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What's New in Food Supply Medicine at Mizzou

The past year has seen more changes in the food animal section at MU. In October, the first large class size entered the clinical curriculum. In order to enhance food supply education and clinical experience, while dealing with class size expansion, the food animal section has undertaken a number of initiatives to enhance our program. The clinical rotation has been reorganized to better accommodate students and maintain a reasonable student-to-teacher ratio. The clinical block now includes two weeks of individual animal training, two weeks of field service and herd level training, and two weeks of regulatory medicine. The regulatory medicine portion focuses on federal accreditation requirements and the post-farm aspects of food supply medicine including food safety, public health, and regulatory requirements. The regulatory medicine rotation includes field trips to a sale barn, slaughter facility, dairy processor, state department of health, and a commercial research dairy farm.



"The mission of the food animal section is to benefit public health, the veterinary profession, and livestock producers and bolster the

economy of Missouri by providing excellent professional, graduate, and undergraduate education; protecting animal health and well-being through individual animal and herd services; providing extension and continuing education; and conducting research."

With the support of the department, College and University, we are hopeful that the next 12 months will see the hiring of two new field service faculty and further enhancement of our education and service missions. In this volume we will introduce our new house officers, introduce Dr. Meera Heller, and recognize Dr. Ross Cowart for his years of service to MU. We will also highlight recent food supply research performed at MU. In addition, each of the residents has written an article on a topic requested by you the readers in feedback from previous editions. Finally, we wish everyone a happy, healthful, and productive 2012!

John Middleton—Section Head, Food Animal Medicine and Surgery

Food animal caseload and student exposure to routine food animal health management has been enhanced by entering into an agreement with the Department of Animal Science to provide veterinary care to its regional beef and dairy herds, including farms in Columbia, Lineus and Mt. Vernon, Mo. Students are involved in routine processing of cattle, sick animal assessment and care, and management of herd health protocols and record-keeping. Through collaboration with veterinary extension, students now spend at least one day per rotation with Dr. Craig Payne discussing and observing commercial beef cattle production, a half-day with Dr. Beth Young discussing and observing commercial swine production, and two days with Dr. Scott Pock discussing dairy production and providing routine sick cow care at the MU Foremost dairy. Dr. Josh Schaeffer, our first-year production medicine resident, is working closely with Drs. Dusty Nagy, Payne and Pock to develop up-to-date beef (Cow Sense) and dairy cattle (Dairy Comp 305) computer-based records to enhance student education and routine herd management.

There have been a number of changes in the food animal section personnel in the last year and these will be detailed in the food supply personnel updates that follow. Despite changes in personnel and human resource shortfalls during the last 12 months, the food animal section has remained dedicated to its mission.

FOOD ANIMAL NEWS

Food Supply Faculty and House Officer Updates and Recruitment

Dr. Ross Cowart retired after more than 25 years' service to MU and the food animal section. We would like to recognize Dr. Cowart for his years of service and his expertise in the area of field service and swine medicine. His book on swine diseases continues to be a go-to text for veterinarians and veterinary students. He leaves us for a new career with the U.S.D.A. Food Safety Inspection Service. Dr. Cowart will maintain his connection to MU as an associate professor emeritus in the Department of Veterinary Medicine and Surgery. We wish him the best of luck in his new venture and encourage him to stop by and visit when time allows.

Recently, Dr. Loren Schultz has taken on greater responsibility in the Masters of Public Health (MPH) veterinary emphasis area, for which he is the director. He remains actively involved in the DVM curriculum by teaching the regulatory medicine portion of the food animal clinical rotation in conjunction with Dr. Patrick Pithua. However, with his time commitments now being centered on public health and regulatory medicine, he is no longer seeing cases as a field service clinician for the food animal service.

In October, Dr. Meera Heller joined our faculty and serves as an in-house clinician and researcher in the food animal section. Dr. Heller received her bachelor of science from Stanford University ('96) and DVM ('01) and PhD ('09) degrees from University of California, Davis (UCD). She also completed a large animal internal medicine (LAIM) residency at UCD becoming board certified (ACVIM- LAIM) in 2005. Her clinical interests cover a breadth of food animal medicine and surgery topics from small ruminants to cattle and are detailed in the following chart. Welcome Dr. Heller! With the addition of Dr. Heller, Dr. Dusty Nagy now spends more time in the field service area with a minority of her time being spent in-house.

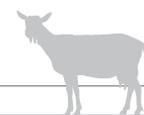
Dr. Davin Ringen completed his residency in July 2011 and now resides in Denver, Colo. Dr. Noe Galvan completed his rotating internship in June 2011 and now resides in Houston, Texas. Dr. Josh Schaeffer completed his rotating internship with us in June 2011 and is now pursuing a production medicine residency with a combined master of public health degree. He is pursuing board certification in the American College of Veterinary Preventive Medicine. We have three new trainees, Drs. Pamela Fry and Ignacio Idoate and Mr. Kenton Hoernig. Dr. Fry joins us as a food animal medicine and surgery resident pursuing board certification in large animal internal medicine through the American College of Veterinary Internal Medicine. She will also pursue a PhD in conjunction with her residency focused on mastitis pathogen genomics. Dr. Fry holds a bachelor of science from the University of Nebraska, Lincoln and a DVM and master of science degree from the Ohio State University. She completed a food animal internship at the Ohio

State University in June 2011.

Our second food animal medicine and surgery resident, Dr. Idoate, completed his pre-veterinary studies at Montana State University and received his DVM from Colorado State University. Dr. Idoate comes to us having successfully owned and operated a mixed animal veterinary practice in eastern Montana for the last 11 years. His residency will be combined with a master of science degree. He too will pursue board certification in large animal internal medicine. Finally, Mr. Kenton Hoernig joins us as a master of science degree candidate. Mr. Hoernig received his bachelor of science from MU in May 2011 and has applied to the MU College of Veterinary DVM program for a fall 2012 admission. He is studying novel approaches for the treatment of *Staphylococcus aureus* mastitis. Welcome to all our trainees!



A retirement ceremony for Dr. Ross Cowart held at the Veterinary Medical Teaching Hospital gave colleagues and friends the opportunity to thank the honoree for more than 25 years of service to the College.



Summary of current food animal personnel

Faculty	Title	Clinical/Research interests
John Middleton, DVM, PhD, DACVIM	Associate Professor, Section Head, Assistant Director – Agricultural Experiment Station	Internal medicine, general medicine and surgery / mastitis, molecular epidemiology of bacterial pathogens
Meera Heller, DVM, PhD, DACVIM	Assistant Professor	Internal medicine, general medicine and surgery/ immunology, bacterial disease
Dusty Nagy, DVM, PhD, DACVIM	Assistant Teaching Professor	Internal medicine, general medicine and surgery, field service
Loren Schultz, DVM, MS, DACVPM	Associate Teaching Professor	Public health, epidemiology
Patrick Pithua, BVM, MSc, PhD	Assistant Professor	Public health, epidemiology/passive immunity, Johne's disease

House Officers

Pamela Fry, DVM, MS	Resident (Internal Medicine)	Medicine and surgery/molecular epidemiology of bacterial pathogens
Ignacio Idoate, DVM	Resident (Internal Medicine)	Medicine and surgery/passive immunity
Josh Schaeffer, DVM	Resident (Production Medicine)	Production medicine, public health

Staff

Julie Holle, RVT	Senior Veterinary Technician	Medicine and surgery
Karen Siegler	Service Representative	
Flo Nelson	Office Supervisor	
Ronnie Poe	Food Animal Caretaker	

Graduate Student

Kenton Hoernig, BS	Staphylococcus aureus mastitis
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New Faces

With the changes in personnel we are now short two food animal faculty. We have searches under way for two faculty positions with a primary emphasis in field service. One position is a teaching track position, while the second is eligible for either teaching track (non-tenure track) or tenure track. A brief description of the open positions is appended on page 7.



Ignacio Idoate, DVM



Kenton Hoernig, BS



Josh Schaeffer, DVM



Meera Heller, DVM, PhD, DACVIM



Pamela Fry, DVM, MS



Spotlight on Food Animal Research at MU in 2011

The food animal faculty continues to be actively engaged in basic and applied research that has direct relevance to veterinary practice and food animal producers. The research team comprises faculty, staff, graduate students, and undergraduate/professional students. While our primary focus is food animal diseases, we have collaborations with faculty in small animal medicine, equine medicine, and human medicine. Current areas of research include bovine mastitis, multidrug resistant bacterial pathogens, transition dairy cow metabolism, Johne's disease, *Corynebacterium pseudotuberculosis* and passive immunity. Research on these subjects is funded by the United States Department of Agriculture, industry, and the College of Veterinary Medicine.

Our research has been highlighted locally, nationally and internationally. Dr. Davin Ringen presented his work on use of pre-partum parameters to predict intramammary infection in dairy heifers at calving at the National Mastitis Council Annual Meeting in Arlington, Va., the American College of Veterinary Internal Medicine (ACVIM) Forum in Denver, Colo., and the Third International Symposium on Mastitis and Milk Quality held in conjunction with the American Association of Bovine Practitioners meeting in St. Louis, Mo. Dr. Ringen received the first-place resident research award at the ACVIM Forum. William Chamberlin (combined DVM/MS degree candidate) studied the influence of subclinical hypocalcemia at calving on post-partum liver health and disease incidence in dairy cattle. He completed a master of science degree in May 2011 and is completing his clinical rotations in the DVM curriculum. He also presented his data at the Symposium on Mastitis and Milk Quality. In addition to traditional graduate research training, we actively participate in the Veterinary Research Scholars program (VRSP) for undergraduate and

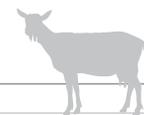
veterinary students. This past summer we had a VRSP student (Tony Dank) who compared methods for aseptic preparation of the teat end prior to milk sample collection or mastitis treatment infusion. Preliminary data from his work were presented in August 2011 at the National Veterinary Research Scholars Symposium.

Dr. Patrick Pithua continues to be actively involved in research evaluating the efficacy of colostrum replacement products in ensuring calf health. This work is being conducted in collaboration with the University of California, Davis at its Tulare facility. Short-term goals include measurement of adequate passive transfer and measurement of calf-hood morbidity and mortality. Long-term goals are focused on whether replacers are efficacious in preventing Johne's disease transmission. Dr. Pithua also has funding to study Johne's disease in meat and dairy goats.

Dr. Meera Heller joined our research team in October 2011 and already has funding to evaluate cellular immunity in calves following consumption of maternal colostrum, colostrum replacer, or no colostrum. She also has an interest in *Rhodococcus equi* infections in horses and *Corynebacterium pseudotuberculosis* infections in sheep, goats and horses.

Our new residents were recently funded through the Phi Zeta research grant program to study Johne's disease in sheep (Dr. Idoate) and *Salmonella enterica* ssp. *agona* in horses and cattle (Dr. Fry). Kenton Hoernig will be studying novel antimicrobial compounds for the treatment of chronic *Staphylococcus aureus* intramammary infection in dairy cattle.

For more information on any of the research topics, contact us at 573-882-6857.



Update on Bluetongue Virus in Cattle

By Josh Schaeffer, DVM

Culicoides sp., the arthropod vector responsible for the spread of bluetongue virus (BTV), is adapted to tropical and temperate zones such as Missouri. Due to this fact, Missouri is considered by some to be endemic for BTV. However, this does not mean that the prevalence of clinical disease in cattle is high in our state. In general, cattle tend to remain asymptomatic when infected with BTV especially when compared to sheep, and many factors play a role in the clinical manifestations of BTV in cattle.

Host, viral strain, vector, and environmental factors all play a role in the development of clinical disease. Naïve cattle that are not from an endemic region tend to be more prone to developing clinical disease as their immune systems have not been primed to the disease. Furthermore, seroprevalence tends to increase with age, possibly due to prolonged exposure to the virus. Sources have shown some cross-protection across serotypes, but the cross-protection is not complete. Virulence varies greatly across strains, even within serotypes. A strain has the potential to experience a change in virulence as BTV is known to mutate frequently to maintain adaptation to host and vector. Environmental factors, such as temperature, affect the rate of virus production within the vector and as a result impact the amount of virus to which the host may be exposed. Furthermore, environment plays a large role on the prevalence of Culicoides sp. present in a region. Cold winters and dry summers often reduce vector numbers, while warm, humid seasons often result in an abundance of Culicoides sp. However, not all Culicoides sp. have the same role in the spread of BTV. Some species tend to be more host adapted, preferring cattle over sheep and vice versa. Likewise, only a few of the more than 1400 species of Culicoides have been shown to incubate and/or transmit BTV.

As previously stated, cattle tend to remain asymptomatic when infected with BTV, but when clinical disease does

develop, a wide range of clinical signs may be present. The presence of fever (104-106°F) during the viremic stage is a common clinical finding. If clinical disease progresses beyond this stage in cattle, the clinical signs are often the result of damage to the vascular endothelium by the virus. Ulcerative lesions may be present on the oral mucosa, tongue, lips and muzzle. These lesions are often painful and may result in excessive salivation and anorexia. Vascular damage in the lungs may lead to pulmonary congestion and edema. Laminitis

often results from the vascular damage and may progress to the sloughing of the hoof. These clinical signs mimic those of emerging and exotic diseases, such as foot-and-mouth disease, and, therefore, when seen, proper authorities should be contacted. In addition, infection during pregnancy may result in abortion or congenital malformations in the fetus, such as hydrancephaly, blindness and deformity of the jaw. It should be noted that the BTV effects on the fetus are well-documented on experimentally infected and vaccinated animals, but there are few documented cases of abortion or malformations as a result of wild-type strains.

Suggested Readings

Maclachlan, NJ, et al. *The Pathology and Pathogenesis of Bluetongue. Journal of Comparative Pathology* 2009;141:1-16.

Michelsen, PGE, Smith BP. *Bluetongue in: Large Animal Internal Medicine. 4th ed. St. Louis: Mosby Elsevier, 2009;786-789.*

Radostits, OM, et al. *Bluetongue in: Veterinary Medicine: A textbook of the diseases of cattle, horses, sheep, pigs, and goats. 10th ed. Philadelphia: Saunders Elsevier, 2007;1299-1305.*

Due to the fact that cattle tend to remain asymptomatic when infected with BTV, other differentials for clinical disease, abortion, and fetal malformations should be ruled out before confirming a diagnosis of BTV. A definitive diagnosis of BTV should be based upon clinical signs and evidence of vascular damage at necropsy, if applicable. Virus isolation may be beneficial during the early stages of disease (between days 11 and 49 post infection). Reverse transcription-polymerase chain reaction (RT-PCR) can detect the virus up to 222 days post infection. Antibody tests are often not helpful as antibody to BTV can persist for more than two years. Due to the potential seroprevalence to BTV in Missouri cattle, a positive test result should be used in conjunction with clinical signs and patient history to establish a definitive diagnosis of bluetongue.



Update on Hairy Heel Warts in Cattle

By Pamela Fry, DVM, MS

Bovine digital dermatitis (BDD) is an infectious lameness of cattle responsible for economic losses due to reduced productive performance, decreased milk yield, increased number of culled cows, and cost of treatment and control. This disease is very painful for infected animals. Current prevalence of this disease is not well defined. The USDA released a report in 2007 stating that 28.7 percent of dairy operations had at least one case of digital dermatitis in bred heifers, while 70.2 percent of operations had at least one case in cows during the previous 12 months. A more recent study done in Ontario, Canada found that 92.1 percent of free stall herds were affected with 22.9 percent of cows within these herds having BDD lesions (Cramer, 2008).

Previously thought of as a polymicrobial disease, the majority of recent epidemiologic studies have confirmed treponemes as the most likely causative agent (Brandt et al., 2011, Evans et al., 2009, Klitgaard et al., 2008). Increased understanding of the causative agent has helped researchers to further study the antimicrobial susceptibility of this agent as well as the host and environmental reservoirs.

In the United States, the most common methods used to treat BDD include antimicrobials and non-antimicrobials applied to a bandage, as topical sprays, or in footbaths. Depending on the method, treatment efficacy varies and recurrence has been reported to be high. One of the more effective treatments, with better than 90 percent recovery rate, has been topical antibiotic treatment under a bandage (Guterbock et al 1995).

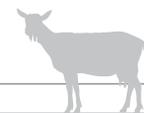
Treatment failures are likely related to using treatments with little or no proven efficacy. When effective treatments yield poor results, failure may be due to inconsistent application of treatment. Poor response may also be due to improper formulation of topical spray treatments. One study demonstrated

that topical oxytetracycline at concentrations of 1 to 4 mg/ml was not effective and that minimum concentrations of 10 to 25mg/ml were required (Reed et al., 1996, Shearer, 1998).

With the recent identification of a specific species of the *Treponema* spirochete being highly associated with this disease, in vitro antimicrobial susceptibility testing has been studied (Evans et al., 2009). In this study, the BDD spirochetes exhibited the highest susceptibility to penicillin and erythromycin. The study found that the spirochetes were somewhat susceptible to oxytetracycline, although this was not the most effective agent. Effectiveness of oxytetracycline in the field is likely due to the high concentrations achieved when applied as a single topical application, with topical applications being up to 25 times more concentrated than the antibiotic in a footbath.

Other recent research on BDD has focused on reservoirs of infection (Evans, 2011). Specific treponemes, or BDD treponemes, are highly associated with BDD lesions and are rarely associated with healthy foot tissues (Evans, 2009). In these studies, the researchers did not find any evidence for the presence of BDD treponemes on insects, in environmental slurry, or in GI tract contents. However, they did find evidence of these organisms in the oral cavity, the rumen, and the rectal-anal junction. The authors were unable to find evidence of the major BDD treponeme in feces, despite their presence in the bovine rectal tissue, suggesting there may be only sporadic, low number bacterial shedding from this site. This suggests that direct skin contact or short term persistence in environmental reservoirs may be the major transmission route for BDD treponemes.

With the latest research helping us to better understanding of the causative agent, the antimicrobials it is susceptible to, and the reservoir for infection, future research focusing on treatment and prevention seems more promising.



Surgical Correction of the Right Displaced Abomasum

By Ignacio Idoate, DVM

Right paralumbar fossa (flank) is the most commonly used surgical approach for the correction of right-sided displacement of the abomasum (RDA) or right-sided abomasal volvulus (also referred to as right torted abomasum; RTA).

For surgical correction, the entire paralumbar fossa is clipped of hair and aseptically prepared in a routine manner. The paralumbar fossa is then anesthetized using regional anesthesia. The options for regional anesthesia include 1) line block, 2) inverted-L block, or 3) a paravertebral block (proximal or distal) in which branches of the spinal nerves T13, L1 and L2 are anesthetized.

The abdomen is entered by making a 20-25cm vertical incision in the center of the paralumbar fossa, starting one hand width below the transverse processes of the lumbar vertebrae. After incising through the skin, the external abdominal oblique muscle is incised followed by the internal abdominal oblique, transversus abdominis, and the peritoneum. The peritoneum is best entered by blunt dissection so as to avoid incising the descending duodenum, which lies below the incision.

Once the abdomen has been entered, the position of the abomasum can be assessed. With a simple right displacement, the greater curvature of the abomasum will be displaced dorsally and apparent just cranial to the incision. With an abomasal volvulus, the omentum is wrapped in the torted abomasum (counterclockwise), and the abomasal fundus appears at the incision site without being covered by the omentum.

A large gauge needle attached to sterile tubing (bell IV set works great) is used to remove gas from the abomasum to

facilitate placement of the abomasum back on its normal anatomical position. In severe right-sided abomasal volvulus cases, fluid ingesta may need to be evacuated from the abomasum to allow replacement of the abomasum into its normal anatomic position.

Once the abomasum has been deflated and replaced, the omentum is grasped with the hand and gently pulled out of the incision until the pylorus can be identified. A series of two-to-three mattress sutures of #3 or #4 chromic gut are placed about 3 cm caudodorsal to the pylorus, incorporating the omentum, peritoneum and transverse abdominal muscle. The peritoneum and transverse abdominal muscle is then closed using a simple continuous pattern of #3 or #4 chromic gut incorporating the omentum. The internal and external abdominal muscle layers are then closed in similar fashion using a simple continuous pattern. The skin is closed with #3 or #4 Braunamid suture in a Ford-interlocking suture pattern. A couple of cruciate or simple interrupted sutures can be placed in the distal skin incision to facilitate removal and drainage should an incisional abscess develop.

Broad spectrum antibiotics are routinely administered following surgery, but may not be necessary depending on cleanliness of the surgical environment and the presence or absence of concurrent disease in the cow. Special efforts should be made to identify other problems that might have contributed to the development of the displacement. Common risk factors include metritis, mastitis, and ketosis. In these cases, additional supportive care such as fluid and electrolyte therapy and nutritional support might need to be implemented.

Position Announcement

The University of Missouri (MU) College of Veterinary Medicine, Department of Veterinary Medicine and Surgery, invites applications for two full-time faculty positions in food supply veterinary medicine. See complete postings on MU website: <http://hrs.missouri.edu/find-a-job/academic/index.php>.

Two positions are available – one is teaching track, the second is eligible for teaching track or tenure track. The basic job description is the same. However, for a tenure track position, the candidate will be expected to develop an independently funded research program. The appointment's primary focus in each case will be field service and production medicine, with the candidate being expected to: Develop

caseload-based clinical curriculum in livestock production medicine; Contribute to production medicine clinical elective, taught yearly; Interact with animal-owning public, referring veterinarians, students, commodity groups, extension faculty, animal science faculty, and the Missouri Department of Agriculture; Share in after-hours calls; Share in training interns, residents, graduate students. Participate in clinical/production based research or develop independently funded research program (tenure track). Didactic teaching, outreach, or administrative service comprises the remainder of the appointment.

Application materials must be submitted online: <http://hrs.missouri.edu/find-a-job/academic/index.php>.

Contact Dr. John Middleton, 573-882-6857, middletonjr@missouri.edu with questions.





FDA to protect important class of antimicrobial drugs for treating human illness

Agency issues order prohibiting certain uses in food-producing animals

The U.S. Food and Drug Administration issued an order that prohibits certain uses of the cephalosporin class of antimicrobial drugs in cattle, swine, chickens and turkeys effective April 5, 2012.

Antimicrobial drugs are important for treating disease in both humans and animals. This new order takes into consideration the substantial public comment FDA received on a similar order that it issued in 2008, but revoked prior to implementation.

FDA is taking this action to preserve the effectiveness of cephalosporin drugs for treating disease in humans. Prohibiting these uses is intended to reduce the risk of cephalosporin resistance in certain bacterial pathogens.

Cephalosporins are commonly used in humans to treat pneumonia as well as to treat skin and soft tissue infections. In addition, they are used in the treatment of pelvic inflammatory disease, diabetic foot infections, and urinary tract infections. If cephalosporins are not effective in treating these diseases, doctors may have to use drugs that are not as effective or that have greater side effects.

In its order, FDA is prohibiting what are called "extralabel" or unapproved uses of cephalosporins in cattle, swine, chickens and turkeys, the so-called major species of food-producing animals. Specifically, the prohibited uses include:

- using cephalosporin drugs at unapproved dose levels, frequencies, durations, or routes of administration;
- using cephalosporin drugs in cattle, swine, chickens or turkeys that are not approved for use in that species (e.g., cepha-

- losporin drugs intended for humans or companion animals);
- using cephalosporin drugs for disease prevention.

In 2008, FDA issued and then revoked an order that prohibited extralabel uses of cephalosporins in food-producing animals with no exceptions. Today's announcement responds to public comment and includes the following exceptions, which protect public health while considering animal health needs:

- The order does not limit the use of cephapirin, an older cephalosporin drug that is not believed by FDA to contribute significantly to antimicrobial resistance.
- Veterinarians will still be able to use or prescribe cephalosporins for limited extra-label use in cattle, swine, chickens or turkeys as long as they follow the dose, frequency, duration, and route of administration that is on the label.
- Veterinarians may also use or prescribe cephalosporins for extralabel uses in minor species of food-producing animals such as ducks or rabbits.

"We believe this is an imperative step in preserving the effectiveness of this class of important antimicrobials that takes into account the need to protect the health of both humans and animals," said Michael R. Taylor, Deputy Commissioner for Foods.

The new order of prohibition has a comment period that will begin on Jan. 6, 2012 and close on March 6, 2012. To comment on the order of prohibition, visit www.regulations.gov and enter FDA-2008-N-0326 in the keyword box. Following the comment period, the FDA will consider the comments prior to the order of prohibition going into effect on April 5, 2012.