

**NATIONAL MASTITIS COUNCIL, INC.
BOARD OF DIRECTORS REPORT**

HUMAN HEALTH RISKS ASSOCIATED WITH HIGH SOMATIC CELL COUNT MILK

SYMPOSIUM SUMMARY

Introduction

To openly question whether high somatic cell count (SCC) milk poses a direct human health concern is important to reassure the protection of consumers. Limits on the maximum SCC in bulk milk collected at the farm in the United States have been instituted as a national standard for milk sanitation in the Grade "A" Pasteurized Milk Ordinance. The National Mastitis Council (NMC) has sponsored proposals to the National Conference on Interstate Milk Shipments during four of the last five conferences to lower the legal limit of SCC in milk from the present value of 750,000 cells/ml. Discussions at the National Conference on Interstate Milk Shipments on the value of decreasing the legal limit of SCC in bulk milk led the NMC Board of Directors to organize a symposium at the NMC 44th Annual Meeting in Orlando, Florida on January 16, 2005. The purpose of the symposium was to report the current understanding of the possible connections between SCC in bovine milk and human health. Major points of the symposium are outlined in this document and represent the consensus opinion of the NMC Board of Directors.

Direct Effects of Neutrophils

The cells that compose milk somatic cells are primarily leukocytes and secretory cells. As the SCC increases, the percentage of cells that are neutrophils increases. In this strictest definition of the problem, any potential health risk of consuming milk with an elevated SCC would depend largely on the human health concerns of ingesting bovine neutrophils. The review of literature presented in this symposium did not reveal a known, direct health concern with consuming milk with an elevated SCC. Although the ingestion of large numbers of bovine neutrophils in milk may be objectionable, direct negative effects on the safety of humans have not been documented as a result of consuming dairy products made with milk having high SCC.

Transfer of Pathogens

The primary cause of a high SCC in milk is intramammary infections. Neutrophils migrate from blood into the mammary gland in response to an intramammary infection. The vast majority of bovine intramammary infections are caused by bacteria. Many of these bacteria are also the causative agents of human diseases (i.e. *Escherichia coli*, *Staphylococcus aureus*, *Streptococcus agalactiae*). Fortunately, pasteurization of milk kills the most common mastitis causing bacteria. Proper pasteurization of milk is very effective in preventing the transfer of viable pathogens from milk of infected mammary glands to humans. However, emerging technology has proposed an additional epizootic path of infectious agents from cow to man despite pasteurization of milk for public sale. Recent studies have indicated the transfer of bovine strains of *Streptococcus agalactiae* to human populations with devastating effects, apparently after the wide spread acceptance of pasteurization (2).

Evidence has been reported that *Mycobacterium avium* subsp. *paratuberculosis*, associated with Johnes in cattle and isolated from human patients with Crohn's disease, may survive some accepted milk pasteurization procedures. Although the possible association between shedding of the *Mycobacterium avium* subsp. *paratuberculosis* in milk and subsequent survival after pasteurization is compelling, the rate of shedding is low in infected cows and not related to an increase in SCC (5).

Pasteurization reduces the number of viable microorganisms, but often does not negate the effects of toxins produced by mastitis pathogens. The transfer of heat stable toxins produced by mastitis pathogens in milk is a potential concern. Specifically, enterotoxin produced by *Staphylococcus aureus* in milk of infected cows has been implicated in cases of food poisoning. As *Staphylococcus aureus* continues to be a major cause of mastitis in many parts of the world, the frequency of enterotoxin production among strains of this species causing mastitis is a potential concern (1, 3).

Secondary Relationships

The established ancillary relationships between SCC and human health concerns are possibly more problematic than the direct health concerns of consuming high SCC milk. Investigators have consistently reported a positive relationship between SCC of bulk milk and antibiotic residue violations (4). Consumption of milk products adulterated with antibiotic residues poses a potential catastrophic risk to humans hypersensitized to the antibiotic. However, milk is screened for the presence of violative levels of antimicrobial inhibitors. In addition, verified medical cases of humans having allergic reactions due to consumption of antibiotics in milk products are very rare. Transfer of antibiotic resistant bacteria to humans from milk is unlikely after milk is pasteurized and selection of resistant bacteria in humans after ingesting antibiotics in milk is only speculative.

The use of bulk milk SCC as an indicator of farm hygiene has been related to the potential for human health risk (1). A large and diverse group of human pathogens reside in the cow's environment including *Salmonella dublin*, *Campylobacter jejuni*, and *Listeria monocytogenes* (3). These microbes are often pathogens or normal flora of dairy cows. Evidence suggests that contamination of milk with most of these pathogens occurs during or after harvest of milk and is not due to intramammary infections. However, herds with high bulk milk SCC are more likely to have these pathogens infecting cows and are present in elevated populations in the farm environment (3). The tempting inference is that farms ineffective in implementing hygiene practices to reduce bulk milk SCC are also ineffective in other farm hygiene measures aimed to reduce exposure of milk to human pathogens via routes other than intramammary infections. The relative risk to humans is minimized by pasteurization that effectively destroys the majority of human pathogens that may reach the bulk milk as result of poor farm hygiene practices.

Unpasteurized Milk and Milk Products

The greatest risk of high SCC milk to human health is in the consumption of unpasteurized or improperly pasteurized milk (3). Viable pathogens and their toxins can be transferred from the milk of infected quarters directly to humans. A potentially greater concern for consumer safety arises from transfer of pathogens from the environment during and after harvest into milk that is consumed unpasteurized. Surveys indicate that dairy producers and their families drinking milk

produced on their own farms are among the demographic groups in the United States at greatest risk to foodborne diseases due to consumption of unpasteurized milk.

Conclusions

Most reports indicate that lowering limits of SCC will positively influence acceptability and suitability of milk as measured by improved safety, milk quality, and value added products. The relationship of high SCC milk with poor farm hygiene, antibiotics residues, and presence of pathogenic organisms and toxins offers insight into the potential increase in safety risk factors to consumers when high SCC milk is marketed. However, consuming milk with high SCC does not appear to pose direct, specific health risks to humans. In other words, scientific studies have not shown that the ingestion of large numbers of bovine leukocytes is harmful to humans.

Models currently do not exist to define the magnitude of decreased risk to consumers that would result from lowering the maximum limit of SCC in bulk milk. Nevertheless, safety, suitability and consumer acceptance each should play comparatively important roles as driving forces for lowering SCC. Safety, acceptability and suitability are not discrete properties of a product, but rather they overlap and intertwine when assessing risk to consumer health.

Reviews Cited

1. Heeschen, W.H. 2005. Somatic cells as indicator of milk hygiene, scientific basis and the EU approach. Proc. 44th NMC Annual Meeting. Orlando, FL, pp. 52-72.
2. Leigh, J.A. 2005. Are bovine *Streptococcus agalactiae* (GBS) a leading cause of neonatal death? Proc. 44th NMC Annual Meeting. Orlando, FL, pp. 41-51.
3. Oliver, S.P., B.M. Jayarao, and R.A. Almeida. 2005. Foodborne pathogens, mastitis, milk quality, and dairy food safety. Proc. 44th NMC Annual Meeting. Orlando, FL, pp. 3-27.
4. Ruegg, P.L. 2005. Relationship between bulk tank milk somatic cell count and antibiotic residues. Proc. 44th NMC Annual Meeting. Orlando, FL, pp. 28-35.
5. Stabel, J.R. 2005. Paratuberculosis and Crohn's disease. Proc. 44th NMC Annual Meeting. Orlando, FL, pp. 36-40.

The National Mastitis Council, Inc. (NMC), is a not-for-profit professional organization dedicated to reducing mastitis and enhancing milk quality. For additional information, contact the NMC, 421 S. Nine Mound Rd., Verona, WI 53593; phone: 608-848-4615; fax: 608-848-4671; website: www.nmconline.org.