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LACTATION

TECHNOTE 13

Seek professional advice if problems persist

To recommend an effective plan to solve a mastitis problem, advisers must be confident that they have clearly defined the problem. This does not happen in a single step but requires a systematic investigation of the problem. A clear definition of the problem describes:

- the nature of the problem i.e. whether it is a grading or high bulk milk cell count, high clinical case rate, or poor teat condition;
- when it is occurring; and
- what bacteria are causing the problem in the herd.

It is also important to develop a good sense about the factors contributing to the problem in a particular herd. A handy way of getting an overview of the issues faced by individual herds is to consider:

- The people involved, for example: is there good communication and feedback between team members? Are responsibilities for tasks allocated to specific people? Are protocols well understood? Are there tensions between staff, managers or owners? What other pressures are the managers facing?
- The cows, for example: is it an older herd? Have cows of unknown mastitis status been introduced in the past couple of years?
- The farm dairy, for example: are the plant and equipment well maintained and regularly serviced?
- The environment, for example: does it pose a particular mastitis risk for any reason?

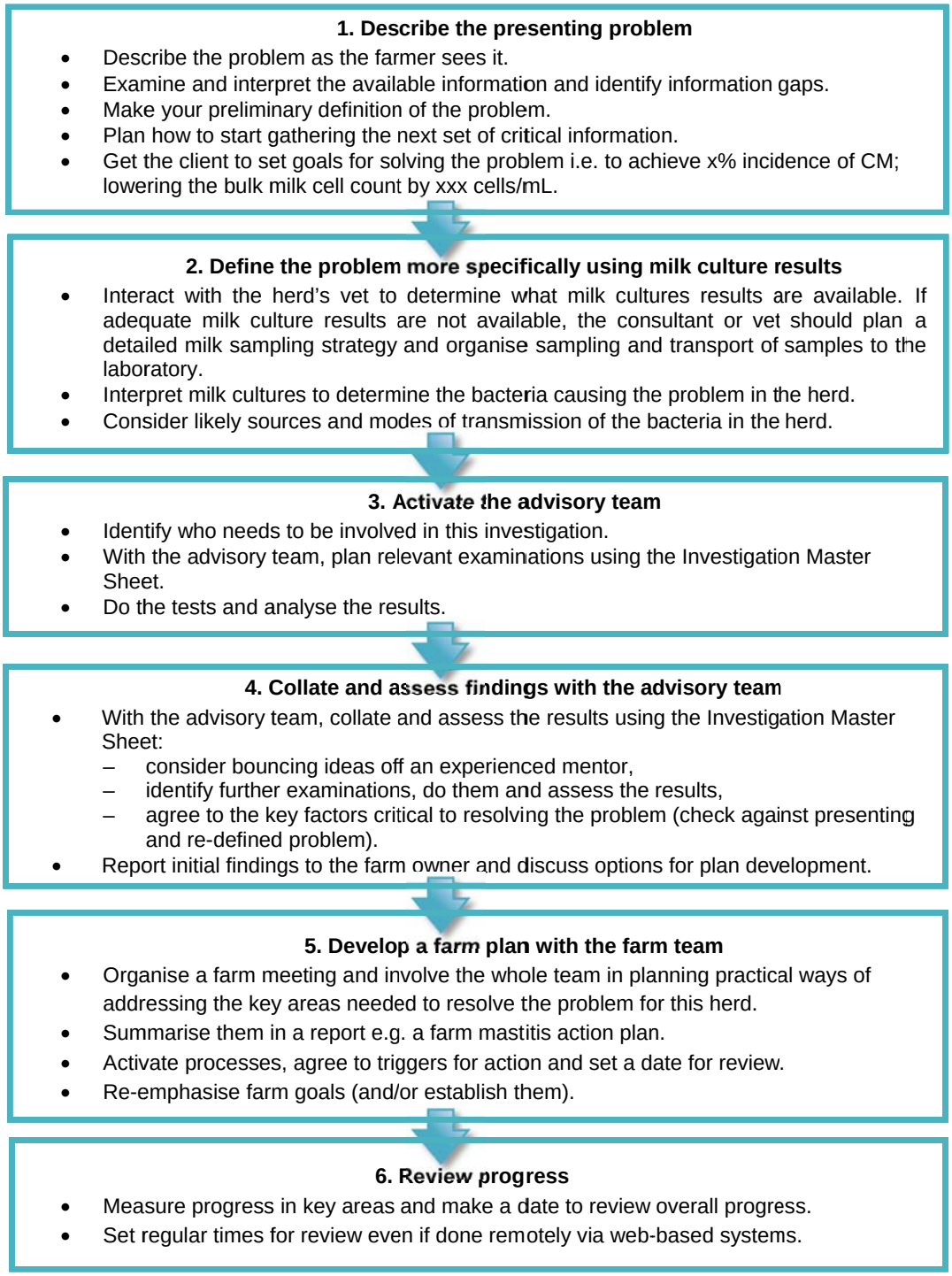
Defining the problem is likely to require coordinated input from several disciplines – veterinarians, milking machine technicians, and other dairy advisers (Figure 1).

Once the advisory team has investigated and clearly defined the problem, the task is to develop a plan that works for the farm. This involves agreeing to a few key factors (usually 3-4) that must be addressed if progress on the problem is to be made, and then working with the farm team to establish specific actions for implementation.

The DairyNZ SmartSAMM website provides a wealth of up-to-date technical information for farmers and advisors, as well as links to valuable training opportunities for different advisors.

This Technote describes the SmartSAMM Mastitis Investigation Kit which advisers can use to gather relevant information when undertaking a full mastitis investigation. The Kit includes checklists and recording sheets for use during farm visits. It also contains an Investigation Master Sheet to help collate, interpret and prioritise information, and develop a workable plan for the farm. The SmartSAMM Mastitis Investigation Kit can be downloaded from: **www.smartsamm.co.nz**.

Figure 1. Flow chart of the general approach for investigating a mastitis problem



In some circumstances actions in Boxes 2 and 3 may be done in reverse order.

13.1

Review mastitis indicators regularly.

Farmers are urged to seek professional advice if problems persist in their herds or if a warning sign exceeds a certain level.

Warnings can take the form of an alert, when a critical event occurs, such as receiving a warning for a grade, or receiving a penalty grade, for bulk milk somatic cell count (BMSCC, Table 1).

Warnings can also take the form of 'triggers'. Most farmers are familiar with this concept, which involves regular monitoring of performance, and following up on selected events that exceed a pre-set level. An example of a trigger might be 'any bulk milk cell count above 200,000 cells/mL'. Triggers are often set at or below the alert warning levels, depending on the farm's goals (Table 2).

The warning levels given in the SmartSAMM Guidelines and Mastitis Focus are based on extensive field experience (e.g. teat condition), economic penalties (e.g. BMSCC), common sense (e.g. the presence of *Strep. agalactiae* or *Staph. aureus*), and expert opinion (e.g. measuring mastitis spread using individual cow somatic cell counts (ICSCC)).

Mastitis Focus helps identify problem areas and potential risks for a herd, as well as track progress after any management changes are made.

The SmartSAMM Gap Calculator can be used to identify the benefits of closing the gap between a herd's current performance and industry goals.

Generate a SmartSAMM Mastitis Focus report after each herd test, and after uploading mastitis treatment records.

Table 1. Take immediate action and seek help when alert levels are reached.

Background	Indicator	Alert levels	Reason for action
Technote 11.2	Bulk Milk SCC	One or more SCC above grading (e.g. 400,000 cells/mL) or alert level (e.g. 300,000 cells/mL) from dairy company.	Grading for SCC is costly. Action is required to reduce the SCC to below penalty levels.

Table 2. Take action and seek help when trigger levels are exceeded, before problems escalate.

Background	Indicator	Trigger levels	Reason for action
Technote 11.2	Bulk Milk SCC	Regular spikes in SCC (i.e. increase of 50,000 cells/mL or more above previous tests) OR Upward trend in SCC is steeper than target curve OR Monthly average SCC above industry average, or a herd's self-selected target for past 3 months.	Herds with BMSCC above 200,000 cells/mL are at risk of grading before the end of the lactation.
Technote 4	Clinical cases See Mastitis Focus report.	More than 8 clinical cases per 100 cows calved (or 16 cases per 100 first calvers) for **monthly clinical case rate at calving**. OR More than 1 clinical case per 100 cows in milk for **monthly clinical case rate in lactation**.	These clinical case rates have been observed in herds with below average performance.
Technote 12.3	Individual Cow SCC See Mastitis Focus report.	More than 10 cases per 100 cows in milk per month for **new infection rate – subclinical and clinical** OR More than 30% for **first calver new infection rate**	These estimates are indicators of the spread of infection in seasonally calving herds.
Technote 4.3	Cultures	The presence of *Strep. agalactiae* in **any** culture samples. The presence of *Staph. aureus* in the **majority** of culture samples.	*Strep. agalactiae* is highly infectious and has been eradicated from majority of herds. *Staph. aureus* is contagious and hard to cure. Good milking hygiene and appropriate culling is required to reduce the incidence of infection.
Technote 9.1 Section D	Teat condition	5% of cows (2% of teats) affected by gross lesions or cracks OR 10% of cows (4% of teats) affected by dry or rough skin or haemorrhages OR 20% of cows (8% of teats) affected by hyperkeratosis, or redness/blueness, ringing, wedging or openness after milking.	Teat condition reflects the quality of milking management, the dairy system and the environment.

13.2

Seek professional advice if mastitis indicators are above warning levels.

SmartSAMM strongly recommends advisers to use a team approach to troubleshoot problems. Fully resolving a mastitis problem and creating a robust plan frequently requires the expertise of more than one profession.

Someone needs to take the lead in activating and coordinating the advisory team (those involved in interpreting information and developing the control plan), and to keep other interested parties informed of progress.

The advisory team needs to reach early agreement on:

- what tests and observations are appropriate to investigate the problem;
- how they will organise the farm visits;
- how often and when they will consolidate and discuss their results; and
- how to interact with the farm manager at strategic points, such as ensuring the planned investigation meets their expectations, communicating the initial findings and discussing the control options.

Mapping out a timetable that is realistic and achievable, and sticking to it, is both satisfying and professionally stimulating for the team (see Flowchart in Figure 1 for a guide).

There is an extended advisory network to draw upon, within the regions and nationally. Consulting an experienced mentor at critical points in the investigation can boosts the team's confidence and can also help them reach agreement on difficult issues.

The SmartSAMM Mastitis Investigation Kit

The SmartSAMM Mastitis Investigation Kit consists of:

- the Investigation Master Sheet (Sheet A) for coordinating the investigation and formulating a plan of action; and
- 12 recording sheets (Sheets B to M) for gathering and interpreting relevant information.

This Technote contains a brief description of each element of the Kit and how to use it. Investigators need to be familiar with how to use the Kit before starting a farm investigation.

Early in the investigation, the advisory team should determine what testing needs to be done to complement existing information and then allocate tasks to team members. The team should use the Kit to ensure factors that may impact on the problem are checked and to collect and analyse data using the relevant recording sheets.

This approach often uncovers issues which are not directly relevant to the current problem. They are marked on the Investigation Master Sheet as 'different problem' and should be dealt with separately.

Confidence – High

Because mastitis is a multifactorial disease, SmartSAMM recommends a team approach by relevant professionals for solving problems.

Research Priority – Low

One of the local advisers should coordinate the investigation.

Contact details of dairy professionals from across New Zealand who are familiar with the SmartSAMM resources can be obtained from the SmartSAMM website.

The SmartSAMM Kit can be downloaded from: www.smartsamm.co.nz.

Use a new copy of the Kit for each investigation.

See this Technote, pages 14-15 for tips on how to collect data most efficiently at a milking-time visit.

General approach to investigating a mastitis problem

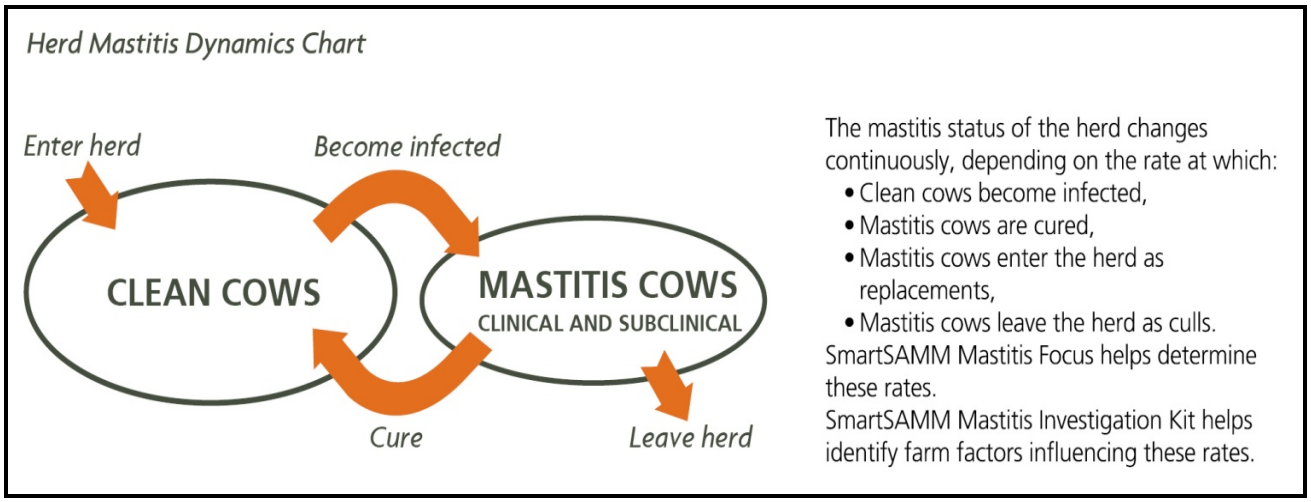
A. Investigation Master Sheet

The Investigation Master Sheet (A1-A7) provides a process for identifying the key areas on which to base the action plan. It is the lynch pin of the investigation because it is used:

- by the advisory team to construct a clear, concise definition of the problem and to allocate tasks;
- by each team member to summarise their findings and identify practices that are not aligned with the SmartSAMM Guidelines; and
- as a focal point for deciding if these practices are contributing significantly to the problem and identifying the key factors underlying the problem.

The Herd Mastitis Dynamics Chart (Sheet A7) enables advisers to construct a pictorial summary of how farm management is affecting mastitis in the herd (Figure 2).This enables the team to retain an overview of mastitis control in the herd while tackling the seasonal and high priority issues.

Figure 2. A model to describe the ever-changing infection status of cows in a herd.



To enhance the likelihood of your investigation leading to a solution for a problem:

- Identify the factors you have rated as 3 or 4 in importance in the right hand column of the Investigation Master Sheet.
- Mark these on the Herd Mastitis Dynamics Chart (Sheet A7) according to their area of influence.
- Consider the Herd Mastitis Dynamics Chart in the light of the epidemiology of the major pathogen(s) in the herd.
- Allocate priorities to the factors most likely to solve the problem effectively.
- List these factors in the box on the front page of the Investigation Master Sheet (Sheet A1) and incorporate them in your report to the farmer.

An example of a completed chart is shown in the Example Kit, which can be downloaded from: **www.smartsamm.co.nz**.

B. Farm Profile

The Farm Profile is a 5-page questionnaire that is used to:

- summarise the presenting problem (Box 1 of flow chart in Figure 1);
- establish information that is available for assessment by the team; and
- suggest leads for advisers to investigate.

The first page of the Farm Profile gives advisers a 'big picture' overview of the client and the herd, and can be collected by any competent person in the business, as details are factual, and does not explore the technical aspects of the problem.

Farm Profiles B2-B5 are used to assess farm management practices that influence mastitis and need to be completed by one of the advisory team - usually a veterinarian. The questionnaire has been kept short so that it maintains focus and yields good quality information.

SmartSAMM recommends that advisers obtain the information by personal interview (either telephone or face-to-face) and fill in the pages themselves. This ensures that questions are put into context and appropriate responses are received. It also provides an opportunity to follow-up interesting comments with a targeted line of questioning.

Note that the Farm Profile is the *only* sheet in the Kit to obtain information on BMSCC trends, numbers of clinical cases, drying off strategy and the effects of mastitis on the herd culling policy.

Use the left hand side of the Farm Profile Sheet B1 to organise the collection of information that is already available. This can be done before a farm visit to make the process of information gathering efficient.

C. Milk Cultures

A critical step in the investigation is to establish which bacteria are causing the problem in the herd (Box 2 of flow chart in Figure 1). This can only be done by assessing an adequate set of milk cultures.

See Technote 4.3 for a detailed description of the collection, storage and analysis of milk samples for bacterial culture.

A common error in mastitis investigations is to base the assessment on too few sample results, often because there is a real or perceived reluctance of farmers to pay for culturing. This is a false economy because, if the bacteria are not defined, the likelihood of a targeted and cost-effective solution is much reduced. It is usually the responsibility of the veterinarian in the team to organise and interpret the milk cultures. Clear communication with the farmer about the importance of this step is required.

The objective is to determine which bacteria are causing the problem. To make this decision it is important to have at least 20 complete milk culture results (excluding contaminated samples) and, to achieve this, milk samples should be collected from at least 25 cows.

If clinical cases are the presenting problem, samples should be taken from all cases as they are detected and prior to treatment. These samples can be frozen and submitted in batches. Some samples (or results) may already be available.

If high cell counts are the problem, selection of cows to sample is usually based on mastitis history or recent ICSCC. In these circumstances it is important for the veterinarian to choose the particular cows rather than leave the selection to the farmer. Pick a range of cows:

- a mix of age groups including heifers,
- some animals with a recent rise in cell count
- some animals with a persistent rise in cell count,

These animals might include those that have had a maximum SCC of 150,000 to more than one million cells/mL.

Once the cows have been selected, the best sampling strategy is to collect samples from quarters that are most likely to be infected. This may mean examining each quarter with a cow-side test (such as a Rapid Mastitis Test or using a conductivity meter) and sampling individual quarters that show signs of subclinical mastitis.

When sampling a number of cows, avoid collecting samples at milking time. Preferably draft out cows at a morning milking and then sample them immediately before the afternoon milking. This allows sampling to be done in a clean environment.

As a last resort, collect ‘composite samples’ (a roughly equal volume of milk from each quarter into a single sample jar for each cow). However, this strategy can increase the chance of ‘contaminated’ results, and provides no information on which quarters are affected.

Milk Cultures Sheet C can be set up as a pre-prepared list of cows to sample. A separate copy of Sheet C should be used to track the information and results for each batch of samples.

D. Individual Cow Somatic Cell Count Analysis

Herd-level analyses of ICSCC can be used to assess the apparent prevalence of mastitis in different groups of cows (for example different ages, stages of lactation or management groups), and estimate the rate of new infections occurring in the herd.

Most ICSCC data are available in paper and electronic formats. Herd improvement organisations provide web-based analysis functions to assist interpretation of the data. But often, the most common approach is for the advisers to conduct some relatively simple assessments.

The analyses summarised on Sheet D provide:

- **Comparison of mastitis prevalence in different groups of cows**

The proportion of cows in different age groups that have had a maximum cell count above 150,000 cells/mL (or 120,000 cells/mL for first calvers). This gives a guide to the likely prevalence of infection in the groups. Note, however, that it is often difficult to interpret data from small groups of cows.

- **An estimate of the rate of new infections occurring in the herd**

The proportion of first lactation animals that have had a cell count above 120,000 cells/mL over the course of the lactation. This provides a guide as to the contagious spread of mastitis in the herd. As a guide, an unacceptably high spread of infection is suspected if more than 30% of heifers have had a maximum ICSCC above 120,000 cells/mL by the end of their first lactation.

SmartSAMM Mastitis Focus uses a level of more than 10 newly infected cows per 100 cows in milk per calendar month as a warning of the spread of infection within a herd.

- **The number of persistent infections**

The proportion of cows with persistent mastitis infections (cell counts above 150,000 cells/mL in the current and previous lactations). This provides a guide to the chronicity of the problem and the effectiveness of the last dry period mastitis management.

SmartSAMM Mastitis Focus identifies the impact of persistent infections in two ways, by the number of cows that are eligible for culling and by the proportion of clinical cases that have been retreated.

Analyses of ICSCCs should be based on regular herd testing data, not on single 'spot' tests. It is recommended to have at least four ICSCCs to determine the status of a cow during lactation.

SmartSAMM Mastitis Focus provides a herd-level analysis of the infection status of the herd from the ICSCC data.

Technote 12 describes methods of analysing and interpreting ICSCCs.

- A cow is classified as infected or uninfected according to her highest (or maximum) cell count taken during the lactation.
- In NZ, where *Staph. aureus* and *Strep. uberis* are the main pathogens, cows are designated as 'infected' if their ICSCC exceeds 150,000 cells/mL.(120,000 cells/mL for first calvers).
- For the purposes of Mastitis Focus, cows remain infected until they have four or more subsequent tests below these values, or a dry period with antibiotic dry cow treatment and one ICSCC test below 150,000 cells/mL.

E. Milking Machine Dry Test (NZMPTA test or equivalent dry test)

To be confident in the quality of testing and standard of reporting, SmartSAMM recommends the use of technicians who are certified by the New Zealand Milking and Pumping Trade Association (NZMPTA) to perform a Dry Test on the milking machine. This ensures the equipment is comprehensively tested, and that results are recorded on NZMPTA or equivalent report forms and interpreted using the NZMPTA specifications.

Examples of other Dry Test procedures and recording forms that may be regarded as equivalent include the International Standard ISO 6690:2007 Annex D (ISO 2007) and the standard Australian machine test report form.

Technote 25.2 describes different tests that can be conducted by a registered milking machine technician.

A Dry Test will include:

- Assessing cluster components to ensure compatibility – so that cluster position and weight balance are good; liners fit shells and claw nipples and are suitable for the average teat size; and cluster air admission meets guidelines.
- Assessing the effectiveness of vacuum regulation – specifically, that the vacuum is appropriate for the milkline height, that the vacuum regulator is functioning, that vacuum reserve is sufficient (unit fall-off test), and vacuum undershoot and overshoot is minimal.

Technote 25.3 lists the key points to review on a Dry Test report.

When assessing the impact that machines may be having on the mastitis problem (Boxes 3 and 4 of the flow chart), the advisory team should review the key points of the milking machine Dry Test report.

Machine technicians can also perform a Wet Test, which involve testing the machine when air and water, or artificial milk, is pumped through the system. A Wet Test is often used to commission a new installation or a major plant upgrade, and may help to pinpoint a vacuum regulation problem.

F. Performance Tests of Milking Machines

Milking-time machine tests provide a measure of the 'goodness of fit' between the milking herd and the milking equipment. These performance tests include:

- Assessing cluster compatibility with the average udder and teat size.
- Assessing vacuum stability in milkline and receiver.
- Measuring the range of claw vacuums that occur during milking.

Technote 6.1 provides guidelines for interpreting milking routine observations, including milking times and completeness of milking.

When assessing the impact that machines may be having on the mastitis problem (Boxes 3 and 4 of the flow chart, Figure 1), use the guidelines for performance tests given in Technote 25.

These performance tests are designed to build on the results of the milking machine Dry Test and they often help to pinpoint the underlying causes of frequent liner slips (Sheet G), poor teat condition (Sheet I), poor cow behaviour or slow milking (Sheet J), or incomplete milking (Sheet K).

G. Milking Routines and Cup Slips

Milking Routines

This checklist for milking routines (Sheet G) is designed for advisers to fill in from *their own observations* in the farm dairy at milking (do not give the sheet directly to milkers to fill in). In most of the lists, one or more of the tick box lists may be appropriate.

Careful assessment of the milking routine often identifies factors contributing to the presenting problem (Boxes 3 and 4 of the flow chart). When it comes to developing a farm plan (Box 5), building good routines and communication with the on-farm team members is low-cost and motivational, as well as benefiting mastitis control.

Cup Slips

Because cup slips or falls can occur randomly during a milking, experienced observers usually listen and watch for these events while they are engaged primarily in recording other events (such as milking routines or cow behaviour). The rate of slips or falls per 100 cows milked can be estimated from the average number of cows per milked per hour if the time of the first and last recorded slip or fall was also noted.

Technote 6.1 lists the common causes of cup slips and falls.

A handy technique is to use a 'Post-It' note to record audible cup slips or falls. You can move this note page to the top of each recording sheet as you work.

H. Clinical Cases

The robustness of clinical case management can be assessed by looking at the quality of the clinical case records (Farm Profile Sheet B3) and using Clinical Cases Sheet H to check what is happening at milking, discuss issues with the milkers and assess the technique used for treatment of cases.

Technotes 4 and 10 describe recommended methods of detecting and treating clinical cases.

Technote 8 gives a guide to hygiene requirements.

I. Teat Condition

Formal assessment of the herd's teat condition aids detection of any milking machine induced, management or environmental factors, or infectious agents, influencing teat and udder health (Boxes 3 and 4 of the flow chart).

Teat skin condition can be checked before milking but is often easier after milking. All other parameters on Sheet I should be assessed immediately after milking.

Technote 9.1 gives a guide for making and interpreting teat observations in commercial herds.

Remember to exclude pigmented teats when assessing teat colour.

J. Cow behaviour and milking time per cow

Cow Behaviour

A cow's behaviour is an indicator of her comfort or discomfort with the milking environment, milking routine and machine. Scoring systems such as KiSt (Kick, Step; Technote 6) can be used to make assessments.

Observations are made at different stages during milking: whilst cows are in the stalls waiting to be milked, during cow preparation and cluster attachment; during the first two minutes of milking; and during the last two minutes of milking. In herringbone dairies, cow behaviour and milking time per cow can be observed concurrently for each cow (working across the

Technote 6.1 describes the types of problems that may be occurring for cows showing discomfort at different stages of milking and outlines the KiST scoring system.

sheet). In rotaries, it is usually more efficient to observe different groups of cows. See the tips on efficient data collection on page 14.

Milking Time per Cow

Three valuable pieces of information can be derived from careful measurements on a representative sample of cows:

- the proportion of cows exhibiting signs of delayed milk let-down (minimal if fewer than 10% of cows, or moderate if 10-20% of cows);
- the average milk flow time per cow (which can be compared with guidelines in Technote 6);
- the average length of the over milking period per cow (minimal if the mean over milking time is less than 1 minute per cow; moderate if between 1 and 2 minutes per cow).

Technote 6.1 gives the expected milk flow time for herds producing 10, 15 and 20 litres of milk per milking and situations that will increase the average cups on time per cow.

The results of a few careful time measurements can provide a solid framework for advice on improving milking management. In addition, they will help to explain the underlying causes of new mastitis infections, frequent liner slips (Sheet G), poor teat condition (Sheet I), poor cow behaviour (Sheet J) or incomplete milking (Sheet K). For example, warning bells should ring if over milking occurs in conjunction with pulsation failure (Sheet E).

K. Completeness of milking and cluster alignment

Completeness of Milking

Technote 6.1 gives a guide to assessing incomplete milking

Although there is little recent evidence information that under milking affects the risk of new infection, its measurement provides information about the efficiency of the milking machine and milking team (applicable to Boxes 3 and 4 of the flow chart).

If the herd appears not to be milking out completely (under milking), this can be established by hand stripping at least 25 cows or 100 quarters at the end of milking, as described in Technote 6, page 6.

Cluster Alignment

The effect of poor cluster alignment on completeness of milking can be demonstrated simply by manually re-aligning the cluster at about the time when milk flow from any cow has almost ceased.

Hold the cluster squarely under the udder by manipulating the long milk tube - without putting additional downwards pressure on the cluster. Often, milk will start flowing again from one or more quarters into clusters that are poorly aligned.

A pattern of different strip yields from rear versus front quarters, or between quarters on the right versus the left side of udders, usually indicates a problem of poor cluster positioning or uneven weight balance between the four teat cups.

Teat Size

Visual assessment of herd teat size and shape is useful when liner selection is being reviewed.

L. Teat Disinfectant

Sheet L helps advisers check issues associated with use of teat disinfectant *before* application (Boxes 3 and 4 of the flow chart), from selection of the stock product through to mixing and storage.

Issues of teat coverage are checked when assessing the milking routine (Sheet G of the Mastitis Investigation Kit).

The section of Sheet L on mixing is not needed for farms using a ready-to-use teat disinfectant product.

Use Technote 7 to interpret the information and identify any leads to follow up about post-milking teat disinfection.

M. The Environment

The environmental checklist helps advisers assess a herd's level of exposure to environmental contamination, especially at calving and immediately after milking. It is necessary to think about potential problem areas and physically inspect them at the most appropriate time of year, for example the calving areas at calving time, or feedpad areas when in use.

Assessment of udder contamination prior to milking is recorded on Sheet G.

Tips for efficient data collection during milking-time tests and observations

Getting the numbers right

A common limitation in mastitis investigations has been that sample sizes for milking-time observations have been too small. When sample sizes are too small, the professionals who collected the information have largely wasted their time and effort because it is impossible to draw confident conclusions.

SmartSAMM recommends that a minimum of 25 cows and ideally, up to 100 cows, are evaluated for other milking-time observations, such as cow behaviour and milk flow times per cow (Sheet J) and completeness of milking (Sheet K). Table 8 in Technote 9 summarises the minimum number of abnormalities that meet different prevalence thresholds, which can also be "triggers for action".

Technote 9.1 Section D provides guidelines on the number of teats and cows that are required to evaluate teat condition. These are:

- Assess all teats of 100 cows to investigate system faults and causes of teat damage.
- Assess smaller numbers of cows (e.g. 50) to identify if a problem warrants further investigation.

Efficient teamwork for data collection

According to anecdotal reports, many udder health advisers and milking machine technicians are investing four or more person-milkings to collect all the data required at milking-time to provide comprehensive recommendations. One pair of experienced technical people found that they needed two milking-time visits to complete most of the tests and observations. They each recorded their own data.

Consider asking a member of the farm family to help with recording the data.

Some options that have been used to shorten this time consuming, labour intensive and expensive process are described below:

- Conduct a quick test of the regulator undershoot and overshoot before milking. This is a partial substitute for monitoring receiver vacuum during milking.
- Measure the mean claw vacuum, before milking, in 3-5 clusters using a flow simulator set at a controlled liquid flow rate of 5 litres per minute. This wet test is an acceptable substitute for measuring the mean claw vacuum on 6-10 real cows during milking. In fact, it is a better measurement in some ways because the simulator flow rate is known and is highly repeatable.

If the above options are adopted, then milkline vacuum stability is the only milking-time machine test that needs to be done *during* milking. This test should be conducted in the first 15 minutes of milking when milk flow is likely to be highest. The measurement can be made at any convenient empty stall for one rotation in a rotary dairy. In a herringbone dairy, the measurement can be made at any convenient milking unit and recorded while the first complete side of clusters is removed and reapplied.

In dairies where the milkline size and slope comfortably meet the current guidelines for effective milkline capacity, it could be argued that the milking-time measurement of milkline stability is not necessary. Nevertheless, it does provide a neutral 'activity' for a visiting technician while the milking staff settle into their routine and forget about the visitors, before observations are made on milking routines, cow behaviour, etc. Furthermore, the actual milking-time performance test with all the 'warts', including operator actions, often gives extra insight and also allows correlation of events with measurements.

If a flow simulator is not available, then the measurement of mean claw vacuum is simplified greatly by pre-installing 3-5 T-pieces between the claw outlet and long milk tube. These T-pieces are capped when not in use. The vacuum recorder is connected to record mean vacuum at 30 seconds and 90 seconds of milking for one cow then it can be moved immediately to the next available milking unit without having to wait for the first cow to finish milking. One group of 3-5 cows can be recorded as soon as milkline vacuum stability has been measured. A second group of 3-5 cows can be recorded later in the milking.

It should be possible to collect all or most of the data by using two people at one milking (with the option for one person to return for a follow-up visit if necessary) by organising tasks along the following lines:

Before milking

Both observers should arrive at the farm at least one hour before milking. One person evaluates possible environmental factors. The more technically-oriented person assesses liners, and takes all measurements of working vacuum, regulator undershoot and overshoot, claw air vents (either hole size or individual claw air admission), mean claw vacuum with flow simulator, and/or pre-installs T-pieces. This person also checks pulsators.

During milking

Adviser One evaluates teat condition on groups of cows throughout milking and observes milking routines.

Adviser Two:

- Records milkline vacuum stability (15 minutes) and receiver vacuum (if necessary).
- Records mean claw vacuum (if necessary) on the first group of 3-5 cows.
- Observes cow behaviour and milking times per cow:
    - Observe behaviour in yard and during loading into the bail area, and interaction with milkers.
    - In a herringbone dairy, observe groups of 3-4 cows, for a whole side.
    - In a rotary dairy, it is more efficient to observe cow behaviour for 25 (or more) cows near the cow entry position, while noting the approximate stall position when milk starts flowing strongly into most claw bowls. When this average starting point for milk flow has been estimated, the observer moves to a convenient vantage point near the cups off position. A different group of 25 (or more) cows is observed to determine:
        - the average stall position at which milk flow slows or stops for the majority of cows,
        - the average stall position at which most clusters are detached,
        - cow behaviour during the last 2 minutes of cups on.
- The total cups on time and average milk flow time per cow can be calculated by measuring the rotation time of the platform, including normal repeatable stoppages but not unusual events during the time of the observations.
- Listens for and records any audible cup slips and falls as they occur.
- Records mean claw vacuum (if necessary) on the second group of 3-5 cows.
- Measures completeness of milking by hand-stripping all quarters of 25 cows preferably, dictating results into a tape recorder or with help from the teat evaluation assistant. It is not necessary to continue stripping any quarter after it becomes obvious that the strip yield exceeds 100 millilitres. It is quicker and more efficient to stop, record the quarter as ‘High’, and move on to the next teat.

Follow-up visit(s)

If two milking-time visits are planned, it is well worth including one morning and one afternoon milking due to the differences commonly seen in cows’ production levels and changes in milking staff.

13.2

Record problems and actions taken.

The aim is to develop a workable plan for the farm: formulate the plan with the on-farm team, write a clear report, ensure that the required activities are detailed on a wall chart or some other visible checklist, and schedule follow-up.

To increase the likelihood of recommendations being adopted, it is important that clients see the suggested changes as relevant, offering real rewards (preferably financial), and not too complex for the available resources (Gardner 1990). A plan that they build themselves, with guidance from an adviser, is more likely to be workable and implemented.

Confidence – High

A clear written report is less likely to be misinterpreted by the farmer and other professional advisers, and more likely to be implemented correctly.

Research priority – Moderate

A better understanding of how advisers can package and deliver their services in a way that encourages farmers to adopt the recommendations and implement change on their farms is needed.

Providing a clear written report

The Investigation Master Sheet in the SmartSAMM Mastitis Investigation Kit is used by the advisory team to collate and prioritise findings and re-define the problem until solutions can be recommended. More steps are then needed to convert the findings of the investigation into do-able steps to promote implementation on farms. This process is usually achieved through written reports to the owner/manager and through meetings of the farm staff and adviser(s) where the team members develop an approach suitable for their herd and allocate appropriate resources.

Clear written reports provide a permanent record of the problems and recommendations for the owner and are more likely to be implemented correctly. They may form the basis of discussion at future visits and are necessary when other professionals advise the farmer. Reports should contain:

It is increasingly incumbent on professionals to document their work carefully.
Most advisory services document recommendations and actions taken during client interactions as standard practice.
Written records are invaluable to help resolve problems and disputes.

- The specific objectives of the original visit.
- The salient points of the investigation.
- The agreed list of what must be done, by when, and who is responsible.
- Arrangements for follow-up.

Because excessive detail buries important points, a short (preferably single page) report is recommended. Report writing does not have to be an onerous task. Time invested in setting-up a customised template (e.g. on word processing software) will help to structure and simplify the process.

It is important to encourage the owner and staff to record relevant information as they implement the plan. To avoid the need to keep extra records it may be possible to incorporate some of this within the Quality Assurance records on the farm.

Following-up

The report must indicate what areas need to be tackled after the immediate changes have been made in order to maintain progress. Specifically, it needs to clearly state what the tasks ahead are, when they should be discussed in more detail, and who should be involved.

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Key papers

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