15th Annual
Applied Animal and Public Health
Research and Extension Symposium
Sponsored by the American Association of Extension Veterinarians

Saturday, October 26, 2019
3:00 – 6:00pm
Room: Convention Center 551
Providence, Rhode Island

Coordinators:
Kimberly Woodruff, Mississippi State University (moderator)
Molly Lee, CFSPH, Iowa State University

Time	Title	Presenter
1:30 – 3:00	AAEV Business meeting	
3:00 – 3:05	Welcome and introductions	Kimberly Woodruff, Mississippi State University
3:05 – 3:25	"Investigation of presence, tissue distribution, and concentrations of residues associated with barbiturate euthanasia"	Renee Dewell, Center for Food Security and Public Health, Iowa State University
3:25 – 3:45	"The effect of antimicrobial use policies on relative profitability of post-weaning beef production systems in the United States based on system dynamics modeling"	David R. Smith, Mississippi State University
3:45 – 4:05	"How would eliminating pneumonia in calves prior to weaning affect the net income of the US cow-calf industry?"	David R. Smith, Mississippi State University
4:05 – 4:25	"Child's play: using interactive, educational games to increase public health knowledge in the swine industry"	Brooke Kitting, University of Pennsylvania *AAEV Student Travel Award recipient*
4:25 – 4:40	Break	
4:40 – 5:00	"Introducing an innovative livestock biosecurity curriculum for youth"	Julie Smith, University of Vermont
5:00 – 5:20	"Causes of bovine mortality diagnosed at necropsy at the Utah Veterinary Diagnostic Laboratory over a ten-year period."	Savannah Gucwa, Utah State University
5:20 – 5:40	"Linking Beef Quality Assurance program standards to research and training in best management practices "	Carla L. Huston, Mississippi State University
5:40 – 6:00	"The dairy goat industry and caprine udder health in the Intermountain West"	David Wilson, Utah State University

Investigation of Presence, Tissue Distribution, and Concentrations of Residues Associated with Barbiturate Euthanasia

RD Dewell[1], MR Tyrrel, BA Sponseller[2], SS Caston[2], S Radke[3], DE Schrunk[3], D Borts[3], AJ Fales-Williams[4], S Ensley[3]

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Pentobarbital is a commonly used drug for euthanasia in both small and large animals. This drug has associated with environmental toxicity as well as multiple secondary toxicities. Veterinarians may be liable for secondary toxicities that occur following euthanasia with pentobarbital. There is insufficient data regarding tissue distribution and concentration of pentobarbital in euthanized cattle. Our study investigates the presence, concentration, and distribution of pentobarbital in tissues from bovines euthanized with pentobarbital. We obtained liver, kidney, and muscle tissue samples from five cattle who had been euthanized with intravenous pentobarbital at 10 cc/100 pounds. Following sample homogenization, pentobarbital concentrations were quantified using gas chromatography and mass spectrometry with a nitrogen phosphorus detector. Results were compiled and descriptive statistics were generated. In our study, the primary depot for pentobarbital was in the kidney tissue with a mean concentration of 531.1 ppm (range 166.7 – 928.9 ppm). Mean pentobarbital distribution in liver was 95.38 ppm (range 32.1 – 165.1 ppm) and muscle 19.1 ppm (range 4.7 – 41.4 ppm). This data provides veterinarians with evidence-based data to counsel owners regarding potential issues with toxic tissues. For example, a twenty kilogram dog would only have to consume 1.88 kg of kidney and 52.36 kg of muscle to have toxogenic affects (50mg/kg). To avoid issues with environmental toxins and secondary toxicities, veterinarians should strongly consider alternatives to the use of pentobarbital for euthanasia.

The Effect of Antimicrobial Use Policies on Relative Profitability of Post-Weaning Beef Production Systems in the United States based on System Dynamics Modeling

Tyler McMurray; Robert W. Wills, DVM, PhD, DACVPM (Epidemiology); David R. Smith, DVM, PhD, DACVPM (Epidemiology).

Department of Pathobiology and Population Medicine, College of Veterinary Medicine, Mississippi State University

Introduction:
The objective of this study was to understand how profitability of post-weaning beef production systems in the US is affected by health and production factors, including antimicrobial use policies, such as prohibiting the use of mass medication or applying price incentives for cattle not treated with antimicrobials.

Materials and methods:
Vensim Personal Learning Edition software was used to create causal loop and stock and flow supply-chain models describing the post-weaning beef production system. A spreadsheet was used to calculate the breakeven purchase price of the systems modeled.

Results:
A casual loop diagram was created to describe the factors important to profitability in post weaning beef production systems, including body weight, purchase price, compensatory gains, risk and cost of bovine respiratory disease (BRD), tolerance for BRD, metaphylaxis, and social concerns regarding antimicrobial use. Converting the causal loop to a stock and flow model revealed that cattle flow through six basic systems with the primary factor being whether the calves are considered high or low risk for BRD. Those systems are: high risk calf-fed feedlot, high risk backgrounder, high risk yearling feedlot, low risk calf-fed feedlot, low risk backgrounder, and low risk yearling feedlot. High risk calf-fed systems with metaphylactic use of antimicrobials have higher breakeven purchase prices (higher relative profit) compared to low risk calf-fed systems without metaphylaxis. Changes in antimicrobial-use policy affect which systems are the most profitable.

Conclusion:
This model creates a platform to evaluate different antimicrobial-use policies and to understand the implications of those policies on the beef cattle industry.

How would eliminating pneumonia in calves prior to weaning affect the net income of the US cow-calf industry?

M. Wang, R.W. Wills, D.R. Smith

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Our objective was to investigate the difference in net income between a US beef cow-calf system either with or without pneumonia in beef calves prior to weaning. Cattle market data were used to simulate the annual net income of beef cow-calf industry. Parameter values for simulations were drawn from USDA and peer-reviewed papers, and the initial values of beef cow inventory were based on USDA survey data. A system dynamics model was developed using Vensim®. Several scenarios were designed: 1) the current situation with pneumonia in beef calves prior to weaning; 2) elimination of pneumonia without cost; 2) eliminate pneumonia with an annual cost per cow of US$10 - $50. The simulation results were validated against the actual behavior of the beef cattle cow-calf system. Beef cow inventory, feeder cattle value, and net income per cow followed the classically described 10-year cattle cycle. The cumulative industry net income changed little by eliminating pneumonia without any cost. With cost to remove pneumonia, the beef cow inventory reduced which increased feeder cattle value, and net income increased with less fluctuation. Beef cow-calf producers not experiencing calf-hood pneumonia have an economic advantage over producers with pneumonia. Affected producers bear the cost of the disease, but, non-affected producers benefit from higher market prices because of fewer calves in the market. Assuming no change in demand, eliminating pre-weaning pneumonia without cost may benefit previously affected producers, but the additional supply of beef reduces calf market prices for all such that net income to the industry does not change. Costs to eliminate pneumonia decrease number of cows and supply of calves into the market resulting in increased cattle value, which may benefit total net income.

Child's Play: Using Interactive, Educational Games to Increase Public Health Knowledge In the Swine Industry

B Kitting [1, 2], M Burke [1], L Censi [1,3], H N Fowler [1]

[1]National Pork Board, Clive, Iowa; [2]University of Pennsylvania, Philadelphia, PA; [3]University of Iowa, Iowa City, IA

Zoonotic disease prevention at fairs remains a major focal point for public health professionals nationwide. As a trusted resource of information to the show pig industry, the National Pork Board (NPB), recognizes that they are well-positioned to affect change in this space. In fall 2018, the organization set out to improve the knowledge and practices of show pig producers with the goal of reducing zoonotic disease transmission to exhibitors and fair visitors through the use of interactive games. In doing so, NPB created the Swineology games playbook, an activity set comprised of seven card and/or board games, derived from well-known games such as UNO®, BINGO, and Memory, that target youth pig exhibitors from 4 to 21 years old.

The Swineology games playbook was designed with the next generation of animal agriculturists in mind. The activity set draws its inspiration from the card game Germ-O created by the state of Maine's health and agricultural departments, yet reaches a wider range of age groups and places an emphasis on diseases of swine. The content of the playbook however maintains relevance to all animal industries. Through play participants gain a better understanding of otherwise complicated topics such as biosecurity, routes of disease transmission, signs and symptoms of disease-causing agents, and the definition and importance of zoonotic diseases in the livestock industry.

Following the creation of the playbook, the activities were piloted both internally with NPB employees and externally with a local 4-H group in the Des Moines, IA area. Each pilot included survey evaluation of the game itself as well as documented improvement in zoonotic disease knowledge among players. Pilot results suggest that this playbook provides a fun and effective way of improving public health knowledge among youth pig exhibitors.

Introducing an Innovative Livestock Biosecurity Curriculum for Youth

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[4]University of Vermont

Youth participating in 4-H livestock projects or other agricultural education programs should understand and apply biosecurity practices to mitigate disease transmission risks. Online education is a cost-effective way to reach youth and other learners, regardless of time or place, with a consistent message. To this end, a multi-state team of veterinarians developed an interactive online biosecurity curriculum for youth in grades 6-12, with expected diffusion to younger children and adult audiences. Six highly interactive modules have been developed requiring learners to think, problem-solve, and apply information and concepts presented. Modules 1 through 4 teach research-based biosecurity best practices: 1) "What is Animal Biosecurity? Why Should We Care?"; 2) "Biosecurity: Routes of Infection and Means of Transmission"; 3) "Biosecurity: Finding Sources of Disease Transmission Risk"; and 4) "Biosecurity Strategies." The modules have been peer-reviewed, revised, piloted, and revised again. Pilot testing with 6th-8th and 9th-12th graders indicated a large majority agreed or strongly agreed with positive statements on nine different parameters such as holding their attention and using what was learned during the module. (Results follow for 6th-8th, 9th-12th: Module 1 - 92%, 84%; Module 2 - 86%, 86%; Module 3 - 89%, 93%; Module 4 - 70%, 89%.) Links to these modules can be found in the educational resources section of the healthyagriculture.org site. The final two modules, 5) "Creating a Persuasive Presentation" and 6) "Public Speaking for Biosecurity Advocates," guide students in making their own biosecurity presentations and practicing verbal and non-verbal communication techniques to deliver a dynamic persuasive speech. These are undergoing the same review process as the first four modules. A teacher's guide explains how the curriculum addresses Content Standards published by the National Council for Agricultural Education and provides suggested activities for different age groups to supplement the modules. In addition, hands-on learning activities called Science Creates Real Understanding of Biosecurity and packaged as "SCRUB kits" complement the online learning modules, or can be used independently. These STEM-centric activities include instructor guides, step-by-step instructions, materials lists, and evaluation tools. This work is supported by the USDA National Institute of Food and Agriculture, under award number 2015-69004-23273.

Causes of bovine mortality diagnosed at necropsy at the Utah Veterinary Diagnostic Laboratory over a ten-year period.

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To assist bovine owners and veterinarians with husbandry, mortality causes from 2251 Utah Veterinary Diagnostic Laboratory bovine necropsies from 2008 to 2019 were summarized; 95% were diagnosed. Ages were from 60 days in utero to 12 yr old, including 58% females and 42% males. Of 1475 with breed identified, 44% were beef and 56% were dairy. Most common breeds were Holstein, Angus, Jersey, and Hereford. Among all cattle, gastrointestinal (GI) disease was the main cause of death in 667 animals (30%), followed by abortion for 389 animals (17%) and respiratory disease for 347 animals (15%). Other causes of death included omphalitis (3%), bloat (2%), abomasal perforation (2%), and congenital abnormalities (2%). Among aborted fetuses, the mean gestational age was 210 days. Of the abortions, 52% were idiopathic, 20% were bacterial, 10% were viral, and 8% were congenital abnormalities. The most common pathogen was IBR (6%), followed by *Neospora caninum* (5%). Of neonates, 25% died from dystocia, 25% from GI disease, 11% from congenital abnormalities, and 12% were undetermined. In baby calves, 62% died from GI disease, 11% from respiratory disease (BRD), and 5% from omphalitis. In older calves, 35% died from BRD, 32% from GI disease, and 10% of beef calves from abomasal perforation (none in dairy). In 1 to 4 yr old cattle, 18% died from BRD, 8% from GI disease, 8% from traumatic reticuloperitonitis, and 9% of beef cattle from emaciation (none in dairy). In animals over 4 years old, 16% died from BRD and 10% from traumatic reticuloperitonitis. Most common GI pathogens were *Cryptosporidium* sp. (24%) and Rotavirus (15%). Most common respiratory pathogens were *Mannheimia* spp. (24%), followed by *Pasteurella* spp. (22%).

Linking Beef Quality Assurance program standards to research and training in best management practices

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Since its inception in the late 80's, the Mississippi Beef Quality Assurance (MS BQA) program has been a cooperative effort between all facets of the beef industry. In order to become more flexible and sustainable, the MS BQA program underwent some programmatic changes in 2015 which included revising educational materials and implementing a fee structure. Since that time, 55 BQA programs have been held in 33 counties, resulting in 1735 certifications. Post-program surveys indicated that participants planned to implement record-keeping practices and improve animal welfare through handling and transportation practices based on information obtained during the program. Participants also estimated that management practices learned through the MS BQA program could have an economic benefit from $1 – 25 per head per year on their operation. By uniting animal scientists, veterinarians, feed suppliers, animal health companies, and state and federal regulators with producers, the BQA program acts as a catalyst to encourage use of the latest science and technology to meet industry expectations. A targeted area of interest within current BQA standards has been the use of analgesia and anesthesia when performing potentially painful procedures in calves such as castration and dehorning. A study examining the effects of castration method on stress response and performance of beef bull calves was performed which also allowed for the development of updated educational materials. Two methods of castration were compared, along with the use or nonuse of a non-steroidal anti-inflammatory drug for analgesia. There were no differences in weights or ADG in calves castrated by surgical or banding method at 42 days post-procedure, nor in calves receiving the analgesic. Videos were also produced demonstrating the various methods of castration, as well as the administration of a local anesthetic prior to the procedure. Other examples of research and training opportunities aligning with BQA standards include producer surveys developed to examine record-keeping practices to facilitate the development of user-friendly phone apps, as well as studies based on the use of remote delivery systems to complement standards on proper injections and injection site management. Overall, the collaborative nature of the MS BQA program facilitates the leveraging of resources to optimize research and training opportunities as industry and consumer needs change.

THE DAIRY GOAT INDUSTRY AND CAPRINE UDDER HEALTH IN THE INTERMOUNTAIN WEST

D.J. Wilson

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There are 298 dairy goat farms with 2463 milking does in Utah. Mean reported milk production is 1856 lb (843 kg) per 305 d, with some farms' mean > 3000 pounds (1360 kg). Breeds are Saanen, Toggenburg, Alpine, LaMancha and Nubian. Reported milk processing methods: On-farm handled milk, 2220 goats (90%); 4 "raw milk for retail" (Utah state program) farms, 150 goats (6%); owner operated on-farm milk plant, 90 goats (4%). Most milk marketing is by farms' websites.

Caprine milk culture results: 73% culture-negative (many herds 85-90% neg), 23% coagulase-negative staphylococci, 1.5% *Staphylococcus aureus*, 0.8% *Streptococcus* spp. Mean SCC in goat milk is 835,000/ml. In herds > 1,000,000/ml (mean 1,435,000/ml), 32% of does are milk culture-positive; in herds < 1,000,000/ml (mean 499,000/ml), 26% of does culture-positive. Goat milk SCC is strongly related to days in milk; many herds have most kids born between March and May, and by late summer or fall, bulk milk SCC > 1,000,000/ml is common. After drying off does and when kidding begins again, SCC is markedly decreased in most herds.

Udder prep methods include udder wash, spray "dip" of teats, or teat dip. Many goat milkers do not wear gloves. In one herd, a "teat dip" mixed by the owner of 350 ml tap water, 3 drops soap, and 1 drop each of tea tree oil, peppermint oil, lavender oil, and grape seed extract was used. Milk from 2 does with chronic clinical mastitis and SCC of 3,000,000/ml (Porta SCC goat milk test®), the teat dip, and a swab of the teat dip container were all culture-positive for *Pseudomonas aeruginosa* (API 20 NE® test). Milks from the remaining does, water, feed, shavings bedding, and a swab of the water hose for drinking and udder wash water were all culture-negative for *P. aeruginosa*. The owner began using a commercial teat dip and culled the 2 positive does.

Intramammary antibiotic treatments used: 78% of herds use IMM antibiotics during lactation (78% cephapirin, pirlimycin, penicillin, amoxicillin); 84% dry treat (78% all does, 6% selective treatment) (73% penicillin/streptomycin). Some goat mastitis control practices should be more widely adopted.