Changes in Standards for Milk Quality and How They Will Affect Your Clients

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Abstract

Since 1995, the US limit for somatic cells in milk has been 750,000 cells/ml for Grade A milk. Stricter requirements for milk at plants that produce manufactured products for export to the European Union, proposed changes to the Pasteurized Milk Ordinance, and demand for enhanced milk quality by individual bottlers will drive down the effective somatic cell count limits. New limits will not be difficult for most farms during most months but may be very challenging for some farms during some months. Dairy farmers must be prepared in the event that milk handlers and cooperatives adjust levels at which quality premiums are paid. Dairy farmers must face the challenge of more stringent somatic cell count limits by utilizing known prevention, monitoring, management, treatment, and culling strategies with renewed emphasis.

Introduction

During January, 2010, Trade Commissioners from the European Union (**EU**) began negotiations with the United States Department of Agriculture (**USDA**) to enforce EU regulations that somatic cell counts (**SCC**) of bulk tank milk from all individual dairy farms supplying milk to plants that export products to the EU must be below 400,000 cells/ml. Previously, USDA interpreted regulations to apply to comingled milk stored or arriving at the plant prior to manufacture of the products to be exported. Because milk is frequently diverted from plant to plant or ingredients are made at separate plants, this requirement effectively would reduce the limit of SCC from the current 750,000 cells/ml limit set by the Food and Drug Administration's (**FDA**) Pasteurized Milk Ordinance **(PMO)**. Simultaneously, both the National Milk Producers' Federation and the National Mastitis Council will propose to change the limit for SCC of farm milk to 400,000 cells/ml in the PMO by January 1, 2014. Additionally, due to desire for extended shelf life, some plants in the midwest and southeast have contacted farms that supply them, announcing an intent to accept milk only from those farms that can routinely supply milk with SCC below 250,000 cells/ml.

While the vast majority of milk produced in the U.S. will easily meet the pending standards for SCC, it may not be as easy for all dairy farmers to meet these more stringent standards during all seasons of the year. Nevertheless, if production of high quality milk becomes an important goal of the dairy farm, it can be accomplished, even in the southeastern US, where heat and humidity make mastitis control especially challenging.

Decreasing Regulatory Limits for SCC

European union export compliance

Since 1994, when SCC limits were last reduced under FDA's PMO, the legal limit for SCC in Grade A milk has been 750,000 cells/ml. Selling

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milk with official monthly tests over that limit for 3 of 5 consecutive months can result in loss of one's permit to ship Grade A milk. California has a state imposed limit of 600,000 cells/ml, and other SCC standards are in Table 1. Since 1997, the regulatory limit for SCC has been 400,000 cells/ml in most EU member states. Initially, the EU limit was applied to comingled milk at the dairy plant. However, in 2004, the regulation was modified to require *individual farms* to meet the 400,000 cells/ml limit, based on a 3-month rolling geometric mean. The USDA officials apparently did not pick up the slight change in language in the new rule and continued to enforce the rule for comingled milk.

As in the US, the EU experienced similar pressure on milk prices in 2009, but the EU intervention policy required European governments to purchase large quantities of surplus dairy products. Therefore, the EU had a huge financial incentive to limit imports. During the summer of 2009, EU auditors called on US dairy plants to ensure compliance with export certificates and discovered that US manufacturers were complying with the spirit of the EU regulations but not following the rule exactly. The US manufacturers were meeting the 400,000 cell/ml limit with comingled milk by tanker or silo but not requiring every individual farm to meet the 400,000 SCC limit (Dickerell, 2010). In December 2009, EU officials notified USDA that US plants were out of compliance with the export certificate requirement. On January 10, 2010, USDA issued a notice of intent that all US plants would need to meet the new requirement on February 1, 2010 to qualify for export certificates. However, in many regions of the country, plants have a substantial number of patrons that exceed 400,000 SCC for at least some months during the year. One cooperative has 5% of midwest patrons exceeding 400,000 cells/ml each month of the year (Dickerell, 2010). Several years ago, one Indiana plant reported average SCC of comingled milk greater than 500,000 cells/ml for August. So, meeting the requirement for individual producers in such short order was not feasible. Over the summer of 2010, the deadline was extended first to October 1, 2010, then to December 1, 2010, and finally to sometime early in 2011. To the author's knowledge, no firm deadline date has yet been implemented, but make no mistake, the 400,000 cells/ml SCC limit will soon be imposed on milk from individual farms for plants to qualify for export certificates.

Realistically, the 400,000 cell/ml requirement will apply to all farms because it is the only way to ensure that milk cooperatives have flexibility to move milk to other plants to balance a supply that is not uniform during the year. Furthermore, even plants that bottle milk entirely for US consumption often have loads of cream that may go to plants manufacturing products for export.

U.S. regulatory approaches

During Summer 2010, US Senator Kirsten Gillibrand (D-NY) took the unusual approach of introducing legislation to force the US FDA to reduce the US limit for SCC in milk from 750,000 to 400,000 cells/ml. The proposed legislation has not come forward for vote, but it is unusual in that milk safety issues are usually developed by recommendation of the National Conference on Interstate Milk Shippers (**NCIMS**) and then approved for inclusion in the PMO by FDA. The NCIMS meets biannually in odd numbered years, and it is composed of state sanitarians, milk cooperative representatives, and members of other industry organizations. In their 2011 meeting in Baltimore, NCIMS will entertain a joint proposal by the National Milk Producers Federation and the National Mastitis Council to reduce the US limit for SCC in Grade A milk. This joint proposal would require that dairy farms meet a limit of 600,000 cells/ml for milk sold on or after January 1, 2012, 500,000 cells/ml for milk sold on or after January 1, 2013, and 400,000 cells/ml for milk sold on or after January 1, 2014. Further, this proposal would allow regulatory discretion "while assuring public health—to temporarily allow for seasonality dependent increases or events outside of human control." The proposed rule would continue regulatory enforcement with a warning when 2 of 4 official monthly tests exceed the limit and suspension at 3 of 5 (Jonker, 2010). The NCIMS delegates will have the opportunity to vote on this proposal. Similar proposals in the past have been defeated for the reasons that SCC could be viewed as a quality issue and not a safety issue that is better left to be determined by milk handlers. Furthermore, strong voting blocks have voted against proposals on the grounds that meeting lower SCC restrictions would be too difficult to meet in certain parts of the country, such as the southeast. Given present pressures from the EU, proposed reduction of SCC limits for the PMO seems much more likely to pass than in past years.

Market-based reductions

At least one milk bottler in the mideastern US has contacted its dairy producers to inform them that it intends to purchase milk with SCC of less than 250,000 cells/ml. Such demands are plausible if the plant has ready access to milk from farms that can routinely deliver a reliable supply of high quality milk. If this level of quality becomes a marketing advantage, look for other handlers to quickly follow suit.

It should also be pointed out that effective January 1, 2011, Indiana's Board of Animal Health has reduced the SCC limit for Manufacturing Grade milk (for cultured products) from 1,000,000 to 750,000 cells/ml. Effectively, this closes an escape valve for dairy farms that may have lost their permit to sell Grade A milk, at least until limits for Grade A milk are potentially reduced. But, it reveals that it will become exceedingly difficult for producers to find a home for milk with SCC greater than 750,000 cells/ml.

Implications for Dairy Farms

Most farms will not have great difficulty in meeting the stricter 400,000 cells/ml limit. However, a large number of farms do not presently meet the 400,000 cells/ml limit during *all* months of the year. Data from Federal Milk Market Orders in 2009 showed the following: 1) more than 99% of the milk marketed in Federal orders and 98% of the farm bulk tank shipments met the current regulatory limit of 750,000 cells/ml, 2) of the 32,854 producers included, 90.5% shipped milk with bulk tank SCC **(BTSCC)** below 750,000 cells/ml during **all** of the months monitored, 3) 89% of the milk would have met a goal of less than 400,000 cells/ml, and 4) only 50% of the producers shipped milk with BTSCC less than 400,000 during **all** monitored months (National Mastitis Council, 2010).

Annually, USDA's Animal Improvement Programs Laboratory reports on the percentage of herd test-days by state from Dairy Herd Improvement records that would not meet the 750,000 or 400,000 cells/ml limit. Figure 1 has the range of percentages for which each state falls. For most western states, along with Michigan, Vermont, Delaware, and Rhode Island, fewer than 10% of all herd test days would have had average SCC of over 400,000 cells/ml. On the other hand, 5 southeastern states would have had more than 40% of herd test-days failing to meet that limit. For 2009, two southeastern states had more than 50% of herd test-days over 400,000 cells/ml. While it is tempting to blame heat and humidity for the difficulty in maintaining low SCC, the relatively better performance of Florida dairy farms proves that success is possible. David Sumrall, manager of Dairy Production Systems in High Springs, FL states well "As a guy who has managed cows and people in Idaho, Colorado, Texas, Mississippi, Georgia, Florida, and Maryland, I can tell you that milk quality has nothing to do with where you milk cows. It has everything to do with commitment. If quality is important to you, it is achievable anywhere, anytime."

Table 2 has the percentages of Dairy Herd Improvement test days over 750,00 or 400,000 cells/ml for the Tri-State Region from 2000 to 2010. While there are sizable differences across the 3 states, excellent progress has been made in the past 11 years to reduce the percentage of herd test-days over the respective limits. It is important to note that the Dairy Herd Imp-rovement test-day records are likely to be conservative in that they probably overestimate SCC for milk actually shipped. Some cows are tested whose milk is withheld from the bulk tank but included in the test-day averages. Furthermore, not all herds are on test, and the characteristics of herds either on test or not on test can vary from state to state.

Typically, milk marketing cooperatives base their SCC premiums on the average SCC of patron milk. As legal limits for SCC are reduced, customers such as bottlers and processors enforce higher standards for milk quality and patrons produce milk of higher quality (lower SCC); it is quite reasonable to expect that SCC limits at which premiums are paid could be ratcheted down, requiring lower SCC to achieve the same premium level. On the other hand, as some markets demand milk with SCC below 250,000 cells/ml, branded advertising may force other markets to follow suit, creating extra demand and value for high quality milk, such that premiums for milk with low SCC could potentially increase. Time will tell what impact new SCC milk market limits will have on producer milk checks.

Achieving Lower SCC

Unfortunately, there is not a new "magic bullet" to prevent or treat mastitis and thereby reduce SCC levels in herds. While the focus of this discussion will be on prevention of new cases of mastitis, it should be pointed out that treatment strategies continue to evolve. Public scrutiny of the use of antibiotics in food animals and increasing regulation by the US FDA make it increasingly difficult for pharmaceutical companies to develop and test new products. However, research data, though shying away from direct comparison of antibiotic products, can guide treatment strategies and decisions that will be more effective (Ruegg, 2010). Focusing treatment efforts on cows more likely to benefit (younger cows and cows without a history of previous infections), diagnosis of causative pathogens and their sensitivity to specific antibiotics, and administering antibiotics for appropriate durations can improve the outcomes of treatment for contagious mastitis (Barkema et al., 2006). Producers are encouraged to work closely with their herd veterinarians to develop appropriate culturing and treatment strategies, considering that extended treatment can be extra-label use and so requires a veterinary prescription. When used in extra-label fashion, great care must be taken to ensure against antibiotic residues in milk.

To achieve low SCC consistently, continued effort must be placed on prevention of mastitis infections. Targeting of mastitis control strategies to times of greatest risk of new infections allows the most progress in reducing SCC. It has been well documented that cows are at greatest risk of developing new infections in the 2 weeks after dry-off and during the week of calving (Dingwell et al., 2003; Ostergaard et al., 2005). But, cows are at continuous risk of developing infections anytime during the lactation. The relative risk of new mastitis infection is depicted in Figure 2.

It is not difficult to understand the increased risk of development of new mastitis infections at dry-off because it is a time of great change for dairy cows. Some factors affecting this risk may include level of milk production at dry off, cessation of the flushing action of daily milking to remove bacteria, rapidity of udder involution, teat end condition, and level of contamination of teat ends (Oliver and Sordillo, 1989; Williamson et al., 1995; Dingwell et al., 2003). A major risk factor in the establishment of new mastitis cases after dry-off may be that there is often a delay in the innate formation of a complete keratin plug in the streak canal (Williamson et al., 1995; Dingwell et al., 2003). Williamson et al. (1995) reported that 50 and 5% of teats had an incomplete keratin plug present after 7 and 50 days of the dry period, respectively. Dingwell et al. (2003) reported that 50 and 23% of teat ends remained open after 1 and 6 wk of the dry period, respectively. Quarters that remained open and quarters that had cracked teat-ends were both 1.7x more likely to develop new mastitis infections during the dry period compared to those that closed (Dingwell et al., 2003). Thus, exceptional care of all cows at dry off should include:

1. Milking out the udder completely,
2. Careful cleaning and sanitizing with alcohol of teats with focus on the teat-end,
3. Careful infusion of a long-acting dry cow antibiotic for every quarter of every cow at dry-off,
4. Careful infusion of an internal teat sealant into the teat cistern,
5. Dipping teats with an effective teat dip immediately after infusions, and
6. Provision of a clean and dry environment to house dry cows, especially in the 2 weeks after dry-off.

Dry cow facilities often do not get the same level of attention as milking cow facilities, but it will pay to be sure that lying surfaces, especially at the udder, are routinely cleaned, just like the milking cow stalls. Effective use of dry cow antibiotic therapy offers the opportunity to terminate residual infections by contagious organisms from the previous lactation and to provide protection against new infections during the early dry period.

The late dry period around calving is another time of significant risk of mastitis infection (Figure 2). Factors such as swelling of the udder; prevalence of environmental pathogens colonizing the udder, teats, and teat ends; and weakening of overall immune response (Kehrli et al., 1989) can allow mastitic infections to be established and flourish. Again focus of prevention strategies center around protecting teat ends from pathogenic bacteria. The following procedures should be routinely followed:

1. Provide clean, dry lying surface during the late dry period, in the calving pen, and in fresh cow housing,
2. Observe close-up dry cows and heifers frequently for signs of clinical mastitis before calving,
3. Remove calf before it has opportunity to the nurse cow,
4. Clean teats well, and sanitize and dry them before first milking and removal of colostrum,
5. Be sure that milking equipment used for colostrum removal is clean and functioning properly,
6. Position milking machine well to reduce liner slips, which may be difficult if udder edema is moderate or worse,
7. Use effective post milking teat dip,
8. Perform California Mastitis Test (or other test for SCC) on all cows around 3 days in milk to find any infected quarters,
9. Culture infected quarters, and
10. Aggressively treat clinical cases of mastitis in early lactation.

With downward pressures on SCC and increased regulation pending, target levels of no more than 10% new infections during the dry period and first 2 weeks after calving should be the goal.

Of course, renewed efforts to enhance milking procedures are also warranted because cows are at risk whenever they enter the parlor, perhaps 1,000 times or more during a single lactation. There are many sources for information on milking procedures and all agree that milking procedures must be identical for every milker and for every cow, every time she enters the milking parlor. This requires training of employees and evaluation of their performance, including correction if the procedure is not followed and reward if it is. Dairy Practices Council Guideline #98 "Milking Procedures for Dairy Cattle (Herremans et al., 2007) provides specific milking procedures for 13 combinations of milking systems and teat sanitizing choices. It also provides check lists that can be utilized to evaluate milkers. In all cases, the primary goal for milking routines should be to milk clean, dry, stimulated teats.

By now, everyone involved with producing high quality milk ought to know the key parts of the milking routine: 1) load cows into the parlor calmly, 2) remove excess organic matter, 3) sanitize teats, 4) forestrip, 5) wipe teats with single clean towel no sooner than 30 seconds after sanitizing, 6) attach properly functioning milking unit 60 to about 90 seconds after initial contact (sanitizing and forestripping), 7) adjust milking unit properly 8) immediately attend to liner slips, 9) detatch milking unit immediately after milkout, and 10) post-dip with an effective product. Some portions of the milking routine generate much discussion. For example, there are 2 lines of thinking about whether forestripping should come before or after pre-dipping. Forestripping after pre-dipping can reintroduce bacteria from the milker's hands to the teat surface. On the other hand, forestripping itself can provide a very good way to work the pre-dip onto the skin surface. Neither argument is wrong and some farms have found great success in compromise—applying pre-dip both before and after forestripping! Further details of the how's and why's of following a single milking routine can be found in Dairy Practices Guideline #98 (Herremans et al., 2007).

Since this is a nutrition conference, it should be noted that there are nutritional aspects of mastitis. While little is known about how to enhance the bovine immune system through nutrition or dietary supplements, it has been clearly shown that diets of dairy cows can influence the resistance of cows to intramammary infection (Smith and Hogan, 1993). Specific dietary ingredients known to be important include vitamins E, A, and b-carotene and the trace minerals selenium, copper, and zinc. Cows fed diets deficient in vitamin E or selenium are at greater risk of environmental streptococcal mastitis (Smith et al., 1984). The risk of low blood and tissue concentrations of vitamin E and selenium appears to be greatest around calving, a period of known high susceptibility to environmental streptococci.

Conclusions

Stricter requirements for milk at plants that produce manufactured products for export to the EU, proposed changes to the PMO, and demand for enhanced milk quality by individual bottlers will drive down the effective SCC limits. New limits will not be difficult for most farms during most months but may be challenging for some farms during some months. Milk handlers and cooperatives may adjust levels at which quality premiums are paid. Dairy farmers must face the challenge by utilizing known prevention, monitoring, management, treatment, and culling strategies with renewed emphasis. Focusing efforts at the early and late dry period when cows are most at risk will have the greatest impact on reducing new mastitis cases, and hence, decreasing SCC.

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Table 1. Present somatic cell count (SCC) limits in different markets.

Location	SCC limit (cells/ml)
United States	750,000
California	600,000
Canada	500,000 going to 400,000
European Union (27 countries)	400,000
Some US handlers	250,000
New Zealand	400,000 considering 300,000
Australia	400,000

Table 2. Percentage of Dairy Herd Improvement test-days with somatic cell counts greater than 750,000 or 400,000 cells/ml by state in the Tri-State region.

	Test-Days > 750,000			Test-Days > 400,000		
Year	IN	MI	OH	IN	MI	OH
2000	6.9	3.4	4.5	36.5	27.0	29.9
2001	5.0	2.9	4.7	33.3	23.4	32.2
2002	6.3	4.2	5.1	37.1	28.8	31.5
2003	9.3	6.0	6.3	39.5	29.7	31.2
2004	8.3	5.2	5.6	36.2	26.3	26.9
2005	8.7	5.2	5.7	36.7	25.8	27.5
2006	6.5	3.7	4.3	33.9	21.4	27.0
2007	4.6	2.3	3.6	28.6	16.5	26.7
2008	3.7	1.8	2.7	24.8	12.1	21.4
2009	3.3	1.0	1.6	21.8	10.3	14.9
2010	3.3	0.9	1.4	21.6	8.3	13.8

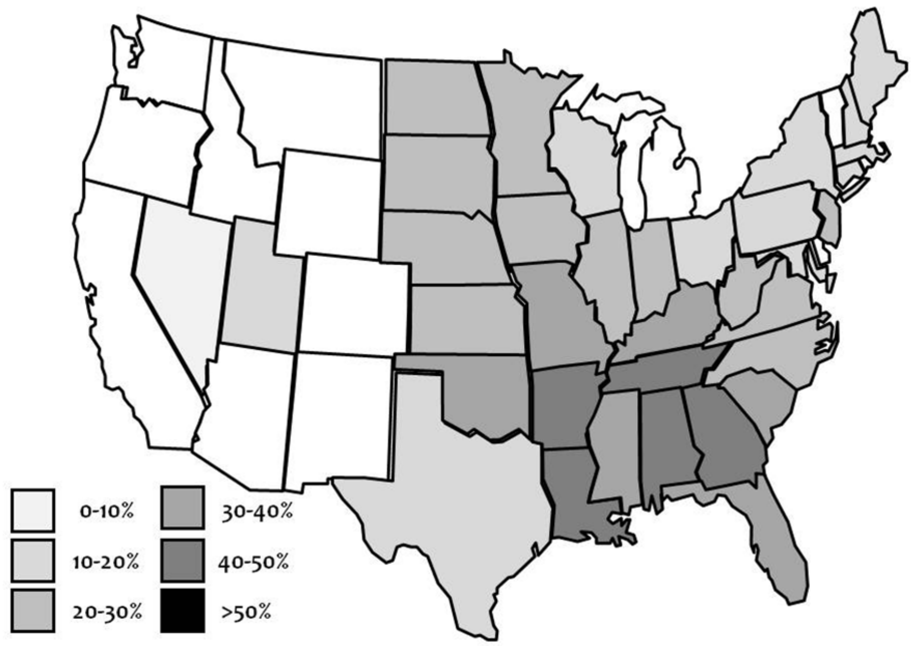

Figure1. Percentage of DHI herd test-days with somatic cell counts greater than 400,000 cells/ml during 2010 (Norman et al., 2011).

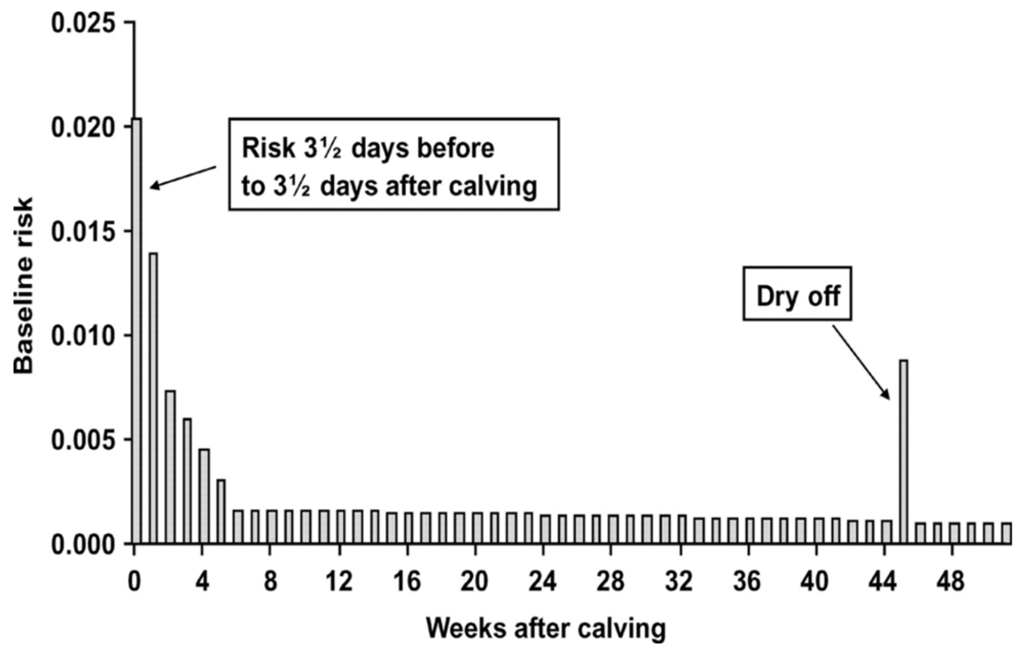

Figure 2. Relative risk of new mastitis infection by week after calving (Ostergaard et al., 2005).