

The high SCC herd - a guide to mastitis investigation

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High SCC herds – an investigative strategy

Investigations into the high somatic cell count (SCC) herd can be confusing and frustrating, with many possible contributing factors in need of exploration or correction. This paper aims to highlight key areas of investigative strategy that may help to untangle problems and allow the prioritisation of solutions.

The objective of problem investigation should be to obtain a clear understanding of the processes which drive disease mechanisms on-farm. This is achieved with a systematic, targeted approach. Epidemiological principles can be used to assess farm performance, for example, by looking for patterns of disease among problem cases. Patterns in time, space and among different animal groupings are interpreted along with on-farm findings, to generate hypotheses behind what problems are present.

Preparation for an investigative visit

Detailed preparation is essential to improve the efficiency and success of an investigative visit. This includes data analysis to assess disease patterns.

Milk recording

The backbone of any disease investigation is solid, reliable data. Fortunately, some data for mastitis problems are generally available; for example, the bulk milk somatic cell and total bacterial counts. The analysis and interpretation of bulk milk data are, however, limited for detailed investigations as they represent amalgamated data, derived only from those animals whose milk actually reach the bulk tank. Individual cow SCC records provide a more representative view of the disease dynamics within the herd. As such, it is essential for any farmer serious about

tackling somatic cell count issues to involve his or her herd in monthly milk recording. In this country, these data are collated by the Irish Cattle Breeders Federation (ICBF) and, with the farmer’s permission, can be accessed over the internet by vets.

ICBF milk recordings should be systematically analysed. The ‘milk quality’ report provides readily available, easily interpretable data. These data should be examined for evidence of either recent or chronic infection problems, as shown by a scatter plot diagram (Figure 1). The trends in time and in animal groups should then be examined for patterns in SCC and the nature of infections. Trends in time are shown based on the monthly herd SCC recordings (Figure 2). Trends in time, regarding recent or chronic infections, are best assessed by analysing several monthly reports (Figure 3). Trends in animal groups are shown by days in milk and age (Figure 4).

Common questions that should be asked include: Is the high SCC due to recent infections, chronic infections or both? In what age groups and stage of lactation are recent and chronic infections occurring? Which groups are the worst affected? Is there evidence of spread of chronic infection and, if so, from which animals? The effectiveness of dry cow therapy can also be analysed by comparing individual cow SCC prior to drying off and past calving (Figure 5).

Clinical disease records

These records are, unfortunately, often non-existent or incomplete on many Irish farms. Useful details for these records are cow identity, calving date, clinical signs, quarter affected, diagnosis if cultured, date of treatment, therapy used and response. Target rates for clinical mastitis data

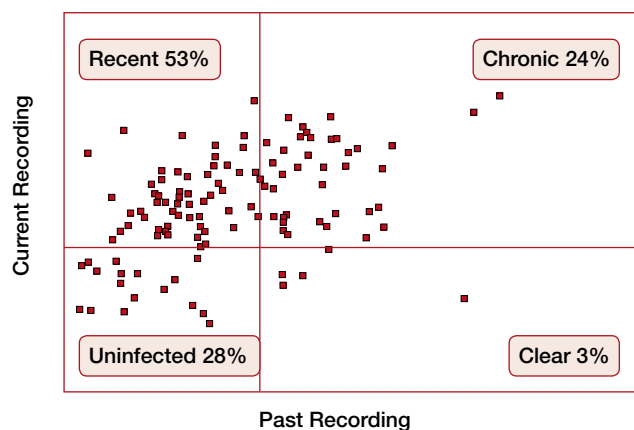


Figure 1: Scatter plot (www.icbf.com).

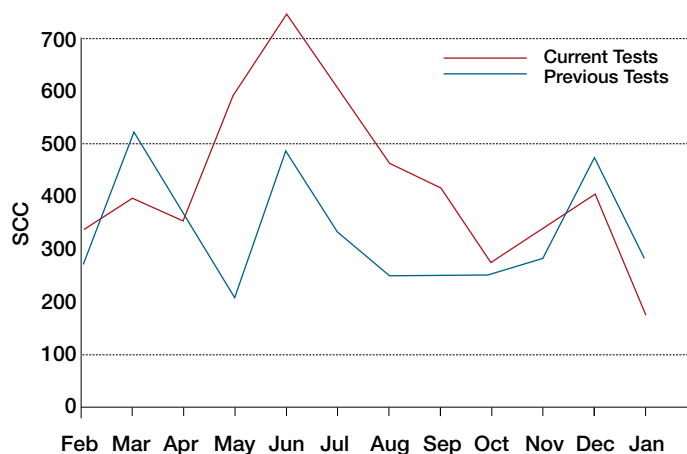


Figure 2: SCC trends over time (www.icbf.com).

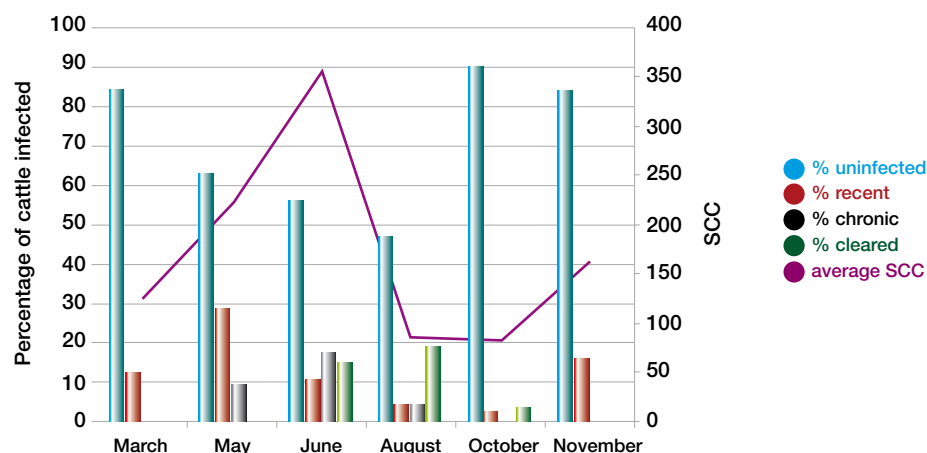


Figure 3: SCC trends over time, including recent and chronic infections (Targets for recent infections < 2.5-5% and chronic infections <5-10%).

are shown in **Figure 6**. However, interpretation of records will be affected by mastitis detection protocols and the motivation of the farmer to record.

Once the patterns have been established, it is advisable to prepare a brief descriptive summary of these findings for discussion with the farmer.

On-farm investigation

Once the initial preparatory work has been completed, the on-farm visit should be planned. This planning should include a broad choreography of the visit. A suggested outline of a visit is detailed below:

Initial questioning

Obtaining general farm details at the start will allow a greater understanding of the farming systems in place and farmer motivations, which can influence future recommendations. Care should be taken to avoid talking about the problem at this stage as it becomes easy to become distracted from, or overlook, this step.

Reviewing the current farm preventive protocol

Every farm will have some actions to address mastitis, be they good or bad. Key areas for questioning are: monitoring policy; culling policy; dry cow management and therapy; and, lactating cow management and therapy.

Costing problems

Look at the financial losses associated with the current

problem and the future goals. These are useful in providing motivation for both the initial investigation and the uptake of recommendations. Losses due to high SCC can be assessed from milk recording data. Other areas of losses that should be documented are: culling; treatments; discarded milk; and, penalties/lost bonuses.

Investigating areas of concern – milking routine

An assessment of milk routine should focus on assessing activities that may allow the increased spread of mastitis. A summary of areas for assessment is detailed in **Figure 7**.

- Cows entering the parlour

The entry of the cows into and in the parlour, coupled with the milker’s demeanour in collecting cows should be assessed. High levels of unwillingness to enter the parlour or rough handling are likely to reduce milk let-down, which in turn will contribute to higher SCC and under-milking. The milking order will also contribute strongly to the spread of mastitis if high SCC cows and uninfected cows are milked in one group.

- Parlour hygiene

Issues with poor parlour hygiene, such as poor machine cleaning, will result in a higher risk of spread of mastitis and increased thermophilic (organisms capable of surviving high temperatures) counts.

- Milker hygiene

Assessment of milker hygiene should include the condition

	Mean SCC		Median SCC		Non-infected		Non-infected Recently cleared		Recently infected		Chronically infected	
	Cows	Mean	Cows	%	Cows	%	Cows	%	Cows	%	Cows	%
Overall	81	604	81	149	49	60	2	1	17	21	13	16
Stage of lactation												
0-100d	57	492	57	149	34	60	2	4	15	26	6	11
101-200d	19	879	19	131	14	74	0	0	2	11	3	16
201-300d	3	961	3	503	0	0	0	0	0	0	3	100
Over 300d	2	622	2	95	1	50	0	0	0	0	1	50
Lactation number												
1	17	253	17	125	14	82	0	0	3	18	0	0
2-3	26	312	26	117	15	58	2	8	6	23	3	12
4-5	22	602	22	121	13	59	0	0	5	23	4	18
6+	16	1452	16	434	7	44	0	0	3	19	6	38

Figure 4: Trends in animal groups - herd performance by lactation number and stage of lactation (www.icfb.com).

of protective clothing, hands/gloves and any udder cloths or wipes used. Care should be taken to note any milking practices that would promote the spread of pathogens.

- Pre-milking processes

Teat preparation by the cleaning and disinfection of teats is important to prevent the risk from environmental pathogens and to reduce the levels of TBCs. For pre-dipping to be effective, it should be done using a commercial pre-dip and allowed to act for 30 seconds, before being wiped off. If teats are washed then they should be dried to avoid the collection of organic matter at the teat orifice. Effective mastitis detection is needed for prompt treatment and management of mastitis cases. Other benefits include increased milk letdown early detection of teat lesions.

		First SCC recording post calving	
		High	Low
Last SCC recording prior to drying off	High	Failure (< 10%)	Cure
	Low	New (< 5%)	Success

Figure 5: Comparing the effectiveness of dry cow therapy.

- Cluster application and removal

Clusters should be applied quickly and squarely to avoid teat end vacuum fluctuations. The removal of clusters should be done so that the milking vacuum is released before removal. All cups should also be removed at once. Other activities such as machine stripping should be discouraged.

- Post-milking procedure

Post-milking teat disinfection, by either spraying or dipping, is an essential step in the prevention of the spread of mastitis. The recommended volume of dip used is 10ml per cow (15ml for teat spraying). The choice of post-milking teat disinfectant is also highly significant in reducing the spread of mastitis, with iodine and chlorohexidine-based products preferred. Care should be taken to calculate the volumes used and the management of dips, especially if dilution is required. Some farmers may top-up the container by 'guesstimating' volumes. Cows should not be returned to housing for 20 -30 minutes in order to allow teat sphincters to fully close.

Investigating areas of concern – the milking machine

A basic on-farm assessment of the milking machine should be performed where there is a suspicion of in-parlour spread. A summary of areas for assessment is detailed in **Figure 8**. This list should be used as a means to assess areas of milking machine function that are cause for alarm, rather than as a complete test for milking machines. If problem areas are detected, then a certified milking machine technician should be requested to conduct a full diagnostic milking machine service.

- Previous reports

Milking machines should ideally be serviced every six months, or after any upgrades. All services should be accompanied by a written report.

- Teat scoring

Teat scoring is an excellent method of assessing the impact of milking machine function. Every teat should be

examined using a good light source and findings should be recorded for each cow. This will allow the analysis of any trends in terms of cow age or days in milk. Detectable problems include hyperkeratosis, cyanosis, petechiation, wedging, oedema and congestion. If greater than 20% of teats show signs of lesions, then further investigation is required. These findings suggest problems such as: excessive vacuum, pulsation problems, worn liners, over-milking or removal of the cluster without releasing the milking vacuum.

- Rubber-ware

An assessment of rubber-ware should be based on the history of liner replacement e.g., at least every six months or 2,500 milkings and on visual assessment of the milking machine tubing. Squeaks and squawks during milking are indicative of liner slippage. Liner slippage impacts on the spread of mastitis and teat end damage.

- Vacuum stability and reserve

Before milking, the parlour gauge should be read when the machine is turned on. Target vacuum levels are 46-48 kPa for a high-line plant and 42-44 kPa for a low-line plant Vacuum reserve can be tested by leaking air in through clusters and assessing any observed changes. For example:

- Leak air through one cluster - there should not be a drop in vacuum.
- Leak air through two clusters (or one cluster for every five) - there should not be a drop in vacuum of more than 2kPa.
- When air leaking is stopped, vacuum should return in less than three seconds.

- Pulsation

The pulsation ratio should ideally be 60:40, with ratios above 70:30 being cause for concern in herds with teat damage. The pulsation phases should ideally be >40% for phase B and >15% for phase D.

The 'thumb test' is a crude method of assessing the effects of the pulsation cycle on teat condition. The thumbs of both the vet and milker are placed into the cluster. If a throbbing is felt around the thumbs then it is likely that the cow's teats are feeling the same congestion.

	Target
Mastitis rate (number of quarters affected)	30 quarters / 100 cows / year
Percentage of herd affected	20 % of herd affected / year
Reoccurrence rate (quarters requiring repeat treatment)	10 % of total number of cases

Figure 6: Targets for clinical mastitis.

- Regulator

The maintenance of regulator function is essential in the maintenance of a stable vacuum. This should be assessed visually by observing filter cleanliness (often neglected) and also by opening a few clusters to drop the kPa by 4-5 units. The regulator should cease leaking air into the system if it is functioning properly. Also, malfunction should be suspected if the vacuum gauge 'over shoots' as the clusters are closed again.

Entering the parlour	Parlour hygiene	Milker hygiene	Pre-milking processes	Cluster application / removal	Post-milking procedure
order and willingness	preparation	hands	teat preparation	position	teat dipping
hygiene	washing history	udder cloths	mastitis detection	vacuum removal	cow management
hygiene					

Figure 7: Areas for milking routine assessment.

Investigating areas of concern – housing

An assessment of the housing should include both milking cow and dry areas. General consideration should be given to dimensions, stocking density and hygiene. Questioning regarding cow behaviour and observation of cows in the housing will generally provide a good assessment of cow comfort and hygiene. Housing findings should be assessed in light of other investigation and diagnostic findings, as many farms will show several deficiencies in housing specifications, but not all are contributors to current mastitis problems.

Diagnostic sampling

Diagnostic sampling has several aims. Historically, sampling was performed to identify the predominant pathogen type on-farm, e.g., environmental or contagious pathogens, thus allowing the correction of relevant risk factors or advice on treatment protocols. However, deciding which cows to sample, how many and the interpretation of a mixed bag of pathogens can be confusing. Animals should be selected to answer questions arising from the farm investigation, e.g.:

- Do recent infections involve the same pathogen as chronically affected cows?
- Are young animals affected by same pathogen as old cows?
- Do are different pathogens present a different stages of lactation?

Are clinical cases affected by the same pathogen as subclinical infections?

Milk recording data are very useful for selecting cows for sampling. Within the ICBF milk-recording database, cows can be selected based on age or duration of infection from the ‘problem cow list’. Ideally, the vet should take the milk samples (or, if properly trained, the farmer) using a California mastitis test (CMT) to identify the worse affected quarter. Ten to twelve samples are generally enough to answer these questions, but more should be taken as needed.

Evaluation of findings and recommendations

The on-farm investigation is best seen as an information gathering exercise. As such, the evaluation of the problem is best performed after all the information is gathered. This helps to avoid the pitfalls of jumping to conclusions too soon. Both the evaluation and recommendations should focus on addressing two main areas: the relevant sources of infection and the significant factors in the spread of

infection.

In general, sources of mastitis can be divided into two main groups; infected cows and the environment. Measures to help reduce the number of infected cows are milking cow treatments, dry cow therapy and culling whilst a focus on management practices and hygiene look at environmental issues. The spread of mastitis can also be divided into tackling challenges from either infected cows or the environment. Cow-to-cow spread can be addressed by looking at the milking parlour, milking machine and segregation. Addressing spread from the environment is based on a balance of cow resistance (increasing immunity/ improving teat integrity) and managing exposure at key times e.g., post-milking.

Report and follow-up

Ideally, a written report should always accompany any on-farm investigation. The structure of the report should generally follow that of the investigation outlined above. The report should be concise and contain separate sections including: an initial introduction to the farm and the problem history; documentation of the facts found during the investigation; and, evaluation/ interpretation of the facts and recommendations.

Following up an investigation is an essential factor in achieving success. An initial follow-up should be performed to discuss the findings and recommendations detailed in the written report. Other areas to look at include the monitoring of progress through records remotely and making return visits at key times such as drying off or after correction of specific problems. Further investigation can often be highly motivational for farmers in the implementation of recommendations.

Further reading

Andrews, A. H., Blowey, R. W., Boyd, H. and Eddy, R. G. (2004). Mastitis and teat conditions. *In: Bovine medicine (Diseases and husbandry of cattle)*. 2nd edition. Oxford: Blackwell Publishing. pp 821–829.

Bradley, A. and Green, M. (2005). Use and interpretation of somatic cell count data in dairy cows. *In Practice* 27: 310-315.

Edmondson, P. (2001). Influence of milking machines on mastitis. *In Practice* 23: 150-159.

Jones, T. and Ohnstad, I. (2002). Milking procedures recommended for the control of bovine mastitis. *In Practice* 24: 502-511.

Veterinary Ireland - Herd Health Planning training literature.

Rubber-ware condition	Vacuum stability and reserve	Pulsation	Regulator	Teat scoring
liner changes	parlour gauge	teat condition	maintenance	hyperkeratosis scoring
liner slippage	air leak test reports	thumb test report	sucking in air	

Figure 8: Areas for milking machine assessment.