never pull the cluster off while under vacuum.
- Avoid overmilking, which can contribute to teat-end damage.
- Regular machine maintenance, including a 6-monthly service ensures optimal machine function.
- Change liners after 2,000 milkings, or every 6 months, whichever comes first.

Segregate the infected cows from the uninfected cows

If all the uninfected cows are milked first with a clean milking machine they cannot be exposed to any potential infection from the infected cows in the herd.

Depending on the farm system, this may be practically achieved in different ways:

- Run infected cows as a separate herd, and milk after the main herd.
- If running a separate herd is not practical on your farm, mark infected cows and prevent them from entering the parlour until the end of milking. They will quickly learn to hang back making this job easier.
- Alternatively, don't put clusters on these marked cows when they come up the line for milking. Instead, draft them out when the whole row leaves, and milk these high-risk cows as the last row of the milking.

Whatever the method, it is essential to ensure that the milking machine and equipment is thoroughly washed and allowed to dry before the next milking.



Alternatives to segregating the herd

These practices aim to mimic the effect of segregation by ensuring a clean cluster is put on every cow.

1. Cluster dipping

This practice is often used in an effort to reduce the transfer of infectious mastitis bacteria via the liner from one cow to the next. Further research is needed to determine the effectiveness of this approach, and to establish recommendations around solution refresh rates, contact time etc. Peracetic acid should be used as the dipping solution rather than sodium hypochlorite. Check with your CellCheck Advisor as to how to carry out this practice correctly on-farm and as to the suitability of it for your farm.

2. Cluster flushing

A 2007 study in the UK highlighted the benefits from cluster back flushing and also the added benefits from having it automated, resulting in a better milking routine overall.

Studies from Moorepark evaluating automated cluster flushing have shown that cluster flushing reduces numbers of bacteria in liners and sanitises the cluster between each cow. Care must be taken that the correct detergents are used and that their concentration is correct to ensure that there is no danger of residue contamination. A CellCheck Advisor with a background in milking machines will be best placed to give advice on the suitability of one of the automated cluster flushing systems for your milking machine.

3. Separate cluster

The practice of using a separate cluster can be applied when milking high SCC cows, as well as clinical cases. The cluster should be clearly marked to ensure that all milkers know that it should only be using for milking infected cows. It is also essential to disinfect the cluster after every use.



Notes





CellCheck Farm Guidelines for Mastitis Control