Using DHIA and bacteriology to investigate herd milk quality problems.

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When bulk tank somatic cell counts rise and clinical mastitis rates increase, we need to know what to fix to resolve the problem. For a successful milk quality investigation we need information. This article deals with how we, at the University of Wisconsin, School of Veterinary Medicine (UWSVM), approach a milk quality problem and assemble data to form a complete picture so that we can identify and target the area on the farm that will have the greatest impact on milk quality in the shortest possible time.

Population at Risk

The starting point is identifying the population at risk. Individual Cow Somatic Cell Counts (SCC) are the key. The Food Animal Production Medicine group at the UWSVM has developed a simple way of summarizing large amounts of data in a graphic form – we call it Wisgraph®. Wisgraph® is a spreadsheet program available from AgSource Cooperative Services (http://www.agsource.com/wisgraph.htm) which allows us to directly download farm data (with the farmers permission!) via modem prior to a herd investigation. At the touch of a computer key we can get a graph printed like the one in Figures 1 and 2.

From that graph, using a SCC cut-point of 200,000/ml to determine infected and non-infected cows, we can tell whether the herd is suffering from too many chronic cows, and/or too high a rate of new infections. We can also breakdown the new infections into two populations; infections occurring before first test – we call this the fresh cow new infection rate, and those occurring beyond first test – the lactating cow new infection rate. If fresh cow infections appear to be a significant problem, we can further analyze the heifer new infection rate at first test and the dry cow new infection rate in cows that dried off uninfected. Using this graph, we know exactly where we can have the greatest impact on a dairy farm and focus our efforts in this area on the day of the visit.

Defining the Pathogens Involved

Once we know the population at risk, we need to know the udder pathogens responsible for the problem. That's where culture comes in. Bulk tank culture is an extremely useful technique for screening for contagious pathogens such as *S.agalactiae*, *S.aureus* and *Mycoplasma*. These may be bought in during a herd expansion and routine regular screening is essential.

Interpreting the source of the environmental bacteria in bulk milk is difficult and there is far too much misinterpretation occurring. Environmental streptococci may come

from the teat surface, they may come from the machine itself but most often, in my experience, they come from chronically infected udders. With adequate premilking teat dipping, coliforms are rarely high, and when they are, the udder is the usual source. For that reason, we should always extend our bacteriology sampling to individual cows to confirm suspicions raised by the bulk tank.

There are three populations of interest for culture:

1. Clinical Mastitis Cases.

An aseptically collected quarter sample from a case of mastitis may be taken from every cow and held frozen. In the vast majority of situations we cannot justify culturing every single case – the practicalities of getting results back to the farm quickly enough for the result to influence therapy are often too challenging. I do however suggest pathogen profiling – sending in a random selection of samples each month to determine whether there has been a change in the predominant pathogen type – for example a switch from environmental streptococci to coliforms, or a switch from *E.coli* to *Klebsiella*. These switches may direct a change in therapy or help direct the focus of an investigation. No growths are not a waste of money. For clinical cases, they tell us that the sample was taken hygienically, and in most cases they result from a coliform infection, where the bacteria have been consumed by white blood cells in the milk before the sample was taken.

2. Chronic Cows.

What pathogens are failing to cure, resulting in high SCC problem cows? These are the second group of cows to look at. We typically create a list of cows >200,000 for the last three tests as a starting point. We then either use CMT and sample the trace and positive quarters or sample all four quarters without CMT. Never take a composite from all four quarters for these cows. Detecting *S.aureus* effectively relies on culturing quarter samples and plating out large 0.1ml inoculum volumes. In addition to *S.aureus*, we commonly find environmental streptococci such as *S.uberis* causing chronic persistent infections. You will also probably find some coliforms as well – especially *Klebsiella*. Depending on the isolate, we use the data to drive decisions to cull, treat or dry off these cows. No growths in this population may be intermittent *S.aureus* excretors, but in many cases I believe that they represent cows with residual inflammation (and hence a high SCC), persisting after a coliform infection.

3. Fresh Cows and Heifers at calving.

Many farms are using the FreshStart program – using CMT at the third or fourth milking to identify infected quarters and treating them before they become clinical mastitis cases later in lactation. Samples from CMT positive quarters from both heifers and cows are informative. They tell us the types of pathogen causing non-lactating period infections and help determine the type of intramammary tube we need to use for FreshStart treatments.

Developing Action Plans

Combining our WisGraph® SCC analysis and identifying populations at risk with knowledge of the pathogens involved we can now look at the specific risk factors for each group derived from our herd assessment of milking practices, machine performance, housing and drug treatment protocols, and develop a targeted action plan.

For example, in a herd where more than 60% of the infected cows are chronic, such as the one in Figure 2, we need to take action on this population to achieve improvements in bulk tank SCC. Infected cows may be segregated, first lactation heifers with an SCC<1million and only one quarter infected may be treated with extended antibiotic therapy, high SCC quarters giving less than 5lbs milk per milking can be dried off, some pregnant cows may be dried off early and of course a cull list will have to be developed targeting open cows with low production initially. In order to prevent chronic infections we analyze clinical case data and with the help of the local veterinarian suggest changes to the treatment protocol.

In a herd with a major new infection rate problem in lactating cows beyond first test, risk factors include milking machine function, milking routine and barn hygiene. Where coliforms and environmental streptococci predominate, we target our efforts on improved hygiene and tightening up the milking preparation procedures. Where *S.aureus* predominates, we target machine problems aggressively and work with the milking routine.

Where fresh cow new infections contribute more than one third of the overall new infection rate we target the non-lactating period (Figure 1). Dry cow and heifer housing facilities come under scrutiny, dry off procedures and maternity pen management and fresh cow milking procedures and equipment are looked at closely.

After every investigation we return to the farm to deliver the report and analysis in person. At that time some compromises are made, and everyone leaves with a clear view of the plan of action. Analysis of SCC data and summarizing culture information in an organized manner is the corner stone of a successful problem solving visit. Targeting the population at risk is a far more effective way of improving milk quality than attempting to introduce sweeping changes in all areas of the farm – in the hope of improving the one area that is causing the problem.

Figure 1 A Wisgraph SCC summary from a 90 cow dairy, identifying the three populations at risk. There is a dramatic increase in fresh cow and heifer infections at first DHI test in April, which continues into June.

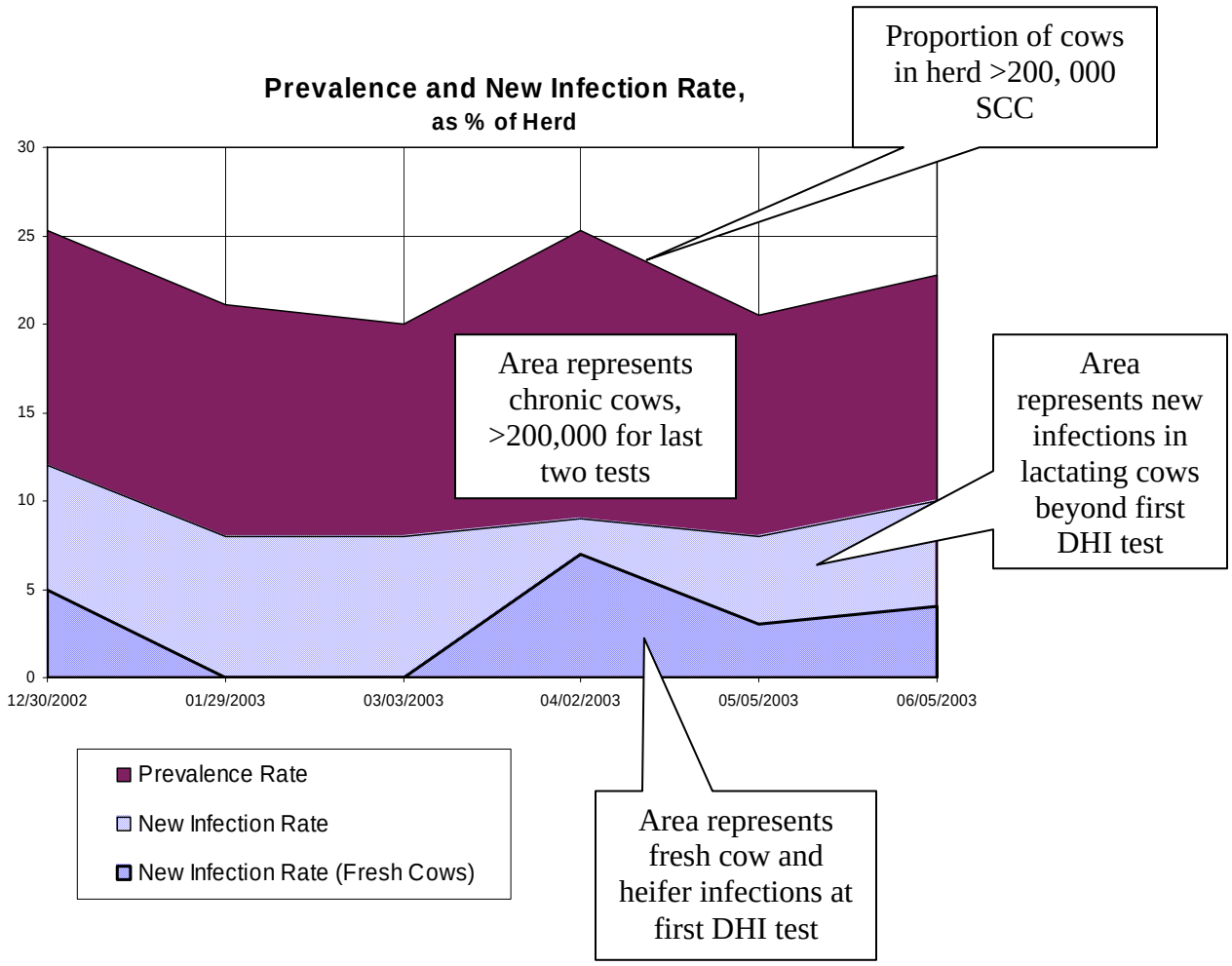

Figure 2. A 120 cow freestall herd with an accumulation of chronically infected cows.