

Section 5

Food Assurance and Safety

by John O'Dwyer



Introduction

National and international competitiveness is about price, quality and safety. Producers are legally responsible for the safety of food produced on their farms if it is within their control.

- ① What are the key concepts in relation to food assurance and safety that farmers need to be aware of?

Food Assurance and Safety

① What are the key concepts in relation to food assurance/safety that farmers need to be aware of?

Food industries use 'hazard analysis' and 'risk assessment' as tools to prevent substandard food entering the food chain.

Basic hazard analysis principles

- **Hazard analysis** means “identify what could go wrong”.
- **Controls** means “prevent things from going wrong”.
- **Records** provide proof that you have done all you can to produce quality food.

Table 1 : Example of a basic hazard analysis and control plan for a farm

| | | | |
|-------------|--------------------------|-----------------------------|---|
| Milk | Faeces contamination | Operator hygiene | Medicine records |
| | Chemical residues | Clean teats/udder | Machine service records |
| | Pathogens in raw milk | Clean tank +milk lines etc. | TBC and SCC results |
| | High herd mastitis level | Service milking equipment | Vet. health cert tank temp. log |
| | Faulty bulk tank | Use food grade detergents | Water quality report (private water supply) |
| | Faulty machine | Obey withdrawal periods | |
| | Taints | Clean approved premises | |
| | | Safe storage of chemicals | |
| | | Test water quality | |
| | | Never drink raw milk | |

Basic risk assessment principles

In assessing hazards, two factors are taken into account:

Risk – how likely the hazard is to occur.

Potential damage – how much damage will be caused to people, farms or markets if it occurs.

If there is likely to be severe damage, laws or regulations are in place to control the situation. For example, when foot-and-mouth disease hit Britain, cattle movements were stopped, because the disease would have caused great loss on farms if it had spread.

Due diligence

This is “taking care of others” and also covering yourself against any legal action or penalties, should a food hazard from your farm damage someone. EU food law requires food business operators (this includes farms) to take responsibility for the food that they produce.

It is your responsibility to:

- reduce risk of hazards occurring
- inform anyone at risk
- be able to show that you did all you could to prevent any damage occurring to others or to markets.

Assurance schemes are based on hazard analysis and control principles

Quality Assurance:

Say it

Do it

Prove it

Section 5

Milk Payment Systems

by Laurence Shalloo, Una Geary



Introduction

In Ireland over the past number of years there has been a gradual movement to multiple component pricing systems (better known as A+B-C).

- ① What are the key parameters determining the value of milk?
- ② How are payment systems evolving?
- ③ What can you do to improve the milk price that you are being paid and insulate yourself against milk price volatility?

Milk Payment

1 What are the key parameters determining the value of milk?

Milk payment systems

Currently (2011) most milk payment systems have four components:

- quantity of protein produced in kg
- quantity of fat produced in kg
- volume of milk produced
- milk quality-penalties and/or payments.

The A+B-C milk payment systems currently pay for each kg of protein and fat that is produced and a charge is placed on the volume component of the milk. Approximately 70% of the milk that is produced in Ireland is paid for in this way, with remaining processors moving in this direction. Across processors there is significant variation in the relative values of protein to fat content, with a range of between 2 to 1 and 3 to 1.

The fat and protein composition of milk changes throughout lactation as demonstrated in Figure 2. While the components of fat and protein are the largest factors in the milk price, milk quality penalties can have a severe negative effect on price if standards are not met. (Example 1. How fat and protein values impact the milk price - see end of chapter)

Each processor is different, but the most common quality parameters are SCC levels, TBC, thermodurics, inhibitors, low milk lactose and sediment. All of the processors are different, with some incentivising higher milk standards and others simply penalising milk that does not reach a specific standard.

Figure 1: National trends in Milk protein and fat concentrations between 1990 and 2015

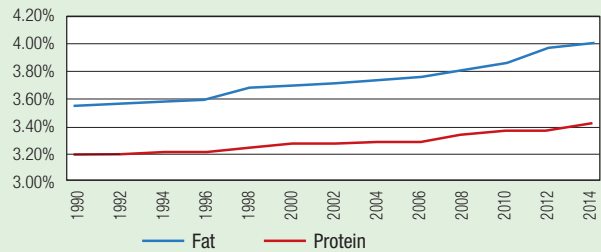
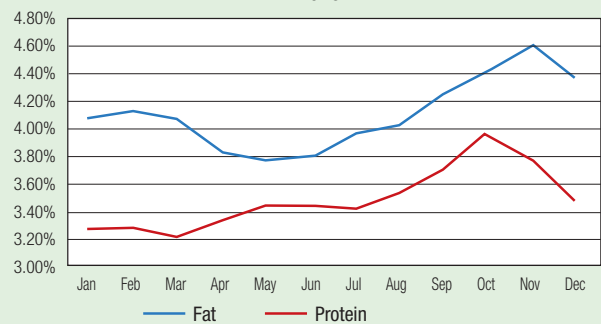


Figure 2: Seasonal variation in Milk protein and fat concentrations in 2015



When the effect of an increase in protein and fat on net farm milk receipts is calculated using a base milk price of 29c/l using the A+B-C system, it is clear there are huge advantages from increasing fat and protein concentration at farm level. Between 2000 and 2015 milk receipts have increased by €161 million using the 2015 milk volumes and the 2000 and 2015 milk solids concentrations. The corresponding figure for 2007 and 2015 is €120 million.

Table 1. Variation in product market values 2004-2011

| Product market values €/tonne | | | | | |
|-------------------------------|--------|--------|-------|-------|--------|
| Years | Cheese | Butter | WMP | SMP | Casein |
| 2004 | 2,375 | 3,005 | 2,558 | 2,044 | 3,990 |
| 2008 | 3,300 | 2,627 | 2,701 | 2,128 | 8,928 |
| 2011 | 3,050 | 3,820 | 3,250 | 2,600 | 6,974 |

WMP = Whole Milk Powder SMP = Skim Milk Powder



Product mix & product market values

The type and volume of products that are being produced significantly impacts the returns the processor can generate. The more high value products that are produced, the higher the returns and so the higher the milk price that can be paid to producers.

The product market values change throughout the year and between years. Table 1. summarises the change in product market values between 2004 and 2011. As a result, the product mix to yield the highest returns could change between years as the product market values change. The seasonal milk supply profile in Ireland presents some processing challenges to Irish dairy processors. The seasonal variation in milk composition means that cheese and casein cannot be produced in the months of January and December from spring calving herds. This has implications for processors' returns and the prices that can be paid to producers during these months.

② How are payment systems evolving?

Seasonal milk payment systems

Because of the seasonal nature of the Irish grass-based systems of milk production, there is a need for additional processing capacity at peak lactation (April to June).

Recent Teagasc Moorepark research has shown that staying with the seasonal milk supply profile is the optimum strategy, however there is a requirement to tighten calving spread. In a 'no quota scenario' the optimum mean calving date will be slightly earlier than the current national mean calving date of March 14th.

Seasonal milk payment systems currently being developed aim to encourage early compact spring calving which will result in the maximum proportion of grazed grass in the diet of the dairy cow. To date, these schemes have focused on a penalty being applied to milk supplies over a certain level at peak and a bonus being paid for early spring milk.

It is estimated that milk production will have increased 50% by 2020 (Food Harvest 2020). The processing capacity in a large proportion of Irish dairy processors is currently being maximised at peak (April-June). A 50% increase in the current peak milk supply will require considerable capacity investment within the Irish dairy industry.

Most Co-ops are in forcing a minimum shareholding as part of a contract that must be signed. This will generally lock the producer to the Co-op for a period of time.

Additional components

Emphasis on value-added products and on functional foods increases the likelihood of further steps around multiple component milk pricing systems. Incorporating different components of the milk (e.g. lactose, whey, casein, saturated fatty acids, non-saturated fatty acids) into the payment systems would mean that producers are also being paid for the components of milk that are adding value to the processor, in addition to the crude values of fat and protein that are currently in the payment systems. There have been some moves Internationally to add lactose to the payment systems. However based on the Irish product portfolio and the Irish milk this is not an issue in the short term.

③ What can you do to improve the milk price that you are being paid and insulate yourself against milk price volatility?

Genetics

Selecting animals based on the EBI (which is using the A+B-C system of milk payment) is the first step to increasing milk value. The milk sub-index of the EBI selects animals using the A+B-C milk payment systems with a relative ratio of protein to fat of 2.7 to 1 to represent future market expectations.

Grassland management

One of the key factors which affects milk solids concentration is the general grassland management on the farm. Achieving a long grazing season, with high quality pasture resulting in high intakes of grazed grass will help to achieve good concentrations of milk solids.

Compact calving and date

Compact calving with a mean calving date of mid- to late-February has been demonstrated to be the most profitable for Irish dairy farms, as it maximises the amount of grazed grass in the diet and reduces the use of high cost concentrate. It will also result in a net increase in price in the seasonality schemes as well as increased milk solids concentrations.

Milk quality

Having a milk quality plan on the farm will ensure that penalties are avoided and bonuses achieved. It will also ensure that the minimum amount of milk is dumped. Recent research from Teagasc Moorepark has shown for milk quality issues such as SCC, the penalty is only a fraction of the overall costs associated with the disease on the farm.

Milk Payment

Example 1. How fat and protein values affect the milk price.

Assumptions

Value per kg of fat = €3.057

Value per kg of protein = €7.354

Volume of milk = 1,000 litres

Milk 1: Fat 3.6%, Protein 3.3%

1,000 litres of milk with this composition has:

37.1 kg of fat

34.0 kg of protein

Milk price calculations

Fat calculation (37.07* €3.057) +
Protein calculation (33.99* €7.354) –
Carrier calculation (1,000* – €0.04)

= €113.323 + €249.962 – €40

1,000 litres of milk/71.06 kg of milk solids
= €323.29 + VAT

Milk 2: Fat 3.4%, Protein 3.7%

1,000 litres of milk with this composition has:

35.0 kg of fat

38.1 kg of protein

Milk price calculations

Fat calculation (35.0* €3.057) +
Protein calculation (38.1* €7.354) –
Carrier calculation (1,000* – €0.04)

= €106.995 + €280.187 – €40

1,000 litres of milk/73.12 kg of milk solids
= €347.18 + VAT

Milk with higher fat and protein percentage yields a higher milk price



Section 5

Milk Quality Mastitis and SCC

by Bernadette O'Brien



Introduction

Mastitis and SCC (somatic cell count) reduce the yield and quality of milk from dairy cows. High levels of SCC can adversely affect the processability of milk.

- ① How do I calculate the true cost of mastitis and SCC?
- ② How can I manage an SCC/mastitis problem?
- ③ What maintenance should I carry out on the milking machine?
- ④ What is a good milking routine?
- ⑤ How should I manage drying off?
- ⑥ How should I manage freshly calved cows?
- ⑦ How do I identify and treat problem cows?
- ⑧ What is a good action plan when SCC is high or there is an increase in clinical mastitis?

Mastitis & SCC

1 How do I calculate the true cost of mastitis and SCC?

Milk SCC levels above 100,000 mean you are losing money. On average mastitis costs farmers €60/cow/year.

- 200,000 to 300,000 cells/ml indicates that approximately 30% of the herd are infected.
- 300,000 to 400,000 cells/ml indicates that approximately 40% of the herd are infected.

How to

Calculate the cost of mastitis and high SCC



Costs associated with mastitis

- Subclinical costs = milk quality penalties + loss in milk produced by cow
- Clinical costs = antibiotics + discarded milk + labour + veterinary attention + culling/mortality

Calculation of cost of mastitis (subclinical + clinical) in a 100 cow average dairy herd

Example

Cost of mastitis in dairy herd of average bulk milk SCC 400,000 cells/ml (274,000-546,000)

versus 100,000 cells/ml (69,000-136,000) with 100 cows (25% 1st lactation) (assuming potential milk yield of 3,874kg and 5,165kg for 1st lactation and older cows, respectively)

Total cost due to subclinical mastitis = € 10,316
Total cost of clinical mastitis = € 1,400
Total cost of mastitis in the described 100 cow herd per lactation = € 11,716
i.e. (€117/cow/year)

In this example a herd with an SCC of 400,000 was €11,716 less profitable.

Key terms

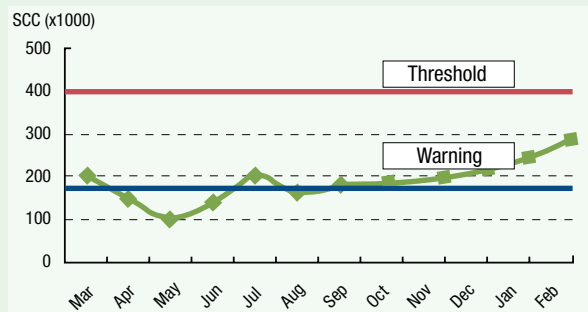


Clinical mastitis infection - changes in the udder and/or the milk are detected easily by the milker, i.e. clotting and discolouration of the milk, reddening, heat, pain, swelling and hardening of the udder.

Subclinical mastitis infection - the udder and milk appear normal and there are no visible signs of infection but the somatic cell level in the milk is raised.

Somatic cell count (SCC)

Subclinical infection in a herd is measured by somatic cells in milk. Cows free of mastitis and with no previous infections would probably have an SCC of less than 100,000 cells/ml.



Below the blue line, performance is good.

It is widely accepted that an individual cow SCC greater than 150,000 cells/ml or an individual heifer SCC greater than 120,000 cells/ml indicates infection in that animal.

Key facts



- 100,000 to 200,000 cells/ml indicates that approximately 20% of the herd are infected.

2 How can I manage an SCC/mastitis problem?

The farmer needs to allocate TIME and ATTENTION to the problem. It is better if there is a group approach, i.e. the farmer, milk quality advisor, veterinarian and milking technician, so that all angles are covered.

Consider the following factors:

Malfunction of milking equipment: For the average size dairy, milking equipment should be tested and serviced every 9–12 months, so this would be a good place to begin troubleshooting.

Clean environment: If over 5% of the cows are heavily soiled with manure on the rear legs and udder (especially on the teats), there is a problem with management. Ensure that approach roadways, milking parlour and cubicles are clean and properly maintained.

Contagious mastitis and milking procedures: The most common form of contagious mastitis is caused by *Staphylococcus aureus*. Almost all herds have some infected cows. The milking preparation procedures should be reviewed and compared to the ideal, and improvements and changes made where needed.

Post-milking teat disinfection and dry cow therapy: If these practices are not being used, they should be introduced. Teat disinfection reduces new infection rates by 50%. Dry cow therapy cures subclinical infection and prevents new infections at drying off.

Dry period and calving management: This is a critical time in the lactation cycle. These cows should be kept very clean, dry and comfortable, especially at calving.

Key Point Checklist



- Correctly disinfect all teats of all cows after each milking.
- Monitor SCC of all quarters of all cows during lactation and apply dry cow therapy at end of lactation as appropriate.
- Have milking equipment checked and serviced every 9-12 months.

- Review milking practices and hygiene.
- Keep cow udders clean between milkings and maintain good teat condition.
- Remove clusters carefully.
- Cull chronic problem cows.
- Culture and identify the bacteria if there is a recurring herd problem.
- Clip tail hair regularly.

3 What maintenance should I carry out on the milking machine?

Each day:

- Check the vacuum gauge (47-50 kPa for mid-level plants).
- Check to ensure claw air bleeds are free of dirt.
- Check rubberware for leaks and replace any worn or broken rubberware.

Each week

- Check oil flow from the oil reservoir.

Every eight weeks

- Remove filters at vacuum regulator and wash and dry.
- Flush each pair of long pulse tubes with warm water.

Twice a year

- For spring calving herds, change liners twice a year or after 2,500 cow milkings, whichever comes first.
- Ensure that liners are compatible with shells.
- Change complete set of liners at the same time.
- Record exact dates of liner change in the farm diary.

At least once a year

- Have the milking machine tested by a qualified technician.

Mastitis & SCC

④ What is a good milking routine?

- Only attach teatcups when teats are clean and dry.
- Wash your hands before, and wear gloves during milking.
- Inspect the foremilk for signs of clinical mastitis.
- 'Best practice' is to wash and dry cows before milking, in particular wash and dry cows when they are indoors or on out-wintering pads.
- Avoid splashes or sprays of milk onto hands or clusters.
- Use running water and disinfectant solution to remove infected milk from gloves, clusters or other surfaces.
- Standing areas and yards should not be washed down until the cows have departed.
- If possible, identify high SCC and clinical cows and milk them last in the herd. If this is not possible, sanitise the cluster before attaching it to the next cow.



Checklist

Milking technique

- Attach clusters to cows in batches as soon as possible after preparation.
- Hold the inverted cluster level in your hand so that the vacuum is cut off from the cups and air leakage is minimized.



- Attach each teat cup in sequence and as quickly as possible.
- Remove clusters when milk flow ceases and shut off vacuum at the claw-piece before removing the cluster.
- Establish, and if necessary write down, a set of procedures so that each milker is absolutely consistent at every milking.

Post-milking teat disinfection

- Spray all teats of all cows as soon as possible after every milking (20ml per cow/milking).
- Ensure that the entire circumference of the teat is covered - a drop of disinfectant should be seen at the end of the teat.
- Apply teat spray from directly underneath the tips of the teats.
- Check the 'far sides' of teats of some cows to ensure correct spraying.
- Have sufficient teat disinfection sprayers (e.g. one per four units).
- Ensure that teat disinfection sprayers are operating correctly.
- If using a teat disinfectant that is not 'ready to use', dilute daily.
- If using a dip cup, wash it daily or more frequently if contaminated.

Checklist

To achieve milking excellence

- Set performance goals - ultimate target <150,000 cells/ml.
- Rapidly identify mastitis problems.
- Milk clean cows.
- Standardise the milking routine.
- Train staff.
- Have treatment protocols.
- Maintain and update the milking system.
- Set time aside to manage milk SCC and mastitis incidence.

- Buy only healthy cows.
- Use dry cow therapy.

5 How should I manage drying off?

- Cows at eight weeks or less to expected calving date should be dried off.
- Cows at more than eight weeks to expected calving date BUT with milk yield at 8-9kg or less /cow/day should be dried off.
- Cows at greater than eight weeks to expected calving date with milk yield greater than 8-9kg/cow/day BUT with milk SCC greater than 300,000 cells/ml should be dried off.

How to

Dry off an individual cow

- Treat all quarters of each individual cow with the same treatment.
- Milk out the quarter fully before infusing the dry cow antibiotic/sealant.
- Administer dry cow therapy after the final milking.
- Disinfect the teat end with cotton wool soaked in methylated spirits.
- Avoid contamination of the nozzle of the antibiotic tube.
- Partially insert the antibiotic tube nozzle into the teat canal.
- Infuse the contents of the antibiotic tube into the quarter – gently massage the antibiotic upwards into the teat.
- Teat spray (post-milking teat disinfectant) treated quarters immediately after infusion.
- Teat sealer should be considered with or without antibiotic treatment.



Mastitis & SCC

6 How should I manage freshly calved cows?

At calving time a number of measures should be taken.

- Provide cows with a clean dry environment for calving.
- Check udders of all freshly calved cows for heat and pain; check milk from all quarters; milk and disinfect teats post milking.
- Withhold colostrum from the normal milk supply for a minimum of seven milkings.
- Ensure each cow has exceeded the dry cow treatment dry period before putting milk into the bulk tank.



7 How do I identify and treat problem cows?

How to

Detect mastitis

- Examine each quarter for changes in the milk (wateriness or clots) by examining foremilk before the milking cluster is applied.
- Examine the bulk milk SCC to determine the actual SCC level and the two to three day variation in that SCC.
- Examine the milk filter for clots after each milking.
- Examine each cow udder for heat, swelling or pain at each milking.

How to

Treat clinical mastitis infection

- Milk out the quarter fully before infusing the antibiotic.
- Disinfect the teat end with cotton wool soaked in methylated spirits.
- Avoid contamination of the nozzle of the antibiotic tube.
- Partially insert the antibiotic tube nozzle into the teat canal.

- Infuse the contents of the antibiotic tube into the infected quarter and gently massage the antibiotic into the teat.
- Teat spray treated quarters immediately after infusion.
- Clearly mark the treated cow and treated quarter.
- Withhold milk from the normal milk supply until the end of the recommended withholding period stated on the label.
- Record treatment details on a chart at the parlour so that other milkers may check treatment details and milk discarding period.

How to

Take udder quarter milk samples:

- Label a sterile bottle with date and cow identification and cow udder quarter.
- Disinfect the teat ends before sampling with cotton wool soaked in methylated spirits.
- If sampling more than one teat, then disinfect the teats furthest away first.
- Allow the teat to dry.
- Discard three strips of milk from the quarter in order to flush out any teat canal contaminants.
- Strip one to two good squirts of milk (5-10 ml) into the sterile bottle.



How to

Carry out a CMT (California Mastitis Test)

- Discard the first squirt of foremilk.
- Squirt milk from each quarter into a different well on the CMT test tray (approximately 2 ml from each quarter).
- Mix each milk sample with an equal volume of reagent (available commercially).
- Swirl the mixture vigorously for maximum of 20 seconds and examine the degree of thickening/gelling in each sample (gelling may be more visible if the test tray is tilted).



1. All milkers should wear gloves.
2. Pre-spray teats with disinfectant approved for use as a pre-spray product, and dry wipe all cows. Avoid washing, only wash dirty cows.
3. Dip all clusters in peracetic acid solution between cow milkings, 20 mls to 9 litres of water. Change solution after 12 clusters have been dipped in solution.
4. Post-spray all cows. Ensure 20 mls/cow/milking is applied.
5. Keep cows off cubicles for 30 minutes post-milking during the winter and cut off access to cubicles during the summer.
6. Get machine checked.

8 What is a good action plan when SCC is high or there is an increase in clinical mastitis?

Action Plan when problem arises

The following protocol should be implemented until culture and sensitivity results and individual SCC reports are available.

This programme prevents the spread of infection within the herd until the cause of the problem has been established. Seek advice as soon as possible.





Section 5

Milk Quality Bacterial Contamination

by Bernadette O'Brien



Introduction

Silage, faeces, animal bedding and soil contain large numbers of bacteria. The challenge is to reduce numbers entering raw milk to a minimum. Milk contaminated with bacteria from teat surfaces will, in turn contaminate milking machine clusters, milk receivers, milk pipelines and the bulk tank. Without adequate cleaning, contamination will build up, particularly in hard to clean areas, such as pipeline joints.

- ① What makes up an effective dairy hygiene programme?
- ② How does my milking plant regime compare with best practice?
- ③ What are the key points for bulk tank hygiene?

Bacterial growth in milk

Key performance indicator



EU legislation indicates that total bacterial count (TBC) in milk should be less than 100,000/ml. However, ideally and on many farms, a TBC of less than 15,000/ml can be reached. TBC greater than 50,000/ml and thermophilic bacteria counts of greater than 500/ml are generally penalised. However, ideally this count should be less than 200/ml and depending on the product mix, non-detectable levels may be required by some processors.

1 What makes up an effective dairy hygiene programme?

Checklist

For an effective dairy hygiene programme:



Pre-milking hygiene

1. Clip hair on tails post-calving, mid-lactation and at drying off (minimum).
2. Clip hair on udders once per year, post-calving or near the end of lactation.
3. Maintain entry and exit to paddocks, areas around troughs and gates, and the collecting yard in a clean condition and without surface water.
3. Keep the milking parlour and dairy tidy, clean and hygienic.
4. Ensure cubicle beds are clean and dry.

Udder hygiene

1. Wash your hands and preferably wear gloves during milking.
2. Inspect foremilk for signs of clinical mastitis.
3. It is considered 'best practice' to wash and dry cows before milking, however, it is strongly recommended to wash and dry cows when cows are indoors or on out-wintering pads.
4. If teats are washed, it is absolutely necessary to dry teats with a paper towel.
5. Teats should not be hosed as the cows are coming into the parlour.

Checklist



UDDER HYGIENE SCORING CHART

| SCORE 1: | SCORE 2: | SCORE 3: | SCORE 4: |
|--------------|-------------------------|----------------------------|-----------------------|
| Free of dirt | Slightly dirty 2-10% | Moderately dirty 10-30% | Caked-on dirt >30% |

(Source: Milk Money Programme, UW-Madison)

An udder hygiene score should be carried out weekly using the chart. Ideally all cows in the herd should be scored at 1 or 2. It is definitely NOT good management practice to have greater than 20% of the herd score 3 or 4.

Milking plant hygiene

An effective cleaning routine for the milking plant may be an automatic or manual system, it may involve a hot wash system consisting of at least one hot circulation cleaning per day or a cold circulation cleaning with one hot circulation cleaning carried out per week. Larger plants and those with accessories, e.g. milk metres should receive hot circulation cleaning. Irrespective of the cleaning system used, the detergent cleaning product should be selected from the Teagasc tested list of products (www.teagasc.ie).

2 How does my milking plant regime compare with best practice?

Example of manual hot circulation cleaning

- Wash jettors and outside of clusters and attach clusters to jettors.
- Remove milk filter and rinse plant with 14 litres of cold water per cluster. Remove milk filter post-rinse.
- Mix an approved alkaline chlorine detergent-steriliser at the recommended use rate in hot water at 70-75°C allowing 9 litres of solution per cluster.
- Circulate the solution for 10 minutes.
- After the circulation wash, rinse the plant with 14 litres of rinse water per cluster.
- Ensure that milklines are drained completely before milking.

Descale/milk stone removal

- Regularly descale with acid wash routine for hot circulation cleaning (weekly recommended).
- Use a solution of approved milkstone remover (acid detergent), preferably in hot water for 5 to 10 minutes and flush to waste with cold water.
- Follow with the usual alkaline chlorine detergent steriliser wash, preferably in hot water at about 60°C.
- Follow by flushing plant with 14 litres of cold water per cluster.

Key risks



- Use only detergent cleaning products from the Teagasc list and use according to manufacturer's recommendations.
- Check water temperatures regularly (70-75°C before and 43-49°C after circulation).
- A circulation rate of 3.5–4.5 litres/min/unit is required.
- If the detergent-steriliser contains chlorine the solution should be rinsed from the plant directly after circulation and (not left in plant until next milking).
- Monitor the rate of usage of the detergent product.
- Automatic washers should be serviced annually.
- Renew the cleaning solution after two milkings.
- Change rubberware at least annually.
- Avoid storage of warm water (plate cooler) for machine cleaning.

3 What are the key points for bulk tank hygiene?

- Ensure that washer is connected to the tank and that refrigeration is turned off.
- Put the correct amount of detergent in detergent bowl and replace it on the holder.
- Follow the wash programme according to the manufacturer's instructions.

Risk points



- Ensure that tanks are serviced regularly and include checking of the thermostat.
- Check that spray heads are giving good spray coverage.
- Check filters on water intake valves regularly and clean if necessary.
- When inspecting totally enclosed tanks for cleanliness, pay particular attention to the lid and vent pipes, which, if unclean can readily contaminate the milk; also check milk outlet and inlet pipe of tank.
- Rinse cycles may need to be extended to minimize residues.

Milk cooling and storage

Milk leaves the udder at approximately 35°C, but only rapid cooling to a storage temperature of around 4°C prevents or minimises bacterial growth.

Critical factors

- Initial bacterial count must be low.
- Cooling rate must be fast.
- Storage temperature must be low (3-4°C).
- Storage time must be minimised.

TBC targets

<1,000/ml as milk leaves the udder
<3,000/ml as milk leaves the milking machine
<5,000/ml in the bulk tank

Both storage temperature and time are important. Milk with an initial TBC of 5,000/ml and stored at 4°C would be expected to have a TBC of 10,000/ml or 30,000/ml after 2 or 3 days storage, respectively.

If the target is to achieve a grade of <30,000/ml in milk stored at 4°C for 3 days, then an initial milk TBC of 3,750/ml is required, respectively. Attention to detail is required in order to achieve initial TBCs of this magnitude.

It is vital to recognise that cooling is a complement to, not a substitute for, hygienic milking conditions.

Checklist for milk storage



- Slow initial cooling is not advised, tank specification must be correct.
- Fast cooling rate is necessary, avoid high blend temperatures.
- Plate cooling helps (35°C reduced to 15°C approximately).
- Accurate temperature control is essential during storage (3-4°C).

Key performance indicator



Milk temperature should reach ~ 4-5°C within 30 min of completion of milking.



Section 5

Milk Quality Residues in Milk

by Bernadette O'Brien



Introduction

The person responsible for milk production on the farm must be aware of all of the chemicals that may leave residues in milk. These include detergents, disinfectants, flukicides and antibiotics. The dairy farmer is obliged to demonstrate that he or she is minimising or eliminating residues in milk at all stages of milk production.

- ① How do I control trichloromethane (TCM) levels in milk?
- ② How do I minimise iodine levels?
- ③ How do I prevent flukicide contamination?
- ④ How do I prevent antibiotic contamination?

Residues in Milk

A legal limit exists for trichloromethane (TCM) within the German market and is set at 0.1 mg/kg of product. While TCM levels in Irish products are well within this limit, competition between the different exporting countries means that for Ireland's product to be at the forefront, it is now necessary to have very low levels e.g. a TCM level in lactic butter of 0.03mg/kg or less.

For similar reasons, stringent standards require that iodine levels do not exceed 250mg/l milk. Critical to this standard is the absence of any form of veterinary drug residue, including flukicidal residues. Antibiotic residues, also cannot be present in milk and dairy products.

1 How do I control TCM levels in milk?

Key performance indicator

TCM less than 0.00155mg/kg milk

TCM arises from interaction of detergent and sterilising solvents (containing active chlorine, used to clean milking and milk storage equipment) and milk. When chlorine in the detergent/steriliser comes in contact with milk, the chlorine binds to it and forms TCM. Thus, TCM develops within the detergent/steriliser solvent. This solvent is used and often re-used to clean and disinfect the milking and storage equipment. If this solvent is not removed completely from the equipment by effective rinsing, then TCM will be transferred to the milk that subsequently comes in contact with those surfaces.

- Select detergent/steriliser product from the Teagasc list (chlorine content <3.5%) and mix and use as recommended by the manufacturer.
- Drain all milk remaining in milk tubes/pipelines of plant after milking.
- Rinse with clean water (14 litres/cluster) and drain.
- Carry out the main wash cycle of the plant with detergent/sterilising solvent.
- Rinse plant again (14 litres/cluster) and drain.
- At the end of the second rinsing, no detergent should remain in the plant and the rinse water should run clear.
- The detergent/sterilising solvent should not be re-used more than once.

- Similar control measures must be used when washing the bulk tank.
- Dipping clusters in chlorine between cow milkings should be avoided - peracetic acid may be used instead of chlorine.

2 How do I minimise Iodine levels?

Key performance indicator

Iodine - Target <250mg/litre milk

The two main sources of iodine in milk are animal feed and teat disinfection products. Veterinary treatments/products may also contribute. Studies have shown a transfer rate of 30-40% of iodine between animal feed and milk, thus high iodine feedstuffs can result in dramatic increases in milk iodine concentration. Pre-milking disinfection of teats with iodine carries with it a substantial risk of direct transfer of iodine to milk, unless all of the iodine is carefully removed from the teats before cluster attachment. Most iodine disinfection products are not approved for use pre-milking.

How to

Avoid excess milk iodine

- If concentrate feeding levels of the cow need to be increased, use concentrates with lower iodine levels.
- Remove all traces of iodine from teats before milking cluster attachment.
- Mix and use teat disinfection iodine products as recommended.
- Carefully monitor veterinary treatment products containing iodine.

3 How do I prevent flukicide contamination?

A number of flukicide products such as those with the active ingredients: clorsulon, closantel, nitroxylnil, rafoxanide and triclabendazole, do not have milk target levels set for them as yet, and therefore use of these products could result in problem flukicide levels in milk. Non-compliance with milk withholding periods after any flukicide product application to animals intended for milk production will lead to flukicide residues in milk.

Key performance indicator

Flukicides: none detectable

How to

Avoid flukicide contamination

Use a flukicide product selected only from the Irish medicine board (IMB) list recommended for use for dairy cows. Adhere strictly to withdrawal periods as recommended for the product, especially in cases where cows calve-down early.

4 How do I prevent antibiotic contamination?

Key performance indicator

Antibiotics: none detectable

It has been estimated that over 70% of antibiotic residues result from the use of lactating and dry cow intramammary antibiotics. Failure to discard the milk from treated cows for the recommended period is the principal cause of antibiotic residues in milk. Contamination of milking equipment after milking a treated cow will also result in antibiotic residues in milk.

How to

Avoid antibiotic contamination

- Clearly identify antibiotic treated cows and record treatments on the parlour noticeboard.
- Discard milk for the recommended period.
- Separate antibiotic-treated cows from the herd and milk them last.
- Flush contaminated parts of the equipment after milking a treated cow.
- Dry cow product should be appropriate to the length of the dry period.



