largely invisible labor force transits from farm to farm unrestricted by biosecurity protocol.

Key Words: Latino, Immigration, Assimilation

183 Extension's role in conflict resolution and consumer education. M. M. Schutz* and J. S. Ayres, *Purdue University, West Lafayette, IN.*

The role of extension dairy, poultry, and livestock educators is evolving rapidly; and to be relevant, we must continue to provide science-based information to an ever-broadening clientele. Campus-based specialists have remained insulated from this shifting paradigm longer than field-based staff that often facilitate disputes involving agriculture. Examples of conflicts involving animal agriculture include disagreements over manure or odor regulations, animal welfare, animal cloning, and food safety (for example sales of raw milk). The situational framework of Heifetz and Sinder describes three situations that illustrate the shifting paradigm faced by extension specialists. In the first situation, both a problem and a solution are clear, which characterizes the traditional role of extension specialists as experts in a particular field. The second situation, where a problem is clear but a solution is not; is familiar ground for those of us trained as scientists. But the third situation, where both the problem and solution are unclear, will become more common as we tackle the larger societal issues facing animal agriculture. In 1988, Carpenter and Kennedy put forth the concept of a spiral of unmanaged conflict. Initially, the problem arises, sides form, and positions harden. But as the conflict spirals out of control, communication stops, resources are committed, conflict spills outside the community, perceptions become distorted, and a sense of crisis emerges. As livestock, dairy, or poultry extension specialists, our best opportunity is to be involved and to provide science-based solutions or alternatives before the conflict begins to spiral out of control. Once communication stops, even science-based information may be misinterpreted as advocacy. Unfortunately, in most cases we are not properly trained and do not feel comfortable in dispute resolution; and our reward systems within our universities do not properly recognize efforts in public issues education, conflict resolution, or consumer education.

Key Words: Extension, Conflict Resolution, Consumer Education

Dairy Foods: Perspectives on Raw Milk Cheeses

184 Survival of *Escherichia coli* in Cheddar and Colby cheese. D. R. Henning*, *South Dakota State University, Brookings.*

Trials evaluating survival of *Escherichia coli* in Cheddar cheese provided data indicating this organism will survive 60 days of curing if present in sufficient numbers and cheese composition is favorable for the organisms survival. Cheddar cheese manufacturing and curing were used for two treatments utilizing a cocktail of three strains of *E. coli* O157:H7. The target for treatment one was 10^3 colony forming units per mL (cfu/mL) in pasteurized cheese milk; treatment two was 1 cfu/mL of cheese milk. Cheeses were analyzed at 0, 14, 28, 42, 60, and 74 d, and at 28 d intervals thereafter until *E. coli* O157:H7 could no longer be detected in two successive sampling periods. When no cfu/g were detected by plating, 25 g of cheese were enriched to detect viable *E. coli* O157:H7. Treatment one resulted a two log reduction in cfu/g after 60 days of curing with viable *E. coli* O157:H7 being detected in 25 g of cheese after 150 days. Treatment two resulted in reduction of *E. coli* O157:H7 numbers to 1 or <1 cfu/g in 60 days with none detected in 25 g of cheese at 150 days. Both treatments permitted the survival of *E. coli* O157:H7 for more than 60 days of curing. The second study mathematically described the decline of viable biotype 1 *E. coli* during the curing of cheese. Pasteurized milk was inoculated with 10^2 to 10^3 cfu/ml for making Cheddar and Colby cheeses. Multiple regression was employed to determine the effects of low to high levels of composition and curing temperatures in typical cheese [moisture (34 to 40%), pH (5.0 to 5.6), curing temperature (4 to 13C), and salt level (0.8 to 1.7%)] on survival of *E. coli* during cheese curing. A total of 56 survivor curves representing combinations of the parameters were generated during four-months of curing. The model for surviving biotype 1 *E. coli* can be described as: Log(Days4D) = -74.64881 + 28.5745*P 0.00098*M*T 2.64579*P*P, where Days4D = time, in days, needed to reach 99.99% inactivation, P = pH, M = moisture, and T = temperature. R2 = 0.532.

Key Words: Cheese Curing, *Escherichia coli* Survival, Survival Model

185 Use of heat-treated cheesemilk to make high quality Cheddar cheese. B. Luth*, *Tillamook County Creamery Assn., Tillamook, OR.*

The primary argument in favor of creating cheese from heat-treated milk is to retain the quality and flavor characteristics of the cheese as it ages. This process is used because natural enzymes in the milk, essential for producing quality cheddar cheese, suffer during full pasteurization. One of the distinguishing attributes of Tillamook Cheddar Cheese is the consistent ability to age cheddar cheese for two years or more without the development of bitter or atypical flavors. Studies have been conducted using commercial vats of cheesemilk that have been pasteurized compared to commercial vats of cheesemilk heat-treated at 150° F. These were sampled over time for blind analysis by trained panels. Results show that pasteurized cheese only five months old was determined to be significantly different in flavor and texture when compared to heat-treated control samples made at the same time. The panels noted flavor attributes of bitter, bland and flat and the texture deficiency of pasty body for the pasteurized product. The process of pasteurization of milk at 161° F for 15 seconds was designed and implemented for the control of pathogenic and spoilage microorganisms. Studies have demonstrated, however, that many organisms are inactivated by heat treatments of 148° F or above for 16.2 seconds and that heat-treatment of cheesemilk is but one of the technologies and practices which contribute to the manufacture of safe cheese. It is recommended that the heat-treatment process be recognized for cheesemaking based on the following parameters: 1. Raw Milk intended for heat-treatment meets the following requirements on a daily average: SPC < 15,000 cfu/ml; SCC < 250,000 cells/ml , indicating that the milk was from healthy animals. 2. Raw milk is heated to 148° F or greater and held for a minimum of 16 seconds. 3. Finished cheese produced under these conditions will be cured at a temperature of greater than 35° F for a period of at least 60 days.

Key Words: Cheese, Heat-Treatment, 60 Day Hold

186 Approaches to ensuring the safety of raw milk cheeses. C. Donnelly*, *The University of Vermont, Burlington.*

Although cheeses have been linked with documented outbreaks of foodborne illness, epidemiological evidence collected from around the world confirms that this occurs infrequently. Cheeses can become contaminated with bacterial pathogens as a result of their presence in raw milk used for cheesemaking and subsequent survival during the cheesemaking process. Alternatively, bacterial pathogens can contaminate cheese via post-processing contamination if sanitation and other measures in the processing plant are not sufficient to prevent re-contamination. The characteristics of the specific cheese variety will dictate potential for growth and survival of microbial pathogens, with ripended soft cheeses presenting a higher risk for growth and survival of pathogens in comparison with aged hard cheeses where a combination of factors including pH, salt content and water activity interact to render cheeses microbiologically safe. This presentation will compare and contrast approaches used worldwide to insure the safety of raw milk cheeses. The 1996 European Union Statutory Instruments contain regulations for hygienic production and marketing of milk and milk based products. EU regulations establish limits for pathogens in raw milk cheese, where presence of *S. aureus* and *E. coli* would indicate poor hygiene. The relative merits of such approaches in the context of assuring cheese safety will be reviewed.

Key Words: Cheese, Safety, Pasteurization

187 Survival of a five strain cocktail of *Escherichia coli* O157:H7 during thermalization and the 60 day aging period of hard cheese made from unpasteurized milk. J. Schlesser*, *Food and Drug Administration, NCFST, Summit-Argo, IL.*

Cheeses have been cited as vehicles for outbreaks of foodborne illness. The standard of identity for hard cheeses requires pasteurization of the milk or as an alternative treatment, a minimum 60-day aging for cheeses 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 10^5 CFU/ml. Supply milk and thermalized milk were taken at 0, 45 and 90 minutes to determine the levels of *E. coli* O157H7. 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 anestrous postpartum beef cows; 2) reduce the incidence of a short luteal phase among anestrous 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. Powers[2], and T. J. Applegate[3], [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 exists 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