

minimizing nutrient excretion by horses is the use of commercially manufactured feeds that complement specific forages. For example, when alfalfa hay is used, the amounts of protein and calcium included in the concentrate can be significantly reduced. However, horse owners often have difficulty distinguishing among forages, making the successful application of this approach difficult. The approach with the most potential to reduce nutrient excretion by horses would be enhanced education of horse owners to improve their understanding of how to effectively match feed characteristics with the nutrient requirements of horses.

Key Words: Equine, Waste Management, Nutrient

703 Development of on-farm treatment of animal waste. J. B. Carey*, *Texas A&M University, College Station.*

Development of new and alternative on-farm systems to manage waste must address several obstacles or issues in order to have significant potential for adoption by producers. A primary obstacle is time. The new or alternative method must involve a reduction in the amount of time needed for waste management or at least no increase in time required to address waste management duties. Another issue to address is cost. Obviously, any method that actually reduces costs would be considered favorably. However, it is essential that all costs be considered including any potential costs of marketing final products. Additionally, new or alternative methods must prove effective and reliable under field conditions. If extensive training, monitoring, or non-traditional skills are needed for success then the applicability to commercial settings will diminish. Reliability also includes the assurance of consistent performance and accomplishment of the waste management tasks under all field conditions utilizing the skill sets available among producers and farm workers. It is also important that the new or alternative method produce an advantage or benefit, economic or otherwise to the producer. This can range from reduced pressure on existing methods to financial returns. If producers are expected to adopt new technology or change practices, they must perceive a benefit. While this list of issues and obstacles is not exhaustive, it provides a basis for consideration of new and

alternative waste management technologies. Methods such as on-farm composting and marketing of manure or litter require full consideration of these issues. Mortality management alternatives such as acid or alkaline preservation, in-vessel composting and similar technologies require broad cooperation among a wide range of scientific and professional disciplines in order to adopt a research concept to a workable on-farm solution to waste management issues.

704 Alternative uses and value added processing of animal waste products. C. M. Williams*, *North Carolina State University, Raleigh.*

Traditional animal waste treatment generally involves on-farm land application of manure as a source of plant nutrients. Although cost effective, such practices may not be sustainable in some regions that produce large quantities of meat, eggs and milk. Technologies that provide economically feasible alternative strategies for processing large quantities of manure and generating marketable value-added products are needed. Some processes identified as potentially effective include centralized processing of manure to generate bio-based energy (methane), diesel fuel, and ash for a granular fertilizer product. Examples of work in progress to accomplish these objectives include high solids anaerobic digestion (HSAD), bio-methanol production, and fluidized bed combustion. The HSAD produced approximately 12 decatherms of methane per ton of feedstock and post-processed material met Class A biosolids requirements for fecal coliform bacteria. The bio-methanol plant capacity is approximately 7,500 gallons of methanol daily from a manure feedstock from 12 farms containing 12,000 finishing pigs each. The methanol is railed to a refinery for biodiesel fuel blending. A combustion study processing approximately 90 tons of combined swine biosolids and turkey litter showed that the fluidized bed technology at combustion temperatures above 1,600° F resulted in efficient combustion and low emissions of carbon monoxide, and minimal emissions of criteria pollutants. Collectively, these technologies demonstrate potential new and off-farm alternatives for processing animal waste products.

Food Safety: Alternatives to Antibiotic Use

705 Control of *Salmonella* in poultry production, the European experience - can it be adapted to the US? J. S. Bailey*¹ and T. Roberts², ¹*Agricultural Research Service, USDA, Athens, GA*, ²*Economic Research Service, USDA, Washington, DC.*

Sweden and Denmark have instituted programs which have significantly controlled *Salmonella* in broiler chicken production. Sweden's program was initiated about 15 years ago and Denmark's program was started about 10 years ago. In both programs, extensive testing programs are in place, no *Salmonella* positive feed is allowed, and all breeder birds that test positive for *Salmonella* are eradicated. In Sweden the program is continued for final grow-out and no *Salmonella* positive birds are allowed to be sold to the consumer and any *Salmonella* positive flocks are killed and disposed of. In Denmark, *Salmonella* positive grow-out broilers are processed separately, but can be sold to the consumer. Initially the costs of implementing the programs in both Sweden and Denmark were paid for by the government. Sweden has moved to a program that is self insured through industry check-offs. Denmark is attempting to implement a similar insurance program. Final economic analysis for a similar program in the U.S. is ongoing, but it will likely not be economically feasible to implement this same program in the U.S. However, alternative methods of achieving similar results may be possible. The use of live and killed cell vaccines in breeders, competitive exclusion treatments in breeders and broilers, and extensive biosecurity in breeder and broiler operations should yield similar results without the extensive costs of eradication programs. Intuition would suggest and the European experience has confirmed that the best way to control pathogens like *Salmonella* in food systems is to control the pathogens on the farm and to prevent them from ever entering the processing plant.

Key Words: Broiler, *Salmonella*, Control

706 Use of competitive exclusion to control enterotoxigenic strains of *E. coli*. R. B. Harvey*, R. C. Anderson, K. J. Genovese, T. R. Callaway, and D. J. Nisbet, *Food and Feed Safety Research Unit, ARS-USDA, College Station, TX.*

Foodborne diseases, morbidity, and mortality in food-producing animals, associated with pathogenic strains of *Escherichia coli*, are of public health and economic significance. Increasingly, *E. coli* have become resistant to most antibiotics and alternative control measures are sought. Our laboratory developed a defined culture of commensal bacteria of porcine GI tract origin, maintained it in continuous-flow culture, and designated it as RPCF. When administered to neonatal gnotobiotic pigs, immunoglobulin levels were increased 20- to 100-fold. *In vitro* laboratory studies have shown that RPCF prevented colonization of O157:H7 and F-18 strains of *E. coli*. Other laboratory studies demonstrated that RPCF-treated pigs had decreased mortality and bacterial shedding compared to controls when challenged with enterotoxigenic strains of *E. coli*. In field trials involving five geographically separated nursery farms with a history of high mortality from F-18 strain of *E. coli*, piglets were orally administered 10⁸ CFU of RPCF within 24 h of birth, were monitored throughout the nursery period, and the performance of RPCF-treated pigs were compared to a similar number of untreated pigs on the same farms. A total of 34,676 pigs were included in these trials. We observed decreased medication costs and a 3.53% decrease in nursery barn mortality in RPCF-treated pigs compared to controls. There was an annual cost benefit of \$22,196 per farm due to improved livability and reduced medication. Results from the present studies indicate that under laboratory and field conditions, RPCF was effective in controlling disease induced by enterotoxigenic *E. coli* and may be a viable alternative to the use of antibiotics.

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Key Words: Pathogenic *E. Coli*, Alternative to Antibiotics, Mortality

707 Strategies to reduce *Campylobacter*. Norman J. Stern^{*1}, E. A. Svetoch², B. V. Eruslanov², Y. N. Kovalev², L. I. Volodina², V. V. Perelygin², E. V. Mitsevich², I. P. Mitsevich², V. D. Pokhilenko², V. N. Borzenkov², V. P. Levchuk², O. E. Svetoch², and T. Y. Kudriavtseva², ¹USDA-ARS-Russell Research Center, Athens, GA, ²State Research Center for Applied Microbiology, Obolensk, Russia.

We evaluated anti-*Campylobacter* activity among 11,790 isolates of lactic acid bacteria from poultry production environments. We measured zones of *C. jejuni* inhibition surrounding the candidate strains and observed 279 isolates exhibiting antagonism. A *Lactobacillus salivarius* strain PVD32, was identified and deposited under provisions of the Budapest Treaty (NRRL B-30514). The cell-free, ammonium sulfate precipitate from the culture was termed the crude antimicrobial preparation (CAP). A zone of *C. jejuni* growth inhibition surrounding 10 ul of the CAP was observed. *C. jejuni* growth resumed when the CAP was pre-incubated with protease enzymes, thus demonstrating the peptide characteristic consistent with bacteriocin definition. The bacteriocin was further purified using a combination of ammonium sulfate precipitation, CM-Sepharose, Superose, and ion exchange chromatography. SDS-PAGE electrophoresis provided an estimated molecular weight of 6 KDa. MALDI-TOF analysis refined the molecular weight as 5,123 Da. The isoelectric point of the active fraction was determined at a pH of 9.0. The amino acid sequence of the bacteriocin was determined. The bacteriocin activity was stable following exposure to 90°C for 15 minutes. The moiety was purified and encapsulated in polyvinylpyrrolidone (PVP), and added to feed at levels of 250 mg/Kg feed. Day of hatch chicks were colonized with *C. jejuni*; log 10 cfu/gm feces mean levels in untreated, 7-day old control chicks was 6.21, while birds provided bacteriocin in feed 3 days prior to sampling was 1.98; untreated, 10-day old control chicks were colonized at a means of 8.99 and treated birds were colonized at 0.61. Among an additional 14 trials, comprised of 290 chickens, of varying ages, with varying amounts of bacteriocin administered, and challenge strains of *C. jejuni*, we consistently observed at least a one-million fold reduction in cecal levels among treated birds. The bacteriocin from this *L. salivarius* appears useful to control *C. jejuni* in poultry.

Key Words: *Campylobacter*, Poultry, Bacteriocin Therapy

708 Strategies to reduce *Clostridium perfringens*. G. R. Siragusa^{*}, Agricultural Research Service, USDA Russell Research Center, Athens, GA.

In the context of poultry production, *Clostridium perfringens* (*Cp*) represents both a potential food borne pathogen as well as a significant poultry disease. As a human food borne disease agent, this spore forming pathogen has accounted annually for over 248,000 total cases of food borne disease in the United States alone. As illnesses caused by this pathogen are not part of an active surveillance program in the U.S., the aforementioned figure is estimated to be a tenfold under reporting. Within the context of production, *C. perfringens* necrotic enteritis (NE) is a peracute disease associated with predisposing factors including coccidial infections, feed types and environmental stresses. Complete withdrawal of antibiotic growth promoters from feed is one factor strongly associated with NE. This presentation will present newly initiated research to both develop alternatives to antibiotics to control *Cp* in the live bird but also research into our current understanding of gut microbial ecology preceding this disorder. Our lab has been successful in isolating a number of bacteriophage lytic for *Cp*. These virions display a highly narrow spectrum of activity against different *Cp* strains however; it is noteworthy that they show a high level of variation in plaque morphology. Work is ongoing to isolate, purify and clone the phage lytic enzyme responsible for the lysis activity and for potential use as either a therapeutic or prophylactic agent in live production. Work is also underway to identify and characterize bacteriocins for the purposes of *Cp* control. This effort has so far resulted in strains of *Cp* which produce bacteriocins against other non-producing strains. The quantitative profiling of the gut flora during growout is a goal so far achievable only on a small sample basis. Work is underway to develop sets of tools based on non-cultural methodology that can be applied to large numbers of samples thereby enhancing the diagnostic and accuracy of a general gut microbial profile. Results from other antibiotic alternative strategies to control *Cp*, e.g. sodium chlorate, as well as a review of the potential role of quorum sensing in gut modulation of specific pathogens will be presented.

Key Words: *Clostridium perfringens*, Lytic Bacteriophage, Bacteriocins

Women and Minority Issues in Animal Agriculture Symposium

709 Gender and animal agriculture. C. Sachs^{*}, Rural Sociology and Women's Studies, Penn State University, University Park.

Women have become increasingly involved in agriculture in the U.S. in recent years. More women are farming on their own, while others are more involved in decision-making with their spouses or other agricultural partners. Women farmers are more likely to be involved in animal agriculture than in crop production. Also, women on farms extensively participate in farm tasks and decision-making related to livestock. This paper will use data from a national survey of 2,661 farm women collected in 2001 to understand the extent of women's involvement in farm tasks, farm decision-making, and off-farm work. This study will report differences in women's involvement in tasks and decision making in livestock production by type of farm, type of livestock, sociodemographic characteristics of farm women, and region.

710 A respect for the land. A. J. King^{*}, University of California - Davis.

Historically, Japanese, Chinese and Mexican Americans have made valuable contributions to farming in the West. Today, many Hmong families

have leased lots of a few acres in Washington and California to raise specialty crops that are sold at local farmers markets. There are also populations of East Indians growing several different types of row and fruit crops in Northern California. The number of African American farmers is significant when focusing on the West and the Midwest. Minority groups (African Americans, American Indians, Chinese, East Indians, Hispanics, Hmong, Japanese, Laotians and women) who choose farming as careers continue to face obstacles while contributing in several ways to the ample and diverse food supply produced in the Western United States. What are these obstacles, their similarities and differences? What unique contributions have been made to farming processes and distribution related specifically to animal agriculture? How are minority farmers redefining the profile of animal agriculture and engagement by grassroots organizations?

Key Words: Minority Farmers, Animal Agriculture, Obstacles and Contributions

Animal Health - Growth and Immunity

711 Preliminary evaluation of the efficacy of halofuginone lactate (Halocur[®]) as an aid in the prevention of cryptosporidiosis in Ontario dairy calves. B. D. Jarvie, K. E. Leslie^{*}, A. S. Peregrine, T. F. Duffield, and J. Scott Weese, University of Guelph, Guelph, ON, Canada.

Cryptosporidium parvum is a common cause of diarrhea in neonatal calves. The incidence of shedding of *C. parvum* and clinical disease is

high on many dairy farms. There are currently no approved products in North America for the prevention of cryptosporidiosis. In Europe, halofuginone lactate (Halocur[®]) is marketed for the prevention of cryptosporidiosis. The objective of this study is to evaluate the efficacy of halofuginone lactate as an aid in the prevention of cryptosporidiosis in dairy calves. Commercial dairy farms participated in this study from February to July 2003. A total of 509 replacement heifer calves from 24 farms were enrolled and randomly assigned to one of two groups.