

made from unpasteurized milk, to eliminate the foodborne pathogens. From 1948 to 1988, there were 6 confirmed foodborne disease outbreaks in the U.S. transmitted with domestically produced hard cheeses as the food vehicle. Various research reports have raised concerns about the public health protection provided by the current 60-day aging period in the manufacture of hard cheeses made with unpasteurized milk. The objective of this study was to investigate the adequacy of the 60-day minimum aging to eliminate the foodborne pathogens and evaluate milk thermalization as a process to improve the safety of hard cheeses made from unpasteurized milk. Hard cheese was made from unpasteurized milk inoculated with a five-strain cocktail of acid-tolerant *E. coli* O157:H7. Samples of unpasteurized milk, curd and whey were collected during the cheese manufacturing process. After pressing, the blocks of hard cheese were packaged into plastic bags, and sealed with a vacuum-packaging machine, and aged at 7 °C. After 1 week, the cheese blocks were cut into smaller uniform-sized pieces, and vacuum sealed in clear plastic pouches for ease of sampling at the various aging intervals. Samples were plated and enumerated for *E. coli* O157:H7. Populations of *E. coli* O157:H7 increased during the cheese making operations. Population of *E. coli* O157:H7 in cheese aged for 60 and 120 days at 7 °C, decreased less than 1 log and 2 logs, respectively. Experiments were conducted at 64.4 °C for 16 seconds on milk inoculated with *E. coli* O157:H7 at 10⁵ CFU/ml. Supply milk and thermalized milk were taken at 0, 45 and 90 minutes to determine the levels of *E. coli* O157:H7. Thermalization runs resulted in a 5-D *E. coli* O157:H7 reduction.

Key Words: Thermalization, *Escherichia coli* O157:H7, Raw Milk Cheese

188 An integrated approach to the safety of raw milk cheeses. P. S. Kindstedt*, *University of Vermont, Burlington.*

In the ongoing quest to reduce the risk of foodborne illness associated with cheese, the goal should be to achieve the appropriate level of

safety using approaches that are both effective and practical, and that avoid placing unnecessary burdens and restrictions on cheesemakers and cheese consumers. Among the possible approaches that could be implemented to enhance cheese safety, mandatory pasteurization of all milk for cheesemaking stands out as being exceptionally burdensome and restrictive to producers and consumers of raw milk cheeses. Expanding mandatory pasteurization to include all cheeses should not be pursued if the appropriate level of safety already exists under current regulations or can be achieved through other practical and effective but less burdensome and restrictive approaches. Recent research strongly suggests that some raw milk cheeses, such as the highly cooked hard Italian and Emmental-types, present very low microbiological risks when made and aged properly. A strong argument can be made that these raw milk cheeses achieve the appropriate level of safety as a consequence of the high heat treatment that they receive during manufacture, their chemical composition and their long ripening times. Therefore, the safety emphasis for these cheeses should be on insuring that cheesemakers are adequately trained in cheese technology, hygiene and safety and held to appropriately high standards, rather than on mandatory pasteurization. For other raw milk cheeses that pose greater microbiological risks and which are deemed to fall short of the appropriate level of safety under current regulations, at least two different approaches should be evaluated and compared for overall merit: 1.) mandatory pasteurization; 2.) a combination of other safety approaches such as mandatory technical and safety training for cheesemakers (e.g. via a cheesemakers certification or licensing requirement), mandatory implementation of an approved risk-reduction (e.g. HACCP-like) program, and mandatory finished product testing for pathogens. The latter approaches have been used for raw milk cheesemaking in some European countries with apparent success.

Key Words: Cheese, Safety, Pasteurization

Extension Education: Applied Reproductive Management Symposium: Beef and Dairy Cattle Topics

189 Using melengestrol acetate (MGA)-based protocols to synchronize estrus prior to fixed-time artificial insemination in postpartum beef cows. D. J. Patterson*, F. N. Kojima, and M. F. Smith, *University of Missouri, Columbia.*

Beef producers are often restricted in their operations from implementing production-enhancing technologies, including estrus synchronization and AI, due to a lack of time and labor. The inability to predict time of estrus for individual cows in a herd often makes AI impractical to use because of the labor required for detection of estrus. The development of methods to inseminate beef cows at a fixed time with high fertility should result in a dramatic increase in the adoption of AI in beef herds. Although hormonal treatment of cows to group estrous periods has been a commercial reality for over 30 yr, producers have been slow to adopt this management practice. Perhaps this is because of past failures, which resulted when females that were placed on estrus synchronization treatments failed to resume normal estrous cycles following calving, and the reality that early estrus synchronization protocols failed to synchronize follicular waves, resulting in more days in

the synchronized period. These factors collectively precluded the application of fixed-time AI with acceptable pregnancy rates. We proposed the general hypothesis that progestin treatment prior to the GnRH-PG estrus synchronization protocol would successfully: 1) induce ovulation in anestrus postpartum beef cows; 2) reduce the incidence of a short luteal phase among anestrus cows induced to ovulate; 3) increase estrous response, synchronized conception and pregnancy rates; and 4) increase the likelihood of successful fixed-time AI. This review considers recently developed methods to control estrous cycles of postpartum beef cows with MGA. New methods of synchronizing estrus in beef cows with the MGA Select or 7-11 Synch protocols prior to fixed-time AI present the opportunity to enhance results from AI and eliminate the need to detect estrus entirely. These new protocols provide an opportunity for the beef cattle industry to expand the application of this important reproductive technology by making the implementation of an AI program feasible.

Key Words: Beef Cow, Estrus Synchronization, Progestin

PSA Air Emissions & Poultry Production

190 Air emissions in poultry production: Current challenges and future directions. R. Angel*¹, W. Powers², and T. J. Applegate³, ¹*University of Maryland, College Park*, ²*Iowa State University, Ames*, ³*Purdue University, West Lafayette, IN.*

In the last few years, regulatory focus has been on nutrient management from animal feeding operations (AFOs) with recent emphasis on air emissions. Concerns are with air-borne emissions of nitrogenous compounds as well as with small particulate matter (PM 2.5). Of specific interest to the Environmental Protection Agency and specific states include ammonia, hydrogen sulfide, nitrogen oxides, sulfur oxides, nitrous oxide, and volatile organic compounds but the main challenges are establishing current emission levels and determining best methodologies for measuring these accurately. Currently methodologies to measure air emissions under field and research conditions exist and are being further developed but extensive challenges exist as to both accuracy and

precision of the different analytical methods. Current best estimates are based on a mass balance modeling approach (Air Emissions From Animal Feeding Operations, NRC 2003) but due to lack of current biologically generated data to use in the models, nutrient excretion and emission levels appear to be overestimated by these models. Extensive work is being done on dietary strategies to reduce nitrogenous excretions from poultry but the impact of these on air emissions is not always defined. Litter management strategies that reduce volatilization of nitrogenous and other compounds have shown promise and are being further developed. Flock, house, and whole farm management strategies are also being successfully implemented and further developed. The magnitude of the potential impact on air emissions of each of these strategies is still in question. There is no question, though, as to the need for the use of whole farm systems that implement different strategies at all