Food Safety: The Future of Food Safety: An Issue of National Importance

577 Foodborne illness and antibiotic resistance: Types, sources and extent of problem. M. P. Doyle*, *University of Georgia*, *Griffin*.

The leading bacterial causes of foodborne illness and several other significant foodborne pathogens are largely associated with livestock and/or poultry as primary asymptomic carriers. Included are *Campylobacter, Salmonella* and enterohemorrhagic *E. coli* O157:H7. Recent reports by the Centers for Disease Control and Prevention of risk factors of sporadic infections in the United States attribute chicken and nonpoultry meat prepared at restaurants to 45% of *Campylobacter* infections, chicken prepared outside the home to 27% of *Salmonella* Enteritidis infections, and eating pink hamburger, visiting a farm with cows and living on or visiting a farm to 31% of *E. coli* O157:H7 infections. Manure from livestock and poultry is a primary vehicle for transmitting these pathogens, with cell numbers of 10^2 to 10^8 cfu/g frequently present in feces. Trends in antibiotic sensitivity and resistance of foodborne pathogens as determined by the National Antibiotic Resistance Monitoring System for Enteric Bacteria indicate for *Salmonella* between 1996 and 2001 an increase in pansusceptible isolates from 63% to 72%; however, the percentage of isolates resistant to eight or more antibiotics has increased from 0.3% in 1996 to 4% in 2002, largely due to the spread of multi-drug resistant *Salmonella* Newport. For *E. coli* O157:H7, 79% of isolates were pansusceptible in 1996 compared to 91% in 2001. For *Campylobacter*, 48% of isolates were pansusceptible in 1997 compared to 50% in 2001; however, resistance to ciprofloxacin has increased from 9.4% in 1998 to 14.7% in 2003, although methods for testing changed and may have affected the results.

Key Words: Foodborne Ppathogens, Antimicrobial Resistance, Salmonella

578 Ethical issues surrounding food-borne illness: Who is responsible? B. Rollin*, *Colorado State University*, *Fort Collins*.

Food-borne bacterial illnesses affect more than an estimated 76 million Americans each year. Many of these illnesses can be traced directly or indirectly to animal sources. Yet because of the nature of modern animal production practices the direct responsibility for safeguarding the public from food-borne illness remains nebulous. Are farmers, dairymen, transporters, feedlot operators, packers, or processors responsible for food-borne illnesses? Or is the consumer ultimately responsible for their own safety through proper in-home handling preparation and thorough cooking? With the consolidation of meat distribution, what responsibility do the retailers bear? What about chain and local restaurants? In this session, we will discuss who bears the ethical responsibility and what the role of each participant in the production chain should be. We will also discuss how these different segments need to work together to improve the safety of our food supply.

Key Words: Food Safety, Bioethics

579 Pathogen control in the field. What can we do to reduce pathogens entering the abattoir? T. Edrington*, T. Callaway, K. Genovese, R. Anderson, and D. Nisbet, *USDA-ARS-SPA, Food and Feed Safety Research Unit*, *College Station, TX*.

While the meat processing industry has made significant improvements in the handling and processing of animals at slaughter and continues to produce one of the safest meat supplies in the world, the system is not 100% effective at eliminating contamination by pathogenic bacteria. Large scale meat recalls continue to exact a heavy economic toll on the industry. It has been said that "strategies that reduce specific foodborne pathogens entering the abattoir could produce the most significant reductions in human exposures to the organism and therefore in related illnesses and deaths." A substantial amount of research has been conducted and continues to focus on eliminating pathogenic bacteria in the animal before it is presented for slaughter. Diet manipulation, vaccines, competitive exclusion, various feed additives, and antibiotics have all been employed with varying levels of success. Research with chlorate and other similar compounds have yielded promising results. Recent research involving modulation of the innate immune system as a means of controlling pathogen populations is providing interesting data. New bacteriophage research has likewise yielded important information regarding *E. coli* O157:H7. Additionally, a new hypothesis regarding the seasonality of *E. coli* O157:H7 has generated research with intriguing results and will be discussed in addition to the above research areas.

Key Words: Foodborne Pathogens, Preharvest Food Safety, *E. coli* O157:H7

580 Pathogen control during processing: What we can do to reduce pathogens in the processing plant. J. Sofos*, *Colorado State University*, *Fort Collins*.

In efforts to meet regulatory criteria and commercial specifications by reducing the incidence of pathogens such as *Escherichia coli* O157:H7, the meat industry employs decontamination processes such as animal washing, spot-cleaning of carcasses by knife-trimming or steam-vacuuming, and spraying, rinsing, or deluging of carcasses pre-evisceration, and before and possibly after chilling, with chemical solutions (e.g., organic acids, acidified sodium chlorite, trisodium phosphate, etc.), hot water or steam; most processors employ more than one of these interventions in sequence. While *E. coli* O157:H7 is the pathogen of major concern in fresh meat, *Listeria monocytogenes* has become a major food safety issue in ready-to-eat meat and poultry products. This happened following some major listeriosis outbreaks, which caused hundreds of illnesses and many deaths, as well due to frequent and highly publicized recalls of potentially contaminated products. These developments have alerted the industry, regulators, public health authorities and researchers to develop and establish effective controls for the pathogen. Results of studies have shown that heat, steam, high pressure, or inclusion of antimicrobials (acetates, diacetates, lactates, benzoates, sorbates, glucono-delta-lactone, nisin and their combinations at reduced concentrations) in the formulation or their application as dipping solutions after product slicing and before packaging are effective *L. monocytogenes* controls in ready-to-eat meat products contaminated after cooking. These approaches may be useful to the industry in its efforts to select and employ alternative post-lethality controls as required by regulation. The overall microbiological status of products reaching consumers, either as raw meat or ready-to-eat items, depends on the extent of exposure to contamination and its control during all steps of the food production, processing, distribution, storage, retailing and preparation for consumption chain. Proper application of the processes described above will yield products that should be safe for consumption following proper cooking and serving.

Key Words: Meat, Safety, Pathogens

581 The economics of pathogen control in the meat industry: Who is going to foot the bill? R. Huffman*, *American Meat Institute Foundation*, *Washington, DC*.

The United States has one of the safest food supplies in the world. During recent decades, the safety of meat products has improved dramatically. Yet each year the 5 most common food-borne pathogenic bacteria cost the United States economy more than $6.9 billion according to the USDA Ã¢â‚¬â•œ Economic Research Service. Over the past 20 years, the beef industry has invested more than $2.5 billion in control strategies against *E. coli* O157:H7 alone. The implementation of mandatory Hazard Analysis Critical Control Point also came at a significant cost to the meat industry. These major investments in meat safety initiatives underscore the fact that the meat industry takes the issue of public health and safety very seriously. However because of the segmentation of the meat industry, it has been difficult to truly assess costs of pathogen control. To

date, in-plant strategies are the primary means used to achieve pathogen reduction in the supply chain, and these costs are borne almost entirely by the packing sector. As on-farm strategies for pathogen control are explored questions about cost have arisen. Who is going to pay for on farm, in feedlot, in transit, in lairage, or further intervention strategies? These are difficult questions to answer, but will be discussed in this session.

Key Words: Food Safety, Economics

Goat Species: Educational Resources and Field Experiences to Enhance and Promote Goat Production and Management

582 Fitness indicators among Boer, Kiko, and Spanish does managed on pasture in central Tennessee. R. Browning, Jr.*, T. Payton, B. Donnelly, P. Pandya, M. L. Leite-Browning, W. Hendrixson, S. Kebe, and M. Byars, *IAgER-Tennessee State University*, *Nashville*.

Boer (BR; n = 42), Kiko (KK; n = 38), and Spanish (SP; n = 47) straightbred does representing a broad base of within-breed genetic lines were managed together on pasture from September 2003 to August 2004. Three-quarters of each breed were mated in October and the remainder bred in December. Herd health records were analyzed by GLM or χ^2 for the 2003-2004 production year to begin assessing animal fitness under the prevailing production environment. Does were treated for hoof scald and hoof rot upon observed lameness. The herd was not vaccinated for hoof rot. Breeds differed ($P < 0.01$) for lameness cases treated during the year. Boer required more ($P < 0.01$) treatments for lameness (1.77 ± 0.22 cases/doe) than SP (0.60 ± 0.22 cases/doe) or KK (0.47 ± 0.24 cases/doe). A higher ($P < 0.01$) frequency of BR (52.3%) required multiple hoof treatments per year compared with SP (19.2%) or KK (10.5%). Does were dewormed as a group in January (ivermectin) and individually at parturition (moxidectin). Does kidding in March were also dewormed as a group in June (moxidectin). Individual does presenting clinical symptoms of internal parasitism during the year received additional moxidectin treatments. Breeds differed ($P < 0.01$) for extra anthelmintic treatment. Additional dewormings were more numerous for BR (0.53 ± 0.09 cases/doe) than for SP (0.11 ± 0.09 cases/doe) or KK (0.07 ± 0.10 cases/doe). A higher ($P < 0.01$) frequency of BR (40.5%) received extra dewormings during the year compared to SP (6.4%) or KK (2.6%). Fecal egg counts (FEC) were determined on a random subset of does (19 BR, 15 KK, 18 SP) across kidding groups as kids approached 3 mo of age (June and August). Breed affected ($P = 0.04$) log transformed FEC with values higher ($P < 0.04$) for BR than for SP. Geometric mean FEC for BR, KK and SP were 606 ± 19, 307 ± 12, and 237 ± 9 eggs/g, respectively. Lower frequencies ($P < 0.01$) of BR does weaned kids at 3 mo (76%) and survived though the production year (79%) compared with SP (96%, 98%) and KK does (100%, 100%). Preliminary results suggest a difference among meat goat breeds for fitness under southeastern US conditions.

Key Words: Meat Goats, Breeds, Fitness

583 Goat sales and price patterns in West Virginia. D Singh-Knights*[1], D Smith[1], and M Knights[2], [1]*West Virginia University*, *Morgantown*, [2]*The University of the West Indies*, *St. Augustine, Trinidad*.

Sales of goat meat (chevon) in the Northeast US have increased continuously since the early 1980s. The production of goats is therefore a potentially profitable option for full-time and part-time farmers in the Northeast region. However, inadequate year round supply, low and fluctuating prices, as well as inconsistencies in meeting specific consumer preferences are thought to be limiting growth of the industry. The present study was aimed at determining factors affecting regional variations in prices and number of goats sold. Analysis of variance using the Generalized Linear Model (GLM) procedure of SAS (SAS Inst., 1985, NC) was conducted on goat sales transactions for 1999-2003 from auction markets in West Virginia and neighboring markets in Virginia and Pennsylvania. Sales transactions were analyzed to determine the effects of year, month, location, market class (selling weight and body condition) and their interactions on price and number of goats sold. The number of goats sold during 1999-2003 varied with class of goat, month, year and class within months and years (Month, Class, Month X Class, Year, Year X Class, $P < 0.01$). There was a significant interaction between class of goat and month on prices received (Month X Class, $P < 0.01$) probably reflective of shifting consumer preferences throughout the year associated with specific ethnic holidays. Significant increases in sale of goats occurred over the period 1999-2003 driven by increasing prices and possibly increasing demand. It is suggested that the monthly variations in both prices and number of animals sold is probably reflective of both seasonal nature of reproduction and seasonal demands associated with ethnic holidays. The results of this study can be used by individual producers or extension educators to evaluate production and marketing options in an effort to enhance revenue generation by goat producers in West Virginia (WV) and surrounding areas.

Key Words: Goat, Prices, West Virginia

584 Formation of the Missouri Boer Goat Association. E. Walker*[1], S. Hamilton[2], and B. Watts[3], [1]*Southwest Missouri State University*, *Springfield*, [2]*University of Missouri*, *Columbia*, [3]*Missouri Boer Goat Assocation*, *Springfield*.

Over the past 20 years, the ethnic population living in Missouri has increased, which could be indicative of a growing potential market for goat meat. Missouri has a high potential for multiple-use land since pastures consist of a variety of grasses, forages, and browse. Missouri is centrally located in the United States and could provide goat carcasses to Midwestern cities possessing a growing cultural base of potential goat consumers. Missouri, with its diverse land, a growing interest in goat production by producers, and close proximity to several large cities, could prove to be a major goat producing state. Missouri goat producers face challenges that goat producers face nationally including: negative perceptions of other livestock producers, lack of farm supply stores which sell goat-related products, lack of information on goats, and lack of marketing strategies. For these reasons, Boer goat producers in Southwest Missouri came together to form The Missouri Boer Goat Association. While other goat associations do exist within the State, none exist specifically to promote the Boer Breed. The overall goal of the association is help producers with goat production challenges and educate people as to the potential benefits of raising either purebred Boers or raising goats which are Boer influenced. Over 70 people from all over the State attended the first open association meeting. Meetings will occur quarterly and meeting topics will relate to the current or projected needs of the industry. Our next meeting will coincide with a goat show and sale. Congruently, the association will also host a showmanship and selection workshop for 4-H and FFA members. We have also developed a PowerPoint presentation which is available to our members so that they may promote the Boer breed. A website will be hosted by the Missouri Boer Goat Association. The unofficial slogan of the Missouri Boer Goat Association is “Boer: the beef goat of the future”, as that is the image we wish to convey.

Key Words: Missouri, Boer, Goat

585 Using the internet to extend the reach of small ruminant extension programs in Maryland. S. Schoenian* and C. Fritz, *University of Maryland Cooperative Extension*, *Keedysville*.

According to the UCLA Internet Project, 71 percent of Americans used the Internet in 2002. Seventy percent ranked the Internet as their most important