

Mastitis can strike, but there is always a reason. It can be reduced to 1%.

Acknowledged copying is allowed & quoting is encouraged.

Mastitis is an inflammation of the udder, usually caused by microbial infections in one or more quarters. It can be from organisms, injuries and/or bruises. Dogs or farm bikes that make cows run have increased SCCs and mastitis, showing that mastitis can be aseptic (not always from infections).

Mastitis can strike at any time, but there is always a reason. A Waikato 400 cow farm had 40 with mastitis when I started consulting for them. It was partly caused by a bad brand of milking machine which changing to DeLaval reduced, a bad soluble mineral mix containing cheap bad quality wrong minerals, including manganese, and acid soils from superphosphate fertilisers and fertilising with manganese advised by a consultant influenced by USA information, where Mn is very low.

Its milk was as shown below.

In 2013 Chinese mothers expressed concern about low levels of iodine in New Zealand milk. I checked and found that they were right, so developed the systems described below, which have improved iodine and milk quality. The figures below show typical levels in row 1 and in 2 good levels achieved on a client's 400 cow farm.

Compatibility (1 to 100 scale of how much it suits people. 1 is bad, 90 is very good.)

	Comp	Hg	Cd	Mn	Al	Pb	Mg	Iodine	SCC in ppm.	
1.	23	15	20	20	5	10	10	15	300	30 cows with mastitis
2.	85	0	0	2	0	0	40	90	105	1 with mastitis.
3.	45	0	25	40	20	Vet fed Mg chloride.				220

Row 1. Bad levels typical on acid soils lacking LimePlus and cows not fed Solminix.

Row 2. After 14 weeks good levels because they did everything I suggested for a year.

Row 3. Vet recommended Mg Chloride fed on pasture. The milk quality crashed and the SCC rose from 105 to 220. Some chlorides and most oxides are close to poisons, not just in themselves, but also because of what they do to soils and animals. Superphosphate fertilisers make soils acid, and make the toxic elements available and the good items unavailable. Don't believe it? Read Milk Profit & Quality or do your trials and measure levels in pastures, not in soils, animals don't eat soils.

Mastitis costs dairy farmers millions of dollars in antibiotics, grades, lower milk production and culls, which is bad enough, but when the time involved in treating them and discarding antibiotic milk is added, it is even more costly. It is also a cost to the farmer and whole industry when milk quality is adversely affected.

Dairy industries worldwide want lower SCC levels. Most dairy companies are currently happy with 200,000 cells per ml, but some dairy companies have plans to lower this and give penalty grades to achieve it. There are many suppliers with levels under 100,000 and some produce milk with only 50,000. Good milking machines correctly adjusted, LimeMagPlus to reduce manganese and other heavy metals, Solmin and not rushing cows, all help.

There is a vaccine being tried, which is typical of the New Zealand health and veterinarian people 'treating' instead of preventing. Treating gives them work and income, selling medicines, whereas prevention earns them nothing, except a good name.

SCCs vary during the year. They increase as the cows' volume of milk decreases, because the percentage of somatic cells increases. If a cow has a high SCC, but not obvious mastitis, squirting four or more squirts of milk into a bucket may lower the count in the vat, but do not touch another cow until your gloves have been washed and disinfected.

Never squirt milk onto the floor, use a bucket, because otherwise it will get washed out with the effluent and onto pasture where cows lie down, and never feed that in the buckets to calves. Spread it onto grass or soil where animals never go.

SCC levels indicate the amount of mastitis in the herd. Penn State University, Cornell University

and New Zealand figures are similar, and indicate that a herd SCC of 100,000 has 5 to 6% of cows with mastitis, and 500,000 has about 50% of cows with mastitis.

Apparently cows can have sudden substantial increases in their SCC level following an infection.

Damage to milk secreting cells causes a decrease in lactose, casein, and fat, so the milk price, if on component pricing, will be reduced by mastitis. As tissue damage increases, blood components such as sodium, chloride and serum albumin enter the milk in amounts greater than normal.

Generally, quarters with a high SCC produce less milk than ones with a low SCC, so one should aim to detect mastitis early and treat it immediately. The University of Kentucky research suggested that below 200,000 SCC there is a 0% production loss, at 500,000 it is 6%, at 1,000,000 about 18% and at 1,500,000 there is a 29% loss.

Increased mastitis has been frequently documented in herds deficient in copper. Deficiencies of copper and/or selenium decrease the ability of white blood cells to kill bacteria. Livers and hair are the only places to measure Cu accurately. Blood is just a carrier, so levels fluctuate. Liver levels in L:Cu mmol/kg should be at least 400, but better at 900, and not over 2,000.

New born calves' liver should have 3,000 to sustain them until eating solids, because milk has very little Cu. This high figure sometimes frightens vets who don't know it. The foetus takes copper from the dam, so cows fed low Cu diets can be severely deficient at parturition, when the udder is particularly vulnerable. See spreadsheets > Blood & Liver levels.

In the 1990s, several farmers with high cell counts reported it halving within a week of supplying Solminix in the drinking water. It is based on sea salt which has many elements, with the lacking elements of sodium (Na), magnesium (Mg), zinc (Zn), sulphur (S), copper (Cu), cobalt (Co), the maximum allowed selenium (Se) and iodine (I).

Copper deficiency can be due to a combination of problems such as high molybdenum (Mo), high sulphur/sulphates and high iron (Fe). Mo and S, particularly if they're present in significant amounts, such as in ingested soil or high-sulphur water, can bind copper and make it unavailable for absorption by the animal. Iron in water, soil from grazing short, drought-affected or mud covered pastures, or even as iron oxide in some bad mineral supplements, can reduce copper absorption by animals. Grazing animals almost never need Fe supplemented, despite some thinking they do. Most anaemia is from low cobalt which should be 0.13 ppm in pasture, and also be fed in mineral supplements.

Bacteria

Most mastitis is caused by one of two bacteria. During the dry period and early lactation, the major cause is *Streptococcus aureus* which originates from contamination between milkings, by contact with infected pasture, soil and dung. The pathogens can be found even on the skin of healthy cattle, so should be considered environmental. Apparently *Streptococcus* thrives and survives in the cow's nose, so after drenching, wash your hands in a strong teat dip before returning to milk. Mastitis caused by Strep is mostly subclinical, with intermittent clinical flare-ups.

As lactation progresses, *Staphylococcus aureus* can increase from established infections, particularly if there is a milking machine problem, or inadequate teat spraying, overmilking or pulling the clusters off roughly. One percent of mastitis per month is acceptable, which is no more than 1 to 2 cases per week per 500 cows.

It spreads from cow to cow during milking. Milking hygiene and spraying teats properly reduces the likelihood of infection. Spraying so that a drip hangs on the bottom of the teat must be done immediately after cluster removal to prevent pathogens from entering the teat.

Mud increases the risk of *Streptococcus uberis*.

Costs

Clinical mastitis damages the udder, reduces milk production, and adversely affects milk quality, to the extent that grades can be given, usually from streptococcal infection. Grade penalties have cost some farmers thousands of dollars, plus worry, drugs, and the loss of discarded milk. 18% of cows in New Zealand are treated against mastitis during a lactation, while only 5% (or none on good farms)

are treated for metabolic diseases, and under 3% for lameness (hoof trimming, foot rot, etc.), showing how important it is to manage to prevent mastitis.

Milk at calving can have high SCC levels, which drop after four days in cows and five days in heifers. At ten days levels should be down to normal.

Comparisons have shown that confined cows have double the mastitis that rotationally grazed ones on clean pastures have, possibly because there are more flies and fewer cleaner places to lie down. Controlling flies and ensuring cleanliness helps lower mastitis and SCC levels.

During the first two months of a lactation, the rate of infection is higher than during the remainder, unless a faulty milking machine or bad milking practices are involved.

Pre-milking teat sanitising has been proved to be **ineffective**.

Any form of simulation is bad. As a consultant, when staying with client Austin Moore of Maine, USA in 1982, I noticed that while he was doing the usual USA pre-milking udder preparation of washing and wiping dry, most of his gentle quiet Jerseys fidgeted and moved from foot to foot, which are signs of discomfort. They were grazing on new clean paddocks after each milking and walking on a clean dry lane. I suggested that he need not prepare them because the udders were clean and cows did not need or like prepping. His tie-stall barn was also spotless. The next morning he was in for breakfast 20 minutes ahead of time and his wife asked what the problem was, and he told us that he had put the clusters straight on. After breakfast I said let's check the milk volume and it was up. So there are two messages.

Somatic Cell Counts (SCC)

Somatic cells are in all milk, in the form of white blood cells attacking infections and damaged udder cells. One bad cow can raise vat (USA tank) levels from 100,000 to about 120,000, but, when the count is around 300,000 and with large herds of more than 300 cows, it is not so easy to use the vat SCC figures to identify new mastitis cases.

My best dairy farmer client, who does most of the things in this chapter, has a SCC as low as 40,000 and up to 70,000. At 40,000 one can assume there is no mastitis in the herd, so those who say that mastitis can't be reduced to 'not a problem' are wrong.

Causes of Mastitis and High Somatic Cell Counts

- The first cause of these in an animal's life, is calves sucking each other's udders, which can start in the first few weeks of their life. Teats can become lengthened and distorted, infections can occur and udders can start making milk if the bad habit continues. After sucking, the moist teats attract flies and dirt. Flies spread bugs, and fly bites can cause dermatitis around the teat opening and leave the animal susceptible to mastitis. The result can be first calvers with high SCC and mastitis. Discourage sucking by using small-hole slow flow teats, so that calves are fully satisfied by the time they have had their milk. Also feed good hay, silage and/or muesli immediately after the milk. For those that still suck, use a weaner plate or piece of sharpened wire in the bone gap in the nose that can be felt with your fingers. Use 4 mm (8 gauge) soft wire, not 2.5 mm (16 gauge) high tensile, because it can't be shaped as well so can catch in things more easily. Gently twist the wire to make two spikes protruding forwards and upwards. They cause less suffering than occurs when one gets an infected udder and it is not noticed until calving. A vet may have to help insert the wire sucker-stoppers.
- An Australian survey revealed that 15% of first calvers had mastitis at calving. First calvers with mastitis at calving have higher somatic cell counts and produce less milk all their life, so avoiding calves sucking each other is important.
- Newly purchased cows and heifers can bring in infections.
- Force feeding before calving with pasture or BF can increase mastitis if cows bag up excessively. Half pasture and half hay (best) or silage reduces bagging up problems and increases the rumen size for earlier filling on pasture after calving. Bagged up (tight uddered) cows and heifers may need to be partly milked before calving. All first calvers should be milked within 12

hours of calving to reduce SCC and mastitis. This is important, and is beneficial with all cows, so bringing calvers in twice a day has financial benefits. It also decreases mismothering and ensures calves getting colostrum.

- When milking cows before calving, save the first colostrum for the calf unless you have other cows calving and can get enough from them.

- Avoid grazing high endophyte grasses like Yatsyn before calving, and at all times if possible. Safe endophyte grasses have many advantages. The New Zealand best at this time is NEA2 endophyte in Tetraploid Bealey and in Diploid Trojan.

- Handling teats increases mastitis. Young staff once fixed a mastitis problem in an old employer's herd while he was on holiday, by changing to no hand washing of teats except when necessary, but concentrating on identifying and treating clinical mastitis cases. If you wash dirty udders, then dry the udder with disposable towels so that absolutely no dirty moisture seeps down into the liner.

- Housed (confinement) cows are at greater risk of environmental mastitis than cows on clean pasture. If the SCC is high, spread agricultural lime over the bedding and keep it and surroundings clean, and ensure that ventilation is adequate.

- Milking equipment suppliers frequently blame bugs for causing mastitis, rather than their machines, however, either or both can be the cause.

- Mineral deficiencies are a major, but less understood cause, particularly Se, Zn and Cu. These elements affect the function of the immune system. While Se (and vitamin E which is necessary for the absorption of Se when not on green pasture, which has plenty of Vitamin E), in most well-managed herds is supplemented, insufficient Zn and Cu can also cause problems. Deficiency problems in animals can be due to deficiencies and/or interactions of minerals. High molybdenum (Mo) can lower Cu absorption by the animal, high sulphur and/or iron (Fe) can be offenders that can lower Se and Cu absorption. Fe can be ingested with soil in dust or mud or in the drinking water. Too much sulphur in water can bind Cu and make it unavailable for absorption.

- The foetus can out-compete the dam for available copper. Calves are born with very high copper levels in their livers because the milk that they live on solely for a few weeks has little Cu, so cows can be severely deficient at parturition when the udder is particularly vulnerable. A good Soluble Mineral Mix (SMM) fed to cows all year helps. Feeding the SMM to calves after a week, in tepid water at 0.006% of live weight after they have had their milk, works wonders. Never feed one containing manganese in the Waikato, or in most of New Zealand which has too much Mn, especially in under-drained acid soils, so common in NZ. High levels stress cows. See Elements > Manganese.

- Some farms that don't need drains use the system of no gates, they just let fences down.

- Wet conditions. A USA survey showed that dry States had less mastitis than wet ones.

- Dirty udders from dirty tails. A Missouri University study showed cows with docked tails had lower SCC's. Keep tails trimmed and clean. Feed and supplement to avoid loose dung.

- Teats that drip can allow bug entry.

- Flies, which go from dirt to teats for some dripping milk, and to any remaining milk on teats after milking, especially when teats are not fully sprayed after milking.

- Pendulous udders. SCC levels have dropped in US confinement where udders have been supported. This research also showed that cows with shorter teats, tighter fore udders and higher udders had lower SCC.

- Untreated mastitis.

- Wrong or incomplete treatments. Before treating, find out which type of mastitis you have and treat it fully, so as not to build up resistances to antibiotic treatments. Many farmers say that mastitis is not as easy to control now with antibiotics as it was in the past. Resistance could be a reason.

- Mud, muck and dirt, especially if it is infectious mud, as in lanes, footpaths and gateways. Many farms have gravel under the gates, then a low place in the paddock that gets muddy. All entrances to

paddocks should be raised for 20 metres and shaped to slope from a crown, so the lane shape continues into the paddock. This can be achieved by pulling drain banks off and to gateways, or carting knobs off paddocks to gateways.



- The footpaths on the left paddock above will splash mud on to udders, but that will not happen on the right one on this muddy Tātuanui, Waikato farm. See Soils > Draining. This V shaping of drain banks should be done on even deep drains to stop weed growth and save having to spray drains with the dangerous Glyphosate, which on drain banks in Australia is banned because their underground water is polluted with it. In some countries it is banned completely. See Weeds.
- Not using dry cow therapy on infected cows and/or problem herds at drying off. Teatseal (plugs the teat - search the Net for suppliers) has found favour with farmers in NZ for reducing dry period mastitis infection in cows with SCC under 150,000 (over this, use a dry-cow antibiotic). It is an Irish idea which is squirted into the base of the teat (don't work it up as is done with antibiotics) and acts solely as a physical barrier to bacteria, and lasts until calving when it either comes out or is sucked out by the calf.
- Faulty milking machines.
- Erratic milking procedures.
- Over-milking.
- Incompletely milked out quarters increase in SCC. Clusters hanging with a twist can cause this.
- Cup slip. It need not happen, except on badly shaped udders. It causes cow stress and teat blasting, which damages the end of the teat and can increase the rate of mastitis.
- Old, cracked rubberware. Replace liners at least every six months, before they become cracked, fat impregnated and milk poorly.
- Mastitis milk going down the drain can end up being spread over paddocks. Pour it down an offal hole that is not too deep so that it does not affect underground water, or on grass or soil where cows never go.
- Making cows run. A dog can do this at the back of a paddock out of sight. Some dogs think it is fun to make animals run and can learn to get away with it when they can't be seen. This problem increases in large herds. Keep mobs at no more than 300 cows. 200 is better, so that they are not too long off the paddocks.
- High endophyte grasses. On a Rukuhia, Waikato, farm using two mobs, those grazing a high endophyte perennial ryegrass had higher SCC counts that dropped on the day of grazing low

endophyte or safe-endophyte perennial ryegrasses, and increased again each time they grazed the high endophyte perennial ryegrass.

- Age. Many old cows have higher cell counts. Sometimes one or two old or infected cows can raise a herd's SCC figure, especially on once a day milking. Dry off those with high counts.

- Low milk production, especially below 5 litres (11 lbs) per cow per day, as when drying off. Dry off cows producing below this.

- A comparative trial with identical twins showed that the half fed 50% less pasture had an average SCC of 150,000, while the other half of the twins on their regular amount of pasture averaged 50,000, so, if short of feed, dry off some and feed the remainder better. As well as the better quality milk, figures show that it is profitable to do this because more total milk can be produced.

- The change to once a day milking can increase the SCC. After a few days SCC levels decrease again, but not to the original twice a day milking figure. If deciding to change a seasonal herd to once a day milking, make the change before production gets too low, and keep feeding them well to hold production. Before doing so, check and dry off or cull the high SCC cows. Ten percent of cows with high counts can raise the bulk level enough to cause a milk down grade.

- Plan cow movement to keep walking to a minimum, walk them slowly (avoid dogs chasing them), keep lanes direct, short, clean and in good condition. When Northern Hemisphere cows are changed from confinement to grazing, SCC sometimes goes up for a while, although some, who have changed the whole system from having cows in mucky yards to having them on clean pastures, find that SCC goes down. Whilst walking long distances increases SCC, grazed cows have less mastitis than confined ones.

- Low Zn. The University of Missouri found that supplementing with Zn can reduce mastitis in some herds. Good SMM's contain adequate Zn for this, but not enough for facial eczema prevention, which is a different and special requirement.

- Inadequate selenium. This also causes scours and dirty tails which spread mastitis.

- Inadequate vitamin E, which can occur if not supplementing it, or not grazing green pasture which has plenty.

- Inadequate copper.

- Leptospirosis.

- Mouldy feed. Remember that long pasture in moist climates can have a mouldy base, so graze it down in stages allowing the sun to dry out any mould before grazing. Break some off at ground level and smell it, and you'll smell the mould.

- Being in season.

- Grazing fertiliser or effluent covered pasture. The latter, even after 12 days, if not washed in, has caused substantial SCC increases.

- Grazing pastures high in nitrogen.

- Sudden changes of diet, say from pasture to turnips, can increase SCC.

- Over-priming (too much feed before calving) cows with pasture and/or grain can cause milk to drip out of teats before calving, causing the teat canal to be open for long periods, which can increase the chances of infection. If an udder is tight and/or dripping, remove about half the milk then teat spray. If the problem is common, reduce the amount fed and if possible feed some hay or silage and less pasture.

- Heat. A US trial placing cows in a hot chamber didn't increase SCC, but every summer in Florida, SCC increases. It could be from associated activities in a hot summer, such as flies, and increased lying in shade, where there is more likelihood of infection.

- In New Zealand, autumn calving herds can have more mastitis than spring calving ones, possibly because of the warmer weather and more flies in autumn. Teat spraying and using fly repellents help reduce the problem.

- Stress in the farm dairy or anywhere. We had an impatient, intolerant sharemilker who rushed the cows and had high mastitis and SCC's in our herd, which previously had no problems. We

sacked him mid season with some difficulty, and mastitis decreased. Our next sharemilker, Lynton Simmons, was patient and loved the cows and they loved him for the 12 years we had him, with obvious results of low mastitis and record production.

In summer, cool the concrete yard thoroughly BEFORE cows arrive with ample water, not just enough to make steam, to keep cows cool while waiting to be milked. In heat above 25 degrees C spraying them with a sprinkler lowered SCC, and cows produced more milk. Cows should not be stood under a continuous or excessive stream of cold water for too long, because doing so has given some cows pneumonia. Nor should they be stood in a Turkish bath, which can occur if the concrete is not cooled before the cows stand on it, and a fine mister is used. Don't apply so much water that it runs down udders and teats. If sprinklers have large droplets, turn them off once cows are wet, then on again once they dry out a bit. In most cases sprinklers need not be on all the time.

Every farm, herd and situation differs, so do your own trials and improve the problem areas. Differences include the distance cows have to walk to the dairy, speed they have to walk at, whether up hill or not, whether the lane is shaded or not (it should be shaded with trees in hot countries, but not in wet ones), the heat of the concrete (cool it before cows enter), how tight the cows are packed in, how long they are there and whether the yard is shaded or not. Even in semi-tropical areas it should be. Shade cloth (black porous plastic loosely woven material) is cheap and easily erected, by having poles or pipes holding high tensile wire around and across the yard to support the shade cloth. Being crammed in tightly on hot concrete, in the blazing sun, prior to milking can't be conducive to high milk production.

Rain should be diverted from the roof and from the concrete between milkings, or it has to be pumped onto paddocks, which is bad in wet weather when paddocks are already too wet.

Precautions & Prevention

Less obvious ways of reducing counts are to apply the clusters as soon as possible after the cows enter the bails, because they will start letting down. In swing-over New Zealand style herringbones don't allow the second side in until the first side is milked, and you are ready to apply the clusters. After the first side leaves, cluster application should be a continuous operation, so sides can come in by following the last milked cow at the end of each side, giving a speedy change.

Visually check udders as a matter of course. As the shells are applied your forefinger should touch the udder, not the teat, to identify if hard, swollen or hot. If necessary, towards the end of milking a cow, feel the udder rather than relying solely on the sight glass, however, some cows have fleshy udders, while others milk out to just skin. Sight glasses are useful to watch for blood.

As well as good milking procedures from the cows' point of view, there is the importance of milk quality. It is a good idea to give staff quality bonuses, for example an extra payment for no grades and low SCC figures. The base must be revised monthly.

Hand held mastitis and SCC detectors are now available, so should be used when necessary. One gives a reading within three seconds and need not be emptied and washed until the end of milking. A new one called CellSense, released in 2005 by Sortotec, has good reports. Watch for new systems because electronics improve so rapidly.

To reduce the chance of bacteria entering the teat, it is best if cows don't lie down, or be subjected to mud for an hour or more after milking. Good lanes and good pasture farming practices avoid these, because cows should leave the dairy and move straight to the new break or paddock of pasture, which they should receive after every milking. However, if on 24 hour or longer paddock grazing, they may need to be moved to the paddock with a good quiet dog. Animals learn good habits, but only if taught. One is to go straight back to the paddock. Cows dawdling in the lane make muck and mud.

Teat spray with a good product **immediately** after cluster removal. About half the teat spraying I've watched in several countries was ineffective, because either the nozzle was too far from the teat, it fanned out too much (only the teats need it not the udder), operators were not watching what they were doing so missed some teats, or it was applied too late after milking. To reduce infection entering



the open orifice before the sphincter muscle closes, it is essential to achieve a complete coverage of the teat ends until a drip hangs on the end of each teat. Use a directional spray nozzle, not a fan or wide one, and spray each teat. Fully covering teats with a good product containing an emollient keeps them in good condition. In some open dairies, wind can blow spray back on to the operator. One complained that her neck became dry from the iodine, but she was holding the sprayer too low and too far from the teats. If this is a

problem and if good teat care is not being obtained, use a teat dip on an extension handle, to save having to lean over and strain one's back.

There are a wide variety of teat sprays available. Some are excellent, some are not, however, failures may not be from the product but from poor use. Some farm waters render some sprays ineffective within 30 minutes. If you are using a reputable spray and having problems, use rain or town water to dilute your spray. This is another reason for having good water on farms.

Use a spray that is near neutral pH, broad spectrum germicidal, non toxic, non tainting, non irritating, which has a high emollient content to keep the teats in good condition. The spray must be fully approved by human and animal health bodies. Using a PVP iodine teat spray has the added advantage of supplying the cows with iodine, because it is taken up through the skin. Most of New Zealand is low in iodine.

If teats dry out during hot, dry, weather you may like to change away from an iodine teat spray.

A strong colour spray is useful to easily identify those already sprayed.

Automatic spraying in exit races is only satisfactory with rotaries, where cows exit soon after cluster removal.

Breed for brown or black teats, because they are stronger and less prone to cracking than white ones.

Dry cow therapy should be strategic or on the whole herd, depending on the SCC and number of infections during the lactation. Frequently a farmer does the whole herd and has very little mastitis during the following lactation, so then does only those which had mastitis, followed by an increase in mastitis again. Remember to work the product gently up to the top of the teat.

Use a milking machine and milking procedure that give a low SCC, and keep the plant well maintained, by having it serviced twice a year. Tractors are serviced several times a year, and they do only half the hours of a milking machine. We don't begrudge cleaning spark plugs, injectors, points, and filters on our vehicles at six monthly intervals, but most milking machines are expected to run for twice as long without pulsator servicing, some even without air filters.

Cleaning air filters on each pulsator is a bind, and should be overcome by purchasing pulsators that can be attached to a central filtered air system, so that one automotive type air cleaner is cleaned twice a year. Farmers who have installed central filtered air have been delighted with the reduced pulsator maintenance, and with the peace of mind in knowing that dust is not being sucked through the vacuum pump. Pulsators that don't have filtered air fail at a much faster rate than those that do. A failed or faulty pulsator can accentuate mastitis. Learn to listen to them.

Check the milk filter sock for mastitis after every milking before washing and use blue filter socks that make detection easier than on white socks. After checking the filter sock and rinsing it, replace it to prevent foreign material getting into the cooler during washing, and perhaps lodging there. Discard it and use a new filter sock for each milking.

After mastitis is seen in the filter sock, check all cows before milking by using in line mastitis detectors or by pre-sampling. Avoid bending the teats and getting infected milk on your hands.

Fast milking is important, but rough cluster handling upsets cows and causes udder damage. Apply shells (the new international name for "cups") gently. Hold the cluster high and bend the liner tube, without allowing excessive air to be sucked in to cause fluctuating vacuums and teat blasting, and without "clipping" the shells on to teats, which can be sore onto tight, tender udders. Air entering shells after some have been applied causes milk to blast the end of other teats, and some to re-enter the teat. Excreted milk becomes a foreign body if it re-enters a teat.

Remove the clusters gently, by turning off the vacuum and allowing the shells to fall off into your hands on their own, rather than pulling them off. Changing to do this has lowered the SCC. Automatic cluster removers should do the same. Some don't, and cows show their dislike by lifting their leg and sometimes dunging.

Take pride in these milking actions. Bill Chynoweth did and produced twice the NZ average per cow production, equal to northern hemisphere production per cow where they are fully fed on high milk producing (but not always healthy) feeds.

Avoid cup slip, because the same teat blasting occurs. If cup slip is occurring on other than the occasional bad uddered cow, get your milking machine fixed or changed. The 2+2 pulsation system reduces cup slip, a major cause of mastitis, because the milk flows away in a steady stream, reducing the possibility of milk plugging the long milk rubber and/or dropper, which causes a drop in vacuum at the teats. The 2+2 system also achieves a more even and gentle weight distribution on all teats, instead of milking all four teats together.

Avoid using weights on your clusters. If you find them necessary, then get your milking machine corrected or changed, so that they are not necessary.

Many mastitis infections are spread by the hands of milkers and the liners. Keep your nails short and your hands clean and free of cracks, and/or use gloves. There are thin ones that you hardly know you are wearing. When infection starts spreading, check all cows, and milk infected and even suspect ones last. Until the spread stops, dip hands and clusters in strong iodine or other disinfectant solution between each cow. Certainly do this when milking the infected ones. The time taken is shorter than the time taken to treat mastitis cows, and without the lost production.

Antibiotic withholding periods on the instructions should be exceeded, especially in small herds or where several cows have been treated on the same day. Antibiotic treated cows should be milked separately and last, and all milk from all four quarters should be discarded, because untreated quarters can absorb antibiotics. Mark quarters clearly.

Avoid mud and muck in lanes by having well shaped and maintained lanes. See Lanes. This can be achieved, but avoiding mud in paddocks is easier said than done in wet weather, on wet, heavy clay soils. When overstocked it can be impossible to avoid mud because of having to graze too short, and having large numbers on small areas.

Good drainage, with ample small shallow spinner drains in wet soils, shaping paddocks and pulling the drain banks off, subsoiling, mole ploughing and using on-off grazing should all be used where best. Some are not suitable in some conditions. See Soils > Drainage.

Don't use a pad or feeding area unless essential, and keep it CLEAN. Cows milling around splash mud and muck onto theirs and others' udders. Feeding along fence lines is far better in every way. Profitable farmers do this even with grain. Proper length silage wastes little. Look how clean these cows below are in this Bill Chynoweth herd, which averaged double the NZ production per cow.

Don't use the same calving paddock every year, unless it has shelter and is very well drained with no mud, and you don't have a mastitis problem. If you do have a mastitis problem change calving paddocks, or, if calving in the mob, use a grazing system that allows cows to graze shorter pasture over a bigger area, rather than longer pasture over a smaller area that can get muddier. This is not always possible, but if all options are known, the best can be chosen. On/off grazing can also be used onto chip or bark pads on a slight slope.

Use SCC figures to treat cows, to give cows dry cow therapy, and to cull. SCC milk cannot be identified by the human eye unless counts are extremely high, when milk can appear as pus.

Extra selenium may be required, because just fertilising with it is not enough in low Se areas. A New Zealand farmer who had bad mastitis for six years reduced it to average levels after supplying selenium through the drinking water via a dispenser over the three winter months. Supplementing half a batch of identical twins with selenium plus vitamin E in USA in 1987, and doing the same in Australia, reduced mastitis in both cases, compared with the control groups. Cows on pasture do not need the vitamin E because green pasture has plenty.

A survey I did on 25 herds that changed to feeding DeLaval Feedtech minerals, containing selenium and the other six important elements, showed that 40% reduced mastitis after feeding it through the water.

Many areas have low selenium levels, so, if mastitis is a problem, as well as checking the milking machine and milking management, check Se pasture and blood levels.

Too many first calvers have mastitis and high SCC, so feeding mastitis milk to replacement calves should be avoided until this is shown to not be a source of infection, and avoid feeding antibiotic milk to calves, especially those to be slaughtered within two months or longer.

Organic farmers can reduce the ill effects of mastitis by keeping the cow handy to the farm dairy, on safe-endophyte pasture, milking her out several times a day, and each time spraying cold water on the quarter, for five seconds, to increase the blood flow. Wipe it dry gently, then use a good teat spray covering the orifice thoroughly. There are natural remedies with which I am not familiar, but organic farmers usually are. I hesitate to recommend some, because what works for one doesn't always work for another, and organic treatments usually take longer to work. Use all the preventatives.

Curing mastitis in organic cows is a major problem, causing cow and farmer stress, and not always succeeding. The industry should be looking into a safe product, or even a mild short lived antibiotic.

Don't keep replacements from cows that get mastitis.

Organic farmers have to be more thorough in breeding strong trouble-free animals. I'll give two examples of success with this. We grazed the heifers from two adjacent farmers in one mob. One group never got bloat while the others did badly. I made inquiries and found that the owner of the bloated ones drenched his herd for bloat daily while the other had never drenched for bloat. In USA, a client with Herefords, which with white hair around their eyes, attract flies which spread Pink Eye, decreased Pink Eye by never keeping calves from those that got it and in a few decades decreased the problem.

If you are not succeeding in keeping your SCC down and mastitis at under 1% all the time, ask your veterinarian for help and to diagnose the type of mastitis, to know what treatment to use.

Environmental streptococcal udder infections are more accurately diagnosed by taking and measuring several samples of milk than just one, because environmental streptococci can occur in large numbers on teat skin. Care should be taken to clean the teat end thoroughly before sampling.

Seaweed

There are treatments to reduce high SCC that can be used while cows are in milk. One of these is seaweed; in a seven year trial those fed seaweed had less mastitis than those not getting any. Some organic dairy farmers use seaweed with good results, but remember that salt has more minerals than seaweed and has the other essential seven minerals, does reduce mastitis animals SCCs. See the survey below.

Surveys done on 21 farms like this one above are far more accurate than many single herd, company sponsored, scientist ones. Half got a reduction in mastitis after feeding Feedtech Solminix soluble minerals which have the maximum Se allowed by the NZ Animal Remedies Board.

No other mineral mix company has done and published a survey like this.

One 440 cow herd fed a bad soluble mineral mix containing manganese had 30 (8%) of cows with mastitis which dropped to one cow (0.25%), after changing to Solminix.

Optimum Vacuum Level

If the vacuum gets too low, milking time will be extended, which will increase teat damage and

DeLaval Feedtech Soluble Minerals User Survey - November 1990													
		21 reports by users with 4,110 cows.			Feedtech used in drench or dispenser at 25 grams/cow/day								
		# Months	Cow	Heifer	Animal		Cow	Retained			Milk	Milk	Young
Name	Location	Used	Temperament	Appearance	Dung	Cycling	Placenta	Mastitis	Milk	Fat	Protein	Stock	
1	Bindon Robert	Matamata	2	O	O	B	O	B	O	O	U	U	O
2	Black Robert	Matamata	3	B	O	B	O	B	O	D	U	U	O
3	Carswell Terry	Te Aroha	2	O	B	B	B	B	B	D	O	U	B
4	Chynoweth Bill	Pukeroro	4	O	B	B	B	B	O	O	U	U	B
5	Clark Malcom	Patetonga	3	O	O	B	B	O	B	D	O	U	O
6	Clausen Craig*	Whitikahu	12	O	O	B	O	B	B	O	U	O	B
7	Cropp Kevin	Tatuanui	4	O	O	O	O	B	O	O	U	O	O
8	Davis Gary	Tirau	3	O	B	B	O	B	O	D	U	U	O
9	Dawson Rod	Waharoa	2	B	B	B	B	B	B	O	U	U	B
10	Hawe Keith	Walton	4	B	O	B	O	O	O	O	U	U	O
11	Henderson Wally	Matamata	2	B	O	B	O	B	O	O	U	U	O
12	Marson Gary	Waiuku	2	O	O	O	O	B	O	O	O	O	O
13	Orr Richard	Kereone	3	B	B	B	O	O	O	D	U	U	O
14	Saforsen Sterling	Rotorua	2	B	O	O	O	O	B	D	O	U	O
15	Simpson Kerry	Matamata	2	B	O	B	O	B	B	O	U	U	O
16	Singh Jesse	Tauhei	2	B	B	B	B	B	B	D	U	U	O
17	Stent Mike	Putaruru	2	O	O	B	B	B	O	O	U	U	O
18	Webb David	Waharoa	2	B	B	B	B	B	O	D	U	U	O
19	Whittaker K*	Matamata	14	B	B	B	B	B	B	D	U	U	B
20	Wilson Lloyd	Matamata	3	B	B	B	B	S	B	D	O	O	B
21	Wright John	Waharoa	6	B	O	B	O	B	B	D	O	O	O

B = Better, U = Up, D = Down, W = Worse, 0 = No change sometimes because already feeding minerals.
 * Original trial farms Solminix contains seven elements at optimum levels,
 Trials with young stock showed those on Solminix, now called DeLaval FeedTech soluble minerals, ate less, grew faster and needed no, or very little worm drenching.
 See <http://www.grazinginfo.com> > Minerals

mastitis.

In no circumstances should the vacuum be allowed to go above 50 kPa (15 inches), but with low lines (open centre Turn-Styles, etc.) the vacuum should be proportionately lower.

There are farmers with old slide pulsators who don't think it is necessary to have their milking machine tested, but there are current flow in shed milk lift pumps. A farmer with slide pulsators complained to me about how long it took him to milk, so I checked his pulsators by putting my thumb in during milking, and was horrified to find that they were set at about 30/70 (30 milking phase and 70 rest phase). He put his thumb in and said, 'No', the squeeze was about 70% and the release 30%, but he didn't appreciate that the squeeze is the rest time, and when there is no squeeze the milk is being sucked out of the teat. A discussion followed, but I assured him that it was when the air was allowed in behind the liner that the rest occurred. He agreed to get his milking machine serviced. Check yours. People make mistakes. Human error causes more serious problems in the world than anything.

Liners

Replace liners and rubberware after the recommended number of cow milkings, but at least every six months before they become fat impregnated, cracked to harbour bacteria, or milk poorly. Charts are available for liner replacement times, based on the number of cows milked per cluster. The practice by some of not renewing liners until all cows have calved, to use "soft" liners on first calvers, is not always a sound one. The old liners may not milk well, or may carry germs more easily.

Monitor Mastitis

Late lactation is one of the most important times to monitor mastitis, because, if cows are dried off with even traces of mastitis, and without treatment, they are highly likely to calve with mastitis and/or have high SCC.

Farmers who have had outbreaks of mastitis agree that the most important aspect is the prevention of its further spread. To avoid mastitis and its spread, apply the controls listed. They aren't in order of importance - all are important.

If you have a bout of mastitis, discover the type of infection. Decide on the treatment and general

control programme. Write it down and read it weekly initially, then monthly, then once mastitis has been checked, read it at least annually. If you have others involved, they must participate in the recording of problems and the solutions, and must also read the programme, so that you can all discuss the solutions.

Herd testers offer a somatic cell counting service and some consultants offer to test cows before drying off, so that the appropriate ones can be treated with dry cow therapy.

There are conductivity tests that show changes. Some farmers have bought them and don't use them so one sees them for sale.

If needed, ask your vet and all suppliers to get the best one.

A way of measuring infections yourself is to get a black (or paint one) tray with four dishes like small paint, cake or cookie trays, or a Rapid Mastitis Test paddle. With wet hands (to make squirting easier) direct two squirts from each teat into each dish to just cover the bottoms. Add the same amount of diluted four to one standard dish washing detergent and mix it quickly and thoroughly with the milk by fast flicks of a fork. Tilt the tray slowly from side to side to view the stirred milk. If it stays like milk it needs more mixing or more detergent, if it froths there is no infection, if it thickens evenly the SCC is high, if it becomes thick and clotty it is very high, and if it is ropey and sticks to the tray mastitis is severe.

Only the first milk will give accurate results because it usually has the highest infection. Infected quarters are usually sore like a boil, so suspect infection when cows raise their leg or kick.

If there is no infectious milk, the tray can just be emptied and need not be washed between cows.

Drying Off Procedure

It is important to know that new infections of environmental streptococci are higher during the dry period than during lactation. Without dry-cow therapy, this rate increases dramatically during the first two weeks of the dry period. The rate increases again during the two weeks before calving. Allowing time to get dry-cow treatment, decide the date of the last milking.

Continue to feed well to keep production up, to keep SCC's down and to maintain good cow condition. Over the last seven days before drying off, reduce feed to low maintenance and preferably feed straw or your worst hay, but not if mouldy, or long old pasture. Feed about 1% of live body weight DM/cow/day. If necessary, reduce water over the last two days. Avoid limiting water for too long if feeding mostly straw or hay. Feed at low levels (1% of weight) for the first week **after** drying off and continue feeding a good SMM and Se if necessary, in the water, because it can lower the incidence of mastitis that is important during this critical period.

Use fresh, dry, clean, mud-free paddocks or clean pads (not muddy lanes) during and after the drying off period to avoid mastitis infection.

Milk once a day for the last seven days. **Don't** prolong drying off - suddenly milking every second day increases cell counts and the likelihood of mastitis. The last milk of lactations is of poor quality. If your cell counts are high it may pay to discard the milk, although it could be coming from just a few cows, so discard their milk. Spread it onto short pasture and don't graze it for two months and don't graze it short for several grazings. Preferably use on-off grazing a few times, so that cows don't lie down in it.

If mastitis is not a problem, use selective dry cow therapy at the last milking. Before treating, sanitise the teat end thoroughly with methylated spirits or similar. Insert the tube carefully as little as possible (5 mm-1/4") to reduce teat damage. Deep insertion can damage the teat sphincter muscle.

Goats have a small orifice, so, rather than damage it with a tube, use a liquid type product and hold it firmly against the end of the teat and squeeze it in.

Finish with a thorough teat spraying, until a drip hangs on the bottom of the teat.

After the last milking watch for swollen quarters, and check all quarters in the farm dairy visually or by feeling if necessary, NOT by taking a squeeze which opens the teat canal again, unless there is a visual or felt problem.

Remember that dry cow antibiotic treated cows must not have milk sold for six weeks, depending

on the product used. Once cows are dry and free of mastitis, lock up the dry cow product or store it well away from the farm dairy, to avoid it being used when milking.

Teat plugs inserted in the teats after the last milking have no bad effects or problems and have given good results.

Avoid muddy paddocks and lanes until all teats have sealed, and avoid mud again just before calving. If mastitis is a problem at calving, change the calving paddock to a new and clean one, and avoid allowing them to bag up and drip by feeding less pasture and more hay or barley straw, or if these are not available, just less pasture. Hay and straw stays in the rumen for longer and expands it which gives it more capacity for pasture after calving, when pasture should be fully fed and hay decreased over a few days, to avoid sudden diet changes.

You may question taking so much care at the end of lactation, but when cows are being milked twice a day and producing large volumes, infectious material is more likely to be expelled, whereas with once a day milking and when dry, the infections remain in the udder for longer.

Cows are more susceptible to new mastitis infections during the first three weeks of the dry period, so take care during this period. After three weeks the keratin plug should have formed, closing off the access of infections.

Lastly and most importantly, apply the clusters soon after cows enter the bail. Good and trained cows will let down soon after entering. In herringbones close one side until ready for them to enter and be milked. They should not have to stand and wait for about eight minutes. Trials have shown that cows like gentle music so have a radio on 24 hours a day and it will also keep birds away because they associate radios with people. Radios have talking which gets cows accustomed to many voices so if a stranger arrives the cows don't muck.