

A Cwmglyn Farmhouse Cheese Handbook

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INTRODUCTION:

I am a self taught cheesemaker. In 1996 Colin and I moved to a lifestyle property south of Eketahuna and subsequently one of our dairy farmer neighbours gave me a late born heifer Jersey calf to rear. We called her Gwendolyn. At the time I knew nothing about raising calves (or farming) so it was a case of reading books, attending free seminars, (usually run by such organisations as DairyNZ or the Rural Womens' Network) and asking endless questions on calf and cow management of my long suffering dairy farmer neighbours. Gwendolyn was lovely. Her paddock companion, Heulwyn, less so, but both were indulged and grew up in peak condition. They were allowed to finish growing before being inseminated as 3-year olds and, as cows gestate for 9 months I had nine months to build a milking parlour and cheese room to deal with all the milk I was hopefully going to obtain. Heulwyn, being an Ayrshire cow, decided she wasn't having a bar of my lovely little milking parlour so I had to send her off to be a proper cow in a conventional dairy herd with a rotary cowshed. Gwendolyn raised her calf herself and, being a super abundant producer, lavished me with milk as well. I bought lots of books on cheese making and set about making cheese with all my surplus milk.

It took me about a year to get a consistently satisfactory cheese good enough to sell. And selling the cheese was my ultimate aim.

I have always been self-employed -my working life was spent as an artist enamellist and metalsmith with my own studio and therefore I had a working ethos of expecting to be paid *something* for my labours even if the payment was somewhat niggardly when the time spent in the enterprise was factored in. As I was 60 by the time I started in the dairy business I was able to fund the dairy shed build with saved-for-dotage-money and not go into debt. I have long thought that in any self-employed enterprise, it is sensible to grow within your capabilities, consolidating your skills and buying equipment slowly as needed, rather than expanding beyond your financial means in one go. I find that troublesome debt does not induce sound sleep at night and I am a woman who likes to sleep soundly....

The following information is produced to accompany the DVD we have made on cheesemaking at Cwmglyn Farm with the aim of providing help and advice for those who also wish to embark on their own adventure of producing traditional hard cheese for sale on a small scale. In doing so you will be following in the footprints of countless folk who have milked their own animals and made cheese the world over for centuries. Peasant communities have always made wonderful cheese without needing degrees in food technology, although these help if you are manufacturing cheese by the tonne and are aiming for a job with Fonterra! The DVD follows me as I first proceed with milking Sally, my geriatric cow, who is shown wearing her winter jacket made of light Dairyflex fabric with a polar fleece blanket underneath, an then continues with me making an actual cheese in my cheese room.

When I embarked on my cheese producing career, I had a licence to manufacture cheese and butter from the local District Council Environmental officer. I subsequently discovered that this was not legal when the New Zealand Food Safety Authority Investigation and Compliance officials swooped down on me after I appeared on a TVNZ "Country Calendar" programme. These officials have now been amalgamated into MAF (Ministry of Agriculture Fisheries & Forestry) and new regulations are proposed for Micro-cheese makers who milk their own lactating animals with a production level of under 1000 litres of milk per week. This was a result of the inordinate fuss I made over the unfairness of using the same regulations whether you made a kilo of cheese a week or 40 tonnes! However at the time of writing, some 12 months later, nothing has been done!

I am hopeful I will be able to distil all the information and techniques I have learnt over the years to enable you to have the satisfaction of making a wonderful product that will give you, your family and customers much pleasure and delight. Without, I trust, incurring the wrath of the Investigation and Compliance Officers of MAF!

I make traditional Hard Farmhouse cheese from cows milk and this booklet will only cover my experience with this product. I have no experience or expertise on the management of milking sheep, goats, buffalos or yaks or their respective cheese!

FIRST THE COW.

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To make good cheese you need good quality milk from a healthy animal and to make the daily business of milking her pleasurable for both of you, it is a good idea to have a good tempered *quiet* cow! If you have never owned a cow before (or milked one), it might pay you to visit an obliging dairy farmer and ask if s/he has a suitable older cow that you could purchase or lease. Better still would be if s/he would give you some milking lessons before you take an animal home. I spent a fortnight helping with the daily milking of my neighbours' 540 herd of cows to learn the business of machine milking. The main difficulty with taking a cow from a large commercial herd is that they can be 'spooked' by being milked by themselves instead of being side by side with dozens of their mates. They also might not take kindly to amateur hand milking if they are used to being machine milked. I find food bribery usually works wonders and all our cows have a specially prepared feed containing the essential nutrients they need for good metabolic health laced with molasses and lucerne chaff to munch on while they are in the milking parlour. Temperament is often associated with specific breeds of cow and the usual breed of choice for a good house cow is a Jersey one. Their milk has a high fat content which makes for an excellently flavoured cheese and their cream makes wonderful butter. Being a smaller breed of cow, they don't pug the pasture as much as the large black and white Friesians. As a general rule, brown cow breeds seem to make the best cheese - Jersey's, Guernsey's, Swiss Brown's, Dairy Shorthorns. Unfortunately it also seems that the channel island breeds are most likely to be susceptible to Johne's Disease. More on this condition later. Ayrshire cows are used for a traditional cheese called a Dunlop but are also notoriously difficult to handle. This fact, however, is hotly disputed by dairy farmers who breed them!

If you are buying an older cow you will also need to examine your prospective cow's udder and note how it is hung... Sometimes an older, but highly productive, cow will have weak ligaments holding up her udder and it saggily shows. The trouble with this is that if the udder is hung too low and you are machine milking her, it will be difficult to get the milking cluster to hang properly and milk her out, (and this is probably why the commercial farmer is getting rid of her!) And, most horrific of all, such cows have been known to step on their teats with dire consequences. You also need to examine the end of the teats and make sure they haven't been damaged. Damaged teats are an open invitation to any passing pathogenic bug to take up residence. If she is from a commercial farm, ask to see her last herd test results so you can check her SCC (somatic cell count), fat and protein levels in her milk. Ideally she will have a clean bill of health from a vet and be tested TB and BVD free and if this has not been done it would be very sensible to pay for a vet's service for this.

Other things you need to consider are her age (the cow's, not the Vet's) On commercial farms, heifers are put to the bull while they are still 'teenagers' and if they are too young this does seem to stunt their growth a bit and can lead to trouble calving particularly if she has been mated with an inappropriate i.e. too large a breed of bull. Farmers are quite good at sensing trouble before it arrives and sometimes in-calf heifers are sent to the sale yards before the trouble hits! A cow that is around 6 years old is usually in their prime and consequently will be rather more expensive. Ones that are around 11 or 12 might be coming to the end of their productive life on a big commercial dairy herd, but will have years of productive life as a house cow and you can probably buy at the 'cull' price and save them from "the Works" as I did with Sally. Cows are very much creatures of habit, once they have adjusted to your system they settle down quickly, but if you rearrange the milking parlour or the order in which your cows are customarily milked you might well have trouble!

If you buy an 'in-calf' cow or heifer at a sale yard, you will have to make sure she has not been put to an unsuitable bull and you need to manage her pregnancy properly so that she has the correct metabolic nutrients to cope with the stress of calving. Most cows manage to birth happily by themselves (gestation is 282 days -9 months) but you need to familiarise yourself with the process so you can assess when to get help if she needs it. If things are not going right, get expert help fast.... For instance if you see the cow has been straining for more than 6 hours without producing the water bag or if the water bag is present for more than 2 hours without a calf being produced, check the cow and get help.

The other avenue is to rear a couple of dairy heifer calves, but this is not always a good idea as I found with my first two.... Gwendolyn was fine, but Heulwen an absolute nightmare! The other aspect you have to remember is that the first time lactation starts, it can be very sore at first and a young heifer might be a real kicker, especially if she knows you very well and reckons you are a pushover!

Cows do not need to have a calf every year and it is sometimes easier to have a house cow on an 18 month calf producing cycle. She will continue lactation for as long as you keep milking her. Although the amount will be diminished after she becomes pregnant. She will need to be 'dried off' around 60 days before giving birth again to allow her udder time to recharge before the next lactation period. The drying off period needs to be carefully managed to prevent mastitis developing in the un-milked udder. Your Vet can give you advice with this.

Pregnancy can be achieved by AI (artificial insemination) and the services of an AI technician, your Vet or an obliging and competent in that area, dairy farmer neighbour. Semen straws can be ordered from companies like LIC, Ambreed and stored in special gas filled semen banks. Again a dairy farmer neighbour might allow you to store your semen in his or her bank or sell you some spare straws. Cows cycle approximately every three weeks and you have to judge exactly when they are on 'standing heat', that is, when they stand still and permit their paddock companions to mount them and this is when the semen has the best chance of making contact with the cow's ovulating egg. There are various proprietary devices like Kamar patches on the market to help you. These are glued onto the end of the cow's back and they turn a bright colour when they have been rubbed or flattened when mounted by other cows. Look on the LIC web site for more information on heat detection in cows. Heat detection is harder if you only have the one house cow because you will have to observe her behaviour very closely. She will do a lot of walking around and bellowing her availability instead of eating grass, so her milk yield will be less. There might also be quantities of mucus in her vaginal area. You will also have to watch that she doesn't try to mount you in an excess of misplaced sexual enthusiasm. Half a ton of cow jumping you from behind is quite scary, and yes, it *has* happened to me. Knocked me flat and I was lucky she didn't break any of my bones when she landed again. The Doctor nearly fell off his chair laughing when I took my black and blue self for a check-up afterwards. I dare say the people at ACC had a good laugh too.....

With a single cow herd this might be a situation you would find it easier for her to have visiting rights with a bull next door. One thing to be said for bulls is that they don't need little plastic stick-ons to tell when the cow is 'ready'! But be aware that bulls are unpredictable and can be dangerous, particularly Jersey bulls. I personally would think twice about having one to stay. They dig holes in the paddock and wreck fences and will not take kindly to you taking her off for milking every day. Any bull calves born at Cwmglyn get steered very promptly or reared entire off the farm.

Of course a lot will depend on how much land you have available to feed your cows. As a very rough general rule you will need at least a couple of acres per cow. So on a 10 acre block, don't have more than 5 animals as you need to allow adequate time to rotate grazing between paddocks. Remember that in the nature of things they increase. A cow, her calf, maybe a steer from previous year and then they'll be another on the way when she calves again. They will need a constant and good clean water supply for drinking - a lactating cow drinks 60 litres of water a day. She will also need adequate shelter in inclement weather and hay and baleage for the winter. You will also need a suitable shed to store the hay so it won't go mouldy. Mouldy hay is a health hazard for cows and humans alike. You will also need to judge how much time you have to tend to their care and daily milking. If you have a good relationship with a dairy farmer neighbour, it might be possible to come to some arrangement whereby he directs a specific cow's milk into a test bucket that you could provide. This might cause some legal issues as farmers are only allowed to sell 5 litres of milk a day under the terms of the farm RMP. Some farmers get round this by offering you equity shares in a cow. If it is "your" cow, you can have as much milk as you like from her. If you are only intending to make cheese for yourself and family, the volume of milk generated by a house cow might be excessive as she will produce considerably more than would be needed for her calf. In these circumstances, two or three families might share a house cow which would mean that you would only have to milk her every two or three days. But you would have to ensure that your fellow co-owners were reliable and competent to avoid animal welfare issues. A haphazard approach to milking is a recipe for mastitis, a nasty infection of the udder, which in some cases can be fatal. Mastitis is a very painful condition for the cow (as any woman who has also had it will testify) and you cannot make cheese from milk infected with mastitis as the natural antibodies (Somatic cell count abbreviated to SCC) the cow produces to fight the infection will turn your curd to mush. Mastitis is caused by bacteria picked up from the environment or infected cows and if you are milking several cows it can easily be passed on to the next cow. DairyNZ produces an excellent handbook on mastitis and its prevention in cows, which is well worth obtaining. At Cwmglyn Farm, where we milk once a day, we limit the occurrence by doing a rapid mastitis test (RMT) every day on each cow. This is a simple test which has been used for many years around the world. where you squirt 2 ml of milk from each quarter into a specially constructed paddle, add a detergent reagent and swirl it around. This then gives you a measurable indication of whether the milk is healthy or not. If there is no noticeable reaction, the quarter can be presumed to be healthy. If the mixture coagulates into a slime the quarter can be presumed to be infected.

The following describes the process of reading RMT reactions and are taken (with their permission) from the Shoof catalogue:

1. Mixture remains liquid with no evidence of gel formation or solids (precipitate)
= < 200,000 SCC

2. A slight precipitate forms which is seen by tipping the paddle back and forth and observing the mixture as it flows over the bottom of the cup = 150,000 to 500,000 SCC
3. A distinct precipitate but no tendency towards gel formation = 400,000 to 1.5 million SCC
4. The mixture thickens immediately with some suggestion of gel formation. As the mixture is swirled, it tends to move in to the centre, leaving the bottom of the outer edge of the cup exposed. When the motion is stopped, the mixture levels out and covers the bottom of the cup. The mixture clumps slightly = 800,000 to 3 million SCC.
5. A gel is formed which causes the surface of the mixture to become convex. Usually there is a central peak which remains projecting above the main mass after the motion of the paddle has been stopped = 2 to 6 million SCC
6. Viscosity is greatly increased so that there is a tendency for the mass to adhere to the bottom of the cup. The mixture clumps together readily = >5 million SCC.

Take action if any reaction above 2 is observed. By daily testing before cups are applied, if a problem is observed, then that particular cup can be plugged so that no infected milk enters the system to contaminate the healthy milk. The affected quarter can then be hand milked (or a quarter milking device used) and the infected milk discarded. Care must be taken to ensure that the infected quarter is properly milked out. Residual infected milk left in the udder will cause more problems. It should be noted that in a cow, each quarter is entirely separate and that care must be taken if you are handling or hand milking an infected quarter not to infect the other quarters. Wear milking gloves and wash gloved hands meticulously before handling the other quarters, or the next cow. Veterinary advice should be sought about the treatment of infected quarters.

The milking area needs to be arranged so that the cow can be secured in a suitable bail and the surrounding area, preferably sealed, can be easily hosed down and cleaned. In best practice, the udder should be cleaned and dried before milking commences. If you use a milking machine, then facilities must exist so that the machinery and milk lines can be adequately washed and sanitised after milking is completed. Your milking shed must stand up to scrutiny by MAF inspectors who will (for a fee) inspect the premises annually. They will require that bare wood surfaces are painted, walls and floors can be adequately hosed down and drained. Milking machinery must be cleaned with specified and approved chemicals, using both cold water rinses and very hot water (80°C to 85°C) detergent washes for both alkali and acid used in a specified rotation and with a specific amount of water for each cluster. At Cwmglyn we use a stainless steel test bucket full -25 litres- for each cold and hot wash and the single cluster is immersed in it until it is emptied. (The cluster is wiped clean with disposable paper towels before being immersed) Animals remedies to be kept in a locked cupboard, and that the entire premises are kept in a clean and hygienic manner and there are no places where birds and vermin can nest. They will also want to see that the milking machinery and vacuum pulsator has been checked annually by a qualified technician. The vacuum pressure needs to be between 45 to 50 Kpa. Fortunately it is now reasonably easy to buy small portable milking machines. Lifestyle magazines often have advertisements for these and at time of writing they were around \$2000. If Veterinary prescriptions are administered, proper records of these must be kept and any milk withholding times observed and noted as must annual TB test results and leptospirosis vaccinations.

If you hand milk, you must use a suitable milking pail and take care that the milk is not contaminated during the milking process. Clean hands and milking gloves should be worn and it is sensible to use a suitable all-encompassing shit-proof milking gown especially when you are still at novice grade. Even the best regulated cows are susceptible to sudden bowel evacuations, particularly when stressed! At Cwmglyn Farm we always have a special rubber "poo" bucket available for just such eventualities!! Remember too, when you are milking, that cows cannot easily kick backwards as horses do, but they can and do kick 'frontwards' so the traditional milking stool sideways stance can be a bit dodgy with an unknown cow. It is always sensible to tie her leg comfortably to a convenient post so she cannot knock you for six. It is safer to milk from the back rather than the side as you see in old photographs of picturesque milkmaids perched on stools in the paddocks. Of course, this puts you in the direct line of fire from the nether regions above. You just can't win them all. A cheap plastic shower cap is a good option. Any onlookers should be given strict instructions to "watch that tail", cows always lift their tails before action so it's usually not too hard to take avoidance measures.

The demands on a lactating cow are enormous and she will need adequate food and nutrition to keep her healthy and productive. This will include specified daily does of minerals such as calcium and magnesium to avoid metabolic disease, which can strike very quickly and, if help is not given

immediately, can be very quickly fatal. Again either your local Veterinary practitioner or DairyNZ have excellent advice on managing these conditions and how to avoid them. I can assure you that prevention is far less stressful than cure applied too late.

So to sum up:

- You need a healthy, good tempered cow.
- You need to decide how and where she will be milked.
- You need to decide whether to 'share' milk with her calf by leaving the calf with her and shutting up the calf at night in a shed so you get first call on her milk in the morning. The disadvantage of this system is that she will often 'withhold' her milk for the calf and as the calf grows older it will chew and damage her teats in its enthusiasm to suckle and the udder bunting that goes on makes my boobs tingle in sympathy. At Cwmglyn we now prefer to remove the calf as soon as it is born and hand rear it in a very comfortable calf rearing shed. If the calf is kept well fed (we give 3 small feeds per day) and the mother can view it when she wants to, neither seem distressed by this arrangement.
- You must ensure your lactating cow has enough water, feed and mineral supplements to avoid metabolic disease.
- You need to ensure that the cow's udder remains healthy and the milk is uncontaminated.
- And when in doubt, ask a knowledgeable farmer neighbour or your Vet.

Disease in cows:

Brucellosis and Leptospirosis are both diseases which can be passed on to humans who can subsequently become very ill. Fortunately Brucellosis has largely been eliminated in NZ as a result of vaccination, testing and slaughter programmes, but Leptospirosis is common and can be controlled by having all cattle vaccinated annually -calves are normally done at around 6-8 weeks old with another booster injection given about a month later.

Mastitis, an infection of the udder, is covered above.

Bloat can be very serious. The condition is caused by the formation of a foam or froth in the rumen which makes it impossible for the cow to belch out the gases formed by normal rumen activity. As the amount of gas grows, pressure is put on the heart and lungs and can quickly lead to asphyxiation and collapse. Cattle are most likely to be affected when they eat large quantities of lush, clover rich pasture and lucerne particularly in spring if they have been on short winter rations and then are suddenly let loose in fresh pasture, but the condition can occur at any time of the year. It can be controlled by treating the cows with an anti-foaming agent and these are usually various oils that are either given routinely to the cow at milking or added to their drinking water. We always give our cows a daily dose of sunflower oil mixed in their milking feed. The trick, when you add the bloat medication to the water supply, is to get them to drink the water that has been dosed! We always make sure the cows eat some hay before being let loose on very lush pasture and because they are very well fed over the winter, we haven't found bloat to be a problem. If a cow is severely bloated, it may be necessary to relieve the pressure in the rumen by inserting a sterilised knife or trochar directly into the rumen through the left flank. Then get the vet out fast to stitch it up. It would be a sensible precaution to get the vet on a routine visit to show you exactly where you need to insert the trochar should you ever need to do it.

Metabolic Disease: These are

- Grass Stagers (hypomagnesaemia), caused by a low concentration of magnesium in the blood. Grass stagers can be largely prevented by giving the cows additional dietary magnesium before and after calving.
- Milk fever (hypocalcaemia), caused by a low concentration of calcium in the blood. Milk fever is most common, particularly in the first few days of lactation in an older cow. The cow develops muscles tremors, is nervous & irritable and sometimes aggressive. We give our cows a product called calol as soon as they have calved, with another bottle the following day. Warming the whole bottle in a jug of hot water so it goes down easier helps, then you hold her head firmly in an arm lock (while she is in the bale or race, even the tamest cow is unlikely to let you do it in the open paddock unless she is very firmly tied) and angle the narrow neck of the bottle into the corner of her mouth so that as her head is pointed upward you squeeze the bottle and try and get most of it down her throat rather than all over you. It is a miraculous product, Emily, one of my cows who was very, very intelligent and determined, one year would not have her dose and subsequently collapsed. I was then able to get a bottle into her while she was lying down. The vet arrived and

gave her some more medication and she got up and lumbered off to the paddock like magic. After that episode, we always insisted she had her Calol!

- Ketosis (acetonemia), a high concentration of ketones in blood from a rapid fat breakdown. The breath of the cow and milk will smell of acetone. A pink proprietary product is available from your rural supply merchant or vet to dose her.
- Acidosis (grain overload), a high concentration of lactic acid and a low pH in the rumen from excessive fermentation of starch. Give your cow a dose of bicarbonate of soda (300 -500 g) and increase the proportion of fibre in the diet.

Another serious disease in cattle touched on before is Johne's disease. This is a disease that infects very young calves and then lies dormant for several years. The bacterium is referred to by the abbreviation MAP which stands for *Mycobacterium avium paratuberculosis*. It is a similar bacteria to tuberculosis, but has quite distinctive characteristics from the TB bug. Johne's disease is named after the German bacteriologist and Veterinarian, Heinrich A. Johne, who discovered it in 1905. I quote from Wikipedia "In cattle, the main signs of paratuberculosis are diarrhoea and wasting. Most cases are seen in 2 to 6 year old animals. The initial signs can be subtle, and maybe limited to weight loss, decreased milk production or roughening of the hair coat. The diarrhoea is usually thick, without blood, mucus or epithelial debris, and may be intermittent. Several weeks after the onset of diarrhoea, a soft swelling may occur under the jaw. Known as 'bottle jaw' or intermandibular oedema, this symptom is due to protein loss from the bloodstream into the digestive tract. Paratuberculosis is progressive; affected animals become increasingly emaciated and usually die as the result of dehydration and severe cachexia".

A cow with Johne's disease is more than likely to infect her calf, not only through the colostrum but through faecal contamination. The MAP bacteria are very persistent and can live in the soil for months. As it is an incurable disease, any cow diagnosed with Johne's should be culled, as soon as possible, as the longer they live the longer they can infect the pasture and then other young stock are put at risk. Unfortunately we have had 2 of our lovely cows (both from different farms) go down with this horrid condition. We now insist on a blood sample now on every new animal on the farm and continue to check with a blood test annually. Unfortunately a negative blood result does not always mean the cow is free of the disease, but a positive result is ALWAYS positive.

In both cases at Cwmglyn, all the cheese made from the milk of the two cows concerned after diagnoses was buried as well. This incurred a considerable financial loss but as the following information will show it seemed better to take a loss than possibly inflict other worse outcomes.

Sadly it seems likely the MAP bacteria has other serious consequences for the cheese maker. Ini Witzel, a research technician with LIC was kind enough to collate the following information for me from various research papers in her own time: I am very grateful to her for doing this for me.

- Milk may be contaminated with MAP by either direct shedding of the micro -organisms or faecal contamination, during or after milking. It has also been documented that cows with clinical JD or infected cows in the latter stages of infection shed viable MAP cells into their milk, albeit at a low concentration (2 to CFU/50ml of milk; faecal material from clinically infected cows may contain as much as 10 to the power of 9 CFU/g faeces. (A CFU = colony forming unit, a measure of viable bacterial number)
- MAP will not grow in cheese, but is much more resistant to inactivation by adverse conditions such as low pH, high temperatures and salt than most other pathogenic bacteria. In hard cheese the long survival of MAP is rather surprising; compared to other pathogenic bacteria possibly present in raw milk. MAP differs greatly in its capacity to survive cheese manufacture and ripening. The MAP counts decrease very slowly over the ripening period, and the rate of inactivation is thought to depend on the primary concentration of MAP in the raw milk.
- Several studies investigating the heat resistance of MAP have demonstrated the ineffectiveness of standard pasteurisation regimes, including HTST (high temperature. short time pasteurisation), to totally kill MAP. MAP has been cultured from naturally infected cows milk after commercial scale pasteurisation, and has been detected in raw and pasteurised milk from cows, sheep and goats and cheese on retail sale in various countries.
- During hard cheese manufacture, a major portion of the microbial load will be entrapped in the milk coagulum and during elimination of whey will be further concentrated in the cheese curd; therefore if viable MAP cells were to survive pasteurisation they would be concentrated in the cheese curd. MAP cells typically occur as clumps, which are dispersed to some extent during homogenisation of retail milk prior to pasteurisation; it has been suggested that de-clumped MAP

cells are more susceptible to heat treatment, but for most cheese making, liquid milk is not normally homogenised prior to pasteurisation, which could increase the likelihood of clumped MAP cells being present in cheese milk. A combination of homogenisation and pasteurisation was found to be more effective on MAP inactivation than pasteurisation alone.

- Studies also showed release of MAP from cheese milk into the whey fraction during the manufacturing process; the long term survival of MAP in whey may be an important factor to consider when evaluating the use of whey as a cheese processing by-product or the effectiveness of waste water treatment.

Ini Witzel concludes “As is usual in science, there are several studies that contradict each other, but the above summary was put together from a range of studies that have come to the same conclusion. Epidemiological evidence supporting a causal relationship between MAP and Crohn’s disease in humans exists, yet the role of MAP in the aetiology of Crohn’s remains unclear to date.”

Given the above information, I think cheese makers should take Johne’s disease very seriously. It is also found in sheep and goats. Personally I’m surprised that the disease is not mentioned in the cheesemakers RMP Template of NZFSA.

THE MILK

Fresh whole Jersey milk is wonderful. As soon as the milk leaves the udder it should be strained, filtered and cooled rapidly to prevent spoilage. The reason cheese culture grows in milk so beautifully is because milk is the most marvellous medium for growing bacteria, so you must be meticulous in your hygienic handling of it to ensure that no pathogenic material is inadvertently put in it, otherwise that will grow as readily as any subsequent ‘good’ bacteria.

At Cwmglyn, the milk is carried directly from the milking machine cluster on the udder to the receiving churn in the cheese room through stainless steel pipes. This ensures no contamination of the milk takes place in the milking parlour. The sealed churn is opened in the cheese room and the milk emptied through a sieve for the milk’s first filtering. It is then measured and further filtered using sterilised double layered cotton filter clothes to make sure that every tiny speck of dirt is removed from the milk. After use, the filter clothes are washed, and put wet into a microwave on high for 4 minutes to sterilise them before being hung up to dry. You could also use individual disposable filter papers instead. The amount of milk obtained is recorded. This is important if you are making cheese under a micro cheese makers Risk Management Plan (RMP) as you will have to prove your milk production is below the permitted level. But even if you are not, it is still important to record the milk output of each cow so you can monitor production. If it is dropping too sharply, she might not be getting enough to eat or incubating a disease that is not obvious in the milk, e.g. Johne’s Disease.

The milk from the first 10 milkings after calving, which contains colostrum (absolutely essential for the calf) is NOT suitable for cheese making. The antibodies she produces to keep her calf free from infections will nuke the cheese culture as well.

Although the New Zealand Food Regulations are supposed to permit the production of raw milk cheese for sale in New Zealand, in practice, the Food Safety Authorities will not permit it. If you want to make cheese legal to sell, it will be easier for you to start selling cheese made from heat treated milk. Big cheese factories have very large, and costly, pasteurising machinery that are usually beyond the means of small cottage industry producers. Small home pasteurising machines can be purchased from America but they will only treat 7 litres of milk at a time and the actual pasteurising temperature is hard to check without releasing the steam pressure. At Cwmglyn Farm I heat up the milk in large saucepans, stirring the milk gently as it heats up to the required temperature (using a stainless steel probe thermometer to check it), holding it at that temperature for the required period before placing the saucepan -obviously with the hot milk still in it- in a sink of cold running water. The sink has a stainless steel tube that fits over the plug hole so the rising warm water drains through it. I further cool the water with a number of Chilly bin freezer blocks. If I am not making cheese on a particular day the cooled heat treated milk is stored in the refrigerator until needed. Every step in the heat treatment of the milk is noted and recorded for audit requirements.

The amount of milk you get from each cow will depend on her age, how productive she is and the stage of lactation she is at. As a general rule she will achieve her peak production around 6 weeks or so after calving. Thereafter she might lose about 10% or so a month. Commercial Dairy Farmers in New Zealand try to time the peak production time to the famed ‘Spring grass growth flush’ so the peak

production really fills the vat. But not all Springs arrive on time and a lot of farming success is dependent on good forward planning.....

If you are not making cheese as soon as the milk arrives from the cow, it must be stored properly and safely until cheese making commences. You will need to purchase suitable sealable food grade containers that are appropriate for the bulk storage of milk and keep them in good condition. Milk should be cooled to <4°C immediately after milking or after Heat Treatment and thereafter stored in a refrigerator.

However you should be aware that the very best cheese is made as soon as possible after milking.

To make good quality 'fit-for-purpose' cheese that you can legally sell, you will also need to build or lease hygienic premises that will conform to commercial kitchen standards. Cheese making is a process where the product can be easily cross contaminated by other substances and as the process takes several hours to make, it is sensible to only use the premises for cheese making. Surface areas such as walls, ceilings and floors need to be non-porous and easily cleaned. Benches need to be made from stainless steel and the sinks of sufficient size to enable you to clean utensils and containers properly. Water has to be of impeccable potable quality, filtered and UV sterilised. This is particularly important if you are in a rural area and dependant on your own water supply. Hot water for cleaning up has to be in sufficient quantities and of a temperature hot enough to ensure that no pathogenic material survives. Doors and windows need to have fly screen coverings. The cheese storage area where finished cheese is placed to mature needs to be quite separate from the cheese making area. The maturing store also needs to be well ventilated with a constant temperature in the range of 8° - 15°C with a humidity of around 80%. The actual maturing temperature will depend on the type of cheese you are making.

It is useful to have a lobby area to your cheese room where you can change footwear and clothing so you don't introduce pathogenic material from 'outside' into the cheese room. The specialist Cheesemakers Association of Great Britain produces an excellent booklet 'Code of Best Practice' for cheese makers and it is well worth trying to obtain a copy. Although written for British regulations, similar regulatory regimes exist in New Zealand for the advice given to be common to both.

How much equipment you need to assemble for cheesemaking will depend on the size of your projected operation. Innovation & lateral thinking will enable you to obtain a useful compliment of equipment such as catering saucepans for cheese vats, trolleys with large plastic tubs with taps fitted for water bathes, without spending a fortune. Simple plans for making cheese presses can be obtained from Cwmglyn Farmhouse Cheese and stainless steel pasta cookers make excellent cheese moulds. A wander round an Opportunity Shop presents many inexpensive bargains like stainless steel meat carving trays, that with the addition of suitably placed drainage holes will make excellent whey drainage trays at very little cost. It will be useful to establish a good relationship with a local engineering firm with expertise in stainless steel fabrication to make additional moulds and stands as your competency and purse grows large enough to accommodate such purchases. Curd cutters can be made from stainless steel frames threaded with stainless steel fishing wire. Cheese cloth can be purchased by the roll or metre and sterilised before use by boiling.

Heat treatment of milk:

From a Food Safety point of view, Heat Treatment is regarded as a 'Critical Control Point' (CCP) and must be properly controlled and detailed records made of the process. Failure to do so will result in you being enmeshed in an expensive bureaucratic nightmare. It is also very important to avoid cross contamination after you have heat treated the milk. As stated in the UK Specialist Cheesemakers Code of Practice, "Pasteurisation kills only vegetative cells: sporeformers and thermotolerant bacteria can survive and may then multiply in the pasteurised milk if temperature control is inadequate, so rapid cooling and correct storage after heat treatment is important."

There are two recommended methods of Pasteurisation:

HTST (High Temperature Short Time) minimum 72°C for 16 seconds

or

Batch: Minimum 63°C for 30 minutes. Batch pasteurisation will be difficult to achieve without having a proper pasteurisation machine.

** Thermisation is the process of heating the milk in a range of 57°C to 68°C for at least 16 seconds. It is intended to extend the storage time of 'raw' milk by destroying the psychrotropic spoilage organisms. However, whilst it may also achieve the destruction of Gram-negative bacteria such as

Salmonella and E.coli, the destruction of all vegetative pathogens cannot be guaranteed; for example Listeria monocytogenes and Mycobacterium bovis are likely to survive. To ensure destruction of these possible contaminants, cheese made from thermilised milk must be kept in storage for a period of not less than 90 days.

Verification of the calibration of thermometers should be carried out regularly.

With all heat treatment, it cannot be stressed enough that the food safety authorities will want to see that you have kept extremely detailed records of all your procedures and processes and these will be audited on a regular basis. I have included a sample of the forms I have devised for Cwmglyn cheese records at the end. You are welcome to adapt them if you find them useful.

The next prerequisite of proper cheesemaking is the addition of starter cultures. Traditionally a small quantity of the previous days curd or whey was kept warm and then added to the milk the following day. As you can imagine, this method is enough to induce heart failure in any self-respecting food safety officer and would also be the means of introducing all sorts of unwanted pathogens into the cheese. These days most cheesemakers use freeze dried starter cultures of various lactic acid bacteria that are introduced directly into the milk. The starter culture must be active enough to produce the correct level of acidity in the milk. This is not only to make a good cheese, but the acid producing organisms will prevent the growth of unwanted pathogenic ones. Freeze dried cultures are purchased in sealed pouches and should be stored after opening in a freezer at (minus) -18°C. I find that I can reseal the pouches quite easily using the plastic rod sealing devices sold in supermarkets for resealing cereal packets. Then I place the entire sealed pouch in a clip sealed plastic box in the freezer. The Direct Vat Starters (DVS) come in packets sufficient to dose 500 litres of milk. If you are working in a large factory you put the whole lot in, cottage industry operations measure out the granules by the spoonful. Make sure you return the resealed pouch with unused culture back in the freezer as soon as possible. The advantage of using freeze dried cultures such as this, is that the risk of pathogenic contamination is minimal. It is important to follow the manufacturers instructions as to the correct use of their cultures. Firms such as Christian Hansen Ltd have excellent web sites where all this information can be found.

The making of hard cheese is inherently safer than the making of soft curd cheese, because the pH (acidity) of the curd occurs in a shorter time, typically within a 5 hour period. Pathogenic bacteria cannot survive in an acid environment so your record keeping must show the lowering pH levels as your cheesemaking progresses. pH meters are now available at electronic shops and the one I use is designed for tropical fish fanciers to measure the pH of the water their fish swim in. It is not particularly expensive- around \$60- and simple to use. It will need to be calibrated using the buffer solution provided and then the probe is cleaned by dipping it in water. Using a small ladle, spoon out a small quantity of milk or whey and dip the probe in it and read off the value. DISCARD the milk or whey in the ladle as the probe cannot be sterilised, and record the pH value you have obtained. This then becomes part of you HACCP (Hazard Analysis and Critical Control Point) - a food safety system to describe how food safety hazards are controlled and monitored and note that this process is very dear to the hearts and minds of all food safety authorities!!

The main health concern arising from a 'slow vat' - where the acid development of the curd is not performing as it should, is that it may contribute to the production of enterotoxins from Staphylococci .aureus usually referred to as coagulase- positive staphylococci. If the counts exceed 100,00/g then the cheese must be microbiology tested for enterotoxin which is harmful and, in some cases, can be fatal.

The hazards listed in the UK specialist cheese makers code of good practice are beautifully listed as follows:

- *"Growth/survival of harmful bacteria due to inadequate acidity development due to:*
 - *low addition rate of starter*
 - *incorrect incubation conditions (e.g. Temperature of milk)*
 - *slow activity of starter due to incorrect storage conditions*
 - *incorrect bacterial starter strains*
 - *presence of veterinary residues, e.g. Antibiotics*
 - *contamination by bacteriophage (a 'phage is a virus which attacks and kills the starter bacteria)*
- *Inadequate levels of rennet, resulting in high moisture level in the cheese, allowing growth of harmful bacteria*

- *Contamination by harmful bacteria and foreign bodies from operatives, equipment, environment, pests, etc.*

As you will see from the above the correct proportion of rennet to the amount of milk being used in the vat is very important. Too little and the curd will take too long to set, too much and the cheese may turn out to be bitter tasting. In cheese making there is a great deal of what I call the 'Goldilocks Factor' Not too much, not too little but just right and the same goes for temperature ... Not too hot, not too cold but again, just right! **And do not forget to keep detailed records!!** A sheet showing our cheese making record system at Cwmglyn Farmhouse Cheese is given at the back. You can adapt it for your own use

Salt is also added to the curd, not only to add flavour but also to help preserve the cheese. The salt should be without free running additives as included in ordinary table salt. The amount of salt is determined by the quantity of curd and the type of cheese being made. It can be added as dry salt to the curds or pressing dry salt to the outside of a newly made cheese or by putting the finished cheese in a brine bath of strong salt solution or even a combination of dry salt to the curd *and* a brine bath. It is important to salt the curd correctly, not only to inhibit the growth of pathogens and add flavour but making sure it is added at the proper stage of the cheese making. If salt is added too early to the curd, it can retard the activity of the starter culture and therefore diminish the acidity of the cheese curd thereby making it easier for pathogenic bacteria to become established. Coagulase-positive staphylococci, for instance, are acid-sensitive but salt tolerant.

At Cwmglyn Farm I only make the safer hard cheese for sale. The farm is in an isolated area without the usual High Street pedestrian count you get in large cities and towns so it would be hard to find customers for soft cheese before the 'best before date' so beloved of Food Safety Authorities. -I tried to persuade them that for hard cheese you needed a "Not recommended to be eaten before date" but their labelling regulations can only cope with a best before date! As soft cheese has such a limited shelf life and if the opportunity for selling such cheese is not available, it might be advisable to stick to hard cheese making as we do at Cwmglyn Farm. Hard cheese does have the advantage that the longer it is stored, the tastier it gets!

It is important in the pressing stage of cheese to have a fairly constant temperature in the cheese room to encourage the drainage and further rapid acidification. Generally the temperature recommendations are around 16°C for hard cheese and a couple of degrees more for soft cheese.

As we do not brine cheese at Cwmglyn, the management of the brining process is not covered here. Much excellent advice on this process can be found in the UK specialist cheesemakers code of Best Practice.

Temperature control is also very important in the maturing or ripening cheese stage. Temperature control here should always be in the 8-10°C range so that any natural mould covered rind remains innocuous. A regime of regular wiping, using disposable clean paper towels, and turning the cheese to ensure that the moisture and salt levels are evenly developed in the cheese is very important for the continuing food safety of the cheese. Hygiene standards must be meticulously kept for cleaning the shelves and to prevent contamination of the maturing cheese. Cleaning records need to be kept for auditing purposes. The shelves should also permit ventilation of the cheese.

At Cwmglyn, the ripening store was made on site by a local builder using commercial chiller panels -polystyrene sheets enclosed within painted metal sheets with any exposed polystyrene covered with aluminium U tube to fit and sealed against moisture. It stands on a concrete floor and the outer door has an enclosed fly screened porch added, so that when I am in the store, turning my cheese, I can leave the door open for ventilation without having to worry about flies coming in to wreak havoc on my cheese. There is a chiller unit installed on the roof and a further roof structure over that with fly netting to prevent cluster fly or bird or rodent infestation in the winter. There is a large temperature control gauge fitted on the outside so that the inside temperature of the cool store can be checked without opening the door. In the winter, the store is heated by a thermatically controlled cupboard heater to ensure the inside temperature of the store does not fall below 8°C. A small dehumidifier stops the store becoming too humid - I keep the humidity to around 85%. In the inside I have purchased ready made freezer storage shelves. They have removable plastic shelves with slots for ventilation and can be removed piece by piece for cleaning. A picture of the inside of my cool store can be found on our web site. www.cwmglyn.co.nz

There are a number of excellent cheese books on the market which give detailed recipes for specific cheeses. As a very rough guide, the technique for making cheese is mostly the same, the only difference in the type of cheese made, is in the actual culture used and the time and temperature of the curd during the making of it that differs. Traditional hard farmhouse cheese such is made at Cwmglyn Farm usually takes around 5 hours from milk to when the cheese curd is placed in the cheese press. The cheese spends 3 or 4 days in the press (being turned daily) and then a couple of days being air-dried before the cheese is sealed with our own clarified butter. The cheese is then put to store at a temperature of around 10°C and 85% humidity where the cheese is wiped and turned every day for at least 3 months.

Cwmglyn Farmhouse Milk Heat Treatment Record Form

Heat treatment of milk at Cwmglyn Farm is achieved by rapidly heating the filtered and recently milked milk in a pan on a gas stove top to 65°C for thermisation or 72°C for pasteurisation, holding it there for 16 seconds (watching the clock second hand above stove) and then rapid cooling is achieved by placing the container of hot milk in the right hand sink with the water flow control device fitted and cold running water from the side hose on the tap. Milk pan is secured by clip. Milk is stirred both while heating and cooling to achieve a more rapid temperature change. Frozen chilly blocks are added to the cold water bath to further reduce the water temperature. **Unless used immediately for cheese making, Heat Treated milk is stored in refrigerator until needed.**

Date: / /2011 AM milking
COW:Milk QuantityL
 Time Churn Emptied After Milking
 Milk Temp. before Heat Treatment starts°C
 Time at start of process
 Heat Treatment used:
 Thermisation, 64.5°C, hold for 16 seconds.
 Thermisation achieved
 Pasteurisation, 72°C, hold for 15 seconds.
 Pasteurisation achieved
 Time at commencement of rapid cooling in running water
 Water Cooled temperature °C.
 Time processed milk placed in refrigerator

Comments:

CWMGLYN FARMHOUSE CHEESE RECORD FORM— Pasteurised Thermisation Raw

Date Cheese Number
 Cow's Name Full Cream Yes/No
 Amount of MilkL

1. RIPENING:
 Type of starter DVS
 Amount used
 Time when starter added
 Milk temperature°C pH. of milk.....
2. RENNETING:
 Type of rennet usedAmount.....
 Time rennet addedpH
 Milk temperature at the time of adding rennet °C
 Time curd coagulated
3. CUTTING THE CURD:
 Size of the curds:
 Time when curd was cutpH
4. COOKING THE CURD:
 Time cooking curd commenced
 Temperature at start of cooking :.....°C pH

Temperature at finish of cooking:°C pH

5. DRAINING THE CURD :

Time draining started

Time draining finished & transferred to colander.....

6. MILLING THE CURD:

Milling Started..... Ended..... pHat end

7. SALTING THE CURD:

Amount of salt added

Type of boiled seeds or flavour added.....

Amount

8. PRESSING THE CURD:

Time at start of pressingNo. of cheeses made..... Amount of pressure at start (1)Kg

Amount of pressure at start (2)Kg

Amount of pressure at start (3)Kg

Amount of pressure at end of pressingKg

Date at end of pressing / /

9. AIR DRYING IN CHEESE ROOM:

Date started / /

Date finished / /

10. RIND SEALED WITH CLARIFIED BUTTER:

Date sealed / /

11. MATURATION:

Temperature range in cheese store°C to°C

Days kept in store to mature

12. Date sold / / Where?

Cwmglyn Farm Shop, Own use specialist shop,

Restaurant or cafe

Comments and Observations:

List of books I have found useful and in my possession:

UK The Specialist Cheesemakers Code of Best Practice 2007

Diana Lancaster "There's a cow in my garden" Angus & Robertson ISBN 0 207 16153 4

V.Cheke and A.Sheppard "Butter and Cheese Making" Alpha Books 1980 ISBN 0 906670 00 4 -cloth, 0 906670 14 4 paper

Rita Ash "Cheesecraft" Tabb house ISBN 1 873951 21 3

Rita Ash "Cheese Making" New Holland Publishers ISBN 978 1 84773 461 7

Cheese & Cheesemaking Macdonald guides ISBN 0 356 060187

Ricki Carroll and Robert Carroll "Cheese Making Made Easy" Storey Books ISBN 0 88266 267 8

Tim Smith "Making Artisan Cheese" ISBN 1 592253 197 0

Katherine Mowbray "Cutting the Curd" Bateson Publishers ISBN 978 0 9582486 8 6

Milk Production from Pasture -Principles and practice by C.W.Holmes, I.M. Brookes, D.J.Garrick, D.D.S.Mackenzie, T.J. Parkinson and G.F.Wilson. Published by Massey University ISBN 0 473 08308 6

Some of these books may be out of print. Surfing the Internet produces some surprising results

Plans of Cwmglyn Hard Cheese press available from Cwmglyn Farmhouse Cheese, 36 Morgans Road, RD2 Eketahuna 4994.
Price \$15.00 plus postage.

Christian Hansen Limited Freeze dried cheese cultures and rennet can be obtained from:
Food Tech Distributors Ltd., 19C Maui Street, PO Box 1316, HAMILTON 3206 Telephone 07 846 7167

Liquid rennet supplies Renco, Eltham, Taranaki.

You are welcome to E-mail me for any further help and I shall endeavour to answer as soon as time and circumstances permit. My E-mail address is biddy@inspire.net.nz