THE OHIO STATE UNIVERSITY
COLLEGE OF VETERINARY MEDICINE

ADVANCES IN VETERINARY MEDICINE RESEARCH

11 APRIL 2013

BOOK OF ABSTRACTS

PROGRAM

April 11, 2013

POSTER JUDGING

Graduate Student Posters
8:00 am – 10:30 am
(closed session – only open to
those being judged)

AWARDS PRESENTATION

Veterinary Medical Center Auditorium
12:15 pm

GRADUATE STUDENT PLATFORM PRESENTATIONS

Dr. Famke Aeffner
Dr. Andrew Bowman

KEYNOTE SPEAKER

Veterinary Medical Center Auditorium
immediately following the awards presentation and
graduate student platform presentations

Dr. Elizabeth Lautner
Director, National Veterinary Services Laboratories
USDA, Animal Health Inspection Service, Veterinary Services
Ames, IOWA

***"Veterinary Science: Many Forks in the Road –
You Don't Need to Pick Just One!"***

POSTER SESSION

Anatomy Lab Hallway – Sisson Hall
And
Main Hallway – Vet Med Academic Building
11:00 am – 5:00 pm

PROGRAM CHAIR

Dr. Thomas Wittum

ORGANIZED BY

Michele Morscher

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Special thanks to the College's Technology Services for creating the posters

POSTER JUDGING SESSIONS

Wednesday, April 10, 2013
2:00 – 5:00 pm
Veterinary Student Poster Judging

Thursday, April 11, 2013
8:00 – 10:30 am
Graduate Student Poster Judging

Thank you to the following faculty, graduate students, post-docs and guests for taking time out of their busy schedules to judge 81 posters.

Famke Aeffner

Greg Habing

Kate Hayes-Ozello

Eason Hildreth

William Kerns

Krista La Perle

Stefan Niewiesk

Mike Oglesbee

Yasuko Rikihisa

Daniel Rudmann

Karen Tefft

Renukaradhya Gourapura

Kat Ham

Kris Hennessy

John Hubbell

Bill Kisseberth

Xin Li

Donald Noah

Judith Radin

Michael Rohovsky

Laura Rush

THE OHIO STATE UNIVERSITY COLLEGE OF VETERINARY MEDICINE

Office of Research and Graduate Studies

ADVANCES IN VETERINARY MEDICINE
RESEARCH DAY

Awards Presentation, Graduate Student Platforms, & Keynote address
Thursday, April 11th
12:15 – 2:00 pm

Veterinary Medical Center Auditorium
Corner of Coffey Road and Tharp Street
Enter from Coffey road and go up the stairs

Featuring:

"Veterinary Science: Many Forks in the Road – You Don't Need to Pick Just One!"

Dr. Elizabeth Lautner

Director, National Veterinary Services Laboratories
USDA, Animal and Health Inspection Service, Veterinary Services
Ames, Iowa

Posters will be on display in the
Veterinary Medical Academic Building
And
The Anatomy Lab Hallway in Sisson Hall

Poster Judging Schedule:
April 10th: 2:00-5:00 pm for Professional Students

April 11th: 8:00-10:30 am for Graduate Students

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IAMS VETERINARY FORMULA™ versatile by design

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Immunology and Infectious Diseases

IMID – 1 **INFLUENZA-INDUCED CARDIOPULMONARY DYSFUNCTION AND LUNG INJURY ARE ATTENUATED IN MICE HETERZYGOUS FOR THE F508del MUTATION IN THE CYSTIC FIBROSIS TRANSMEMBRANE CONDUCTANCE REGULATOR ANION CHANNEL.** F. Aeffner[a], L.M. Joseph[a], A.A. Gaughan[a], B. Abdulrahman[b], J.M. Hickman-Davis[c], P. Janssen[d], D. Hayes[e], A. Amer[b], D.M. Bedwell[f], E.J. Sorscher[g], I.C. Davis[a]. Departments of [a]Veterinary Biosciences, [b]Pulmonary and Critical Care Medicine, [c]Veterinary Preventive Medicine, and [d]Physiology and Cell Biology, The Ohio State University, Columbus, OH, USA; [e]Nationwide Children's Hospital, Columbus, OH, USA; Departments of [f]Microbiology and [g]Medicine, University of Alabama at Birmingham, Birmingham, AL, USA

IMID – 2 **NANOPARTICLE-BASED ADJUVANTED INACTIVATED PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS VACCINE ELICITS CROSS-PROTECTIVE IMMUNITY IN PIGS.** B Binjawadagi[*], V Dwivedi[*], C Manickam[*], K Ouyang[*], Y Wu[$], M Murtaugh [#], J Torrelles[†], J Lee[$], and R Gourapura[*] [*]Food Animal Health Research Program (FAHRP), OARDC, Department of Veterinary Preventive Medicine, The Ohio State University, Wooster, OH 44691, USA; [$] Nanotech West Lab., The Ohio State University, Columbus; [#]Veterinary and Biomedical Sciences, University of Minnesota, St. Paul, MN 55108, USA; [†]Department of Microbial Infection and Immunity, The Ohio State University, Columbus, OH 43210, USA.

IMID – 3 **REGULATION OF ALLERGEN-SPECIFIC IgA AND IL-17 RESPONSES BY INTESTINAL EPITHELIAL CELLS IKKβ RESHAPES ALLERGIC INFLAMMATION AT DISTANT SITES.** A. Bonnegarde-Bernard, J. Jee, M. Fial, F. Aeffner, E. Cormet-Boyaka, I. Davis, M. Lin, M. Karin and P. Boyaka. Depts of Veterinary Biosciences, The Ohio State University, Columbus, OH, USA and Depts of Pharmacology, University of California, San Diego, La Jolla, CA, USA

IMID – 4 **EVIDENCE FOR THE CIRCULATION AND INTER-HEMISPHERIC MOVEMENT OF THE H14 SUBTYPE INFLUENZA A VIRUS.** A. Fries, J.M. Nolting, A. Danner, R.G. Webster, A.S. Bowman, S. Krauss and R.D. Slemons. Department of Veterinary Preventive Medicine.

IMID – 5 **IL-4 SECRETION BY NKT CELLS REGULATES CD32 AND OVERCOMES MATERNAL ANTIBODY INHIBITION** G. Green, D. Kim, D. Huey, S. Niewiesk. Department of Veterinary Biosciences

IMID – 6 **EFFECTS OF INFLUENZA INFECTION ON MURINE ALVEOLAR TYPE II CELL FUNCTION** C. C. Hofer and I. C. Davis. Department of Veterinary Biosciences

IMID – 7 **HSP70-DEPENDENT ANTIVIRAL IMMUNITY AGAINST LYTIC NEURONAL INFECTION BY VESICULAR STOMATITIS VIRUS.** M. Y. Kim[1], Y. Ma[2], Y. Zhang[2], J. Li[2], M. Oglesbee[1]**.** [1]Department of Veterinary Biosciences [2]Department of Food Science and Technology, The Ohio State University, Columbus, Ohio 43210, USA

IMID – 8 **BACTERIAL PROTEIN ECH0825 INTERACTS WITH RAB5 AND BECLIN-1-CLASS III PHOSPHATIDYLINOSITOL 3-KINASE TO PROMOTE *EHRLICHIA* GROWTH** H. Liu, H. Niu, M. Lin, Q. Xiong, and Y. Rikihisa Depts of Veterinary Biosciences

IMID – 9 **DEVELOPMENT OF ISOLATION AND EVALUATION PROCEDURES OF PIG MYELOID CELLS FOR UNDERSTANDING HUMAN DISEASE IMMUNOPATHOGENESIS RESEARCH.** K. Melendez. H. Strange, T. Papenfuss, Z. VanGundy. Dept. Of Veterinary Biosciences

IMID – 10 **DNASE X, A GPI-ANCHORED NUCLEOTIDASE, IS A MAMMALIAN RECEPTOR FOR ENTRY FOR THE NOVEL *Ehrlichia chaffeensis* SURAFCE PROTEIN.** D. Mohan Kumar and Y. Rikihisa. Department of Veterinary Biosciences.

IMID – 11 **INTRA-ARTICULAR MESENCHYMAL STEM CELLS IN HORSES**
JH Pigott[1], A Ishihara[1], M Wellman[2], D Russell[2], AL Bertone[1]
From the Comparative Orthopedics Research Laboratory, Departments of Veterinary Clinical Sciences[1] and Veterinary Biosciences[2], College of Veterinary Medicine, The Ohio State University, Columbus, OH 43210.

IMID – 12 **GENERATION OF ACTIVATED REGULATORY MYELOID CELLS: DIFFERENTIAL EFFECTS OF RETINOIC ACID ON MYELOPOIESIS VERSUS DENDROPOIESIS.** Z. VanGundy, J. Baker, H Strange, A. White, T. Papenfuss

IMID – 13 **INFLUENZA'S EFFECT ON MURINE ALVEOLAR TYPE II RESPIRATORY EPITHELIAL PHENOTYPE.** P. Woods, C. Hofer, and I.C. Davis. Department of Veterinary Biosciences and The Ohio State College of Medicine.

Molecular and Cellular Biology

MCB – 1 **MOLECULAR CHARACTERIZATION OF METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* ISOLATES FROM HOSPITAL, HIV AND BOVINE IN NAIROBI KENYA.** B A Obanda : Visiting Scholar in Veterinary Preventive Medicine

MCB – 2 **THE ROLE OF TAX-1 AND THE ALTERNATIVE NF-KB PATHWAY IN HTLV TRANSFORMATION.** J.Al-Saleem and P. L. Green, Department of Veterinary Biosciences

MCB – 3 **RELATED HTLV-1 AND HTLV-2 ANTISENSE PROTEINS (HBZ, APH-2) HAVE DISTINCT EFFECTS ON CELLULAR SIGNALING PATHWAYS.** N. Dissinger and P.L. Green. Department of Veterinary Biosciences

MCB – 4 **ONCOSTATIN M INDUCED JUNB PROTECTS BREAST CANCER CELLS AGAINST CHEMOTHERAPY INDUCED APOPTOSIS.** M Hicks, Q Hu, J DeWille, Department of Veterinary Biosciences

MCB – 5 **DEVELOPMENT OF AN INDUCIBLE AND CELL-SPECIFIC TRANSGENIC MOUSE MODEL OF ENDOMETRIAL CANCER.** C. Koivisto[1], A. Perez-Castro[2], A. Clements[2], V. Bravo[2], K. LaPerle[1], G. Leone[3] [1] Department of Veterinary Biosciences, [2] Comprehensive Cancer Center, [3] Department of Molecular Virology, Immunology and Medical Genetics

MCB – 6 **CHARACTERIZATION OF SIALIC ACID CELL SURFACE RECEPTORS ON MDCK CELLS BY FLOW CYTOMETRIC ANALYSIS AND IMPLICATIONS FOR INFLUENZA A VIRUS RECOVERY.** S. Nelson, A. Bowman, C. Hofer, J. Nolting, I. Davis, R. Slemons. Departments of Veterinary Preventive Medicine and Veterinary Biosciences

MCB – 7 **GENE EXPRESSION PROFILES OF KNEE OSTEOARTHRITIS: A META-ANALYSIS.** E. Skinner and A. Bertone. Departments of Veterinary Clinical Sciences and Orthopedics

Structure/Function

SF – 1 **EFFECT OF DECREASED PROGESTERONE CONCENTRATIONS DURING FOLLICULAR DEVELOPMENT ON OOCYTE YIELD AND QUALITY.** F. M. Abreu, S. Kruse, L. H. Cruppe, R. S. Cipriano, M. L. Day, T. W. Geary, M. A. Coutinho da Silva, B. A. Hicks, D. S. Clark, G. A. Bridges; Depts. of Animal Sciences and Veterinary Clinical Sciences

SF – 2 **THE NOVEL ENERGY-RESTRICTION MIMETIC AGENT OSU-CG5 REDUCES PROSTATE CANCER SEVERITY IN A TRANSGENIC MOUSE MODEL OF PROSTATE CANCER.** LD Berman-Booty,[1,2] PC

Chu,[1] JM Thomas-Ahner,[3] D Wang,[1] T Yang,[1] SK Clinton,[3] SK Kulp,[1] CS Chen[1,4]. [1]Division of Medicinal Chemistry, College of Pharmacy, [2]Department of Veterinary Biosciences, College of Veterinary Medicine, [3]Division of Medical Oncology, Department of Internal Medicine, College of Medicine, The Ohio State University, Columbus, Ohio and [4]Institute of Basic Medical Sciences, National Cheng-Kung University, Tainan, Taiwan

SF – 3 **THE NUCLEAR LOCALIZATION SEQUENCE (NLS) AND C-TERMINUS OF PARATHYROID HORMONE-RELATED PROTEIN (PTHRP) REGULATES THE PROLIFERATION AND DIFFERENTIATION OF MESENCHYMAL STEM CELLS (MSC).** B.E. Hildreth III, K.M. Hernon, B.N. Marlow, J. Leong, M.J. Fial, P.N. Boyaka, T.J. Rosol, R.E. Toribio. Departments of Veterinary Biosciences and Veterinary Clinical Sciences

SF – 4 **QUANTITATIVE T2 MAPPING OF KNEE CARTILAGE AT 3 AND 7T IN AN EQUINE MODEL.** [1,2]M. I. Menendez, [2]D. J. Clark, [2]M. V. Knopp. [1]Veterinary Clinical Sciences, College of Veterinary Medicine, [2]The Wright Center of Innovation in Biomedical Imaging, The Ohio State University Wexner Medical Center, Columbus, Ohio, United States

SF – 5 **MICROCOMPUTED TOMOGRAPHY, MICRORADIOGRAPHY, AND HISTOLOGY TO ASSESS SUBCHONDRAL BONE CHANGES IN OSTEOCHONDRITIS DISSECANS LESIONS IN DOGS.** Pugliese, LC, DVM[1], Fitzpatrick, N MVB[2], Allen, MJ Vet MB PhD[1], Russell, D BVMS DACVP[3]. [1] Veterinary Clinical Sciences, College of Veterinary Medicine, The Ohio State University, 601 Vernon Tharp St Columbus OH 43210 [2]Fitzpatrick Referrals Halfway Lane, Eashing, Godalming, Surrey GU7 2QQ, United Kingdom. [3] Veterinary Biosciences, College of Veterinary Medicine, The Ohio State University, 601 Vernon Tharp St Columbus OH 43210

Clinical Research

CR – 1 **ASSOCIATION OF HYPERLACTATEMIA WITH ALDOSTERONE AND ARGININE VASOPRESSIN CONCENTRATIONS AND CLINICAL INDICATORS OF HYPOPERFUSION IN HOSPITALIZED FOALS** K.A. Dembek[1]; K. Onasch[1]; S.D. Hurcombe[1]; C.W. Kohn[1]; N.M. Slovis[2]; S. M. Reed[3]; R.E. Toribio[1]. [1]The Ohio State University, College of Veterinary Medicine; Columbus, OH, USA; [2]Hagyard Equine Medical Institute, Lexington, KY, USA; [3]Rood and Riddle Equine Hospital, Lexington, KY, USA.

CR – 2 **BIOMECHANICAL EFFECT OF AN INTERVERTEBRAL DISK SPACER AFTER SINGLE LEVEL FIXATION IN A CADAVERIC CANINE MODEL.** B. F. Hettlich, M. J. Allen, G. S. Glucksman, G. T. Fosgate, and A. S. Litsky.

Departments of Veterinary Clinical Sciences, College of Veterinary Medicine, Orthopaedics, College of Medicine, and Biomedical Engineering, College of Engineering, The Ohio State University, Columbus, OH and Production Animal Studies, University of Pretoria, South Africa.

CR – 3 **DISTRIBUTION AND PREDICTIVE FACTORS OF SEIZURE TYPES IN 104 HORSES.** V.A. Lacombe, M. Mayes, S. Mosseri, S.M. Reed, T.H. Ou. Department of Veterinary Clinical Sciences, College of Pharmacy, The Ohio State University; Rood & Riddle Equine Hospital; Center for Veterinary Health Sciences, Oklahoma State University; The University of Michigan Center for Global Health.

CR – 4 **EFFECT OF 4 ANALGESIA PROTOCOLS ON COMFORT AND SEDATION OF DOGS FOR 24 HOURS AFTER STIFLE SURGERY**. K. Lewis, R. Bednarski. Department of Veterinary Clinical Sciences

CR – 5 **MORPHOMETRIC MAGNETIC RESONANCE IMAGING FEATURES OF THE CERVICAL VERTEBRAL COLUMN OF GREAT DANES WITH AND WITHOUT CLINICAL SIGNS OF CERVICAL SPONDYLOMYELOPATHY.** P. Martin-Vaquero, R.C. da Costa. Dept. of Veterinary Clinical Sciences.

CR – 6 **EFFECTS OF VARIOUS ANTIOXIDANTS ON LENS EPITHELIAL CELLS IN VITRO AND EX VIVO** EJ Miller[1], AJ Gemensky-Metzler[1], DA Wilkie[1], CMH Colitz[2], HL Chandler[1]. Department of Veterinary Clinical Sciences[1], All Animal Eye Care and Animal HealthQuest Solutions, Jupiter, FL[2]

CR – 7 **RELATIVE POTENCY AND DURATION OF ANALGESIA FOLLOWING PALMAR DIGITAL INTRA-NEURAL ALCOHOL INJECTION FOR HEEL PAIN IN HORSES.** C. Schneider, A. Ishihara, T. Adams, L. Zekas, M. Oglesbee, A. Bertone. Depts. of Veterinary Clinical Sciences and Veterinary Biosciences

CR – 8 **VENTRAL ABDOMINAL PRESSURES IN HORSES WITH ACUTE COLIC PRESENTING TO A REFERRAL HOSPITAL.** V.H.L. Scott, M.C. Mudge, R.E. Toribio, S.D.A. Hurcombe. Department of Veterinary Clinical Sciences

Epidemiology and Applied Research

EAR – 1 **THE USE OF HEAVY METALS MICRONUTRIENTS IN SWINE FEED ITS ASSOCIATION WITH THE OCCURRENCE OF COPPER AND ZINC TOLERANT AND MULTIDRUG RESISTANT *SALMONELLA.*** J. Medardus[1], V. Artuso-Ponte[1], B. Z. Molla[1], M. Nicol[1], W.E. Morrow[2], P. Rajala-Schultz[1], W. A. Gebreyes[1]. [1]Department of Veterinary Preventive Medicine, The Ohio State University, Columbus, Ohio, [2]Department of Animal Science, College of Agriculture and Life Sciences, North Carolina State University, Raleigh, North Carolina.

EAR – 2 **USE OF WHITE LIGHT SCANNING TO GENERATE ANATOMICALLY ACCURATE THREE-DIMENSIONAL MODELS OF THE CANINE CERVICAL SPINE**. J. Bertran, M. Alizadeh, G. Knapik, W. S. Marras and M. J. Allen. Depts. of Veterinary Clinical Sciences and Integrated Systems Engineering

EAR – 3 **MOLECULAR CONFIRMATION OF ZOONOTIC INFLUENZA A VIRUS TRANSMISSION AT OHIO AGRICULTURAL EXHIBITIONS.** A. Bowman, S. Nelson, J. Nolting, R. Slemons. Department of Veterinary Preventive Medicine

EAR – 4 **OCCURRENCE OF METHICILLIN RESISTANT *STAPHYLOCOCCUS AUREUS* IN OHIO DAIRY FARMS.** L da Costa, P Rajala-Schultz, A Hoet, G Schuenemann. Department of Veterinary Preventive Medicine.

EAR – 5 **THE GENOTYPING POTENTIAL OF THE *MYCOPLASMA SYNOVIAE vlhA* GENE.** M. El-Gazzar, A. Wetzel and Z. Raviv. Department of Veterinary Preventive Medicine.

EAR – 6 **ENVIRONMENTAL SURVEILLANCE FOR EXTENDED SPECTRUM β-LACTAMASE RESISTANCE IN ESCHERICHIA COLI AT THE JACKSON PIKE WASTEWATER TREATMENT PLANT.** CA King, DF Mollenkopf, and TE Wittum, Veterinary Preventive Medicine, The Ohio State University.

EAR – 7 **EXTENEDED-SPECTRUM CEPHALOSPORIN RESISTENCE IN ENTERIC BACTERIA FROM THE CANINE GENERAL POPULATION FROM THE OSU VETERINARY MEDICAL CENTER.** D. Mathys, D. Mollenkopf , T. Wittum,. Dept. of Veterinary Preventive Medicine. The Ohio State University, College of Veterinary Medicine.

EAR – 8 **μPET/CT ASSESSMENT OF LUNG METASTASIS IN A MOUSE MODEL OF OSTEOSARCOMA.** A McMurray, M Allen, W Drost, B Chaffee, and K

La Perle. Depts. of Veterinary Biosciences and Veterinary Clinical Sciences

EAR – 9 ***SALMONELLA ENTERICA*** **PRODUCING CTX-M CEPHALOSPORINASE IN US LIVESTOCK POPULATIONS.** D. Mollenkopf[1], M. Erdman[2] and T. Wittum[1]. [1]Department of Veterinary Preventive Medicine, The Ohio State University College of Veterinary Medicine, Columbus, OH; [2]Diagnostic Bacteriology Laboratory, USDA-APHIS-VS-NVSL, Ames, IA.

EAR – 10 **CONNECTING INFECTION AND DEMOGRAPHY: A CAPTIVE BISON POPULATION AND *NEOSPORA CANINUM.*** K. Moreno-Torres[1], L. Pomeroy[1], B. Wolfe[1] and R. Garabed[1] [1]Veterinary Preventive Medicine

EAR – 11 **ANTIMICROBIAL RESISTANCE OF FECAL *Escherichia coli* FROM WHITE-TAILED DEER IN THE CLEVELAND METROPARK SYSTEM.** L. Muñoz-Vargas, D.F. Mollenkopf, P.M. Dennis, J.T. LeJeune and T.E. Wittum. Dept. of Veterinary Preventive Medicine, The Ohio State University College of Veterinary Medicine.

EAR – 12 **ACTIVE SURVEILLANCE FOR MRSA IN THE ENVIRONMENT AND CANINE PATIENTS OF A SMALL ANIMAL TEACHING HOSPITAL.** J. Van Balen[1], C. Kelly[2], R. C. Nava-Hoet[1], S. Bateman[1], A. Hillier[1], J. Dyce[1], T. E. Wittum[1], A. E. Hoet[1,2]. [1]College of Veterinary Medicine, [2]College of Public Health; The Ohio State University.

Educational and Core Resources

EDU – 1 **BIOSPECIMEN REPOSITORY (TISSUE BANK).** W.Kisseberth, C.A.London, and M.Wellman, H.Borghese. Departments of Veterinary Biosciences and Veterinary Clinical Sciences

EDU – 2 **RESEARCH PATHOLOGY SUPPORT FOR EXPERIMENTAL ANIMAL MODELS PROVIDED BY THE COMPARATIVE PATHOLOGY & MOUSE PHENOTYPING SHARED RESOURCE.** K. La Perle. Department of Veterinary Biosciences.

EDU – 3 **CLINICAL TRIALS OFFICE, ADVANCING THE HEALTH OF ANIMALS AND HUMANS.** N.Stingle, T.Mathie, A.Smith, A.Adrian, L.FeoBernabe, N.Ruffin, H.Borghese, C.A.London, and WC Kisseberth, Departments of Veterinary Biosciences and Veterinary Clinical Sciences

Veterinary Students

Clinical Research

VME – 1 **ANGIOGRAPHIC VERSUS ECHOCARDIOGRAPHIC MEASURES OF PULMONARY VALVE DIAMETER IN 40 DOGS WITH CONGENITAL PULMONARY VALVE STENOSIS.** A.T. Amburgy and B.A. Scansen, Department of Veterinary Clinical Sciences

VME – 2 **MONITORING THE INTRAOPERATIVE TEMPERATURE DURING SWINE SURGERY: AN ANALYSIS OF HEATING DEVICES**. M Bradley and D Coble. Veterinary Preventive Medicine and University Laboratory Animal Resources

VME – 3 **ECHOCARDIOGRAPHIC ASSESSMENT OF LEFT ATRIAL SIZE IN CANINE MITRAL REGURGITATION.** L. K. Drake, J. Bonagura, and L. Visser. Department of Veterinary Clinical Sciences; The Ohio State University College of Veterinary Medicine

VME – 4 **DETERMINATION OF REFERENCE ECHOCARDIOGRAPHIC PARAMETERS IN THE BENGAL CAT.** K.L. Ferguson and B.A. Scansen. Department of Veterinary Clinical Sciences

VME – 5 **THREE-DIMENSIONAL EVALUATION OF TIBIAL TRANSLATION AND ROTATION FOR THE NORMAL AND THE CRUCIATE DEFICIENT STIFLE PRE AND POST EXTRACAPSULAR STABILIZATION.** D. Gale, J. Au, B. Hettlich, M. Allen, T. Motta. Department of Veterinary Clinical Sciences

VME – 6 **EFFECT OF AN INTERVERTEBRAL DISK SPACER ON STIFFNESS AFTER MONOCORTICAL SCREW/POLYMETHYLMETHACRYLATE FIXATION IN A SIMULATED CANINE CERVICAL VERTEBRAL MODEL.** G. Glucksman, B. Hettlich, M.J. Allen, G. Fosgate, and A. Litsky. Departments of Veterinary Clinical Sciences, College of Veterinary Medicine, Orthopaedics, College of Medicine, and Biomedical Engineering, College of Engineering

VME – 7 **THE EFFECTS OF ENVIRONMENTAL ENRICHMENT ON THE BEHAVIOR OF SHELTER DOGS.** Herron, M.; Kirby-Madden, T.; Lord, L. Depts. of Veterinary Clinical Sciences and Veterinary Preventative Medicine

VME – 8 **EFFECTS OF IMPLANT MALPOSITIONING ON LOAD TRANSFER FOLLOWING TOTAL KNEE REPLACEMENT IN DOGS.** M. Martinez[1], J. Bertran[1], A. Adams[2*], R. Siston[2*], M. Allen[1]. Department of Veterinary Clinical Sciences; Department of Mechanical Engineering[*].

VME – 9 **DUAL NANOPOROUS ENCAPSULATION AND LOCAL DRUG DELIVERY FOR PANCREATIC ISLET CELL TRANSPLANTATION.** V. Nesser[1], H. He[2], L. J. Lee[2], F. Xu[1], C. Gilor[1], G. Hadley[3], A. Rajab[3], C. Adin[1]. [1]Department of Veterinary Clinical Sciences, Ohio State University. [2]Department of Chemical and Biomolecular Engineering, Ohio State University. [3]Department of Surgery, Ohio State University

VME – 10 **HAEMATOLOGICAL AND BIOCHEMICAL VALUES IN NORTH AMERICAN SCOTTISH DEERHOUNDS.** K.N. Sheerer[1], C. G. Couto[1-3], L.M. Marin[1], S. Zaldívar-Lopez[1-2], M. C. Iazbik[2], J. E. Dillberger[4], M. Frye[5], D.B. DeNicola[5]. The Ohio State University, College of Veterinary Medicine, Department of Veterinary Clinical Sciences[1] and Veterinary Medical Center[2]; The OSU Comprehensive Cancer Center[3] (Columbus, OH); J. Dillberger, LLC (Nashville, IN)[4]; and IDEXX Laboratories (Westbrook, ME)[5].

VME – 11 **ANTI-LUTEOGENIC EFFECTS OF PGF2 ALPHA ADMINISTRATION IN CYCLIC MARES.** H.K. Snyder,[1] E.A. Coffman,[1] C.A. Messerschmidt,[1] K. Cole,[2] C.R.F. Pinto[1]. 1Department of Veterinary Clinical Sciences, The Ohio State University, Columbus, OH 43210. 2Department of Animal Sciences, The Ohio State University, Columbus, OH 43210

VME – 12 **EFFECT OF DYSTOCIA ON DAILY ACTIVITY PATTERNS PRIOR TO PARTURITON IN HOLSTEIN DAIRY COWS.** M. Titler, M.G. Maquivar, S. Bas, E. Gordon, P.J. Rajala-Schultz, K. McCullough, and G.M. Schuenemann. Department of Veterinary Preventive Medicine, The Ohio State University, Columbus, OH, USA

VME – 13 **EFFICACY AND ADVERSE EFFECTS OF NITROFURANTOIN TREATMENT OF URINARY TRACT INFECTIONS IN DOGS AND CATS**. A. Weber, J.B. Daniels, B.M. Pressler. The Ohio State University, Columbus, OH.

VME – 14 **DARK-FIELD MICROSCOPY IN EQUINE LARGE COLON SURGICAL COLIC.** B. Welch, S.D. Hurcombe, J.M. Williams, D. Russell[*], E.S.

Cooper, M.C. Mudge. Department of Veterinary Clinical Sciences and Veterinary Biosciences*.

VME – 15 ASSESSMENT OF LEFT ATRIAL SIZE IN CATS WITH LEFT-SIDED CONGESTIVE HEART FAILURE. E Wetli, KE Schober, W Drost. Department of Veterinary Clinical Sciences

Epidemiology and Applied Research

VME – 16 UNDERSTANDING THE MOLECULAR EPIDEMIOLOGY OF *STAPHYLOCOCCUS AUREUS* IN DOG OWNING HOUSELHODS. K. Brunson[1], J. Van Balen[1], Emily Nutt[1], Anthony Dent[1],T. Landers[2], A. Hoet[1,3]. 1 Department of Preventive Medicine, College of Veterinary Medicine; 2 College of Nursing; 3 College of Public Health, The Ohio State University

VME – 17 ZOONOTIC PATHOGENS IN FRESH RETAIL CHICKEN BREASTS FROM SUPERMARKETS. EM Bryant, JK Cenera, CA King, DF Mollenkopf, and TE Wittum, Veterinary Preventive Medicine, The Ohio State University College of Veterinary Medicine.

VME – 18 ANTIMICROBIAL RESISTANCE IN FRESH RETAIL CHICKEN BREAST FROM SUPERMARKETS JK Cenera, EM Bryant, DF Mollenkopf, CA King, TE Wittum; Department of Veterinary Preventive Medicine, The Ohio State University, Columbus, OH

VME – 19 MOSQUITOES OF THULE AIR BASE, GREENLAND AND PRESENCE OF BARTONELLA AND RICKETTSIA SPP. IN CAT FLEAS AND DOGS TICKS COLLECTED FROM DOGS IN AMERICAN SAMOA M. Glowacki[1] W.K. Reeves[2]. [1]The Ohio State University, College of Veterinary Medicine, 1900 Coffey Rd., Columbus, OH 43210. [2]USAFSAM/PHR, 2540 5th Street, Wright-Patterson AFB, OH 45433. email: will.reeves@wpafb.af.mil

VME – 20 TICK INFESTATION AND DISEASE AT THE HUMAN- LIVESTOCK-WILDLIFE INTERFACE AT RIMPA ESTATES, RIFT VALLEY, KENYA. R. Lauer, W. Gebreyes, L. Capitini, P. Dennis, E. Kariuki, M. Olum, and W. Ogara. The Ohio State University College of Veterinary Medicine, Depts. of Veterinary Clinical Sciences and Veterinary Preventive Medicine, Kenya Wildlife Service, and University of Nairobi.

VME – 21 **TIME AND SPATIAL ANALYSIS OF THE NEW WORLD SCREWWORM (COCHLIOMYIA HOMINIVORAX) IN DARIEN AND COMARCA EMBERA, PANAMA (2001-2011).** M. Maxwell,[a] J. Subia,[b] J. Abrego, [c] E. Jones,[b] R. Garabed,[a] R.E. Toribio[a] [a]*College of Veterinary Medicine, The Ohio State University;* [b]*United States Department of Agriculture, USA;* [c]*COPEG, Ministry of Agriculture, Panama;*

VME – 22 **DAIRY COW BEHAVIOR AS A METHOD OF EARLY MASTITIS DETECTION.** K. E. McCullough, P. J. Rajala-Schultz, G. M. Schuenemann, M. L. Titler, P. N. Gott. Department of Veterinary Preventative Medicine

VME-23 **INVESTIGATION OF EPIDEMIOLOGIC AND NUTRITIONAL FACTORS ASSOCIATED WITH A GLOBAL EPIZOOTIC OF TRANSITIONAL CELL CARCINOMA IN FISHING CATS (*PRIONAILURUS VIVERRINUS*).** E. Marshall*[1], W. Swanson DVM, PhD[2], R. Kelley MS[3], J. Kennedy[3], K. Terio DVM, PhD, Dipl ACVP[4], R. Garabed VMD, MPVM, PhD [1] and T. Buffington DVM, MS, PhD, Dipl ACVN[1]
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VME – 24 **SEROPREVALENCE OF *TOXOPLASMA GONDII* IN FREE-RANGE CHICKENS FROM ADDIS ABABA, ETHIOPIA.** Tilahun G[1], Tiao N[2], Ferreira L[3], Choudhary S[3], Oliveira S[3], Verma S[3], Kwok O[3], Molla B[2], Saville W[2], Medhin G[1], Kassa T[1], Aleme H[1], Gebreyes W[2], Su C[4], Dubey JP[3] [1]Akililu Lema Institute of Pathobiology, Addis Ababa University, Addis Ababa, Ethiopia. [2]Department of Veterinary Preventive Medicine, College of Veterinary Medicine, The Ohio State University, Columbus, Ohio 43210-1092
[3]US Department of Agriculture, Agricultural Research Service, Beltsville Agricultural Research Center, Animal Parasitic Diseases Laboratory, Building 1001, Beltsville, Maryland 20705-2350. [4]Department of Microbiology, The University of Tennessee, Knoxville, Tennessee 37996-0845

VME – 25 **BIOCIDE INTERVENTION IN SWINE PRODUCTION AND ASSOCIATION WITH MDR SALMONELLA.** J. Medardus, G.VanHoy, B. Molla, W. Gebreyes. Dpt. Of Veterinary Preventative Medicine

VME – 26 **EFFECT OF HABITAT BURNING ON TSETSE FLY POPULATIONS, LOGONE FLOOD PLAIN, CAMEROON.** L. Wagner, R. Garabed. Department of Veterinary Preventative Medicine

VME – 27 **GENOTYPIC DIVERSITY OF CAMPYLOBATER COLI IN SWINE HERDS FROMTHE MIDWEST, UNITED STATES IN COMPARISON TO THOSE ISOLATES FOUND ACROSS THE EUROPEAN UNION**
Christine Widmann[1], Greta Gölz[2], Katharina Bratz[2], Prapas Patchanee[3], Thomas Alter[2], Wondwossen Gebreyes[1]
[1]Ohio State University, College of Veterinary Medicine; [2]Institute of Food Hygiene, Freie Universitat Berlin, Germany; [3]Veterinary Public Health Center for Asia Pacific (VPHCAP), Faculty of Veterinary Medicine, Chiang Mai University, Thailand

Basic Research

VME – 28 **COMPARISON OF RECOMBINANT EHRLICHIAL ANTIGEN IN THE SERODIAGNOSIS OF CANINE MONOCYTIC EHRLICHIOSIS.** M Brink, D Nair, TH Lai, and Y Rikihisa, From the Department of Veterinary Biosciences, Ohio State University, Columbus, OH, Research supported by Merial and NIH T35 OD010429 and NIH R01 AI047885

VME – 29 ***IN VITRO* PRODUCTION AND CHARACTERIZATION OF CANINE MYELOID DERIVED SUPPRESSOR CELLS.** P. Gillen, J. Wasserman, M. Sherger, H. Strange, Z. VanGundy, T. Papenfuss. Department of Veterinary Biosciences, Ohio State University, Columbus, OH. Research Supported by NIH T35 RR017491.

VME – 30 **THE EFFECT OF SAMHD1 ON MURINE LEUKEMIA VIRUS INFECTION IN MOUSE NIH3T3 CELLS.** K. Scherer, F. Wang, C. St. Gelais and L. Wu. Dept. of Veterinary Biosciences

VME – 31 **EFFECTS OF STRESS ON NEOSPORA CANINUM ANTIBODY TITERS IN BISON (*BISON BISON*).** Margaret Shoemaker[1], Marco A Coutinho da Silva[1], Barbara A Wolfe[2] [1]The Ohio State University, College of Veterinary Medicine, Columbus, OH. [2]Columbus Zoo and The Wilds, Columbus, OH

VME – 32 **IDENTIFICATION OF VIRULENCE FACTORS, PVL AND TSST, IN METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS (MRSA) ISOLATED FROM CANINES, EQUINES, AND THE ENVIRONMENT AT**

THE OSU VETERINARY MEDICAL CENTER M. A. Tima, J. Van Balen, A. E. Hoet Depts. of Veterinary Preventative Medicine

VME – 33 **RADIOSENSITIZATION EFFECTS OF CURCUMIN AND CALCITRIOL ON CANINE TRANSITIONAL CELL CARCINOMA *IN VITRO*.** R. Gaffke, N. Inpanbutr, and E. Green. Departments of Veterinary Biosciences and Veterinary Clinical Sciences.

VME – 34 **INSULIN-LIKE GROWTH FACTOR-1 RECEPTOR SIGNALING IN AN EXPERIMENTAL MODEL OF EQUINE METABOLIC SYNDROME-ASSOICATED LAMINITIS.** H. Lane[1], R. Geor[2], T. Burns[1], M. Watts[1], L. McCutcheon[2], J. Belknap[1]. 1. Ohio State University College of Veterinary Medicine, Columbus, OH. 2. Michigan State University College of Veterinary Medicine, East Lansing, MI.

VME – 35 **CHARACTERIZATION OF THE PERFORMANCE OF A FILTRATION-BASED EQUINE BONE MARROW STEM CELL HARVEST SYSTEM FOR THE CONCENTRATION, VIABILITY, AND RECOVERY OF STEM CELLS.** L. Mundy*, A. Ishihara*, M. Wellman+, A. Bertone*. Comparative Orthopedics Research Laboratory, Department of Veterinary Clinical Sciences* and Veterinary Biosciences+

VME – 36 **HEAT SHOCK PROTEIN EXPRESSION IN CANINE CORNEAL WOUND HEALING** C.W. Peterson 1, R.T. Carter 2, E. Bentley 3, C.J. Murphy 4, and H.L. Chandler 1. 1 The Ohio State University; 2 Louisiana State University; 3 Department of Surgical Sciences, University of Wisconsin-Madison; 4 University of California, Davis.

VME – 37 **IS APOPTOSIS PRESENT IN THE SPINAL CORD OF DOGS WITH CERVICAL SPONDYLOMYELOPATHY?** J Armstrong[1], RC da Costa[1], D Russell[1], P Popovich[2], D McTigue[2] [1]Department of Veterinary Clinical Sciences and Biosciences, College of Veterinary Medicine, and [2]Dpt. of Neurosciences, College of Medicine, The Ohio State University, Columbus, OH.

VME – 38 **URINARY HORMONE CONCENTRATIONS AND PHARMACOKINETICS/PHARMACODYNAMICS OF HALOPERIDOL IN A FEMALE INDIAN RHINOCEROS (*RHINOCEROS UNICORNIS).*** A. Benco[1,2], M. Campbell[1], M. Barthel[1], C. Pinto[2], K. MacKinnon[1] & M. Stoops[1]

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VME – 39 **ADVANCED GLYCATION END PRODUCT CROSS-LINK BREAKER ATTENUATES DIABETES-INDUCED CARDIAC DYSFUNCTION BY IMPROVING SARCOPLASMIC RETICULUM CALCIUM HANDLING.**

A.L. Kranstuber[1,2], C. del Rio[5], B.J. Biesiadecki[3,4], R.L. Hamlin[1,3], J. Ottobre[2], S. Gyorke[3,4] and V.A. Lacombe[1,6]

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IMID - 1

INFLUENZA-INDUCED CARDIOPULMONARY DYSFUNCTION AND LUNG INJURY ARE ATTENUATED IN MICE HETERZYGOUS FOR THE F508del MUTATION IN THE CYSTIC FIBROSIS TRANSMEMBRANE CONDUCTANCE REGULATOR ANION CHANNEL. F. Aeffner[a], L.M. Joseph[a], A.A. Gaughan[a], B. Abdulrahman[b], J.M. Hickman-Davis[c], P. Janssen[d], D. Hayes[e], A. Amer[b], D.M. Bedwell[f], E.J. Sorscher[g], I.C. Davis[a].
Departments of [a]Veterinary Biosciences, [b]Pulmonary and Critical Care Medicine, [c]Veterinary Preventive Medicine, and [d]Physiology and Cell Biology, The Ohio State University, Columbus, OH, USA; [e]Nationwide Children's Hospital, Columbus, OH, USA; Departments of [f]Microbiology and [g]Medicine, University of Alabama at Birmingham, Birmingham, AL, USA

Influenza A viruses cause a highly-contagious respiratory disease associated with significant annual morbidity and mortality. We have shown that H1N1 influenza A virus stimulates respiratory epithelial Cl^- secretion via the cystic fibrosis transmembrane conductance regulator (CFTR) anion channel in mice. The purpose of this study was utilize F508del CFTR-heterozygous mice to determine the contribution of CFTR-mediated Cl^- secretion to influenza pathogenesis, as well as the potential of CFTR as a therapeutic target.
F508del CFTR-heterozygous progeny (HETs) and wild-type (WT) littermate controls were generated by breeding B6.129S7-Cftr^{tm1Kth} heterozygote mice. Adult mice were mock-infected intranasally with 50 µl virus diluent or infected with 10,000 FFU/mouse influenza A/WSN/33 (H1N1) for 1-6 days. Body weight, carotid arterial O_2 saturation and heart rate were monitored daily. Pulmonary edema was evaluated by lung wet:dry weight ratio. Lung function parameters were measured by the forced-oscillation technique (flexiVent). Levels of inflammatory mediators in bronchoalveolar lavage fluid (BALF) were determined by ELISA. Alveolar macrophages were depleted by intranasal administration of clodronate liposomes 1 day prior to and every 2 days following infection.
Relative to WT littermate controls, infection-induced hypoxemia and bradycardia were attenuated in HETs at 2-6 days post-infection (d.p.i.), although weight loss and viral replication did not differ between the two strains. At 2 and 6 d.p.i., pulmonary edema and bronchoalveolar epithelial injury were reduced in HETs. Likewise, alterations in lung function in infected WT mice were absent in HETs at both 2 and 6 d.p.i. BALF from influenza-infected HETs contained approximately 3-fold greater numbers of alveolar macrophages and more than 10-fold higher IL-6 levels at 6 d.p.i. Alveolar macrophage depletionaccelerated mortality, attenuated the IL-6 response, and increased cardiopulmonary dysfunction to WT levels in HETs.
Reduced CFTR expression resulting from F508del CFTR heterozygosity significantly alters influenza pathogenesis. CFTR-mediated Cl^- secretion is therefore a potential therapeutic target.

Keywords: CFTR, cystic fibrosis, influenza A, H1N1, acute lung injury

IMID - 2

NANOPARTICLE-BASED ADJUVANTED INACTIVATED PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS VACCINE ELICITS CROSS-PROTECTIVE IMMUNITY IN PIGS. B Binjawadagi[*], V Dwivedi[*], C Manickam[*], K Ouyang[*], Y Wu[$], M Murtaugh [#], J Torrelles[†], J Lee[$], and R Gourapura[*] [*]Food Animal Health Research Program (FAHRP), OARDC, Department of Veterinary Preventive Medicine, The Ohio State University, Wooster, OH 44691, USA; [$] Nanotech West Lab., The Ohio State University, Columbus; [#]Veterinary and Biomedical Sciences, University of Minnesota, St. Paul, MN 55108, USA; [†]Department of Microbial Infection and Immunity, The Ohio State University, Columbus, OH 43210, USA.

Porcine reproductive and respiratory syndrome (PRRS) is an economically devastating viral disease of pigs, caused by PRRS virus (PRRSV) responsible for greater than $ 3 million loss daily to the US pork industry. Routinely used modified live PRRSV vaccine provides incomplete protection from emergent PRRSV variants. Because of its safety advantages, in our previous study we attempted strengthening inactivated vaccine by entrapping in PLGA nanoparticles based delivery system (NP-KAg) and the results were encouraging. To further reinforce, in this study we coupled the NP-KAg (using MLV vaccine strain, VR2332) vaccine with entrapped/unentrapped potent adjuvant, *Mycobacterium tuberculosis* whole cell lysate (*M. tb* WCL), that we identified earlier. We tested various vaccine adjuvant formulations with a virulent heterologous PRRSV (MN 184) challenge in pigs. Our results indicated that NP-KAg vaccine with unentrapped adjuvant combination elicited superior cross-protective immunity, with the following immune correlates: (i) increased levels of PRRSV specific IgG and IgA titers with enhanced antibody avidity; (ii) balanced Th1 and Th2 responses; (iii) enhanced VN antibody titers; (iv) increased Th1 and suppressed immunosuppressive cytokines response ; (v) increased population of activated and IFN-γ producing $CD4^+$, $CD8^+$, $CD4^+CD8^+$ T cells, $\gamma\delta^+$ T cells, and NK cells, and the frequency of APCs. These immune correlates were supported strongly with complete clearance of the replicating challenged virus from the lungs and blood of pigs. In conclusion, our study has demonstrated that adjuvanted PLGA nanoparticle delivered vaccine elicited superior cross-protective immunity in pigs against challenged heterologous PRRSV. This project was supported by National Pork Board, USDA PRRSV CAP2, and OARDC OSU to RJG.

Keywords: PLGA nanoparticles, inactivated vaccine, and *M. tb* WCL adjuvant

IMID - 3

REGULATION OF ALLERGEN-SPECIFIC IgA AND IL-17 RESPONSES BY INTESTINAL EPITHELIAL CELLS IKKβ RESHAPES ALLERGIC INFLAMMATION AT DISTANT SITES. A. Bonnegarde-Bernard, J. Jee, M. Fial, F. Aeffner, E. Cormet-Boyaka, I. Davis, M. Lin, M. Karin and P. Boyaka. Depts of Veterinary Biosciences, The Ohio State University, Columbus, OH, USA and Depts of Pharmacology, University of California, San Diego, La Jolla, CA, USA

Regulation of allergic responses by intestinal epithelial cells remains poorly understood. Using a model of oral allergen sensitization in the presence of cholera toxin as adjuvant and mice with cell-specific deletion of IKKβ in intestinal epithelial cells IECs ($IKK\beta^{\Delta IEC}$), we addressed the contribution of IECs to allergic sensitization to ingested antigens and allergic manifestations at distant mucosal sites and the skin. Cholera toxin induced higher proinflammatory responses and altered the profile of the gut microbiota in $IKK\beta^{\Delta IEC}$ mice. Antigen-specific IgE responses were unaltered in $IKK\beta^{\Delta IEC}$ mice, but Th1 responses and associated IgG2a Abs were enhanced. Interestingly, allergen-specific Th17 and IgA Ab responses were enhanced in $IKK\beta^{\Delta IEC}$ mice. Upon nasal antigen challenge, these mice developed lower levels of allergic lung inflammation, which correlated with higher levels of IgA Abs in the airways. However, $IKK\beta^{\Delta IEC}$ mice recruited a higher number of gut-sensitized T cells in the airways after nasal antigen challenge and developed airway hyper-responsiveness, which were suppressed by treatment with anti-IL-17A. Orally sensitized $IKK\beta^{\Delta IEC}$ mice were also protected against allergic inflammation in response to epicutaeous challenge. Ongoing studies are investigating the relative contribution of IgA and T helper cell subsets to the protection achieved in the skin.

Keywords: microbiota, allergy, skin, airways

IMID – 4

EVIDENCE FOR THE CIRCULATION AND INTER-HEMISPHERIC MOVEMENT OF THE H14 SUBTYPE INFLUENZA A VIRUS. A. Fries, J.M. Nolting, A. Danner, R.G. Webster, A.S. Bowman, S. Krauss and R.D. Slemons. Department of Veterinary Preventive Medicine.

Six H14 influenza A virus (IAV) isolates recovered in 2010 during routine virus surveillance along the Mississippi Migratory Bird Flyway in North America raised questions about the natural history of these rare viruses. These were the first H14 IAV isolates recovered in the Western Hemisphere and the only H14 IAV isolates recovered since the original four isolates in 1982 in Asia. Full length genomic sequencing of the 2010 H14 isolates demonstrated the hemagglutinin (HA) gene from the 1982 and five of the 2010 H14 isolates showed 89.6% nucleotide and 95.6% amino acid similarity and phylogenetic analysis of these viruses placed them with strong support within the H14 subtype lineage. A sixth 2010 H14 isolate showed 14 amino acid changes with the other five 2010 H14 isolates indicating a separate H14 subtype lineage circulating in North American waterfowl. The level of genomic divergence observed between the 1982 and 2010 viruses provides evidence that the H14 HA segment was circulating undetected in hosts. The evolutionary relationship observed between 1982 H14 and the closely related H4 subtype HA segments were similar to contemporary comparisons suggesting limited adaptive divergence between these sister subtypes. The nonstructural (NS) segments of two 2010 isolates were placed in a NS clade isolated infrequently over the last several decades that includes the NS segment from a previously reported 1982 H14 isolate indicating the existence of an unidentified pool of genomic diversity. An additional neuraminidase reassortment event indicated a recent inter-hemispheric gene flow from Asia into the center of North America. These results demonstrated temporal and spatial gaps in the understanding of IAV natural history. Additionally, the reassortment history of these viruses raises concern for the inter-continental spread of IAVs and the efficacy of current IAV surveillance efforts in detecting genomic diversity of viruses circulating in wild birds.

Keywords: Influenza A virus, Surveillance, Ecology, Wild birds, Phylogenetics, H14 Subtype

IMID - 5

IL-4 SECRETION BY NKT CELLS REGULATES CD32 AND OVERCOMES MATERNAL ANTIBODY INHIBITION G. Green, D. Kim, D. Huey, S. Niewiesk. Department of Veterinary Biosciences

Inhibition of seroconversion after vaccination by maternal antibodies is a problem widely observed in human and veterinary medicine. Generally, the development of neutralizing antibodies is inhibited, whereas the T cell response is not affected. We seek to define an effective immunization strategy for vaccination in the presence of maternal antibodies. It has been demonstrated that maternal antibodies inhibit B cell responses through cross-linking of the B cell receptor with CD32 (FcγRIIB). Theoretically, a downregulation of CD32 should alleviate B cell inhibition. In vitro, cotton rat B cells express CD32 following stimulation with LPS. Incubation with interleukin 4 (IL-4) leads to a reduction of CD32 molecules. In order to induce IL-4 in vivo, we used the glycolipids α-galactosylceramide (α-gal-cer) and OCH. α-gal-cer stimulates IL-4 and IFN-γ secretion by NKT cells whereas OCH selectively induces IL-4. Cotton rat spleen cells stimulated with α-gal-cer for 20 hours produced similar levels of IL-4 and IFN-γ whereas OCH produced IL-4 only. Using the cotton rat model of MV infection, we have been able to demonstrate that when immunizing against MV in the presence of passively transferred human IgG (maternal antibody) the B cell response is inhibited and vaccination is unsuccessful. However, following intranasal co-immunization of MV and α-gal-cer in the presence of inhibitory antibody, a low but detectable serum titer of neutralizing antibodies was induced which led to reduction of viral titers after challenge in comparison to MV immunization alone. Co-immunization experiments with MV and OCH still need to be performed. So far, our results indicate that immunization with MV plus α-gal-cer induces neutralizing antibody production in the presence of maternal antibody and provides protection against measles virus infection.

Keywords: maternal antibody, vaccination, measles virus

IMID - 6

EFFECTS OF INFLUENZA INFECTION ON MURINE ALVEOLAR TYPE II CELL FUNCTION C. C. Hofer and I. C. Davis. Department of Veterinary Biosciences

Surfactant protein C (SP-C) is a key component of pulmonary surfactant that is produced exclusively by alveolar type II (ATII) pneumocytes. ATII cells are small cuboidal epithelial cells that comprise approximately 15% of the total cells but only 5% of the surface area within the alveolus. The much larger and flatter alveolar type I (ATI) pneumocytes cover approximately 95% of the surface area of the lung and are the primary site of gas exchange. Following lung injury, ATII cells can produce inflammatory mediators and will also differentiate into ATI cells to repair the damaged epithelium. ATII cell differentiation results in a reduction in surfactant lipid and protein production. We hypothesized that, as a known cause of severe lung injury, influenza A virus infection will significantly alter ATII cell function. We therefore infected transgenic mice that express a GFP transgene under the control of the ATII cell-specific surfactant protein C promoter with influenza A/WSN/33 (a mouse-adapted H1N1 strain) for 2-6 days. ATII cells were then isolated from lung digests and analyzed by flow cytometry. We found that influenza infection resulted in a progressive decline in SP-C-positive cells from a mean of 50% in uninfected mice to 24% at day 6. These findings were confirmed by whole-lung imaging using an In Vivo Imaging System (IVIS). Furthermore, ATII cell expression of GROα/KC and TGF-β1, but not IFN-γ or IL-6 was increased in influenza-infected mice. The flow cytometric analysis techniques which we have developed will increase our ability to determine specific effects of influenza infection on ATII cell function and the role of these cells in the post-infection inflammatory cascade and recovery from lung injury. They will also allow us to generate highly-purified ATII cell preparations by cell sorting, which can be used for analysis of influenza effects on ATII cell gene expression.

Keywords: influenza, surfactant, pneumocyte, lung injury

IMID - 7

HSP70-DEPENDENT ANTIVIRAL IMMUNITY AGAINST LYTIC NEURONAL INFECTION BY VESICULAR STOMATITIS VIRUS. M. Y. Kim[1], Y. Ma[2], Y. Zhang[2], J. Li[2], M. Oglesbee[1]. [1]Department of Veterinary Biosciences [2]Department of Food Science and Technology, The Ohio State University, Columbus, Ohio 43210, USA

The major inducible 70 kDa heat shock protein (hsp70) protects against measles virus (MeV) neurovirulence in the mouse that is caused by a cell-associated non-cytolytic neuronal infection. Protection is type I interferon (IFN) dependent, and we have established a novel axis of antiviral immunity in which hsp70 is released from virus-infected neurons to induce IFN-β in macrophages. The present work used vesicular stomatitis virus (VSV) to determine if the relevance of hsp70-dependent antiviral immunity extends to fulminant lytic neuronal infections. *In vitro*, VSV replication was enhanced by hsp70 constitutively expressed in mouse neuronal cells and infection induced an early extracellular release of hsp70 from viable cells, similar to MeV. However, VSV-induced release was also progressive, increasing with virus-induced cell death. The impact of this VSV-hsp70 interaction on neurovirulence was established in weanling male hsp70 transgenic and non-transgenic C57BL/6 mice. Constitutive expression of hsp70 in neurons of transgenic mice enhanced viral clearance from brain and reduced mortality in a type I IFN-dependent manner. Non-transgenic mice were also protected against neurovirulence in a type I dependent manner when hsp70 was expressed by a recombinant VSV (VSV-hsp70), indicating that hsp70 expressed in the virus infected cell is sufficient for host protection. *In vitro* data confirmed extracellular release of hsp70 from cells infected with VSV-hsp70, and also showed that viral replication is not enhanced when hsp70 is expressed in this manner, suggesting that hsp70-mediated protection *in vivo* is not dependent on stimulatory effects of hsp70 on virus gene expression.

Keywords: hsp70, innate immunity, VSV

IMID - 8

BACTERIAL PROTEIN ECH0825 INTERACTS WITH RAB5 AND BECLIN-1-CLASS III PHOSPHATIDYLINOSITOL 3-KINASE TO PROMOTE *EHRLICHIA* GROWTH H. Liu, H. Niu, M. Lin, Q. Xiong, and Y. Rikihisa Depts of Veterinary Biosciences

Ehrlichia chaffeensis, the agent of human monocytic ehrlichiosis, is an obligatory intracellular bacterium that replicates in the membrane-bound compartment (inclusion) in monocytes/macrophages. *Ehrlichia* inclusion resembles the early endosome devoid of lysosomal markers; However, it is unknown how the replicative inclusion is formed and how *Ehrlichia* acquires nutrients for growth in the inclusion. We previously found ECH0825 is the type IV secretion effector required for *E. chaffeensis* infection. Here we found *Ehrlichia* infection was significantly enhanced in host cells overexpressing ECH0825-GFP as compared with cells expressing GFP alone. Both native and ectopically expressed ECH0825 was found on *Ehrlichia* inclusions. GFP-Rab5A, Rab5B, and Rab5C targeted *Ehrlichia* inclusions. Affinity pull-down assays showed that recombinant ECH0825 interacts with native Rab5 and reciprocally, GST-Rab5A interacts with native ECH0825. The interaction was also observed in cells co-expressing GFP-Rab5A and ECH0825-GFP. Thus, ECH0825 alone is sufficient to interact with Rab5 in the absence of other *Ehrlichia* proteins. A Rab5 effector, Vps34 directly binds Beclin 1 in a Class III phosphatidylinositol 3-kinase (PI3KC3) complex, which regulates the formation of autophagosome precursors. Affinity pull-down of recombinant ECH0825 showed native Beclin 1 and Vps34 along with native Rab5 in the complex. *Ehrlichia* growth, but not binding or entry was inhibited by a PI3KC3 inhibitor, 3-methyl adenine, which was partially reversed with supplementation of essential amino acids. Furthermore, *Ehrlichia* growth was enhanced by rapamycin treatment, indicating involvement of autophay in *Ehrlichia* nutrient acquisition. The macropinocytosis marker GFP-Rabankyrin-5, which binds to PI3P and is an effector of Rab5, was localized to *Ehrlichia* inclusions. These data suggest ECH0825 recruits early endosome-autophagosome precursor complex to promote *Ehrlichia* growth.

Keywords: *Ehrlichia chaffeensis*; Type IV secretion effector ECH0825; Endosome-autophagosome

IMID - 9

DEVELOPMENT OF ISOLATION AND EVALUATION PROCEDURES OF PIG MYELOID CELLS FOR UNDERSTANDING HUMAN DISEASE IMMUNOPATHOGENESIS RESEARCH K. Melendez. H. Strange, T. Papenfuss, Z. VanGundy. Dept. Of Veterinary Biosciences

Pigs are susceptible to various pathogens as humans and can bridge a gap between mouse and human model systems. In particular, given the physiological and immunological similarities between pigs and humans, the use of pigs as a model for gastrointestinal pathogens with no *in vivo* or *in vitro* model for human infections can be particularly useful. Myeloid cells are a population of immune cells important in defense against pathogens, control of inflammation and maintenance of homeostasis. Myeloid cells consist of macrophages, dendritic cells, monocytes and their precursors. Monocytes are a circulating myeloid cell derived from the bone marrow that in inflammatory conditions give rise to tissue macrophages and DCs. The gastrointestinal tract is a primary site of pathogen entrance and the mechanisms controlling immune responses at this mucosal site are critical for protection against infection. Given that monocytes directly contribute to intestinal myeloid cells (DCs and macrophages), we were interested in isolating, identifying and characterizing pig myeloid cell populations from the blood and tissue (systemic and mucosal). In these studies, we are developing methods to evaluate myeloid cells from blood and tissue monocytes and differentiated bone marrow dendritic cells and macrophages. Phenotypic markers in pig myeloid cells that are potentially useful for applications in modeling human disease include CD14, CD16, CD172a(SWC3), CD80/86 and MHCII. Using a combination of density (ficoll-paque) gradients for blood, tissue digestion for lamina propria and extracting bone marrow to identify these phenotypic markers using flow cytometry, we can determine the ratios of our cells of interest for each tissue. Future isolation and identification of macrophage and dendritic cell surface markers in the blood and tissue of pigs and comparison to human myeloid cell populations will give a better understanding to pathogenesis and immune pathways.

Keywords: Pig research model, Mucosal immunology, Myeloid cells

IMID - 10

DNASE X, A GPI-ANCHORED NUCLEOTIDASE, IS A MAMMALIAN RECEPTOR FOR ENTRY FOR THE NOVEL *Ehrlichia chaffeensis* SURAFCE PROTEIN. D. Mohan Kumar and Y. Rikihisa. Department of Veterinary Biosciences.

Ehrlichia chaffeensis that causes an emerging infectious disease, human monocytic ehrlichiosis, is a small obligatory intracellular bacterium of limited metabolic capacity. In order to survive, it is essential for *E. chaffeensis* to enter eukaryotic host cells that support its growth. *E. chaffeensis* binds, enters, and replicates in mono-nuclear phagocytes as monocytes/macrophages as well as several non-phagocytic cells. *E. chaffeensis* ligand and the cognitive host cell surface receptor that mediates bacterial entry are, however, unknown. Here, we report that the antibody against the C-terminal fragment of outer surface protein ECH1038 (ECH1038C) significantly inhibited *E. chaffeensis* binding, entry, and infection in both phagocytes and non-phagocytes. ECH1038C-coated polystyrene beads bound and entered non-phagocytic and phagocytic host cells, and the entry was blocked by chemical inhibitors that are known to block *E. chaffeensis* entry. Furthermore, we found ECH1038C directly bound DNase X, a glycosylphosphatidyl inositol–anchored mammalian cell-surface protein, by yeast two-hybrid screening, which was confirmed by far-Western blotting, affinity pull-down, immunofluorescence and co-immunoprecipitation. Antibody against DNase X or reduction of DNase X by small interfering RNA diminished *E. chaffeensis* binding, entry, and infection of both phagocytes and non-phagocytes. *E. chaffeensis* binding and infection of bone marrow-derived macrophages (BMDMs) from DNase $X^{-/-}$ mice were significantly less than those from wild-type mice, and DNase $X^{-/-}$ mice were less susceptible to *E. chaffeensis* infection than wild-type mice. ECH1038-coated beads entered BMDMs from wild-type mice, but not those from DNase $X^{-/-}$ mice. Taken together, these results demonstrate that ECH1038 is the ligand for the host cell entry of *E. chaffeensis* with DNase X as its cognate mammalian receptor.

Keywords: *Ehrlichia chaffeensis*, Human Monocytic Ehrlichiosis, ECH1038, DNase X, Ligand, Receptor, Receptor-mediated endocytosis, GPI-anchored protein.

IMID - 11

INTRA-ARTICULAR MESENCHYMAL STEM CELLS IN HORSES

JH Pigott[1], A Ishihara[1], M Wellman[2], D Russell[2], AL Bertone[1] From the Comparative Orthopedics Research Laboratory, Departments of Veterinary Clinical Sciences[1] and Veterinary Biosciences[2], College of Veterinary Medicine, The Ohio State University, Columbus, OH 43210.

Objective—To characterize the inflammatory and immune response to intra-articular injection of autologous, genetically modified (bone morphogenetic protein 2) autologous, allogeneic, and xenogeneic bone marrow-derived mesenchymal stem cells (MSC) in horses.

Animals—Six 5-year-old Thoroughbred mares.

Procedures—The 4 fetlock joints were each injected on day 0 with 1 of 4 MSC groups with 15 million MSC and were assessed for 1 month for inflammatory parameters including synovitis, joint swelling and pain. Arthroscopic examination was performed and synovial biopsies were taken at day 60 for histologic and molecular analyses. On day 120, peripheral blood mononuclear cells were isolated from each horse and co-cultured with monolayers of each MSC group for analysis of CD4 positive cells via flow cytometry and cytokines via ELISA.

Results—There was no significant difference between autologous and genetically modified autologous MSC for the inflammatory parameters examined. Xenogeneic and allogeneic MSC produced greater peak of inflammation than either autologous MSC group. Synovial histology demonstrated significantly increased cellularity, lymphocyte perivascular cuffing and bone morphogenetic protein 2 antibody uptake for MSC injected joints compared to normal controls. Adaptive immunity was demonstrated upon re-exposure of peripheral blood mononuclear cells to xenogeneic MSC in co-culture.

Conclusions and Clinical Relevance—Intra-articular MSC resulted in a marked acute inflammatory response that was significantly increased for allogeneic and xenogeneic MSC. This difference was small and clinically, appeared insignificant. Immunohistochemical analysis demonstrated a persistent mononuclear synovitis for at least 60 days, the significance of which is unknown. An adaptive immune response was detected for xenogeneic but not for allogeneic MSC suggesting that a second injection of xenogeneic cells would result in a more robust immune response.

Keywords: Stem cell, autologous, allogeneic, horse, joint

IMID - 12

GENERATION OF ACTIVATED REGULATORY MYELOID CELLS: DIFFERENTIAL EFFECTS OF RETINOIC ACID ON MYELOPOIESIS VERSUS DENDROPOIESIS

Z. VanGundy, J. Baker, H Strange, A. White, T. Papenfuss

Myeloid cells (MCs) play important roles in the modulation of the immune system. Regulatory MCs (regMCs) modify the innate and adaptive immune responses through multiple mechanisms. The factors which contribute to the development of regMCs remain poorly understood. Retinoic acid, a metabolite of vitamin A, is a steroid hormone that contributes to immunoregulatory abilities seen in the gut. The purpose of this study was to investigate whether RA could promote the differentiation of regMCs. In order to investigate this, we used an *in vitro* differentiation model that generates dendritic cells (DCs) from bone marrow (BM) progenitors. We hypothesized that the presence of RA during differentiation would induce regDCs. BM cells were differentiated with GM-CSF ±RA for 6-7 days. At 6-7 days of differentiation, BM-MCs containing DCs were evaluated both phenotypically and functionally (ie. Flow cytometry and proliferation assays). We found that day 7 RA BM-MC demonstrated increased expression of activation and maturation markers CD80, CD86, and MHCII. RA BM-MCs also had increased expression of inhibitory marker PD-L1. Functionally, RA BM-MCs had increased levels of intracellular IL-10 and were able to increase Treg percentages when cultured with naïve helper T cells compared to control cells. Importantly, d7 BM-MCs were able to suppress the proliferation of responder (splenic) immune cells even when stimulated with an inflammatory challenge (ie.LPS). Taken together, these results demonstrate that the presence of RA during differentiation produces a regMC population. Interestingly, CD11c+ (DCs) within the population were not the suppressive population. Rather, the suppressive cells were $CD11c^{-}CD11b^{+}Ly6C^{int/low}$ and likely represent a regulatory monocyte or other myeloid population. The development of this model will not only provide a critical tool to investigate the mechanisms involved in the regMC generation, but will also be a useful tool to provide regMCs for possible therapeutic applications for the treatment of inflammatory diseases.

Keywords: Myeloid cell, Retinoic acid, regulatory myeloid cell, Bone marrow

IMID - 13

INFLUENZA'S EFFECT ON MURINE ALVEOLAR TYPE II RESPIRATORY EPITHELIAL PHENOTYPE. P. Woods, C. Hofer, and I.C. Davis. Department of Veterinary Biosciences and The Ohio State College of Medicine.

The alveolar epithelium is composed of two distinct cell types. Alveolar type II (ATII) pneumocytes are small cuboidal epithelial cells that comprise approximately 15% of the total alveolar cells, but only 5% of the surface area within the alveolus. These cells produce surfactant and carryout several functions including the regulation of alveolar surface tension, fluid balance, and host defense. The much larger and flatter alveolar type I (ATI) pneumocytes cover approximately 95% of the surface area of the lung and form the epithelial component of the air-blood barrier, making them the primary site for gas exchange. Under pathological conditions, ATII cells, which have stem cell-like properties, possess the ability to differentiate into ATI cells. This serves as an epithelial repair mechanism, and results in a reduction in surfactant lipid and protein production. We hypothesized that, as a known cause of severe lung injury, influenza A virus infection will significantly alter ATII cell function. We therefore infected transgenic mice that express a GFP transgene under the control of the ATII cell-specific surfactant protein C promoter with influenza A/WSN/33 (a mouse-adapted H1N1 strain) for 2-6 days. ATII cells were then isolated from lung digests and analyzed by flow cytometry. We found that influenza infection resulted in a progressive decline in SP-C-positive cells from a mean of 50% in uninfected mice to 24% at day 6. Likewise, western blot analysis of whole lung lysates and qRT-PCR of purified ATII cells confirmed these results. In contrast, influenza infection had little effect on ATI cell-specific marker expression (Aquaporin-5 and T1α) at the whole-lung level, which suggests that ATII cells may be differentiating into ATI cells given that both cells types are key sites for influenza infection.

Keywords: influenza, surfactant, pneumocyte, lung injury

MCB - 1

MOLECULAR CHARACTERIZATION OF METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* ISOLATES FROM HOSPITAL, HIV AND BOVINE IN NAIROBI KENYA. B A Obanda : Visiting Scholar in Veterinary Preventive Medicine

Background: *Staphylococcus aureus* (SA) is a major cause of skin, soft tissue, bone and joint infections. Published reports of MRSA infections in Kenya are limited. We describe for the first time molecular features of MRSA from hospital, HIV and bovine in Kenya**.**

Methods: 218 isolates of *S. aureus* were isolated from community, hospital, farms and HIV outpatients Clinic in Kenya from 2008 to 2010. Fifty isolates of MRSA and three MSSA were selected. Antimicrobial susceptibility test was conducted using the Kirby-Bauer disk diffusion method. Enterotoxins gene types *Sea, Seb, Sec, Sed ,Tst* and *Pvl* genes were tested by Multiplex PCRs together with SCC *mec* Typing and PFGE typing using Xba restriction enzyme.

Result: Twenty (40%) of isolates were multi-drug resistant, nineteen (39%) of which were methicillin resistant *Staphylococcus aureus* (MRSA) and 10 (7.5%) were pan susceptible. Seventy percent of multi-drug resistant strains were nosocomial. Those isolates recovered from HIV patients were resistant (63%) to cortrimoxazole at 63%. SCC mec type II was predominant (67 %) of the SCC mec type able originating from nosocomial infections. Non typeable MRSA was predominant (75%) with SCC mec typeable (11.3%). The most prevalent enterotoxins detected were *sea* (41, 77%), seb (40, 75.5%) *sec* (7, 13%), *Tst* (7, 13%) and *Pvl* (12, 22.6%) of which one was of bovine origin Seven of the 53 isolates could not be typed using Xba restriction enzyme. A total of 10 clusters groups (A to J) were identified.

Conclusions: There was higher drug resistance among MRSA strain in hospital than community acquired MRSA. Most of the isolates in both groups had enterotoxin *Sea* and *Seb*. Toxin *Pvl* was detected in few isolates mainly from HIV patients. The most prevalent pulsotypes in cluster F were associated with nosocomial infections and antimicrobial drug resistance; cluster G contained human and bovine similarity.

MCB - 2

THE ROLE OF TAX-1 AND THE ALTERNATIVE NF-KB PATHWAY IN HTLV TRANSFORMATION. J.Al-Saleem and P. L. Green, Department of Veterinary Biosciences

Human T-cell Leukemia Virus Type-1 (HTLV-1) is a complex retrovirus infecting 15-25 million people worldwide. HTLV-1 is the etiological agent of an aggressive malignancy of CD4+ T cells termed Adult T-Cell Leukemia (ATL). ATL patients, on average, survive one year from disease onset. The HTLV-1 regulatory protein Tax is required for HTLV-1-mediated cellular transformation both *in vitro* and *in vivo*. Tax primarily functions to promote transcription of viral genes, but has also been shown to deregulate cellular genes leading to cell growth and genetic instability. Previous studies showed that Tax activates two NF-κB signaling pathways: the classical pathway, which is rapid, and the alternative pathway, which is delayed. The exact role of the alternative pathway in HTLV-1-mediated transformation is unknown. We propose that Tax interaction with the alternative NF-κB pathway is important for HTLV-induced pathogenesis. To test this hypothesis we will utilize Tax mutants that have been shown to be deficient in their ability to activate the NF-κB pathways. Viruses containing these mutant forms of *tax* will be used to infect primary peripheral blood mononuclear cells (PBMCs) and transformation will be monitored via a cellular proliferation assay. We also plan to identify Tax-1 binding partners that are important for Tax-mediated activation of the NF-κB pathway. To identify these binding partners we will generate S-protein epitope tagged Tax expression vectors for both wild type and NF-κB activation deficient *tax* genes. We will express tagged Tax proteins in 293T cells and perform immunoprecipitation followed by mass spectrometry to identify binding partners. By comparing the differences between the wild type Tax and mutant Tax binding partners we will be able to identify candidate proteins required for Tax-mediated activation of the alternative NF-κB pathway. We hypothesis that these candidates could then be used in future studies as clinical targets to treat patients with ATL.

Keywords: HTLV, Tax, NF-κB

MCB - 3

RELATED HTLV-1 AND HTLV-2 ANTISENSE PROTEINS (HBZ, APH-2) HAVE DISTINCT EFFECTS ON CELLULAR SIGNALING PATHWAYS. N. Dissinger and P.L. Green. Department of Veterinary Biosciences

HTLV-1 and HTLV-2 are related but distinct pathogenic complex retroviruses. HTLV-1 is the etiological agent of adult T-cell leukemia (ATL) and a chronic neurological disease. In contrast, HTLV-2 is much less pathogenic with only a few reported cases of neurological disease. In addition to the structural and enzymatic proteins encoded by all retroviruses, HTLV encodes regulatory and accessory proteins. The sense strand of the provirus encodes most of the viral proteins including the transforming protein Tax. However, the antisense strand of both HTLV-1 and HTLV-2 encode a protein (HBZ and APH-2, respectively) that down-regulates Tax-mediated viral transcription. Animal studies have shown that while HBZ is essential for infected cell survival and high proviral loads, loss of APH-2 results in increased viral replication and proviral loads. This lends itself to the hypothesis that the biological activities of HBZ and APH-2 are distinct and these differences are important for virus biology and pathogenesis. We examined and directly compared the effect HBZ and APH-2 had on several cellular transcription factors that have been previously shown to interact with HBZ. We observed that APH-2 acted in a similar manner to HBZ in repression of interferon regulatory factors (IRFs) and the classical NF-κB pathway. A difference was observed, however, in the activator protein 1 (AP-1) pathway and the transforming growth factor- β (TGF-β) signaling pathway. While we observe that HBZ represses c-Jun, as reported previously, we see no repression by APH-2. We also found that while HBZ enhances TGF-β signaling, APH-2 does not. We hypothesize that these differences could help explain how the two related viruses have such different disease outcomes and elucidate specific pathways to target for new therapeutics.

Keywords: HTLV, HBZ, APH-2, cellular signaling

ONCOSTATIN M INDUCED JUNB PROTECTS BREAST CANCER CELLS AGAINST CHEMOTHERAPY INDUCED APOPTOSIS. M Hicks, Q Hu, J DeWille, Department of Veterinary Biosciences

Breast cancer is the second leading cause of death among women. Chemotherapy plays a critical role in prolonging the disease-free survival of cancer patients. Despite chemotherapy advances, 30% of newly diagnosed breast cancer patients won't respond to current treatments. There is a critical unmet need to understand breast cancer resistance. OncostatinM (OSM) is a cytokine which can be secreted by either tumor cells or immune cells and is important in immune modulation, migration, EMT, and tumor progression in breast cancer patients. Little is known, however, about the role of OSM in chemotherapy treatment. This study investigated the novel induction of JUNB in human breast cancer cell lines in response to OSM and its effects on chemotherapy induced apoptosis. JUNB is a member of the AP-1 transcription factor complex and has been associated with survival of pancreatic β-cells in Type 1 diabetes. JUNB is markedly induced in breast cancer cell lines treated with OSM. Both JUNB mRNA and protein is also dramatically induced in surviving breast cancer cells challenged with a lethal dose of Flavopiridol (FP), a CDK9 inhibitor chemotherapy drug. Increased JUNB mRNA levels were not due to increased mRNA stability or loss of function of FP. To determine the functional role of JUNB in response to FP, JUNB levels were reduced (~90%) with JUNB siRNA. When challenged with FP, JUNB siRNA treated cells were more susceptible to cell death. These results demonstrate that JUNB may play a previously unrecognized pro-survival role in chemotherapy treated breast cancer cells. Breast cancer cells that are pre-treated with OSM, are protected against FP induced apoptosis. These results demonstrate that OSM, an IL-6 family cytokine, induces JUNB. OSM induced JUNB may play a role in breast cancer chemotherapy resistance. This is the first investigation of OSM protection against chemotherapy is breast cancer cells.

Keywords: Chemotherapy resistance, Breast Cancer, JUNB, Oncostatin M

MCB - 5

DEVELOPMENT OF AN INDUCIBLE AND CELL-SPECIFIC TRANSGENIC MOUSE MODEL OF ENDOMETRIAL CANCER. C. Koivisto[1], A. Perez-Castro[2], A. Clements[2], V. Bravo[2], K. LaPerle[1], G. Leone[3] [1] Department of Veterinary Biosciences, [2] Comprehensive Cancer Center, [3] Department of Molecular Virology, Immunology and Medical Genetics

Endometrial cancer (EMC) is the most common malignancy in the female reproductive tract and the seventh overall most common malignancy worldwide. Alterations in *PTEN* occur in up to 61% of type I EMC in humans and appear be an early event in the transformation process since up to 21% of foci of endometrial hyperplasia contain *PTEN* mutations. Epithelial proliferation is mediated through paracrine and autocrine cell-cell interactions between the epithelium and stroma. Understanding the relationship between EMC tumor cells and their stroma is essential for improving diagnosis and treatment, particularly as to how they relate to invasion and metastasis which are primary reasons for treatment failure in human EMC patients. Previous mouse models designed to study the pathogenesis of endometrial cancer have had significant limitations primarily due to lack of endometrial-specific genes that could serve as promoters for driving transgene expression. The gene *Sprr2f* was recently identified on an organ-specific microarray gene expression analysis as a possible uterine-specific candidate to use in the development of transgenic mice. A *Sprr2f-Cre* mouse model was developed but resulted in ectopic expression of Cre recombinase within the brain and when crossed with floxed *Pten* mice, resulted in lethality within the first few weeks to months of life. In our lab we are creating novel transgenic knockin mice to utilize in studies of uterine development and cancer. The first of these models will result in inducible, uterine-specific expression of Cre recombinase which will then be initially utilized to study the effects of *in vivo Pten* deletion. Additional mouse models will be developed for studying how tumor cells and stroma interact during the natural evolution of EMC. We anticipate that these mice will serve as important preclinical animal models for the development of effective therapeutic strategies to prevent and/or treat EMC.

Keywords: transgenic mouse, endometrial cancer, Pten protein

MCB - 6

CHARACTERIZATION OF SIALIC ACID CELL SURFACE RECEPTORS ON MDCK CELLS BY FLOW CYTOMETRIC ANALYSIS AND IMPLICATIONS FOR INFLUENZA A VIRUS RECOVERY. S. Nelson, A. Bowman, C. Hofer, J. Nolting, I. Davis, R. Slemons. Departments of Veterinary Preventive Medicine and Veterinary Biosciences

Influenza A viruses in swine are a public health risk, emphasizing the need for surveillance and characterization of these viruses. We previously reported that Madin Darby Canine Kidney (MDCK) cells maintained in serum free media (SFM) are superior to embryonated chicken eggs for the isolation of swine origin influenza A viruses. This led us to hypothesize that the increased accuracy of isolation of these viruses with MDCK cells maintained in SFM was due to the receptors expressed on the cell surface. Flow cytometry was used to determine the distributions of α-2,3-linked and α-2,6-linked sialic acid cellular receptors on the surface of the MDCK cells. At passage 20 the MDCK cells maintained in SFM are expressing 98% terminal α-2,6-linked sialic acid cell receptors, with 2.25% of the cells also expressing α-2,3-linked sialic acids. Previous studies have shown that embryonated chicken eggs have predominantly terminal α-2,3-linked sialic acid cell receptors. The predominance of α-2,6-linked sialic acids on SFM adapted MDCK cells is an explanation for the superior recovery of influenza A viruses, especially since it has been previously shown that these viruses preferentially bind to terminal α-2,6-linked sialic acids. Previous characterization of other MDCK cell lines, maintained under traditional cell culture practices with fetal bovine serum (FBS), have shown that MDCK cells have a more equal distribution of both receptor types, leading us to hypothesize that maintaining MDCK cells in SFM may select for α-2,6-linked sialic acid expression. Flow cytometry will be used to investigate if weaning the MDCK cells off FBS and maintaining them in SFM over many passages affects the receptor distribution on these cells. This information will provide a better understanding of the selective pressure of SFM on MDCK cells and will provide insight into the benefits or detriments of these cells in isolating influenza A viruses from swine.

Keywords: MDCK, cell culture, flow cytometry, swine, influenza A viruses

MCB - 7

GENE EXPRESSION PROFILES OF KNEE OSTEOARTHRITIS: A META-ANALYSIS

E. Skinner and A. Bertone. Departments of Veterinary Clinical Sciences and Orthopedics

Our hypothesis was to develop a concise, comprehensive analysis of Osteoarthritis (OA) gene expression and identify novel genes and pathways for future innervation.

The Medline and Cinahl databases identified 3347potential articles related to OA gene expression. Following screening and eligibility requirements, 70 articles met inclusion criteria and full data sets, specifically significant differential expression, were extracted from all papers. Genes were ranked in frequency of occurrence, intensity, and interrelatedness, had ontologies identified in terms of biologic process, cellular component, and molecular function, and the comprehensive interactions of the genes were mapped in visual networks.

In total 473 unique genes were detected from the expression profiles. Of those identified, four down regulated and three up regulated genes displayed disproportionately high fold changes. Five of these genes, Vitrin (VIT), Regulator of cell cycle (RGCC), F-box protein 2 (FBXO2), H1 histone family member X (H1FX), and Inter-alpha-trypsin inhibitor heavy chain 2 (ITIH2), ranked in the bottom third in terms of relatedness to the other genes. Due to their unrelated nature, they lack influence from the other genes, thus potential optimal novel targets for a OA signature.

Gene ontology information in conjunction with comprehensive interactions used to develop a visual network, identified three biological processes, skeletal development, phosphate transport, and cell adhesion, significantly up regulated in the extracellular zone of the cell and one significantly down regulated process, transcription, in the nucleus.

We concluded that our system-based analysis supports the biologic model for osteoarthritis consisting of chondrocyte apoptosis and ineffective efforts to repair. This approach has the exciting capability for identifying specific pathways and novel genes for future research into intervention strategies.

Keywords: Network Visualization, Gene Expression Profiling, Osteoarthritis, Meta-analysis, Prediction

SF - 1

EFFECT OF DECREASED PROGESTERONE CONCENTRATIONS DURING FOLLICULAR DEVELOPMENT ON OOCYTE YIELD AND QUALITY

F. M. Abreu, S. Kruse, L. H. Cruppe, R. S. Cipriano, M. L. Day, T. W. Geary, M. A. Coutinho da Silva, B. A. Hicks, D. S. Clark, G. A. Bridges; Depts. of Animal Sciences And Veterinary Clinical Sciences

The objective was to determine if decreased concentrations of progesterone (P4) during early follicular development would impact number and quality of oocytes recovered by transvaginal ultrasound-guided ovum pick-up (OPU). Ovulation was synchronized with the 5 d CO-Synch + CIDR program in postpubertal heifers in two groups (n = 18 per group) with d of the 2nd GnRH treatment designated as d 0. On d 5.5 all visible follicles in the ovaries were ablated. Heifers were stratified, within group, by estrous expression (yes or no), weight, age, and antral follicle count to receive either a new CIDR (high P4; H) or a previously used CIDR and two-25 mg doses of PGF given 8 h apart (low P4; L) on d 5.5. On d 10.5 (OPU-1), all visible follicles were aspirated, new and used CIDR were replaced, and OPU was performed again on d 15.5 (OPU-2). Follicle stimulating hormone (FSH; 50 mg per dose) was administered on d 7.5, 8, 8.5 and 9 and d 12.5, 13, 13.5 and 14. Blood samples for P4 were collected at ablation, OPU-1, and OPU-2. Number of follicles aspirated was recorded at each OPU and oocytes were graded on a 1 to 6 scale (1 ≥ 5 layers of compact cumulus and homogenous cytoplasm, 6 = denuded). Concentrations of P4, total follicles aspirated, total oocytes recovered, and oocyte quality were compared with the MIXED procedure of SAS. Concentrations of P4 did not differ on d 5.5, but were lower ($P < 0.01$) at OPU-1 and OPU-2 in the L (3.03 ± 1.92 and 2.00 ± 1.01 ng/ml, respectively) than in the H (5.47 ± 2.06 and 5.36 ± 1.60 ng/ml, respectively) treatment. Across OPU-1 and OPU-2, the L treatment had more ($P < 0.05$) total follicles aspirated (15.3 ± 1.1) and oocytes recovered (9.9 ± 1.2) than heifers in the H treatment (12.1 ± 1.0 and 6.4 ± 0.8, respectively). Furthermore, decreased P4 resulted in increased ($P < 0.05$) number of grade 1-3 oocytes collected per heifer (L: 7.78 ± 1.03, H: 4.81 ± 0.72). In conclusion, lesser P4 concentrations during follicular emergence and early development resulted in collection of a greater number of good quality oocytes per heifer by OPU when compared to heifers with Greater peripheral P4 concentrations

Keywords: progesterone, heifers, oocyte

SF - 2

THE NOVEL ENERGY-RESTRICTION MIMETIC AGENT OSU-CG5 REDUCES PROSTATE CANCER SEVERITY IN A TRANSGENIC MOUSE MODEL OF PROSTATE CANCER.

LD Berman-Booty,[1,2] PC Chu,[1] JM Thomas-Ahner,[3] D Wang,[1] T Yang,[1] SK Clinton,[3] SK Kulp,[1] CS Chen[1,4]

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Dietary caloric restriction (CR) is one of the most effective experimental chemotherapeutic and chemopreventive strategies to date. However, because CR is not a practical treatment strategy for human cancer patients, drugs that can mimic CR at the cellular level are needed. These compounds are termed energy restriction-mimetic agents (ERMAs). We have previously shown that 100 mg/kg/day of the ERMA OSU-CG5 decreases prostate epithelial proliferation within prostatic intraepithelial neoplasia lesions of transgenic adenocarcinoma of the mouse prostate (TRAMP) mice, resulting in decreased urogenital tract and prostate lobe weights. In our current study, we evaluated OSU-CG5's ability to act as a chemopreventive agent. While administration of 1286 ppm (approximately 100 mg/kg/day) of OSU-CG5 via an AIN-76A diet to intact male TRAMP mice for 18 weeks did not alter the incidence of poorly differentiated prostate carcinomas or the age at which these tumors developed, OSU-CG5 reduced prostate disease severity, as determined by tumor volume and mass. Namely, the tumors that developed in OSU-CG5-treated mice were 54.6% smaller by volume and 54.1% smaller by mass than the control mouse tumors. The reduction in tumor size was associated with decreased tumor cell proliferation, as determined by Ki67, and reductions in androgen receptor and phosphorylated-Akt levels within the OSU-CG5 treated tumors. OSU-CG5 administered in the diet was well tolerated and did not cause systemic toxicity. Given OSU-CG5's ability to reduce prostate tumor size, OSU-CG5 may have potential as a chemotherapeutic agent for men with prostate cancer.

Keywords: TRAMP, prostate cancer, energy restriction-mimetic agent

SF - 3

THE NUCLEAR LOCALIZATION SEQUENCE (NLS) AND C-TERMINUS OF PARATHYROID HORMONE-RELATED PROTEIN (PTHRP) REGULATES THE PROLIFERATION AND DIFFERENTIATION OF MESENCHYMAL STEM CELLS (MSC). B.E. Hildreth III, K.M. Hernon, B.N. Marlow, J. Leong, M.J. Fial, P.N. Boyaka, T.J. Rosol, R.E. Toribio. Departments of Veterinary Biosciences and Veterinary Clinical Sciences

The N-terminus of PTHrP **1)** stimulates MSC proliferation and **2)** promotes bone and cartilage formation while inhibiting fat and muscle formation from MSC. Since the roles of the NLS and C-terminus of PTHrP are unknown, we investigated the effects of deleting these regions on the proliferation and multi-lineage differentiation of MSC.

MSC were isolated from neonatal mice lacking the NLS and C-terminus (*Pthrp*$^{\Delta/\Delta}$) and wild-type littermates. Proliferation was assessed by a MTT assay and direct counting. MSC were also grown in osteo-, chondro-, adipo-, and myogenic media for 24 days. Lineage-specific protein secretion, gene expression, and flow cytometric/histochemical/morphological indices were compared.

Pthrp$^{\Delta/\Delta}$ MSC proliferated faster and displayed greater ALP activity ($P < 0.0001$). However, *Pthrp*$^{\Delta/\Delta}$ MSC had reduced osteoblast maturation as demonstrated by decreased mineralization and osteocalcin secretion ($P = 0.016$ and 0.029). *Pthrp*$^{\Delta/\Delta}$ MSC-derived cartilage pellets were smaller ($P < 0.0001$) and expressed less *Sox9* ($P = 0.042$), but greater *Ihh* ($P = 0.035$). Despite *Pthrp*$^{\Delta/\Delta}$ MSC producing more adipocytes ($P = 0.023$) and a trend towards increased *Ppar*γ ($P = 0.087$), both genotypes had similar adipogenic gene expression profiles. Interestingly, *Pthrp*$^{\Delta/\Delta}$ MSC produced more myocytes ($P < 0.0001$) and expressed more *desmin* and *myogenin* ($P = 0.002$ and 0.031).

In conclusion, regions distinct from the N-terminus of PTHrP influence MSC proliferation and differentiation. Increased proliferation, ALP, and *Ihh* by *Pthrp*$^{\Delta/\Delta}$ MSC, but less bone and cartilage formation, indicate that the NLS and C-terminus inhibit proliferation, but promote osteoblast and chondrocyte maturation. Our study is the first to demonstrate that additional regions of PTHrP are involved in adipogenesis and myogenesis, of which they complement the inhibitory function of the N-terminus. Similarities in adipogenic gene expression profiles, despite a greater number of *Pthrp*$^{\Delta/\Delta}$ MSC-derived adipocytes, suggest dysregulated energy metabolism, which may contribute to the perinatal lethality in our *Pthrp*$^{\Delta/\Delta}$ mice.

Keywords: PTHrP, osteogenesis, adipogenesis, chondrogenesis, myogenesis

QUANTITATIVE T2 MAPPING OF KNEE CARTILAGE AT 3 AND 7T IN AN EQUINE MODEL.

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Purpose

Knee articular cartilage is only 2.2–2.5 mm and 1.5-2 mm thick respectively, in humans and horses [1]. Thus, Equine joints have been recommended as biological models for comparative cartilage repair research by the United States Food and Drug Administration. Our goal was to describe and compare a two channel transmit/receive radiofrequency coil and one channel knee coil at 7T and an eight channel knee coil at 3T.

Methods

Five ex-vivo mature horse knees were used. Knees were assessed with a 3T whole-body system using an eight channel knee coil. A multi-echo sequence with ten echo times was performed (TR/TE=[3000/12, 24, 36, 48, 60, 72, 84, 96, 108, 120]ms. A 7T investigational whole body system using two channel transmit/receive coil and one channel knee coil performed multi-echo sequences with five echo times (TR/TE=[5000/7, 21, 36, 51, 66]ms, and TE=[6, 18, 30, 42, 54] ms respectively. T2 values were calculated via linear least-squares fit. All calculations were performed using in-house software written in the IDL environment. ROIs in sagittal cross sections were manually traced.

Results

Average T2 mapping values were as follows: (58.8 ± 3.3 SEM) ms for the 3T eight channel knee coil, (61.5 ms ± 8.09) ms for the 7T two channel coil, and (56.4± 6.3) ms for the 7T one channel knee coil. No differences in average T2 mapping were shown among different coils and magnets. Nevertheless, images obtained with the multi-transmit/receive coil at 7T were superior to visualized articular cartilage.

Discussion

Quantitative T2 mapping helped to assess normal articular cartilage using different coils at 3T and 7T. Images obtained with the multichannel transmit/receive coil showed higher qualitative characteristics that facilitated articular cartilage identification and delineation, thus making this method useful for cartilage visualization and evaluation.

Keywords: Ultra high field MRI, Cartilage, Knee, Horse.

SF - 5

MICROCOMPUTED TOMOGRAPHY, MICRORADIOGRAPHY, AND HISTOLOGY TO ASSESS SUBCHONDRAL BONE CHANGES IN OSTEOCHONDRITIS DISSECANS LESIONS IN DOGS. Pugliese, LC, DVM[1], Fitzpatrick, N MVB[2], Allen, MJ Vet MB PhD[1], Russell, D BVMS DACVP[3]. [1] Veterinary Clinical Sciences, College of Veterinary Medicine, The Ohio State University, 601 Vernon Tharp St Columbus OH 43210 [2]Fitzpatrick Referrals Halfway Lane, Eashing, Godalming, Surrey GU7 2QQ, United Kingdom. [3] Veterinary Biosciences, College of Veterinary Medicine, The Ohio State University, 601 Vernon Tharp St Columbus OH 43210

Recent literature suggests the microcomputed tomography (µCT) can provide a robust, efficient evaluation of bone microarchitecture, trabecular organization, sclerosis, surface irregularities, and fissuring in bone pathology. This study evaluates µCT and microradiography to assess subchondral bone density in dogs with naturally occurring OCD. We hypothesized there would be significant differences between 2-D microradiographic data and 3-D µCT reconstructions and that data from volumetric µCT reconstructions would be significantly different from those determined from a less data-intensive 2D reconstruction. Tissues obtained from two affected Golden Retrievers were confirmed with histology. Microradiographs and µCT were performed to calculate and compare BV/TV and assessment of the depth of trabecular bone changes from the cartilage surface between the lesion and an adjacent unaffected reference region. On microradiography, the mean (±SD) BV/TV for the lesion was 86.53 ±4.93 and for the reference range 75.53 ±5.52 (p=0.07). Mean (±SD) depth of bone involvement in the lesion was 8.46mm ± 3.27 (range 1.52mm-12.67mm). On µCT 2-D BV/TV measurements had a mean (± SD) of 71.58 ± 25.83 and 47.63±7.68 (p=0.029) for the lesion and reference region, respectively. Three-dimensional BV/TV measurements had a mean (±SD) of 71.19 ±26.30 for the lesion and 46.97±7.72 for the reference range (p=0.03). A statistically significant correlation was identified between microradiography and 2D measurements (r=0.794, p=0.002) and between microradiography and 3D measurements (r=0.790, p=0.002). The results of this study suggest that data from µCT reconstructions of OCD closely match microradiography results of the sample and are representative for the subchondral bony changes seen on histology. The region of subchondral trabecular architectural disruption was extensive both in width and in depth for each lesion which may have implications for osteochondral allograft procedures.

Keywords: Osteochondritiis dissecans, subchondral bone, osteochondral allograft

CR – 1

ASSOCIATION OF HYPERLACTATEMIA WITH ALDOSTERONE AND ARGININE VASOPRESSIN CONCENTRATIONS AND CLINICAL INDICATORS OF HYPOPERFUSION IN HOSPITALIZED FOALS

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Critically ill foals often present with increased L-lactate concentrations (hyperlactatemia) from impaired organ perfusion (dehydration, hypovolemia, hypotension). The endocrine response to hypotension includes an elevation in aldosterone and arginine vasopressin (AVP) to maintain blood pressure, electrolyte balance and organ function. Several studies have investigated the ability of L-lactate concentrations to predict severity of disease and outcome in critically ill humans, horses and foals. However, information on the aldosterone and AVP response to hypovolemia in septic foals is limited. We hypothesized that septic foals will have higher L-lactate, aldosterone and AVP concentration compared to healthy foals. We also proposed that increased L-lactate, aldosterone, and AVP concentrations will be associated with markers of hypovolemia, renal function, and mortality in hospitalized foals.

Blood samples were collected on admission from 96 septic (sepsis score >12), 182 sick non-septic (SNS), and 37 healthy foals of <3 days of median age. Blood concentrations of aldosterone, AVP were determined by immunoassays.

Aldosterone and AVP concentrations were higher in septic compared to healthy foals ($P<0.05$). L-lactate concentration was higher in septic and SNS foals compared to healthy foals. In hospitalized foals, L-lactate was positively correlated with aldosterone, AVP, and creatinine concentrations, and markers of hypoperfusion ($P<0.01$). Non-surviving septic foals had a higher L-lactate concentration than survivors ($P<0.05$). Admission L-lactate above 7.9 mmol/L could predict survival in most septic foals (72% sensitivity, 68% specificity, 75% PPV and NPV 63%). Risk of non-survival in hospitalized foals increased with every 1 unit increase for L-lactate (OR= 1.27), aldosterone (OR=1.12), and AVP (OR=1.08) concentrations ($P<0.05$).

Based on the results of this study, tissue hypoperfusion in critically ill foals is characterized by elevated L-lactate, aldosterone, and AVP concentrations, and these factors can be used as predictors of non-survival in sick foals.

Key words: equine, foal, sepsis, endocrinology

CR - 2

BIOMECHANICAL EFFECT OF AN INTERVERTEBRAL DISK SPACER AFTER SINGLE LEVEL FIXATION IN A CADAVERIC CANINE MODEL. B. F. Hettlich, M. J. Allen, G. S. Glucksman, G. T. Fosgate, and A. S. Litsky. Departments of Veterinary Clinical Sciences, College of Veterinary Medicine, Orthopaedics, College of Medicine, and Biomedical Engineering, College of Engineering, The Ohio State University, Columbus, OH and Production Animal Studies, University of Pretoria, South Africa.

Traditionally indicated for unstable fracture/luxation injuries, canine cervical vertebral column stabilization is an emerging treatment option for dogs with cervical spondylomyelopathy. One longterm complication after stabilization is failure of implants, especially if bony fusion between stabilized vertebrae has not occurred. The objective of this study was to compare the biomechanical effects of an intervertebral disk spacer in canine cadaveric cervical vertebral columns after monocortical titanium screw/polymethylmethacrylate (PMMA) fixation. The hypothesis was that addition of a spacer would significantly increase construct stiffness compared to cervical vertebral columns stabilized without the addition of a spacer. Six cervical vertebral columns were surgically stabilized at the C4-C5 articulation with a previously evaluated fixation method (monocortical screws/PMMA). Prior to stabilization, a partial diskectomy and placement of an intervertebral spacer into the distracted disk space were performed. Cortical ring allografts of appropriate dimensions served as spacers. Construct stiffness was determined by 4-point bend testing in extension, flexion and lateral bending. Data were compared to that of 6 specimens stabilized with the same fixation method but without an intervertebral spacer. Addition of an intervertebral disk spacer significantly increased stiffness in this cadaveric model ($p=0.002$). Clinical significance of these findings relates to the potential for improved load-sharing between vertebrae and improved implant longevity until bony fusion may occur.

Keywords: cervical vertebral column, intervertebral disk spacer, stiffness, cortical ring, dog

CR – 3

DISTRIBUTION AND PREDICTIVE FACTORS OF SEIZURE TYPES IN 104 HORSES.

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Although many studies have been performed to classify seizures by type in humans and small animals, similar study is lacking in horses.
The purpose of this study was to 1) characterize the distribution of seizure types in 104 horses presented for seizure disorders to OSU Veterinary Medical Center in a retrospective case series; 2) further characterize the various type of seizures by identifying associated clinical factors.
Seizures were classified based on ictal phenomenology and seizure type (axis 1 and 2, respectively), according to the most recent accepted definitions in both human and small animal epileptology. History, clinical and neurological observations, diagnostic investigations and postmortem examinations, when available, were recorded for univariate and multivariate logistic regression analyses.
Seizures were categorized as primary generalized in 23% of horses, focal without secondary generalization in 42% of cases and secondary generalized in 24% of cases. The type of seizures could not be classified in 11% of cases. Significant univariate correlations were found between seizure type and: 1) gender; 2) frequency of seizures; and 3) presence of seizures during hospitalization. Seizure type was not significantly associated with etiology. For a horse with recurrent seizures (i.e., epilepsy), the odds of having focal seizures was higher (OR=4, P=0.02) compared to a similar horse with non-recurring seizures, in the final logistic regression model.
Similar to human and small animal classification, the majority of the seizures described were focal seizures with or without secondary generalization. The clinical presentation was independent of the underlying disease. This study provided a comprehensive classification of seizures by type and showed similarity between seizure semiology expressed in horses and other species.

Keywords: generalized seizure, focal seizure, epilepsy, electroencephalogram

CR - 4

EFFECT OF 4 ANALGESIA PROTOCOLS ON COMFORT AND SEDATION OF DOGS FOR 24 HOURS AFTER STIFLE SURGERY. K. Lewis, R. Bednarski. Department of Veterinary Clinical Sciences

Peri-operative and long-term pain management is essential for dogs undergoing TPLO. Combination analgesic techniques may be superior to individual techniques in dogs after stifle surgery.

Thirty-four dogs presented for tibia plateau leveling osteotomy (same surgeon) were randomly assigned to 4 groups (four group repeated measure ANOVA): 1) Coinfusion (MLK) of morphine (0.24 mg kg-1 hr-1), lidocaine (3 mg kg-1 hr-1), ketamine (0.6 mg kg-1 hr-1); 2) Lumbosacral epidural (LE) (morphine 0.2 mg kg-1) and ropivacaine (0.2 mg kg-1); 3) MLK plus LE; 4) No additional analgesic drug administration after premedication. All dogs received acepromazine (0.02 – 0.1 mg kg-1) and morphine (0.4 mg kg-1) intramuscularly (pre-medication), propofol, and isoflurane in oxygen (depth controlled by adjusting vaporizer setting). Indices of cardiorespiratory function and isoflurane requirement were recorded prior to and at 5-minute intervals during anesthesia. Coinfusion discontinued at the end of surgery. A validated Sedation Scoring System and the Modified Glasgow Composite Measure Pain Score were used by two blinded evaluators to assess comfort and sedation upon extubation, at 60 minute intervals for 4 hours then every 4 hours for 24 hours Dogs with pain scores greater than 6 were given morphine (0.4 mg kg-1 IM).

No differences in pain score, rescue analgesia requirement, or time to rescue analgesia were detected. Values (mean +/- SD for groups 1,2,3 and 4 were (respectively): Pain score: 3.7+/- 2.4; 2.8+/-1.8; 2.9+/- 1.6; 3.3+/-2.1). Sedation score: 6.1+/-4.3; 5.2+/- 4.3; 7.8+/- 4.5; 6.3+/- 4.2). Rescue analgesia was administered to 4 of 7, 4 of 10, 3 of 8, and 3 of 9 dogs in each group for groups 1,2,3, and 4, respectively.

No one technique demonstrated superior analgesia.

Key words: multimodal analgesia, pain scoring, orthopedic pain, MLK co-infusion, epidural, canine

CR – 5

MORPHOMETRIC MAGNETIC RESONANCE IMAGING FEATURES OF THE CERVICAL VERTEBRAL COLUMN OF GREAT DANES WITH AND WITHOUT CLINICAL SIGNS OF CERVICAL SPONDYLOMYELOPATHY. P. Martin-Vaquero, R.C. da Costa. Dept. of Veterinary Clinical Sciences.

Morphometric investigations improve our understanding of spinal diseases by comparing anatomic measurements of clinical normal and affected populations. The purpose of this study was to prospectively characterize and compare the cervical spine morphometry of Great Danes (GDs) with and without clinical signs of CSM using magnetic resonance imaging (MRI). Thirty client-owned GDs were prospectively enrolled: 15 neurologically normal, and 15 with clinical signs compatible with CSM and confirmation using MRI. All dogs underwent 3.0 T MRI of the cervical spine (C2-3 to T1-2 intervertebral spaces). Cranial and caudal articular facets areas were measured and total facet area was calculated. Vertebral canal and spinal cord height/width/area were obtained at three different levels for each space. Right and left middle foraminal heights were measured. The same investigator performed all measurements. Intraobserver agreement was calculated. All measurements were compared for each intervertebral space between groups using a random-effects linear regression model. Mean age at the time of enrollment was 2.3 and 3.9 years for normal and CSM-GDs, respectively. Significant differences were found for the cranial articular facet area at all intervertebral spaces, caudal articular facet area at C6-7, and total facet area at all spaces except T1-2, with CSM-GDs having larger facet areas. The vertebral canal area measurements centered at the disc space and cranial aspect of the caudal vertebral body were significantly smaller in CSM-GDs from C2-3 through C6-7. The spinal cord area was significantly smaller on the CSM-GDs at C5-6 and C6-7 for all 3 levels measured. Middle foraminal height was significantly smaller in CSM-GDs from C3-4 through C7-T1. Intraobserver agreement was high for all measurements (median variation of 1.91%). This study provided the first MRI morphometric data of clinically normal GDs. CSM-GDs have vertebral canal stenosis and marked foraminal stenosis throughout their cervical vertebral column when compared to normal GDs.

Keywords: dog, canine, myelopathy, Wobbler syndrome, spinal cord, cervical spine

CR - 6

EFFECTS OF VARIOUS ANTIOXIDANTS ON LENS EPITHELIAL CELLS IN VITRO AND EX VIVO EJ Miller[1], AJ Gemensky-Metzler[1], DA Wilkie[1], CMH Colitz[2], HL Chandler[1]. Department of Veterinary Clinical Sciences[1], All Animal Eye Care and Animal HealthQuest Solutions, Jupiter, FL[2]

Purpose: To determine if three antioxidants, grape seed extract (GSE), lutein, and omega-3 fatty acids (O3FA), alter oxidative stress, migration, and proliferation in lens epithelial cells (LECs). Methods: An antioxidant reductive capacity assay determined the reducing capability of each antioxidant. A dichlorofluorescein (DCF) assay evaluated the ability of antioxidants to reduce ROS production in UV stressed and unstressed LECs. Arrays were used to determine changes in protein expression following antioxidant treatments. An *ex vivo* model of posterior capsular opacification (PCO) was used to evaluate LEC migration and proliferation. Results: The antioxidant reductive effect of GSE surpassed the positive control, while lutein and O3FA showed little reductive ability. The DCF assay corroborated this data; GSE reduced ROS production in both UV stressed and unstressed LEC cultures compared to the positive control. Lutein appeared pro-oxidative and O3FA had little to no ability to reduce ROS. Protein arrays showed GSE decreased expression of IL-6, IL-8, CCL3, and CCL5 compared to controls. Lutein and O3FA showed an increase or no change in expression of studied proteins as compared to controls. The *ex vivo* PCO model demonstrated increased LEC number and migration resulting in increased area of the posterior lens capsule covered following treatment with O3FA, while GSE and lutein treatments were similar to controls. Conclusions: Only GSE showed substantial antioxidant capabilities with ability to reduce ROS generation. Lutein and O3FA demonstrated no antioxidant abilities and lutein proved pro-oxidative *in vitro*. Following treatment with antioxidants, unstressed LECs showed altered expression of cytokines known to influence redox signaling, migration, and proliferation. O3FA increased cell proliferation and migration in the *ex vivo* PCO model while GSE and lutein demonstrated little effect. Careful conclusions should be made regarding the effects of the studied antioxidants on LECs due to findings of variable and limited reducing power.

Keywords: antioxidants, posterior capsular opacification, lens epithelial cell, grape seed extract, lutein, omega-3 fatty acids

CR - 7

RELATIVE POTENCY AND DURATION OF ANALGESIA FOLLOWING PALMAR DIGITAL INTRA-NEURAL ALCOHOL INJECTION FOR HEEL PAIN IN HORSES.

C. Schneider, A. Ishihara, T. Adams, L. Zekas, M. Oglesbee, A. Bertone. Depts. of Veterinary Clinical Sciences and Veterinary Biosciences

Objective: To determine the potency (percent analgesia), duration of action (up to four months), and clinical and histological effects of surgical exposure and intra-neural injection of 98% dehydrated medical-grade ethyl alcohol compared to no treatment (negative control), sham operation (surgical control), or formaldehyde injection (positive control) to decrease experimentally-induced palmar heel pain in horses.
Animals: Six horses
Procedures: The horses were fitted with a custom pressure-inducing shoe and had outcome measurements for each heel performed before and after nerve treatments. Outcomes included induced lameness grade and vertical peak force with pressure applied to each heel, thermal and touch sensation for each heel, and pastern circumference. Outcomes were followed serially for 112 days when nerves were harvested for histology.
Results: Alcohol and formaldehyde reduced all measures of heel pain which progressed toward return, but persisted over the 112 days of the study ($P<0.05$). Pastern circumference was not different for alcohol than sham treatment, but was greater in formaldehyde than alcohol or baseline ($P<0.05$). Histological evaluation showed preservation of nerve fiber alignment with an intact epineurium, loss of axons (axon drop out), axon degeneration, fibrosis and inflammation in alcohol- and formaldehyde-injected nerves compared to control nerves. Formaldehyde injection induced greater fibrosis and inflammation than alcohol.
Conclusions and Clinical Relevance: Alcohol injection induced effective neural blockade for months with evidence that nerve structure and function could return. Formaldehyde injection showed no advantage over alcohol and is not recommended under the conditions of our study due to soft tissue inflammation.

Keywords: horses, lameness, ethyl alcohol, intra-neural

CR - 8

VENTRAL ABDOMINAL PRESSURES IN HORSES WITH ACUTE COLIC PRESENTING TO A REFERRAL HOSPITAL. V.H.L. Scott, M.C. Mudge, R.E. Toribio, S.D.A. Hurcombe. Department of Veterinary Clinical Sciences

Rationale: Intra-abdominal hypertension (IAH) is the result of sustained increases in intra-abdominal pressure (IAP). Risk factors for IAH identified in people may be comparable to horses with colic due to abdominal/visceral distension, shock and hypoperfusion. IAH has been documented for individual horses, but this area remains minimally studied in cases of equine colic. The purpose of this study was to investigate abdominal pressures in horses with colic using a routine ventral abdominocentesis.

Methods: Ventral abdominal cannulation and direct IAP measurements were collected from 53 horses with colic and 9 control horses. IAP was measured in triplicate at the end expiration and mean values were used for statistical analysis. Differences in IAP between horses grouped according to their type of colic, treatment and outcome were assessed using unpaired t-tests, one-way ANOVA and Kruskall Wallis tests. $P<0.05$ was significant.

Results: Ventral IAP was significantly higher in horses with colic compared to controls (29mmHg and 25mmHg respectively; P=0.025). 15/53 (28.3%) horses with colic had ventral IAP greater than two standard deviations above the mean IAP of control horses and were considered to have IAH. 7/15 IAH horses had a large bowel obstruction and 5/15 IAH horses had small bowel obstruction. No difference in IAP was found between colic survivors and non-survivors (P=0.873) or between horses receiving medical versus surgical management (P=0.587). IAP associated with small intestinal lesions was not different to large colon lesions (P=0.83). Horses with large intestinal disease receiving medical management had a significantly higher IAP than horses with medical small intestinal lesions or surgical large intestinal lesions (36 mmHg, 25 mmHg and 27 mmHg respectively); P=0.0003.

Conclusions: Acute abdominal disease in horses is associated with increased ventral abdominal IAP. Large intestinal medical disease showed highest IAP values. Magnitude of IAP increase did not predict management strategy or outcome.

Keywords: colic, horse, intra-abdominal pressure, intra-abdominal hypertension

EAR – 1

THE USE OF HEAVY METALS MICRONUTRIENTS IN SWINE FEED AND ITS ASSOCIATION WITH THE OCCURRENCE OF COPPER AND ZINC TOLERANT AND MULTIDRUG RESISTANT *SALMONELLA.* J. Medardus[1], V. Artuso-Ponte[1], B. Z. Molla[1], M. Nicol[1], W.E. Morrow[2], P. Rajala-Schultz[1], W. A. Gebreyes[1]. [1]Department of Veterinary Preventive Medicine, The Ohio State University, Columbus, Ohio, [2]Department of Animal Science, College of Agriculture and Life Sciences, North Carolina State University, Raleigh, North Carolina.

Heavy metals are included in the feed of swine to promote growth and improve feed efficiency. Heavy metal tolerance genes and multidrug resistance (MDR) have been identified among *Salmonella* strains; however, the emergence and persistence, as well as the potential association between copper and zinc tolerance factors and antimicrobial resistance among foodborne pathogens are poorly understood and not investigated in US. The objective is to identify and characterize the role of copper and zinc intervention in the emergence of heavy metal resistant *Salmonella* and its association with the emergence and persistence of MDR *Salmonella* in swine. We hypothesize that the use of heavy metals is associated with the occurrence and persistence of MDR *Salmonella*. A total of 351 *Salmonella* isolates were selected; minimum inhibitory concentration (MIC) of Cu^{2+} and Zn^{2+} and the presence of pcoA and czcD tolerance genes were determined. About 48% of the isolates were tolerant to Cu^{2+} at 24mM, while 52% showed tolerance ranging from 4mM to 20mM. About 58% of the isolates showed Zn^{2+} tolerance at 8mM and the remaining 42% showed tolerance at 4mM. Among the most tolerant isolates, the most common MDR patterns were AmClStSuTe and AmStTeKm, both commonly found in swine. Low Zn^{2+} MIC isolates were more likely to be MDR than high Zn^{2+} MIC (P=0.0829). High Zn^{2+} MIC isolates were strongly associated with the AmClStSuTe R-type (P<0.0001) and they were more likely to carry the *czcD* gene (P<0.0001). High Cu^{2+} MIC isolates (>20 mM) were more likely to be MDR (P=0.0073), they were strongly associated with the R-type AmStTeKm (P<0.0001) and were more likely to carry *pcoA* gene (P=0.0003) than low Cu^{2+} MIC isolates (≤20 mM). Findings suggest that the use of in-feed Cu^{2+} and Zn^{2+} leads to a higher tolerance, which in turn co-selects antimicrobial resistance among *Salmonella* strains.

Keywords: heavy metal tolerance, antimicrobial resistance, *Salmonella*

EAR - 2

USE OF WHITE LIGHT SCANNING TO GENERATE ANATOMICALLY ACCURATE THREE-DIMENSIONAL MODELS OF THE CANINE CERVICAL SPINE. J. Bertran, M. Alizadeh, G. Knapik, W. S. Marras and M. J. Allen. Depts. of Veterinary Clinical Sciences and Integrated Systems Engineering

Background: Accurate three-dimensional (3D) models of spine are required in applications such as implant design, finite element analysis and computer-aided surgical planning. Computed tomography (CT) and magnetic resonance imaging (MRI) are currently the gold standard for the acquisition of anatomic data from live patients. The objective of the current study was to compare the accuracy of a novel surface imaging method, white light scanning (WLS), to that of CT for the generation of a 3D model of the canine cervical (Ce) spine. We hypothesized that CT-based models would be sensitive to partial volume effects due to variations in user-selected CT thresholds. Additionally, we sought to determine the feasibility of fusing WLS, MRI and CT data in order to generate a high fidelity 3D model of the Ce spine.

Methods: An isolated canine Ce spine underwent CT scan and WLS. Eleven different models were then created; 1 generated from the WLS data and 10 models with different threshold settings (with different threshold selections) were generated from the CT data. Geometric deviations were calculated between the WLS model and the ten models generated from the CT data. A second intact cervical spine was then imaged by MRI, CT and WLS, with the data being fused to generate a composite anatomic model.

Results: Variations in CT threshold resulted in measurable differences in model geometry. Differences were also seen between levels when using the same threshold suggesting inevitable inaccuracies during CT modeling of a structure. WLS provided a high-resolution model of the cervical spine and we are currently working to fuse the MRI and CT data into this model.

Discussion: This study forms the foundation of ongoing work in which we are fusing WLS data with advanced imaging data to construct anatomically accurate 3D models for surgical simulation of the canine cervical spine.

Keywords: spine; imaging; MRI; CT; computer modeling

EAR - 3

MOLECULAR CONFIRMATION OF ZOONOTIC INFLUENZA A VIRUS TRANSMISSION AT OHIO AGRICULTURAL EXHIBITIONS. A. Bowman, S. Nelson, J. Nolting, R. Slemons. Department of Veterinary Preventive Medicine

Agricultural exhibitions are the primary setting in the United States in which swine from various sources and humans commingle, providing opportunity for bi-directional zoonotic transmission of influenza A viruses (IAV). This animal-human interface proved active in 2012 when 306 human cases of infection with influenza A (H3N2) variant virus (H3N2v) were epidemiologically associated with agricultural exhibitions in 10 states, resulting in 16 hospitalizations and one death. Public health officials in Ohio documented 107 H3N2v cases during 2012, second only to Indiana. Here we compare 14 swine-origin H3N2 IAV isolates containing the M gene from the A(H1N1)pdm09 virus, termed H3N2pM, recovered from pigs at seven agricultural exhibitions in Ohio during 2012 to seven H3N2v human isolates contracted at each of those respective exhibitions. These data, obtained from active IAV surveillance in exhibition swine, provide a unique view of IAV activity occurring at the swine-human interface at agricultural exhibitions. Nucleotide identity of the H3N2 isolates recovered from both humans and swine at all seven exhibitions was greater than 99%, indicating that the same swine-origin H3N2pM IAV infected exhibition swine at numerous exhibitions and was transmitted to humans in at least seven separate events occurring at geographically disparate locations across Ohio over a period of several weeks. Phylogenic analyses showed this H3N2pM virus was similar to contemporary H3N2pM isolates recovered from North American swine. These results provide molecular evidence that zoonotic transmission was widespread and confirms the epidemiological linkages between human H3N2v cases and swine exposure at agricultural exhibitions. The results of the current study demonstrate the need to define the ecology and evolution of IAVs in exhibition swine. Swine-to-human transmission of IAV occurred with an unprecedented frequency in 2012 necessitating the development of veterinary and public health interventions to reduce inter- and intra-species transmission of influenza A viruses at swine exhibitions.

Keywords: Swine, Influenza A Virus, H3N2v, Zoonotic Infections

EAR - 4

OCCURRENCE OF METHICILLIN RESISTANT *STAPHYLOCOCCUS AUREUS* IN OHIO DAIRY FARMS. L da Costa, P Rajala-Schultz, A Hoet, G Schuenemann. Department of Veterinary Preventive Medicine.

Staphylococcus aureus (SA) is the most prevalent contagious mastitis pathogen in US dairies, and mastitis is the main reason for antimicrobial use in dairy herds. The use of antimicrobials in agriculture has, in general, been blamed as one of the potential causes of increasing antimicrobial resistance. Methicillin Resistant *Staphylococcus aureus* (MRSA) has emerged as a concern in veterinary medicine in the past years in Europe. In the USA, a limited number of studies have been published in dairy herds and a low prevalence of MRSA has been reported in those.

Purpose: The objective of this study was to estimate MRSA prevalence in Ohio dairies and the hypothesis was that MRSA would be found in milk but in low prevalence.
Material and Methods: Bulk tank milk from 307 Ohio dairies was cultured for isolation and identification of *SA,* using selective Baird Parker media, Gram stain, and positive catalase and coagulase tests. A duplex PCR using species-specific (*femB*) and methicillin resistance (*mecA*) genes was performed. The clonal relatedness of MRSA isolates was determined using pulsed-field gel electrophoresis (PFGE), Staphylococcus protein A (spa) typing, and staphylococcal cassette chromosome mec element (SCCmec) typing.

Results/Conclusion: Over two-thirds (69%) of the bulk tank milk samples were found positive for *SA*. For this project, 209 *SA* isolates from SA positive herd, distributed across the state were screened. MRSA was detected in two isolates from the same farm (herd prevalence <0.5%), collected at different time points. Both isolates appeared highly clonal and belonged to, USA200, spa type t021, SCC type IV, designed as a community-acquired strain. These results confirm that MRSA can be isolated from milk in Ohio dairies although with a low prevalence. Further studies should investigate the epidemiology and mode of transmission of this very important pathogen.

Keywords: Methicillin Resistant *Staphylococcus aureus,* MRSA, Cows, milk

EAR - 5

THE GENOTYPING POTENTIAL OF THE *MYCOPLASMA SYNOVIAE vlhA* GENE.

M. El-Gazzar, A. Wetzel and Z. Raviv. Department of Veterinary Preventive Medicine.

Studying the epizootiology of *Mycoplasma synoviae* (MS) is an integral part of control efforts in the face of an increasing poultry epidemic. *vlhA* is the only MS gene identified as the target for sequence typing. The 5' third of the gene is relatively conserved and can be used for genotyping purposes while the 3' two thirds of the gene are variable. The source for such variation is suggested to be gene conversion between a single expressed gene and a family of pseudogenes. However, no data is available on the location beyond which the gene conversion process could occur. The purpose of this study is to pinpoint the end of the conserved region and the exact beginning of the variable region. A new PCR assay was designed to amplify a larger segment of the gene which spans the conserved region and part of the variable region. Amplification and sequencing were performed on clinical MS samples and on the *in-vitro* sequential generations of standard MS strain. This allowed both retrospective and prospective investigation of the gene conversion incidence. A 3 base segment was observed as the most proximal point where the gene conversion could occur. This segment is proposed to mark the beginning of the variable region and depict the extent of conserved region. This in turn identifies the maximum discriminatory potential that could be harnessed from this gene. Additionally the new PCR can offer a feasible studying tool for the *vlhA* gene variation frequency and mechanisms.

Key words: *Mycoplasma synoviae,* genotyping, *vlhA* gene, PCR, gene conversion.

EAR - 6

ENVIRONMENTAL SURVEILLANCE FOR EXTENDED SPECTRUM β-LACTAMASE RESISTANCE IN ESCHERICHIA COLI AT THE JACKSON PIKE WASTEWATER TREATMENT PLANT. CA King, DF Mollenkopf, and TE Wittum, Veterinary Preventive Medicine, The Ohio State University.

In response to ever increasing use of antibiotics, bacteria are evolving resistance to critical frontline drugs that fight deadly invasive Gram-negative infections. The most serious threat is bacteria that are resistant to carbapenem drugs. Bacteria gain this resistance by acquiring mobile genes that confer the ability to produce enzymes that inactivate the antibiotic. Two genes, bla_{KPC} and bla_{NDM-1}, are known to encode the ability to produce carbapenemase. While bla_{KPC} is known to be present in the US, bla_{NDM-1} is primarily disseminated in India. Because of the frequency of international travel we hypothesized that bla_{NDM-1} could be present in Ohio waste-water plants. The purpose of this study was to determine if carbapenem-resistant *E. coli* were present in Columbus wastewater, and to fully characterize those isolates and their resistance mechanisms. We collected 334 samples of untreated sewage water at the Jackson Pike Wastewater Plant between June and August of 2011 and 2012. Using selective media, we identified 158 (47.3%) samples with suspect colonies that grew in the presence of 1 mg/L of meropenem. Of these, 51 (32.9%) were classified as meropenem resistant using Kirby-Bauer disk diffusion assay and 29 isolates were also confirmed to be *E. coli* using biochemical tests and PCR. These isolates were resistant to most of the 26 drugs on our MIC panels using micro-broth dilution. Carbapenemase production was verified for 76 isolates using the Modified Hodge test. However, none of the isolates were positive on the Double Disk Diffusion test, indicating absence of metallo-β-lactamase production. Our detection of these isolates suggests the presence of a reservoir of important resistance genes for pathogens. Furthermore, resistant *E. coli* can become pathogenic in hospital environments where patients may be more susceptible to infections. Surveillance for antimicrobial resistance is an important part of education, awareness, and prevention in the public health sector.

Keywords: antimicrobial resistance, carbapenem, public health, wastewater, Jackson Pike, β-lactamase

EAR - 7

EXTENEDED-SPECTRUM CEPHALOSPORIN RESISTENCE IN ENTERIC BACTERIA FROM THE CANINE GENERAL POPULATION FROM THE OSU VETERINARY MEDICAL CENTER. D. Mathys, D. Mollenkopf , T. Wittum,. Dept. of Veterinary Preventive Medicine. The Ohio State University, College of Veterinary Medicine.

Objective: *bla*$_{CMY}$ and *bla*$_{CTX-M}$ are genes that allow bacterial production of extended-spectrum beta lactamases that confer resistance to important cephalosporin antimicrobials. The epidemiology of these resistance genes has been described for food animal populations. However, little is known about the frequency and distribution of these resistance genes in the flora of companion animal populations. The aim of this study is to estimate the prevalence of these resistance genes in the fecal flora of the general canine population providing samples for parasitology testing at the OSU Veterinary Medical Center.

Methods: We obtained fecal samples from 60 dog submissions for parasite screening from Jan. 22 - Feb. 19, 2013. Approximately 4g of feces were incubated overnight in nutrient broth containing 4 ul/ml of cefotaxime. These samples were then streaked onto 3 different MacConkey agar plates containing 2 ul/ml of meropenem, cefipime, or cefoxitin.

Results: We found that 42 fecal samples produced cefoxitin-resistant isolates, representing the expected phenotype of *bla*$_{CMY}$. Therefore the estimated prevalence of *bla*$_{CMY}$ in the general canine population at the OSU VMC is 70% (95% CI 58%-82%). We found that 4 samples produced cefipime resistant isolates, representing the expected phenotype of *bla*$_{CTX-M}$. The estimated prevalence of *bla*$_{CTX-M}$ in the general canine population at the OSU VMC is therefore 6.67% (95% CI 0.2% - 13.2%). Of these 46 isolates, 78% were lactose and indole positive, indicating that they are *E. coli*. The remainder likely represents other common enteric bacteria, such as *Klebsiella* spp.

Discussion: Our results suggest that the general dog population has similar fecal prevalence of *bla*$_{CTX-M}$ and *bla*$_{CMY}$ as has been reported in livestock populations. Additional investigation to identify populations at greatest risk would be beneficial to determine important risk factors, such as chronic antibiotic use, surgical implant, ICU patient, or other high risk populations.

Keywords: antimicrobial resistance, extended-spectrum beta-lactamase, canines

EAR - 8

µPET/CT ASSESSMENT OF LUNG METASTASIS IN A MOUSE MODEL OF OSTEOSARCOMA. A McMurray, M Allen, W Drost, B Chaffee, and K La Perle. Depts. of Veterinary Biosciences and Veterinary Clinical Sciences

Introduction: Osteosarcoma (OSA) is a common canine cancer. Presence of and progression or regression of pulmonary metastasis has bearing on prognosis and treatment. An objective *in-vivo* method for measuring efficacy of treatments is lacking. Most studies involve euthanasia of large numbers of mice at different time points to track the effect of treatment via histopathology which precludes assessment of individual treatment response. Our purpose was to determine whether micro-computed tomography with positron emission tomography (µCT/PET) was more sensitive for pulmonary metastasis than µCT alone and if µPET could quantify active pulmonary metastatic load.

Methods: Twelve mice had canine osteosarcoma cells injected into their right tibias. Mice were imaged and µCT and µCT/PET images evaluated at 3 and 5 weeks post injection. Volumes of interest (VOI) were drawn around the lungs on µCT then applied to corresponding µPET images and fluorodeoxyglucose (^{18}F-FDG) uptake measured. Lung standard uptake values (SUV) were divided by corresponding liver SUVs. The SUV ratios were compared. Mice were euthanized after imaging at 5 weeks and histopathology and stereologic analysis were performed.

Results: 10/12 mice had confirmed metastasis 5 weeks post-injection. µPET and µCT findings were concordant for 70% of the nodules. In 15% of cases, µPET scans identified a nodule not initially evident on µCT, and in 10% of cases a nodule was indicated that was not seen on µCT. In 5% of cases, nodules identified on µCT were not identified on µPET. A statistical difference was not found between the 2 time points (paired t test p= 0.075). SUV values did not correlate to metastatic load.

Conclusion: µCT/PET improved detection or confirmation of pulmonary metastasis compared to µCT alone. In this model, µPET did not quantify metastatic load. Possible reasons include respiratory motion, variable uptake of ^{18}F-FDG or overlap of signal from nearby anatomic structures.

Keywords: µCT/PET, osteosarcoma, pulmonary metastasis

EAR - 9

***SALMONELLA ENTERICA* PRODUCING CTX-M CEPHALOSPORINASE IN US LIVESTOCK POPULATIONS.** D. Mollenkopf[1], M. Erdman[2] and T. Wittum[1]. [1]Department of Veterinary Preventive Medicine, The Ohio State University College of Veterinary Medicine, Columbus, OH; [2]Diagnostic Bacteriology Laboratory, USDA-APHIS-VS-NVSL, Ames, IA.

Extended-spectrum cephalosporin drugs are approved for veterinary use in livestock worldwide. In the US, extended activity formulations are frequently applied prophylactically to intensively managed livestock housed in population-dense environments conducive to the exchange of enteric flora. Bacterial resistance to these drugs is conferred by β-lactamase production which is encoded by genes such as bla_{CTX-M}. The widespread dissemination of *Salmonella* spp. carrying bla_{CTX-M} would pose a threat to animal health and well-being, and their zoonotic food-borne transmission would pose a public health concern. We screened 2034 *Salmonella* clinical diagnostic submissions to the USDA APHIS NVSL between October 2010 and June 2011 for the bla_{CTX-M} phenotype. We identified 12 (0.6%) *Salmonella* spp. isolates carrying bla_{CTX-M} on mobile plasmids. We found 6 of 88 (6.8 %) turkey diagnostic submissions carrying bla_{CTX-M}. Of these, one *S*. Bredeney carried $bla_{CTX-M-1}$ on an IncN plasmid. The remaining 5 turkey isolates were *S*. Ouakam received from March to May 2011 originating from 3 US states carrying $bla_{CTX-M-1}$ on IncN plasmids. One additional *S*. Ouakam carrying $bla_{CTX-M-1}$ was identified among submissions received August 2011. One of 940 (0.1 %) swine diagnostic submission was a rough O:d:e,n,z15 isolate carrying $bla_{CTX-M-1}$ on an IncN plasmid. We found 5 of 143 (3.5 %) equine submissions all from one state between November 2010 and March 2011 were *S*. Anatum, one carried $bla_{CTX-M-1}$ on an IncN plasmid and the remaining 4 carried $bla_{CTX-M-1}$ on IncI1 plasmids. All IncN plasmids were ST1 which has been reported to be epidemic in Europe, indicating pandemic dissemination of this plasmid. None of the 581 cattle, 83 chicken, or 199 submissions from other species carried bla_{CTX-M}. The emergence of multiple *Salmonella* spp. carrying bla_{CTX-M} in diverse US livestock populations is an important concern for both animal and public health.

Keywords: *Salmonella enterica*, antimicrobial drug resistance, beta-lactamase CTX-M

EAR - 10

CONNECTING INFECTION AND DEMOGRAPHY: A CAPTIVE BISON POPULATION AND *NEOSPORA CANINUM.* K. Moreno-Torres[1], L. Pomeroy[1], B. Wolfe[1] and R. Garabed[1] [1]Veterinary Preventive Medicine

Neospora caninum is a protozoan parasite primarily described as a cause of abortion in cattle and a disease of the central nervous system in dogs. A sylvatic cycle of the parasite has also been demonstrated to exist in some wildlife species, such as white-tailed deer and coyotes. However, there are limited investigations on *Neospora caninum* having an effect in the dynamic of nondomestic ruminant's populations. Therefore, we focus our study of Neosporosis and its effect on wildlife and recovering populations in order to help conserve endangered species. The Wilds, a safari zoo and conservation center with the main mission of breeding endangered species has reported a positive prevalence in American bison. Therefore, the goal of this project is to evaluate the effect of *Nesopora caninum* in a bison (*Bison bison*) population at the Wilds. We used a structured population model that incorporates demographic data (i.e., age classes, fecundity, mortality) and epidemiological transitions (i.e., susceptible, infected and recovery classes). The dataset contains around 10 years of Bison demographic data (births, deaths, gender and fertility) and disease parameter values are obtained from the literature. Model simulated give age related prevalence in the herd for 20 years. Also, we did a sensitivity analysis to explore how a small perturbation in vital rates such as fecundity and survival may affect the per capita growth rate (λ) and to identify what ages may be the most important for pathogen control. This project is in progress, thus we hope to implement bison disease data to make a more accurate model. This type of model can be applied to understand the disease ecology in different host species, including livestock in which economic losses are driving the study of control measures.

Keywords: Stage-structured model, conservation medicine, *Neospora caninum*, American bison, demography and infectious diseases

EAR - 11

ANTIMICROBIAL RESISTANCE OF FECAL *Escherichia coli* FROM WHITE-TAILED DEER IN THE CLEVELAND METROPARK SYSTEM. L. Muñoz-Vargas, D.F. Mollenkopf, P.M. Dennis, J.T. LeJeune and T.E. Wittum. Dept. of Veterinary Preventive Medicine, The Ohio State University College of Veterinary Medicine.

Resistance to antimicrobials has been observed in the enteric flora of a variety of wildlife species. Deer and other wild small mammals have been implicated as potential reservoirs for maintaining bacterial resistance within natural habitats. Additionally, they may reflect the dissemination of resistant organisms and resistance genes into the environment from other sources. We assessed the prevalence of antimicrobial resistance of *Escherichia coli* strains isolated from fecal samples collected from wild Ohio white-tailed deer (*Odocoileus virginianus*) living in the Cleveland Metropark System. Fecal samples were collected from individual deer during the annual cull intended to control overpopulation. Individual fecal samples were inoculated onto MacConkey agar, and a single isolated *E. coli* from each sample was subsequently selected for further characterization. Minimum inhibitory concentrations (MICs) for 15 antimicrobial agents were performed for 462 isolates recovered before 2009 and 228 isolates from 2012 using micro-broth dilution. Increase of antimicrobial resistance in *E. coli* strains between the years was observed for amoxicillin/clavulanic acid, ampicillin, ceftoxitin, ceftriaxone, chloramphenicol, ciprofloxacin, kanamycin, kaladixic acid, streptomycin, and sulfisoxazole. The largest increase in resistance was observed for sulfisoxazole which MICs mean changed from 17.6 ug/ml (sd=16.7) to 57.0 ug/ml (sd=59.1), and the proportion resistant from 0.004 to 0.065. No increase in MIC was observed for the drugs ceftiofur, gentamicin, tetracycline, or trimetoprim/sulfamethoxazole. It has been suggested that natural environments can potentially become contaminated by antimicrobial residues from livestock operations that are spread in water or soil. However, the factors influencing the changes in resistance of enteric flora of the deer population living in this area remains unknown.

Keywords: antimicrobial resistance (AMR), *Escherichia coli*, minimum inhibitory concentration (MIC), *Odocoileus virginianus*, white-tailed deer, wildlife.

EAR - 12

ACTIVE SURVEILLANCE FOR MRSA IN THE ENVIRONMENT AND CANINE PATIENTS OF A SMALL ANIMAL TEACHING HOSPITAL. J. Van Balen[1], C. Kelly[2], R. C. Nava-Hoet[1], S. Bateman[1], A. Hillier[1], J. Dyce[1], T. E. Wittum[1], A. E. Hoet[1,2]. [1]College of Veterinary Medicine, [2]College of Public Health; The Ohio State University.

Infectious disease prevention and control programs are critical for managing pathogens such as Methicillin Resistant *Staphylococcus aureus* (MRSA) in veterinary hospitals. To understand the molecular epidemiology and ecology of this bacterium in the hospital environment, an active MRSA surveillance program was established at the OSU Veterinary Medical Center. Molecular epidemiological analysis was performed on environmental and canine-origin MRSA isolates. Antimicrobial susceptibility testing, SCC*mec* typing, PFGE typing, and dendrographic analysis were used to characterize and analyze these isolates. Overall, 13.7% of the surfaces sampled were contaminated with MRSA through the year. During this time, 91.4% of the environmental isolates collected were SCC*mec* type II and 88.9% USA100, which is consistent with HA-MRSA. This reflects a low diversity of MRSA strains circulating in the hospital. One unique PFGE pulsotype was the most prevalent for 5 consecutive months, circulating among different surfaces and hospital locations. It was later replaced by a combination of several different strains, some of which were only detected once on one surface, and others that were found up to 4 consecutive months in different locations and surfaces. The molecular analysis of isolates also suggested that incoming MRSA positive dogs were capable of introducing a new strain not previously seen in the hospital environment. Based on these results, it is evident that once a MRSA strain is introduced into the hospital, it can be easily spread and maintained in the environment over time. This information has been used to develop biosecurity and biocontainment protocols with the goal of decreasing student and personnel occupational exposure to MRSA, in addition to protecting our patients and their owners from potential nosocomial or zoonotic transmission of this pathogen.

Keywords: MRSA, Surveillance, Molecular epidemiology, Veterinary hospitals, Environment.

EDU - 1

BIOSPECIMEN REPOSITORY (TISSUE BANK).

W.Kisseberth, C.A.London, and M.Wellman, H.Borghese. Departments of Veterinary Biosciences and Veterinary Clinical Sciences

Recent advances in genetics and molecular biology have allowed researchers to identify genes and molecules associated with cancer in people. Understanding the genetics and behavior of genes and proteins in cancer cells provides information for prevention and early detection, and enables researchers to identify targets for new drug therapies.

Millions of dogs and cats are diagnosed with cancer each year. We have only begun to investigate the genetics and molecular biology of cancer in dogs and cats, but based on advances in human medicine, it is likely that similar progress can be made in the early detection, treatment, and prevention of cancer in veterinary medicine. The Ohio State University College of Veterinary Medicine established the Biospecimen Repository or “Tissue Bank” to collect tissue samples from dogs and cats with cancer so that the genetics and molecular biology can be more closely studied.

The Tissue Bank collects samples of tumors and normal tissue from dogs and cats, and stores these tissues under controlled conditions for future use by multiple investigators. Tissues are collected and archived only after receiving informed consent from the owners. The types of biological materials that are processed include a piece of the tumor, normal tissue adjacent to the tumor, whole blood, plasma, serum, and urine. Samples are preserved in liquid nitrogen, formalin and Optimum Cutting Temperature (OCT) medium. This tissue bank will serve as a tremendous resource with the ultimate goal of developing new prevention and treatment strategies for companion animals with a variety of illnesses.

Because the biology and behavior of many types of cancer in dogs and cats are similar to cancer in humans, knowledge gained from research on companion animal cancer patients benefits both people and pets.

Key words: biospecimen, cancer, genetics, molecular biology, tumor

EDU - 2

RESEARCH PATHOLOGY SUPPORT FOR EXPERIMENTAL ANIMAL MODELS PROVIDED BY THE COMPARATIVE PATHOLOGY & MOUSE PHENOTYPING SHARED RESOURCE. K. La Perle. Department of Veterinary Biosciences.

The Comparative Pathology & Mouse Phenotyping Shared Resource (CPMPSR) at The Ohio State University supplies readily available, affordable, expert experimental pathology support to investigators utilizing animal models of human and veterinary disease. The CPMPSR comparative pathologists are familiar with the normal anatomy, physiology, and pathology of many animal species, including the potential impact of confounding factors such as age- and strain-related background lesions, pathogens, and husbandry practices on study outcomes. Primary research interests for the CPMPSR pathologists encompass cancer biology, developmental pathology, endocrine disease, immune-mediated conditions, neurobiology, and toxicologic pathology. However, translational research based on any animal model is supported. The CPMPSR offers a full array of pathology services, and can tailor its support to the needs of a client. Routine procedures include comprehensive macroscopic and microscopic examinations with an emphasis on phenotype characterization of newly produced lines of genetically engineered mice as well as pre-clinical efficacy and toxicity studies. Other common methods include clinical chemistry, hematology, radiography, whole slide digitization (Aperio), frozen and paraffin slide preparation, tissue microarray preparation, and many special histochemical and immunohistochemical staining techniques. The CPMPSR pathologists are valuable collaborators for all facets of animal model development including study design, optimal sample collection, data analysis and interpretation, and communication. The CPMPSR was created to serve the experimental pathology needs of investigators at The Ohio State University, especially those in the seven health-related schools and the Comprehensive Cancer Center. However, the CPMPSR also functions as a referral service for experienced biomedical scientists at many other institutions (academic, government, and industrial).

Keywords: animal model, genetically engineered mice, histology, pathology, pre-clinical

EDU – 3

CLINICAL TRIALS OFFICE, ADVANCING THE HEALTH OF ANIMALS AND HUMANS. N.Stingle, T.Mathie, A.Smith, A.Adrian, L.FeoBernabe, N.Ruffin, H.Borghese, C.A.London, and WC Kisseberth, Departments of Veterinary Biosciences and Veterinary Clinical Sciences

The Clinical Trials Office (CTO) at The Ohio State University College of Veterinary Medicine is the largest and most comprehensive center for clinical trials involving client owned animals in the country. The CTO works closely with the Ohio State Center for Clinical and Translational Sciences, Ohio State Comprehensive Cancer Center, and Nationwide Children's Hospital as well as pharmaceutical companies across the country to bring advanced diagnostic techniques and new treatments for animals with a variety of diseases, with the ultimate goal of translating these findings into human medicine.

The CTO provides assistance in the design, execution, and evaluation of veterinary clinical trials of client owned animals, as well as familiarizes those involved in the principles of Good Clinical Practice/ Good Laboratory Practice (GCP/GLP) guidelines. The CTO facilitates the conduct of such studies through input into clinical trial design, networking with regional veterinarians to insure timely enrollment, assistance in collection and coordination of data, and establishment of standard operating procedures (SOPs).

There are several advantages for patients and clients to participate in a clinical trial. In many cases all of the costs associated with the study are covered. Clinical trials frequently provide a financial credit at the Veterinary Medical Center for future treatments and patients enrolled in clinical trials often receive advanced therapies not currently available. The CTO has established and maintained a network of regional specialists and veterinarians to assist with patient enrollment, through newsletters and periodic updates. Plans are also underway to set up satellite locations in Cincinnati, Cleveland, and Pittsburgh areas to enhance recruitment into various studies. Clients may participate knowing that these studies provide critical new information that helps advance the treatment of humans with similar diseases.

Over that past four years the CTO has supervised more than 80 clinical trials involving over 2000 client-owned animals. These studies have provided an unparalleled opportunity for animals and their owners to participate in state-of-the art treatments that have helped to shape the future of both veterinary and human medicine. The ability to perform effective and well-executed clinical trials also enhances the regional, national and international recognition of the OSU CVM as a center for veterinary research, contributing to the advancement of both veterinary and human health.

Key Words: clinical trials, treatment, veterinary medicine, human health

VME - 1

ANGIOGRAPHIC VERSUS ECHOCARDIOGRAPHIC MEASURES OF PULMONARY VALVE DIAMETER IN 40 DOGS WITH CONGENITAL PULMONARY VALVE STENOSIS. A.T. Amburgy and B.A. Scansen, Department of Veterinary Clinical Sciences

Pulmonary valve stenosis (PS), a common congenital heart defect in dogs, results from a developmental abnormality in the right ventricular outflow tract whereby the valve leaflets are thickened and fused. Dogs with PS may progress to show signs of lethargy, collapse, right heart failure, or sudden death. Symptoms of PS can be alleviated or delayed with balloon pulmonary valvuloplasty (BPV), though balloon size chosen for BPV requires an accurate measurement of the pulmonary valve diameter, which can be estimated by either echocardiography or angiography. The purpose of this study was to determine if the two methods commonly employed to estimate the pulmonary valve diameter are comparable in a population of dogs with PS. Records from the OSU VMC Cardiology Service of dogs with PS who had both an echocardiogram and a right ventricular angiogram were reviewed. Echocardiographic and angiographic measurements were obtained at 3 phases of the cardiac cycle (onset of systole, end systole, end diastole), each measured in triplicate by a single observer for both imaging modalities. All data was analyzed for descriptive statistics and normality. The comparison between methods was made by the Spearman rank-order correlation coefficient and the method of Bland and Altman. Forty dogs had sufficient imaging to be included in the study; the median age of the dogs was 6 months. At all phases of the cardiac cycle, the angiographic vs. echocardiographic measure of pulmonary valve diameter showed near perfect correlation ($r = 0.99$) with minimal bias and tight limits of agreement. These data suggest that either echocardiography or angiography can be used to obtain a measurement of pulmonary valve diameter, with both providing comparable results at all phases of the cardiac cycle.

Keywords: pulmonic stenosis, balloon valvuloplasty, echocardiography, angiography

VME - 2

MONITORING THE INTRAOPERATIVE TEMPERATURE DURING SWINE SURGERY: AN ANALYSIS OF HEATING DEVICES. M Bradley and D Coble. Veterinary Preventive Medicine and University Laboratory Animal Resources

Swine are often used as surgical research and teaching models because of their size, physiologic and anatomic similarities to man. The aim of this study was to compare three thermal supplementation devices during experimental swine surgeries. The cardiovascular and CNS effects of anesthesia can result in intraoperative hypothermia. Maintaining intraoperative normothermia is not only beneficial for the patient, but also for any surgical research or teaching, since it best simulates normal surgical operating conditions. The devices compared in this study were the Bair-Hugger, the circulating warm water blanket, and a heated table. Both survival and non-survival surgeries were analyzed, and esophageal temperatures were recorded every 15 minutes from the onset of anesthesia. Significant results were observed following data analysis for the animals in the non-survival data set. None of the selected devices maintained normothermia after the onset of anesthesia, however thermal supplementation minimized the degree of thermal loss. Use of the Bair-Hugger maintained higher body temperatures compared to the control after 90 minutes of surgery. Furthermore, the Bair-Hugger maintained higher body temperatures when compared to the heated table after 150 minutes of surgery. Finally, both the Bair-Hugger and circulating water blanket maintained higher body temperatures when compared to the heated table at 180 minutes. These data show that the Bair-Hugger is the best device analyzed at maintaining temperature, followed by the circulating water blanket.

Keywords: Swine, surgery, heating devices, anesthesia, temperature, hypothermia,

VME - 3

ECHOCARDIOGRAPHIC ASSESSMENT OF LEFT ATRIAL SIZE IN CANINE MITRAL REGURGITATION. L. K. Drake, J. Bonagura, and L. Visser. Department of Veterinary Clinical Sciences; The Ohio State University College of Veterinary Medicine

Introduction: Chronic mitral regurgitation (MR) due to degenerative valve disease is the most important cause of congestive heart failure (CHF) in dogs, with >10% of the older canine population affected. Staging severity of MR and recognizing CHF depends on identification of left atrial (LA) and ventricular (LV) dilation. Echocardiographic methods currently used to assess LA size do not record maximal chamber size and are relatively insensitive to enlargement. A simplified approach has been proposed that uses linear measurements to create ratios of the LA/aortic root (Ao); LV/Ao; and LA/LV with Ao from each subject serving as the internal reference. We hypothesized that diameter ratios could predict ACVIM functional class of heart disease in dogs with MR.
Methods and Procedures: Three groups of dogs were studied: Control Group A (n=24) were dogs (4.8-20 kg) without heart disease; Group B (n=14) were 14 healthy dogs with compensated MR; Group C (n=7) were in CHF due to MR. Echocardiography-derived LA/Ao, LV/Ao, and LA/LV were calculated for each dog. Descriptive statistics were calculated and differences across groups compared using ANOVA (Welch's correction) and Dunnet's (T3) multiple-comparison test. Receiver operator characteristic curves analysis was performed to calculate cut-offs for identifying heart disease and CHF.
Results: LA/Ao for Groups A, B, and C increased with progressive severity of MR with mean(SD) values of 2.02(.22), 2.47(.43), and 3.77(.51), respectively ($p<0.05$). The 95% confidence interval for LA/Ao in Controls was 1.7-2.5. LA/Ao>2.2 was ~80% sensitive and specific (likelihood ratio 3.7) and LA/Ao>2.6 was 100% specific but insensitive for recognizing heart disease (AUC 89.8%).
Conclusions: 2D echocardiographic ratios referenced to aortic diameter can identify cardiomegaly associated with MR and follow the progression of disease. LA/Ao>2.6 defines cardiomegaly; values > 3.3 are suggestive of CHF.

Keywords: Cardiology, Echocardiography, Canine mitral regurgitation, Left atrial enlargement

VME - 4

DETERMINATION OF REFERENCE ECHOCARDIOGRAPHIC PARAMETERS IN THE BENGAL CAT. K.L. Ferguson and B.A. Scansen. Department of Veterinary Clinical Sciences

Echocardiography is the gold standard clinical test in veterinary medicine to detect functional and morphological changes of the heart. The Bengal breed is a relatively new breed of cat and is considered a hybrid, created by crossing the Asian Leopard Cat with the domestic cat; however, measurements of Bengal heart size are currently compared to reference intervals established for all cats. The purpose of this study was to evaluate echocardiographic exams from asymptomatic Bengal cats, which were interpreted by board-certified cardiologists to be structurally normal. Echocardiograms were reviewed either from a retrospective database (n=39) or prospectively recruited for this study (n=10). A single observer (KLF) measured each echocardiogram and averaged variables of heart size and function over 3 cardiac cycles. Forty-nine cats were enrolled in the study, 25 of which were male. The median age at the time of the echocardiogram was 2 years and the median weight was 4.2 kg. The median weight of the females (3.6 kg) was statistically smaller than the males (5.0 kg). Measures of heart size were all within expected feline reference intervals for the female Bengals. However, the male Bengals had significantly larger left atrial size (95% CI: 12.5-18.2 mm), interventricular septal thickness (95% CI: 4.8-6.3 mm), and left ventricular freewall thickness (95% CI: 3.8-6.0 mm) than the females. In addition, the upper 95% measures of heart size for the males were consistently greater than reported feline reference intervals. This study established measurements of heart size for apparently healthy Bengal cats. Of clinical importance is the finding that the hearts of male Bengal cats measure larger than what is traditionally considered normal for the domestic cat.

Keywords: Bengal Cat, echocardiography, reference values

THREE-DIMENSIONAL EVALUATION OF TIBIAL TRANSLATION AND ROTATION FOR THE NORMAL AND THE CRUCIATE DEFICIENT STIFLE PRE AND POST EXTRACAPSULAR STABILIZATION. D. Gale, J. Au, B. Hettlich, M. Allen, T. Motta. Department of Veterinary Clinical Sciences

The circumfabellar-tibial suture (commonly referred to as the lateral suture) is a common procedure in private practice for the repair of the cruciate deficit stifle. The suture is placed such that it eliminates cranial thrust by maintaining the tension applied to the prosthesis at the time of implantation. While it may seem desirable to completely eliminate cranial drawer, excessive suture tension may be more detrimental than minor joint instability. Excessive tension can cause premature failure of prothesis, may cause abnormal pressures within the joint, eliminate normal range of motion, and induce significant excessive external rotation of the tibia, which can lead to abnormal cartilage and meniscal wear, and degenerative joint disease/osteoarthritisThis study used three-dimensional motion capture technology to determine the changes in tibial translation and rotation after the placement of the lateral suture at different applied tension. We hypothesize that tibial translation and the degree of internal and external rotation was different depending on the applied tension to the lateral suture. The Polaris Vicra motion capture technology measured tibal translation and rotation in relation to the femur in the normal and cruciate deficient stifle. A Fiberwire® lateral suture was applied to the stifle and tightened to different tensile forces (20-100N, in increments of 20N), as measured by Arthrex's Suture Tensioner with Tensiometer®. The normal cruciate shows mild cranial tibial translation (1.10mm ± 0.43) and internal rotation (0.43° medially) while weight bearing, which is exaggerated in the cruciate deficient stifle (translation: 9.2mm ± 0.22; rotation 14° medially). As the force applied to the suture exceeded 60N caudal translation and external rotation of the tibia were observed. Excessive tightening of the suture caused caudal translation and abnormal external rotation of the tibia. These conditions are not biomechanically normal for the stifle.

Keyword: stifle, cranial cruciate, lateral suture, motion capture

VME - 6

EFFECT OF AN INTERVERTEBRAL DISK SPACER ON STIFFNESS AFTER MONOCORTICAL SCREW/POLYMETHYLMETHACRYLATE FIXATION IN A SIMULATED CANINE CERVICAL VERTEBRAL MODEL. G. Glucksman, B. Hettlich, M.J. Allen, G. Fosgate, and A. Litsky. Departments of Veterinary Clinical Sciences, College of Veterinary Medicine, Orthopaedics, College of Medicine, and Biomedical Engineering, College of Engineering

Our objective was to compare the biomechanical effects of an intervertebral disk spacer in a polyvinyl chloride (PVC) model simulating the canine cervical vertebral column after monocortical titanium screw/polymethylmethacrylate (PMMA) fixation. Our hypothesis was that addition of a spacer would significantly increase construct stiffness and improve fatigue resistance of the construct.

A cervical intervertebral space was simulated using two PVC pipes separated by a gap and multidirectional stiffness was determined with and without an intervertebral disk spacer. PVC pipe (12.7 mm OD, 2 mm wall thickness) was cut at a 30-degree angle to create a gap model mimicking vertebral endplate orientation and disk space width similar to that of a large-breed dog. Twelve models were created, six with a 4-mm gap with no spacer (group 1), and six with a spacer filling the gap (group 2). Spacers were made out of 4-mm thick rings cut perpendicularly from PVC pipes to simulate a cortical ring allograft used in clinical patients with cervical distraction/fusion. All models were instrumented with monocortical titanium screws and PMMA for fixation of the simulated disk space. Construct stiffness in both groups was determined by 4-point bend testing in extension, flexion and lateral bending. Addition of an intervertebral disk spacer significantly increased stiffness in this model ($p<0.001$). Preliminary data on load to failure and cyclic loading also support use of a spacer. Next, testing will be performed on canine cadaveric cervical vertebral columns stabilized by monocortical screw/PMMA fixation, with and without an intervertebral spacer. If similar results are found, this could have a large clinical impact as the addition of a disk spacer would allow load-sharing between vertebrae, thereby off-loading the applied fixation and improving longevity of spinal implants until bony fusion occurs.

Keywords: cervical intervertebral model, disk spacer, stiffness, monocortical screws, dog

VME - 7

THE EFFECTS OF ENVIRONMENTAL ENRICHMENT ON THE BEHAVIOR OF SHELTER DOGS. Herron, M.; Kirby-Madden, T.; Lord, L. Depts. of Veterinary Clinical Sciences and Veterinary Preventative Medicine

Objective- To determine if food-toy enrichment combined with cage-behavior training increased desirable behaviors and/or adoption rates in shelter dogs.

Design- Prospective study

Animals- 107 dogs

Procedures- Dogs placed up for adoption in a municipal shelter were randomly assigned to either an enrichment treatment group (n=48) or control group (n=59). Treatment group subjects were exposed to an environmental enrichment and training protocol consisting of twice-daily cage-behavior training and provision of a daily food-filled toy[a]. Cage-behavior training included operant conditioning via positive reinforcement of “desirable” behaviors, including approaching the front of the cage, sitting or lying, and remaining quiet when approached. Behavioral observations were performed by a blinded observer using a scan-sampling technique on day 0 (first day on adoption floor) and again on day 3. Body posture, location in cage, and other behavioral parameters were recorded. Adoption information and behavioral observation data were compared between groups.

Results- Dogs exposed to the enrichment protocol were more likely to show an increase in desirable behaviors on day 3, compared to day 0, including sitting or lying down (68% vs. 22%, $p < 0.0001$), and being quiet (40% vs. 22%, $p = 0.017$); and a decrease in undesirable behavior – jumping (54% vs. 10%, $p < 0.0001$) than dogs in the control group. Location in cage, fearfulness, and eye contact were not significantly different between groups. Survival analysis revealed no significant difference in adoption rates between groups.

Conclusions- Results suggest that enrichment programs improve desirable behaviors and decrease undesirable behavior in shelter dogs which may enhance basic welfare and adoptability.

[a]Kong™

Keywords: Shelter, enrichment, dogs, behavior, welfare

VME - 8

EFFECTS OF IMPLANT MALPOSITIONING ON LOAD TRANSFER FOLLOWING TOTAL KNEE REPLACEMENT IN DOGS. M. Martinez[1], J. Bertran[1], A. Adams[2*], R. Siston[2*], M. Allen[1]. Department of Veterinary Clinical Sciences; Department of Mechanical Engineering[*].

Introduction: In humans malalignment of TKR (Total Knee Replacement) implants is associated with an increased risk of early implant failure. We hypothesized that alterations in varus-valgus alignment would be associated with qualitative changes in the pattern of femorotibial contact and statistically significant changes in load transfer within the canine medial and lateral joint compartments.

Materials and Methods: Custom tibial inserts with zero, three or five degrees of varus or valgus angulation were used to create clinically relevant degrees of implant malalignment. Limbs were loaded axially and the distribution and magnitude of femorotibial load transfer was measured using thin-film pressure sensors**.** The distribution of contact pressures within the medial and lateral compartments of the TKR were determined using pressure-sensitive film that was placed between the femoral and tibial components. Data were analyzed using repeated measures analysis of variance and a significance level of $p<0.05$ was considered statistically significant.

Results: Valgus angulation resulted in preferential loading of the medial compartment (8 of 8 limbs) and reduced loading of the lateral compartment (5 of 8 limbs). In contrast, varus angulation increased lateral compartment load transfer (6 of 8 limbs) while decreasing medial compartment loading (7 of 8 limbs).

Discussion/Conclusion: Data from these experiments support the hypothesis that implant malalignment alters load distribution in canine TKR. The clinical significance of these data remains to be determined and we plan to use the findings from this study to develop a retrieval analysis program.

Keywords: implant; arthroplasty; knee; canine

VME - 9

DUAL NANOPOROUS ENCAPSULATION AND LOCAL DRUG DELIVERY FOR PANCREATIC ISLET CELL TRANSPLANTATION. V. Nesser[1], H. He[2], L. J. Lee[2], F. Xu[1], C. Gilor[1], G. Hadley[3], A. Rajab[3], C. Adin[1]. [1]Department of Veterinary Clinical Sciences, Ohio State University. [2]Department of Chemical and Biomolecular Engineering, Ohio State University. [3]Department of Surgery, Ohio State University

Transplantation of pancreatic islets is recognized as a potential curative therapy for Type I diabetes mellitus (TIDM). However, islets are extremely susceptible to the mechanical, hypoxic and immunologic stresses associated with transplantation, causing a high rate of failure. Our overall goal is to evaluate a novel technique to improve islet cell survival, involving dual nanoporous encapsulation and local delivery of the incretin hormone exenatide. In this initial study we used in vitro models to tune exenatide drug delivery and biocompatibility of the implant materials prior to applying the technique in animal models. First, we used an inverted plate technique to investigate the kinetics of exenatide diffusion across a nanoporous drug delivery membrane. Outer chambers of an inverted 6-well culture plate contained RPMI; inner chambers contained one of two different concentrations of exenatide in RPMI (1ug/ml or 10 ug/ml). Exenatide concentrations in the outer chamber were measured over 24 hours and a drug concentration curve was constructed. Based on these data, a 10ug/mL concentration of exenatide is required to achieve therapeutic drug concentrations (10nM) during long-term implantation. Next, we investigated the effect of implant material and hydrophilic Polyethylene Glycol (PEG) coating on implant biocompatibility using a fibroblast adhesion model. There was no significant difference in fibroblast adherence for the three materials studied: polycarbonate (PC), polystyrene (PS), and polymethyl methacrylate (PMMA). PEG coating significantly improved fibroblast growth resistance on PMMA, but did not significantly improve the biocompatibility of PC and PS membranes. These data were used to construct a biocompatible transplantation device (using PC and PMMA materials) with two nanoporous gates, allowing exenatide delivery and diffusion of insulin and nutrients. Future plans include the implementation of dual encapsulated islets and exenatide for in-vivo studies in mice and dogs, with the ultimate goal of curing human TIDM.

Keywords: nanoporous encapsulation, local drug delivery, diabetes, islet cells, transplantation

VME - 10

HAEMATOLOGICAL AND BIOCHEMICAL VALUES IN NORTH AMERICAN SCOTTISH DEERHOUNDS. K.N. Sheerer[1], C. G. Couto[1-3], L.M. Marin[1], S. Zaldívar-Lopez[1-2], M. C. Iazbik[2], J. E. Dillberger[4], M. Frye[5], D.B. DeNicola[5].
The Ohio State University, College of Veterinary Medicine, Department of Veterinary Clinical Sciences[1] and Veterinary Medical Center[2]; The OSU Comprehensive Cancer Center[3] (Columbus, OH); J. Dillberger, LLC (Nashville, IN)[4]; and IDEXX Laboratories (Westbrook, ME)[5].

Objective: Sighthounds, including Deerhounds, have unique physiological traits that result in laboratory test results that may lie outside reference intervals for dogs in general. Although the reference intervals for most analytes are thought to be similar among sighthound breeds, specific reference intervals for sighthounds are available mainly for the Greyhound. The aim of this study was to establish reference intervals for haematology and serum biochemical profiles in Deerhounds.

Methods: Venous blood samples were collected from a population of 96 healthy Deerhounds. Haematologic and biochemical analytes were examined and reference intervals were established using the 5th and 95th percentiles.

Results: The suggested reference intervals for platelets, reticulocytes, T4, chloride, GGT, bilirubin, and glucose were lower than the reference intervals adopted for the general dog population. On the contrary, the reference intervals for MCV, potassium, BUN, ALT, AST, ALP, and cholesterol were higher than the intervals for the general dog population. The reference intervals for eosinophils and globulin were wider than the intervals used for the general non-sighthound population.

Clinical Significance: These results confirm that differences in haematologic and biochemical values exist in the Deerhound. While some of these appear to be shared by all sighthounds, other differences may be unique to the Deerhound.

Keywords: Deerhounds, haematology, biochemisty

VME - 11

ANTI-LUTEOGENIC EFFECTS OF PGF2 ALPHA ADMINISTRATION IN CYCLIC MARES. H.K. Snyder,[1] E.A. Coffman,[1] C.A. Messerschmidt,[1] K. Cole,[2] C.R.F. Pinto[1]
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In this study, we investigated the effects of PGF2 alpha (PGF; dinoprost) administration on luteal function and induction of estrus during the early diestrus period in cyclic mares. Ten mares were randomly allotted to one of the following groups: Group I (early diestrus mares) and Group II (mid-diestrus mares). On the subsequent cycle, the mares received the opposite treatment in a switchback design. Group I mares were treated with twice daily injections of 10 mg PGF on days 0 (ovulation), 1 and 2, and then once daily injection on days 3 and 4. Group II mares were administered a single injection of 10 mg PGF on day 10 post ovulation. Serial blood samples were collected throughout the study. Plasma was stored at – 80^0C until assayed for progesterone (P4) by RIA. Transrectal ultrasonography was used to document follicle growth, time of ovulation and corpus luteum formation. When in estrus, mares were artificially inseminated with semen from a proven stallion and examined for pregnancy 14 days post ovulation. Significance for all statistical analyses was set at $P<0.05$ and data are expressed as mean ± SD. The inter-ovulatory period was compared using a paired t-test and fertility by a McNemar's test. Progesterone radioimmunoassay data is pending and will be analyzed using an ANOVA for repeated measures.

The mean interovulatory interval for mares in Group I was shorter than that of mares in Group II; 18.5 + 2.0 days and 13.1+ 3.7 days, respectively. Preliminary progesterone values indicate PGF administration in early diestrus mares had an antiluteogenic effect, reflected by the absence of rise in concentrations of serum progesterone following ovulation. PGF administration had no effect on progesterone levels in the subsequent ovulation and the mean size of the pre-ovulatory follicles did not significantly differ between the two groups. There was no difference in the number of mares becoming pregnant after artificial insemination; 9 out of 10 and 9 out of 10 in Groups I and II, respectively. The novel approach validated by this study will enhance our ability to pharmacologically interrupt luteal function and shorten the estrous cycle while maintaining the fertility potential of the next induced cycle. This protocol could be applied clinically in breeding management including estrus synchronization and controlled timing of artificial insemination.

Keywords: PGF, Corpus Luteum, Equine, progesterone, diestrus

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VME - 12

EFFECT OF DYSTOCIA ON DAILY ACTIVITY PATTERNS PRIOR TO PARTURITON IN HOLSTEIN DAIRY COWS. M. Titler, M.G. Maquivar, S. Bas, E. Gordon, P.J. Rajala-Schultz, K. McCullough, and G.M. Schuenemann. Department of Veterinary Preventive Medicine, The Ohio State University, Columbus, OH, USA

Dystocia increases the risk for health disorders or mortality, and reduces performance of both the dam and calf. The objective of the present study was to assess the effect of dystocia on cow activity behavior 4 d before calving. A total of 147 Holstein cows (PRIM and MULT) housed in free-stall barns from 3 dairy herds were used. All cows were housed in similar facilities using a close-up pen 15 d prior to the expected calving date and a contiguous individual maternity pen for parturition. Electronic data loggers (IceQube^{TM}, IceRobotics, Edinburgh, Scotland) were placed on the hind leg of periparturient dairy cows at 7±3 d prior to the expected calving date and 14±3 DIM. Calving ease (CE; scale 1-4), parity, calving date and time, and stillbirth (born dead or died within 24 h) were recorded. The number of steps, standing time (min), number of lying bouts (LB), and mean duration of LB (min) were recorded. Unassisted cows (n=132; CE score of 1) were compared to assisted cows (n=15; CE scores of 2-3). Data were analyzed using MIXED (activity patterns) and GLIMMIX (stillbirth) procedures of SAS. Activity patterns for assisted or unassisted cows were adjusted for the effect of herd, parity, and CE. Cows with assisted births spent more time standing (18.6%; ($P<0.05$), had similar number of LB ($P>0.05$), but LB of longer duration (42.6%; ($P<0.05$) 24 h prior to birth compared to unassisted cows. These findings provided evidence that cows experiencing difficult births showed distinct activity behavior 1 d before calving. Recognizing early warning signs (restless activity) of dystocia prior to birth may help identify those cows most at risk and pre-plan a triage as opposed to waiting for the usual signs of intervention. Monitoring cow activity along with proactive management practices around the time of calving should improve the overall survival and welfare of both the dam and calf.

KEYWORDS: Dystocia, Stillbirth, Dairy Cow Welfare, Activity

VME - 13

EFFICACY AND ADVERSE EFFECTS OF NITROFURANTOIN TREATMENT OF URINARY TRACT INFECTIONS IN DOGS AND CATS. A. Weber, J.B. Daniels, B.M. Pressler. The Ohio State University, Columbus, OH.

Efficacy of nitrofurantoin (NFN) for treatment of uncomplicated urinary tract infections (UTI) in people is >70%. In dogs and cats, however, NFN is preferentially used for treatment of resistant UTI, with an anecdotally high prevalence of adverse effects (AE). Study objectives were to determine NFN efficacy for treatment of UTI, and describe NFN-associated AE.

Animals prescribed NFN were retrospectively identified. Inclusion criteria for determining NFN efficacy included culture-confirmed susceptible UTI prior to NFN start, and repeat culture within 45d of NFN discontinuation. Inclusion criteria for AE description included treatment of suspected or confirmed UTI (culture confirmation not required) or for UTI prophylaxis, and ability to determine NFN dosage and days at AE onset and resolution.

NFN efficacy: 18 dogs and 2 cats were prescribed 2.9-5.2 mg/kg NFN (median, 4.0) for 5-75d (median, 14d], q8h (n=18) or q12-24h (n=4) for *E. coli* (n=15), *Enterococcus*, (n=4), or concurrent *E. coli*/*Enterococcus* (n=2) UTI. Resolution was confirmed for 8/21 (40%) UTI (6/15 *E. coli*; 2/4 *Enterococcus*). NFN AE: Peripheral neuropathy (n=3) or gastrointestinal disturbances (n=4) developed 3-52d (median, 7.5d) after start of NFN; total daily mg/kg dose was similar in dogs with (13.2; range, 4.1-17.1) or without (12.1; range, 3.3-18.4) AE. Effects resolved in 6 dogs 2-6d (median, 4d) after NFN reduction or discontinuation; 1 dog was euthanized 3d post onset of neuropathy.

Low NFN efficacy is likely due to preferential use for treatment of complicated UTI, and inappropriately long dosing intervals in some animals. AE consistently resolved with NFN discontinuation or dose reduction.

Keywords: Nitrofurantoin, Urinary tract infections, Adverse effects, Canine, Feline

VME - 14

DARK-FIELD MICROSCOPY IN EQUINE LARGE COLON SURGICAL COLIC

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Rationale: Large colon (LC) volvulus represents a serious and life threatening strangulating obstruction in the horse associated with high morbidity and mortality even with surgical correction. Patient outcome relies on accurate intra-operative assessment of colonic viability to determine the most appropriate course of management. Viability assessment in the clinical setting is largely subjective; whereas objective histomorphometry, while accurate, is not a practical option available to the colic surgeon. We hypothesize that real-time dark field microscopy (DFM) (Microscan®) can detect changes in serosal microcirculatory blood flow in horses with naturally occurring surgical lesions of the large colon and may be useful in the intra-operative assessment of viability. Our objective was to quantify microcirculatory perfusion indices (MPI) (total vessel density (TVD), perfused vessel density (PVD), proportion of perfused vessels (PPV) and microcirculatory flow index (MFI) in horses with strangulating, non-strangulating and simple obstructions of the large colon in addition to normal control horses.

Methods: Control horses with no colonic lesion and client-owned adult horses with primary surgical lesions of the LC were categorized by lesion and imaged using the Microscan® - a hand held video microscope. MPI were determined from video loops using AVA 3.0 software. Comparisons of MPI between lesions types were performed by ANOVA. $P<0.05$ was significant.

Results: Colic horses (n=23) had different MPI compared to control horses (n=9). Specifically, strangulating lesions (n=9) had lower PPV ($P<0.001$), PVD ($P=0.001$) and MFI ($P=0.04$) than control horses. TVD was not different among all groups ($P=0.07$). Strangulating obstructions also had lower PVD and PPV (both $P<0.05$) compared to simple obstructions (n=7) but not statistically different from non-strangulating obstructions (n=7; $P>0.05$).

Conclusions: DFM is an intra-operative technique that can detect differences in colonic serosal microcirculatory blood flow in naturally occurring cases of surgical colon lesions in horses.

Keywords: large colon volvulus, viability, dark-field microscopy, Microscan®

VME - 15

ASSESSMENT OF LEFT ATRIAL SIZE IN CATS WITH LEFT-SIDED CONGESTIVE HEART FAILURE. E Wetli, KE Schober, W Drost. Department of Veterinary Clinical Sciences

Left atrial enlargement (LAE) has been reported as an important radiographic finding in the diagnosis of left-sided CHF (l-CHF) in cats. We hypothesized that LA size as assessed by thoracic radiography can be normal in cats with l-CHF.

100 consecutive cats with acute l-CHF were evaluated. To be included, thoracic radiographs taken in orthogonal planes and transthoracic echocardiography performed within 24 hours of diagnosis were required. On radiographs, presence of CHF, cardiomegaly, LAE, vertebral heart score (VHS), LA-VHS, and the cardio-thoracic ratio (CTR) were assessed. On echocardiography, LAE, maximum LA dimension (LADmax) and area (LAAmax), and LV size were evaluated. Reproducibility of radiographic and echocardiographic data was done using the coefficient of variation and Cohen's Kappa from 20 randomly selected samples. Data was evaluated using standard statistical procedures.

Cats had hypertrophic cardiomyopathy, unclassified cardiomyopathy, dilated cardiomyopathy, restrictive cardiomyopathy, congenital heart disease, chronic renal failure, hyperthyroidism, and other diseases. Administration of blood products, fluids, corticosteroids, and onset of arterial thromboembolism could be identified as trigger events leading to cardiac decompensation. On echocardiography, LAE was diagnosed in 96% of cats based on visual inspection of images; 93% had LADmax>15.1mm and 80% had LAAmax>2.80cm^2 suggestive of LAE. Upon lateral and ventral-dorsal radiographs, only 48% and 53% of cats had evidence of LAE based on subjective assessment, respectively. 36% had absence of LAE in both views, 36% had presence of LAE in both views, and 28% had presence of LAE in only one of the two views. 96% of cats had cardiomegaly based on subjective assessment of radiographs, whereas VHS was >8.1v in 90% of cats. The CTR was > 0.77 in 43% cats. Pulmonary arterial enlargement (67%) was found in more cats compared to pulmonary vein enlargement (51%).

These data suggest that LAE on thoracic radiographs may be absent in cats with l-CHF.

Keywords: Left atrial enlargement, Feline congestive heart failure, vertebral heart score, echocardiography, thoracic radiography

VME - 16

UNDERSTANDING THE MOLECULAR EPIDEMIOLOGY OF *STAPHYLOCOCCUS AUREUS* IN DOG OWNING HOUSELHODS. K. Brunson[1], J. Van Balen[1], Emily Nutt[1], Anthony Dent[1],T. Landers[2], A. Hoet[1,3]. 1 Department of Preventive Medicine, College of Veterinary Medicine; 2 College of Nursing; 3 College of Public Health, The Ohio State University

Staphylococcus aureus (SA*)* is an opportunistic zoonotic pathogen that can be transmitted between people and their pets. Nevertheless, it is unknown if dog ownership is a risk factor for SA colonization/infection and under what circumstances such transmission occurs. Increased colonization is important because it could increase the risk of health consequences in families with pets.

The main objective of this study was to determine the clonal relationship of isolates obtained from people and pets in the same household using *spa* typing. The second objective was to determine the isolates' antimicrobial resistance patterns.

spa typing was based on a technique described by Hallin et.al. (2009). DNA was extracted from each SA isolate using boiling followed by a PCR targeting the *spa* gene. The amplicom obtained was cleaned with a commercial kit and sent to a commercial sequencing lab. The sequence results were entered into an open source web-based program (*spa*Typer, www.Fortinbras.us) which matched the sequence to a global database of *spa* sequences, assigning a *spa* type to each isolate. Antimicrobial resistance patterns were determined by standard Kirby-Bauer disc diffusion method.

To date, 356 humans and dogs have been screened for SA, with 83 (29.8%) humans and 6 (7.7%) dogs testing positive. Of those, 7.2% (6/83) human and 16.7% (1/6) canine SA isolates were Methicillin-Resistant *Staphylococcus aureus* (MRSA). Currently, the most frequent *spa* type detected was t012, which has been reported globally and is one of the most common *spa* types circulating in humans. t012 is associated with children and young adults, women, and health-care workers. All MRSA isolates were considered pansuceptibles, mostly resistant to Beta-lactam drugs as expected.

Because this is ongoing, double blind research, the final analysis to determine any association and potential risk factors involved in human-to-canine transmission of SA at the household level has not been performed.

Keywords: *Staphylococcus aureus*, MRSA, *spa* types, antimicrobial resistance.

VME - 17

ZOONOTIC PATHOGENS IN FRESH RETAIL CHICKEN BREASTS FROM SUPERMARKETS. EM Bryant, JK Cenera, CA King, DF Mollenkopf, and TE Wittum, Veterinary Preventive Medicine, The Ohio State University College of Veterinary Medicine.

Zoonotic pathogens commonly contaminate retail chicken breast meat, which can produce acute gastrointestinal illness in consumers as a result of improper kitchen hygiene and cooking procedures. There is a common perception that retail chicken products labeled as “organic” or “antibiotic free” are healthier than products from conventionally raised chicken due to the belief that meat from chickens raised in an organic or antibiotic free manner will contain fewer pathogens. However, there is little scientific data to support or refute this belief. Therefore, we hypothesized that fresh retail chicken breast labeled as organic or antibiotic-free would have differences in recovery rates of zoonotic pathogens when compared to similar products without those label claims. In order to investigate this hypothesis, we purchased 231 retail packages of fresh raw chicken breasts from 98 stores located in OH, MI, and PA. Of these, 96 packages were labeled as antibiotic free, 40 were labeled as organic, and 95 were conventional packages without either label claim. We then cultured each package for the presence of *Salmonella* spp., *Campylobacter* spp. and *Escherichia coli*, representing three zoonotic bacteria that commonly contaminate packages of retail chicken breast meat. We recovered *E.coli* from 162 (70%) of the packages, *Salmonella* from 53 (23%) packages, and *Campylobacter* from 25 (11%) of the packages. We observed no difference in the recovery rates of these bacteria between chicken breast packages labeled organic, antibiotic free, or conventional. Our results suggest that retail packages of boneless chicken breast labeled as organic or antibiotic free are microbiologically similar to conventional boneless chicken breast without those label claims.

Keywords: Chicken, *Salmonella* spp., *Campylobacter* spp., *Escherichia coli*

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ANTIMICROBIAL RESISTANCE IN FRESH RETAIL CHICKEN BREAST FROM SUPERMARKETS JK Cenera, EM Bryant, DF Mollenkopf, CA King, TE Wittum; Department of Veterinary Preventive Medicine, The Ohio State University, Columbus, OH

The World Health Organization has identified the worldwide increase of antimicrobial-resistant organisms as one of their most important food safety concerns. Recently, the use of antimicrobial drugs in food animals has been implicated as a potential source of resistant bacteria, leading to the introduction of these pathogens into the food supply. To better understand the potential public health risk associated with antimicrobial use in food animals, scientific data is needed on the frequency of resistant pathogens and resistance genes in the food supply. We investigated the prevalence of antimicrobial resistance among commensal *E. coli* and the presence of specific resistance genes on fresh retail chicken breast sold in Ohio, Pennsylvania, and Michigan. A total of 231 packages of boneless chicken breast labeled as either organic (n=96), antibiotic-free (n=40) or neither (n=95) were collected from 98 retail supermarkets in the three states. Each sample was cultured for commensal *E. coli*, and for *E. coli* resistant to fluoroquinolones, and *E. coli* resistant to extended-spectrum cephalosporins using selective media. *E. coli* with an AmpC resistance phenotype were recovered from 162 packages (70.1 %) while *E. Coli* resistant to cefepime were recovered from 16 packages (6.9%). Fluoroquinolone resistant *E. coli* were recovered from 20 packages (8.7 %). Preliminary results indicate the presence of *E. coli* resistant to cefepime, *E. coli* resistant to fluoroquinolones and E*. coli* with an AmpC resistance phenotype in each chicken type. Characterization of samples (PCR to confirm genotype, plasmid profiles, conjugation experiments and sequencing) was performed to better evaluate and understand the presence of the antibiotic resistance pathogens recovered from the samples. We observed little difference in the frequency of resistance among the chicken types. Further research is needed to determine if antimicrobial restriction would reduce the presence of resistant bacteria in food, or that antibiotic use reduces food-borne pathogens.

Keywords: antimicrobial resistance; food-borne pathogens; antibiotic use; retail chicken breast; food supply; public health

VME - 19

MOSQUITOES OF THULE AIR BASE, GREENLAND AND PRESENCE OF BARTONELLA AND RICKETTSIA SPP. IN CAT FLEAS AND DOGS TICKS COLLECTED FROM DOGS IN AMERICAN SAMOA

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Thule Air Base in western Greenland had a previously uncharacterized mosquito problem. Swarms of mosquitoes have been reported from June to late August, but the species were unknown. We conducted a base-wide mosquito vector survey from June-July 2012. Active breeding sites were located throughout the base and surrounding valley. One species of mosquito, *Aedes impiger*, was collected and more than 3000 were processed for PCR based virus surveillance. Two pools of mosquitoes tested positive for an *Orthobunyavirus*, however DNA sequencing of the viral amplicons was not complete enough to fully identify the agent.

A survey of ectoparasites from dogs on the American Samoa islands of Aunu'u and Tutuila was conducted in June 2012, and followed by pathogen screening of the samples. One species of flea, *Ctenocephalides felis*, and one tick species, *Rhipicephalus sanguineus*, were collected and tested for *Bartonella* and *Rickettsia* species via PCR. *Bartonella clarridgeiae* and an unnamed spotted fever group, *Rickettsia*, were detected in the fleas. None of the ticks were positive. The *Rickettsia* species was previously reported from *Ctenocephalides* spp. from Egypt, Thailand, USA, and the Republic of the Marshall Islands, and is likely closely related to *Rickettsia felis*, a flea-borne pathogen. This is the first report of flea-borne *Rickettsia* and *B. clarridgeiae*, from American Samoa. Ectoparasite-borne infections are easily misdiagnosed or ignored as their symptoms are often vague and similar to other illnesses (e.g., dengue). Our results indicate a potential threat to human and animal health as infected fleas were collected from household pets.

Key Words: *Aedes impiger,* Greenland, Arctic, Thule, *Orthobunyavirus*, survey, Ixodidae, Pulicidae, domestic dog, American Samoa, *Rickettsia, Bartonella clarridgeiae, Ctenocephalides felis, Rhipicephalus sanguineus*

VME - 20

TICK INFESTATION AND DISEASE AT THE HUMAN- LIVESTOCK-WILDLIFE INTERFACE AT RIMPA ESTATES, RIFT VALLEY, KENYA. R. Lauer, W. Gebreyes, L. Capitini, P. Dennis, E. Kariuki, M. Olum, and W. Ogara. The Ohio State University College of Veterinary Medicine, Depts. of Veterinary Clinical Sciences and Veterinary Preventive Medicine, Kenya Wildlife Service, and University of Nairobi.

Tick-borne disease is major concern in Kenya, especially in livestock production. Wildlife are commonly blamed as the source of infestation, despite evidence that tick species were introduced to Africa from the exotic cattle trade and that the contribution that wildlife make to the tick problem is overestimated. The prevalence of ticks between domestic animals and wildlife was examined at Rimpa Estates in the Rift Valley of Kenya. Rimpa Estates is an 1800 acre farm located approximately 25 km from Nairobi and close to Nairobi National Park, which creates a unique human-livestock-wildlife interface. Ticks were collected from domestic animals at opportune times and placed in labeled vials with 70% alcohol. Traps from Kenya Wildlife Service (KWS) were placed along the river where the carnivores inhabit. Animals that were caught were anesthetized by Dr. Kariuki of KWS for tick collection. To compare tick species and density, transects were swept for ticks in areas occupied by livestock, areas where they interact with wildlife, and areas where the livestock do not go and only the wildlife cross. Transects were also swept for ticks in different microhabitats to compare tick prevalence and density. Ticks were identified in the laboratory at Kenya Wildlife Service. The main tick specie affecting the cattle was *Rhipicephalus* (*Boophilus) decoloratus*, which was only found on the cattle (except for one tick found on the sheep) and is a species that is maintained by cattle. *Rhipicephalus evertsi evertsi* was the most common species found in the environment and was also found on the domestic animals. The domestic dogs and wild carnivores (mongoose and genet) had one species in common, *Haemphysalis leachi*, which feeds on domestic and wild carnivores. The wildlife is not contributing to tick infestation as much as thought, especially as far as the cattle are concerned.

Keywords: tick, tick-borne disease, human-livestock-wildlife interface, Kenya

VME - 21

TIME AND SPATIAL ANALYSIS OF THE NEW WORLD SCREWWORM (COCHLIOMYIA HOMINIVORAX) IN DARIEN AND COMARCA EMBERA, PANAMA (2001-2011). M. Maxwell,[a] J. Subia,[b] J. Abrego, [c] E. Jones,[b] R. Garabed,[a] R.E. Toribio[a]
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Cochliomyia hominivorax, the New World Screwworm fly, is a voracious consumer of living flesh through its larvae (maggots) and is a threat to food security worldwide causing decreased productivity, increased susceptibility to other pathogens, and, in severe cases, death of domestic livestock and specifically cattle. Screwworm caused extensive economic losses to the US livestock industry. The Sterile Insect Technique (SIT) was used to eradicate screwworm throughout North and Central America and continues to be used as a method of control in the eastern provinces of Darien and Comarca Embera in Panama. The goal of this study was to evaluate the temporal and spatial trends of screwworm myiasis cases collected in Comarca Embera and Darien (border with Columbia), Panama from 2001-2011. We hypothesized that there will be a temporal trend with more cases of screwworm myiasis during the transition between dry to rainy season. We also hypothesized that data would be spatially clustered near Colombia as a result of eradication strategies and the presence of an endemic population of flies. Temporal (month and season) and spatial (Darien, Comarca Embera) data from 2001-2011 was retrieved from the COPEG-USDA database (Panama) and analyzed by an ANOVA, Ripley's K factor, discrete Poisson, and Getis-Ord Gi*. The data were determined to be spatially clustered via Ripley's K factor analysis, and three case clusters were identified using a discrete Poisson and Getis-Ord Gi*. One cluster of cases occurred from 2001-2003 and was considered a focal temporal and spatial cluster. The two remaining clusters contain cases from 2004-2011 and 2001-2011 suggesting an endemic population of flies. No temporal trends were found in the data. We propose that the lack of a temporal pattern in the number of myiasis cases in this region was the result of warm humid conditions associated with a lack of seasonality.

Keywords: Epidemiology, Screwworm, *Cochliomyia hominivorax*, Cattle, Panama, Wound, Mapping

VME - 22

DAIRY COW BEHAVIOR AS A METHOD OF EARLY MASTITIS DETECTION

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Introduction Mastitis continues to inflict dairy cows as one of the most common and economically devastating diseases within the dairy industry. Sickness behavior may be useful as an early detection tool for clinical mastitis (CM). The objective of this study was to describe sickness behavior in cows with naturally occurring mastitis cases and assess the usefulness of sickness behavior as an early indicator of mastitis. We hypothesize that cows with CM will show altered activity due to udder discomfort after the formal diagnosis of mastitis and that these changes in activity could assist in early diagnosis of intramammary infection. **Methods and Materials** To study sickness behavior, activity monitors (IceQube™, IceRobotics, Edinburgh, Scotland) were placed on a hind leg of pregnant dairy cows approximately one week before calving and left there for approximately two weeks after delivery. Eighty cows in two central Ohio dairy herds were monitored during 2011 and 2012. Fifteen cases of CM were identified and included in statistical analysis. The monitors measured number of steps taken, lying time, number of lying bouts, and standing time and an overall motion index was calculated based on these parameters. CM cases were diagnosed by farm personnel according their standard operating procedures. Data were analyzed using MIXED procedure in SAS, v. 9.2 (SAS Institute Inc, Cary, NC). Using daily summary data from CM cows on different activity parameters as the outcomes, days with respect to diagnosis of clinical mastitis was the main variable to interest. Data from 5 days before the clinical diagnosis of mastitis to 3 days post diagnosis were included. Day 5 before diagnosis was used as the baseline level in the analysis. Days in milk at CM diagnosis and herd were included in the models as potential confounders. First order autoregressive covariance structure was used to account for the correlated data between days within cows and cows within herds. **Results and Discussion** Clinical cases of mastitis were diagnosed an average of 4 days in milk (DIM), with a minimum DIM of 1 and a maximum of 15. Preliminary results suggest that cows with CM do show altered behavior patterns. The most significant changes were seen 2 days before CM diagnosis. The length of a lying bout decreased by 30 minutes two days before CM diagnosis compared to the baseline, 5 days before diagnosis (P=0.036) (Figure 1). Also two days prior to mastitis diagnosis, motion index increased by 1457 points (P=0.0923) and daily standing time was 2.1 hours longer (P=0.0304) than 3 days earlier. Overall lying time and number of lying bouts and steps taken per day were not significantly altered prior to CM diagnosis. These results suggest that cows exhibit subtle behavioral changes approximately 2 days before farm staff will notice changes in appearance of milk or more generalized sickness behavior.

Keywords: Mastitis, dairy, behavior

VME-23

INVESTIGATION OF EPIDEMIOLOGIC AND NUTRITIONAL FACTORS ASSOCIATED WITH A GLOBAL EPIZOOTIC OF TRANSITIONAL CELL CARCINOMA IN FISHING CATS (*PRIONAILURUS VIVERRINUS*).

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Transitional cell carcinoma (TCC) of the urinary bladder has been previously reported in fishing cats (*Prionailurus viverrinus*) maintained in North American zoos[1,3], but the pathogenesis and prevalence of TCC are unknown. In this study, our objectives were to: 1) investigate the prevalence of TCC in captive fishing cats in North America and internationally, 2) evaluate risk factors possibly associated with TCC occurrence in North American zoos, and 3) begin assessing nutritional parameters in fishing cats to explore a possible link between diet and TCC. A combination of email survey of zoo veterinarians and pathological surveillance identified 29 confirmed cases of TCC in fishing cats housed in North American zoos since 1995, representing ~35% of all fishing cats (>5 yrs of age) that died during this time period. Notably, TCC was diagnosed in three imported founders originating from three different fishing cat range countries (Thailand, Cambodia, Sri Lanka). Additional TCC cases (n = 13) were observed in fishing cats housed in European and Australian zoos. Epidemiologic analysis of data from the Fishing Cat International Studbook determined that genetic relatedness, geographic region, number of transfers between zoos, and gender were not ($P > 0.05$) correlative factors for TCC. Nutritional analysis of serum samples (n=58) from 42 fishing cats (including 19 TCC cases) in 17 North American zoos found increased ($P = 0.032$) saturated fatty acid and increased ($P = 0.048$) palmitoleic acid and decreased ($P = 0.022$) gamma-linolenic acid (GLA) concentrations in cats affected with TCC versus cats without TCC. Vitamins A and E, and antioxidant levels did not differ ($P > 0.05$). These findings indicate that TCC is a global disease concern, occurring at an epizootic level in captive fishing cats with no identifiable demographic risk factors. Because fishing cat diets in North American zoos are comprised primarily of beef with very little fish (~20%, on average), we suspect that TCC occurrence may be influenced by dietary factors. Beef-based diets are substantially higher than fish in saturated fatty acids, a dietary component correlated with TCC in humans[2] and found in the present study to be higher in fishing cats with TCC. Similarly, levels of GLA, a tumoricidal fatty acid, were lower in TCC-affected cats. These observations suggest that increasing fish composition of zoo diets to more closely mimic diets of wild fishing cats may be warranted as a preventative measure to reduce TCC-related morbidity and mortality.

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VME - 24

SEROPREVALENCE OF *TOXOPLASMA GONDII* IN FREE-RANGE CHICKENS FROM ADDIS ABABA, ETHIOPIA. Tilahun G[1], Tiao N[2], Ferreira L[3], Choudhary S[3], Oliveira S[3], Verma S[3], Kwok O[3], Molla B[2], Saville W[2], Medhin G[1], Kassa T[1], Aleme H[1], Gebreyes W[2], Su C[4], Dubey JP[3] [1]Akililu Lema Institute of Pathobiology, Addis Ababa University, Addis Ababa, Ethiopia. [2]Department of Veterinary Preventive Medicine, College of Veterinary Medicine, The Ohio State University, Columbus, Ohio 43210-1092 [3]US Department of Agriculture, Agricultural Research Service, Beltsville Agricultural Research Center, Animal Parasitic Diseases Laboratory, Building 1001, Beltsville, Maryland 20705-2350. [4]Department of Microbiology, The University of Tennessee, Knoxville, Tennessee 37996-0845

Toxoplasma gondii is a parasitic protozoa of world-wide public health concern. Felids are the definitive hosts shedding infectious, hardy oocysts in their feces. This parasite can infect any warm-blooded mammal including humans. Humans, especially those that are immunocompromised, become infected by consuming undercooked meat infected with tissue cysts, ingestion of food or water contaminated with oocyts, or through accidental ingestion of oocysts directly from the environment. Free-range chickens are a good indicator of environmental contamination with oocysts since they feed directly from the ground.

In this study, the seroprevalence of *T. gondii* antibodies in 125 free-range chickens from Addis Ababa, Ethiopia was examined using a modified agglutination test. IgG antibodies against *T. gondii* were found in 38.4% (n=48) of the 125 chickens with titers of 1:5 in 14, 1:10 in 12, 1:20 in 14, 1:40 in 3, 1:80 in 1, 1:160 in 1, 1:320 in 1, and ≥1:640 in 2 chickens. Titers less than 1:5 were considered seronegative.

Our previous study in feral cats in Addis Ababa found a high proportion of them with antibodies against *Toxoplasma gondii* suggesting a heavy oocyst contamination load in the environment. The results of this study in chickens support those results. In a number of developing countries, including Ethiopia, a high proportion of chickens are killed at home or in unsupervised slaughter facilities and the viscera are left for scavengers or are improperly disposed of. *Toxoplasma gondii* infection can be transmitted if care is not taken to wash hands thoroughly after handling meat and during cooking of meat; however, risk assessment studies have not yet been performed.

Keywords: *Toxoplasma gondii*, Ethiopia, Prevalence, Chickens, Public Health

VME - 25

BIOCIDE INTERVENTION IN SWINE PRODUCTION AND ASSOCIATION WITH MDR SALMONELLA. J. Medardus, G.VanHoy, B. Molla, W. Gebreyes. Dpt. Of Veterinary Preventative Medicine

Salmonella serovars are among the most important foodborne bacterial pathogens causing gastroenteritis in humans. Disinfection of swine production facilities is a critical aspect of the industry's food biosecurity measures to decrease the pathogen load of pigs. The goal of this study was to compare the resistance profiles and biocide tolerance levels of previously collected *Salmonella* isolates from pre- and post-disinfection of swine finishing barns that use Synergize® disinfectant. We hypothesized that the use of Synergize® results in selection of strains carrying multiple antimicrobial resistant and biocide tolerant genes. From swine barns disinfected with Synergize®, *Salmonella* isolates were collected and antimicrobial susceptibility was determined. Serial agar dilutions of Synergize® were used to determine the minimum inhibitory concentration (MIC) of Synergize®. Results from 398 samples taken from barns treated with Synergize® showed MIC's which ranged from 80-320µg/mL. Of these samples, the majority of those acquired prior to Synergize® disinfection were inhibited at 160 µg/ml. Of the samples acquired post Synergize® disinfection a greater amount showed inhibition in the 320µg/mL subset. The shift toward a higher percentage of *Salmonella* isolates requiring greater Synergize® concentration may suggest that the disinfection is producing a selective environment for more Synergize-tolerant isolates. Based on preliminary observations, we expect to identify Synergize-tolerant *Salmonella* strains and identify a positive association between the chemical intervention (Synergize®) and of multi-drug resistant *Salmonella*. Identification of Synergize® tolerance among *Salmonella* in the swine production environment is the first of its kind in the US and would warrant further tests to identify co-selection of resistance with that of antimicrobial resistance. This study, as part of a broader study of *Salmonella* resistance, could result in identification of risk factors and selective pressure in the production environment and assist the pork industry and producers' decision on class of biocide use.

Keywords: Salmonella, Antimicrobial resistance, Synergize, Biocide, Foodborne Illness, Swine Production

VME - 26

EFFECT OF HABITAT BURNING ON TSETSE FLY POPULATIONS, LOGONE FLOOD PLAIN, CAMEROON. L. Wagner, R. Garabed. Department of Veterinary Preventative Medicine

Veterinarians working within the One Health paradigm are committed to a healthier world for both humans and animals. Veterinary diseases not only lead to health problems in animals, but also possible zoonotic concern and severe economic loss in many parts of the world. Trypanosomiasis is a parasitic protozoal disease spread by tsetse fly (Glossina spp) vectors in Africa that can cause sleeping sickness in people and nagana in animals. Preventing the spread of this disease can be theoretically achieved through tsetse fly control and eradication. Past eradication strategies have involved insecticides including aerial spraying, treated screens and traps, and treating cattle directly. Pastoralists on the Logone Floodplain have also anecdotally used controlled burning of the grasslands in the hot/dry season to control fly numbers near their herds, but the effectiveness of this practice has not been tested.

We developed an agent-based model to examine the dynamic interaction between controlled fires and tsetse fly prevalence. We used previously published data on the biology of tsetse fly population dynamics and environmental characteristics of the Far North Region of Cameroon to parameterize the model. It was hypothesized that controlled burning reduces fly numbers in a local area, but is not effective as a permanent eradication method.

Though seasonal fluctuations in tsetse fly population densities were evident, statistically significant changes in mean population numbers in the treatment groups indicated that habitat burning does adversely affect tsetse fly populations; however, this study did not test whether fires are a sustainable or ecologically healthy means of long-term fly control. This study does not recommend that habitat burning be used as a primary method for tsetse fly control without further real-world testing, but control of fly populations may be a benefit to naturally occurring or man-made fires started for other reasons (dry habitat, lightning, stimulate grass regrowth).

Keywords: Trypanosomiasis, tsetse fly control, controlled burning, agent-based model

VME - 27

GENOTYPIC DIVERSITY OF CAMPYLOBATER COLI IN SWINE HERDS FROMTHE MIDWEST, UNITED STATES IN COMPARISON TO THOSE ISOLATES FOUND ACROSS THE EUROPEAN UNION

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Campylobacter spp is a major cause of gastroenteritis throughout the world, in underdeveloped and developed countries alike. Oral contraction is the primary route of infection chiefly occurring by consumption of contaminated water and undercooked meat products. Because of selective pressures, such as the environment, antibiotic usage and carrier species, Campylobacter spp has undergone evolution. In the present study, the genotypic diversity and dynamics of Campylobacter coli were invested by means of MSLT, a molecular method of detection which allows for highly sensitive, specific and rapid identification of Campylobacter sequencing types. By using MSLT and comparing the isolates from different areas of the world and from different species of origin, some hypothesis can be formed about the route of transmission and the evolution of Campylobacter coli.

Keywords: Campylobacter, MLST, Global Health

VME - 28

COMPARISON OF RECOMBINANT EHRLICHIAL ANTIGEN IN THE SERODIAGNOSIS OF CANINE MONOCYTIC EHRLICHIOSIS. M Brink, D Nair, TH Lai, and Y Rikihisa, From the Department of Veterinary Biosciences, Ohio State University, Columbus, OH, Research supported by Merial and NIH T35 OD010429 and NIH R01 AI047885

Canine monocytic ehrlichiosis (CME) is caused by infection with a rickettsial organism, *Ehrlichia canis*. CME has been reported throughout the world but at higher frequencies in tropical and subtropical regions (Ristic, 1993). CME is likely under-recognized since the disease is difficult to diagnose due to variable clinical signs, different stages (acute, subclinical, or chronic) of the disease, and the frequent co-infection with other tick-borne pathogens or other infectious agents. PCR-based diagnosis and serology based on specific antigens provide more sensitive and specific diagnosis for CME. *E. canis* molecular analysis, led to cloning and producing *E. canis* recombinant proteins for serodiagnosis. *E. canis* major surface antigen P30 was found to be a sensitive and specific antigen for CME serodiagnosis. Objectives of this project are to compare recombinant P30 antigen with other potentially immunogenic E*. canis* surface antigens. Our previous study revealed ECH1038 is an outer membrane protein and its N-terminus is highly conserved among *Ehrlichia* spp. Therefore we cloned the N-terminus conserved region of ECH1038 to compare the sensitivity and specificity in diagnosis of CME using well-defined experimentally and naturally *E. canis* infected dog specimens. We will employ slot blot assay combined with highly sensitive chemoluminescence detection. We will optimize the assay conditions to carry out reproducible and reliable comparisons of these antigens. Our preliminary data showed ECH1038N is a good antigen to detect CME. Once the assay is optimized we will also test other potential *Ehrlichial* antigens for serodiagnosis. Improved sensitive and specific serodiagnosis will help prompt and proper treatment of CME, when the disease is still responsive to antibiotic treatment. This will prevent infected dogs from serving as a reservoir for tick transmission.

Keywords: Canine monocytic ehrlichiosis (CME), *Ehrlichia canis*, tick-borne, recombinant protein, serodiagnosis, slot blot assay

VME - 29

***IN VITRO* PRODUCTION AND CHARACTERIZATION OF CANINE MYELOID DERIVED SUPPRESSOR CELLS.** P. Gillen, J. Wasserman, M. Sherger, H. Strange, Z. VanGundy, T. Papenfuss. Department of Veterinary Biosciences, Ohio State University, Columbus, OH. Research Supported by NIH T35 RR017491.

Myeloid Derived Suppressor Cells (MDSCs) constitute a recently described heterogeneous population of immature myeloid cells that abnormally accumulate during cancer in multiple species and significantly contribute to dysregulation of the host immune system. MDSCs are one of the most important factors that limit the efficacy of cancer immunotherapy and a greater understanding of these cells is necessary for the advancement of cancer immunotherapy. Mouse and human MDSCs have been identified as (Gr-1+/CD11b+) and (CD11b+/CD14-/MHC II -/low), respectively. While mice have traditionally been used in the study of human cancer, dogs experience spontaneous forms of cancer and are increasingly being used both as large animal models for studies of cancer immunotherapies and incorporated into the clinical evaluation of candidate therapies for use in humans. The purpose of this project was to generate and characterize *in vitro* canine MDSCs for study. Canine bone marrow progenitor cells were cultured in the presence of tumor conditioned media (TCM) and phenotypically evaluated by flow cytometry using antibodies correlating to known mouse and human MDSC markers. An increase in (CADO48A+/CD11b+) and (CD11b+/CD14+/MHC II -/low) cells was observed in canine bone marrow populations cultured in TCM when compared to cells cultured in media alone. The immunosuppressive function of these cells was evaluated in the presence of responder canine splenocytes and it was found that splenocyte proliferation was suppressed. Further study of the immunosuppressive mechanism of these cells is needed. Specifically, it is hypothesized that canine MDSCs will have increased expression of arginase, nitric oxide and reactive oxygen species when compared with cells cultured in media alone as described from human and mouse MDSCs. In summary, this project generated canine MDSCs *in vitro* that are (CADO48A+/CD11b+) and (CD11b+/CD14+/MHC II -/low), similar in surface marker expression to mouse and human MDSCs, and indicates that these canine MDSCs are immunosuppressive.

Keywords: myeloid derived suppressor cells, canine, cancer, immune

VME - 30

THE EFFECT OF SAMHD1 ON MURINE LEUKEMIA VIRUS INFECTION IN MOUSE NIH3T3 CELLS. K. Scherer, F. Wang, C. St. Gelais and L. Wu. Dept. of Veterinary Biosciences

SAMHD1 is a cellular protein that has been proposed to negatively regulate the innate immune response. Mutations in the *SAMHD1* gene are associated with Aicardi-Goutières Syndrome (AGS). AGS is an early onset autoimmune disease that causes neurologic symptoms. Myeloid cells such as dendritic cells and macrophages highly express SAMHD1. Human SAMHD1 blocks the replication of human immunodeficiency virus type 1 (HIV-1) in myeloid cells and resting $CD4^+$ T-cells. SAMHD1 mediates HIV-1 restriction by decreasing the intracellular concentration of deoxynucleoside triphosphates (dNTPs) in noncycling cells, which blocks HIV-1 reverse transcription during the infection. Murine leukemia virus (MLV) is a mouse retrovirus that can cause leukemia in certain mouse strains. However, it is unknown whether mouse SAMHD1 can block MLV infection in mouse cells. The goal of this study was to examine whether mouse SAMHD1 protein can block MLV infection in the mouse fibroblast cell line NIH3T3. This was accomplished by first transfecting a human cell line to generate retroviral vectors expressing human and mouse SAMHD1 and an antibiotic selection marker. Then NIH3T3 cells were transduced with retroviral vectors that express SAMHD1. A stable cell line expressing human SAMHD1 was generated by puromycin selection. Human SAMHD1 expression was confirmed by Western blot analysis. Then the NIH3T3 cells were infected with a single-cycle luciferase reporter MLV. The infection was quantified by measuring luciferase activity in the cell lysate post-infection. Our preliminary data suggest that human SAMHD1 can block MLV infection in NIH3T3 cells by decreasing the intracellular dNTP pool. We are currently generating stable NIH3T3 cells that express two isoforms of mouse SAMHD1 and optimizing HIV-1 and MLV infections in these cell lines. These studies will enrich our knowledge about the mechanisms underlying SAMHD1-mediated retroviral restriction in mouse cells.

Keywords: SAMHD1, MLV

VME - 31

EFFECTS OF STRESS ON NEOSPORA CANINUM ANTIBODY TITERS IN BISON (*BISON BISON*). Margaret Shoemaker[1], Marco A Coutinho da Silva[1], Barbara A Wolfe[2] [1]The Ohio State University, College of Veterinary Medicine, Columbus, OH. [2]Columbus Zoo and The Wilds, Columbus, OH

Neospora caninum is a major cause of abortion in cattle and in many nondomestic species including *Bison bison*. The specific aim of the study is to determine whether stress affects antibody titers in naturally infected bison.

Thirty bison cows were divided into treatment (stressed) and control (non-stressed) groups. Control animals were housed in a 60-acre pasture. Treatment animals were housed in a 1-2 acre pen and under human manipulation once a week for 8 weeks. Pregnancy status and blood samples were collected at the beginning of the study (Week 0) and after 8 weeks. *N. caninum* antibody titers were evaluated by ELISA. Fecal samples were collected weekly from individual animals throughout the study and evaluated for fecal glucocorticoid metabolite levels using a corticosterone enzyme immunoassay to determine stress response.

Glucocorticoid concentrations and antibody titers were not significantly different between treatment and control groups, however a decreasing trend in antibody titers was detected in both treatment and control groups. It is hypothesized that the lack of difference in glucocorticoid concentrations may be associated with the sensitive stress response of bison to human interaction. Chronic stress is also hypothesized to be associated with generalized immune suppression. This may have resulted in decreased antibody production. Future studies of glucocorticoid levels in response to exogenous adrenocorticotropic hormone stimulation and characterization of the immune system will aid in supporting these hypotheses.

Understanding the effects of stress on pathogenesis of N. caninum will allow investigators to better manage and control the disease, reducing its negative impact on the cattle industry.

Keywords: *Neospora caninum*, *Bison bison*, stress

VME - 32

IDENTIFICATION OF VIRULENCE FACTORS, PVL AND TSST, IN METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS (MRSA) ISOLATED FROM CANINES, EQUINES, AND THE ENVIRONMENT AT THE OSU VETERINARY MEDICAL CENTER M. A. Tima, J. Van Balen, A. E. Hoet Depts. of Veterinary Preventative Medicine

Methicillin-resistant *Staphylococcus aureus* (MRSA) carries a myriad of virulence genes including several toxins, such as Panton-Valentine Leukocidin (PVL) and Toxic Shock Syndrome Toxin (TSST). PVL lyses neutrophils, inhibiting the immune system, facilitating tissue invasion and necrosis. TSST, a superantigen, causes the host to produce numerous pro-inflammatory molecules, launching a non-specific immune response that destroy host cells and facilitates septicemia. Both toxins are able to worsen patient outcome during MRSA infections. Currently, MRSA strains have been found in dogs and horses, but they have been poorly characterized in regards to the presence of virulence factors such as PVL and TSST. Therefore, isolates from canine and equine patients, as well as the environment at the Veterinary Medical Center will be screened for PVL and TSST. Since a majority MRSA strains found in animals tends to be from human origin, which frequently contains these toxins, we hypothesized that some MRSA isolates from animal sources will carry one or both toxins. An improved DNA extraction utilizing achromopeptidase was tested against the traditional boiling method. Also, a novel multiplex PCR to detect TSST and PVL, including 16S as an internal control, is being standardized to test the isolates. Currently, it has been determined that the new DNA extraction is superior to boiling. Two duplex PCRs, one for PVL and 16s and another for TSST and 16s are standardized and work is ongoing to combine them into a multiplex PCR. After standardizing and validating the PCR, the objective will be to test all field isolates. A low prevalence of these toxins is expected in the canine isolates since 91.9% of these are HA-MRSA, which infrequently possess these genes. In contrast, a higher prevalence of TSST and PVL is expected in the equine isolates since 100% of these are CA-MRSA, which more commonly possess these genes.

Keywords: MRSA, PVL, TSST, Multiplex PCR

VME - 33

RADIOSENSITIZATION EFFECTS OF CURCUMIN AND CALCITRIOL ON CANINE TRANSITIONAL CELL CARCINOMA *IN VITRO*. R. Gaffke, N. Inpanbutr, and E. Green. Departments of Veterinary Biosciences and Veterinary Clinical Sciences.

Transitional cell carcinoma (TCC) is an aggressive malignancy that affects both humans and animals and presents a therapeutic problem in veterinary patients because the disease is often very advanced at the time of clinical presentation. Curcumin (diferuloylmethane), a component of turmeric (*Curcuma longa*), has been shown to have anti-inflammatory, pro-apoptotic, and growth inhibitory properties in cancer cell lines. Previous work in our laboratory has shown enhanced radiosensitivity of TCC when pretreated with $1,25(OH)_2D_3$ (calcitriol) at clinically relevant doses. Ionizing radiation (IR) is a well-established therapy in the treatment of many malignancies. However, its therapeutic application in the lower urinary tract for the treatment of TCC is limited due to side effects experienced by adjacent small intestine and colon when aggressive dosing protocols are used. In the current study, curcumin and calcitriol were evaluated to determine if they would enhance the effects of IR on TCC in culture. Canine TCC cells were treated with calcitriol at 10^{-7} M and curcumin at 10, 20, and 30 µM for 24 hours before irradiation by 6MV X-rays at doses ranging from 2 to 10 Gy. Cells were then incubated for 72 and 96 hours. Proliferation was assessed using the CyQuant assay. Curcumin at 10 µM was cytoprotective, 20 µM was mildly inhibitory, while 30 µM showed significant inhibition, varying by IR dose. Calcitriol had variable effects at the 10^{-7} M dose, however concentrations less than 10^{-7} M were cytoprotective. IR doses of 8 or 10 Gy showed marked cell death as compared to 6 Gy or lower, regardless of the addition of curcumin or calcitriol. Western blot analysis of vitamin D receptor (VDR) showed enhanced expression over controls in IR-treated cells and in cells treated with 20 µM curcumin. Preliminary data analysis is in progress on cell cycle arrest and antioxidant enzyme expression.

Keywords: Transitional cell carcinoma (TCC), calcitriol, vitamin D, curcumin, ionizing radiation (IR), vitamin D receptor (VDR).

VME - 34

INSULIN-LIKE GROWTH FACTOR-1 RECEPTOR SIGNALING IN AN EXPERIMENTAL MODEL OF EQUINE METABOLIC SYNDROME-ASSOICATED LAMINITIS. H. Lane[1], R. Geor[2], T. Burns[1], M. Watts[1], L. McCutcheon[2], J. Belknap[1]. 1. Ohio State University College of Veterinary Medicine, Columbus, OH. 2. Michigan State University College of Veterinary Medicine, East Lansing, MI.

Hyperinsulinemia is a risk factor for equine metabolic syndrome (EMS)-associated laminitis (EMSAL), and induces laminitis when experimentally produced in normal horses. The laminar basal epithelial cell (LBEC) layer, the cell layer which dysadheres from the underlying basement membrane leading to laminar failure, does not have insulin receptors but expresses insulin-like growth factor-1 receptors (IGF-1Rc) which can bind insulin. The two primary pathways downstream of IGF-1Rc are the PI3K/Akt and the Ras/Erk pathways, both of which can result in activation of ribosomal protein S6 (RPS6). We hypothesized that, in EMSAL, hyperinsulinemia leads to aberrant LBEC signaling due to activation of pathways downstream of the IGF-1Rc. For this study, 22 ponies stratified by body condition (lean [LN, n=11] and obese [OB, n=11]) were exposed to a low non-structural carbohydrate (NSC) diet (CON, n=5 for OB and LN groups) or a high NSC diet (CHO, n=6 for OB and LN groups) for 7 days. Serum insulin concentrations were obtained prior to the feeding protocol; insulin concentrations and laminar samples were obtained at the end of the 7 day feeding protocol. Immunoblotting was employed to assess laminar concentrations of both activated (phosphorylated) and total protein for key proteins downstream from the IGF-1Rc. Significant correlations existed ($P<0.05$; $r> 0.5$) between the 7 day insulin concentrations and the following phospho-proteins: phospho-mTOR, phospho-p70S6K, phospho-RPS6; no significant correlations existed with phospho-Erk. The only change ($P<0.05$) in activation state between groups was a marked increase in laminar phospho-RPS6 in obese CHO-challenged ponies compared to obese-CON ponies. These results indicate that laminar RPS6 activation occurs in EMSAL due to activation of the PI3K/Akt/mTORC1 pathway. As RPS6 activation is associated with decreased adhesion properties of epithelial cells in human disease, further investigation of this pathway may reveal new therapeutic targets for LBEC dysadhesion in EMSAL.

Keywords: laminitis, metabolic syndrome, epithelium, insulin, insulin-like growth factor-1

VME - 35

CHARACTERIZATION OF THE PERFORMANCE OF A FILTRATION-BASED EQUINE BONE MARROW STEM CELL HARVEST SYSTEM FOR THE CONCENTRATION, VIABILITY, AND RECOVERY OF STEM CELLS. L. Mundy*, A. Ishihara*, M. Wellman+, A. Bertone*. Comparative Orthopedics Research Laboratory, Department of Veterinary Clinical Sciences* and Veterinary Biosciences+

This study assessed the performance of a novel equine bone marrow stem cell harvest filter set by cell recovery, cell viability, and stem cell replication and differentiation capacities. Twelve horses were induced by a short-acting intravenous anesthesia agent and the sternum prepared aseptically. Jamshidi bone marrow aspiration needles were used to collect 60mL of bone marrow into heparin anticoagulant. The bone marrow aspirate was processed through the novel gravity filtration system designed to capture cells and platelets and produce approximately 13mL of bone marrow product. Bone marrow aspirate successfully flowed through ten of the twelve filter sets. Mean cell viability of harvested bone marrow product was 95.9%. Concentration of white blood cells, red blood cells, and platelets were not found to be significantly different between bone marrow and harvested bone marrow product indicating that the filter did not concentrate these hematologic cells. White blood cells and platelets were captured >95% on the filter, but inefficiently released into the bone marrow harvest product. Manual cytology counts indicated that the percentage of neutrophils was significantly lower in the harvested bone marrow product compared to bone marrow. There was a tendency that the total progenitor count was higher in the harvested bone marrow product than bone marrow with a 1.56-fold concentration and 37% recovery. The cells were further characterized by flow cytometry as CD90 positive, MHCI negative, and MHCII negative. Cells from the bone marrow harvest product were multipotent and differentiated into chondrocytes, osteocytes, adipocytes, and tenocytes. Our results showed that this novel equine bone marrow stem cell harvest filter set can significantly increase the progenitor cell component and decrease the neutrophil component of harvested bone marrow. However, it did not efficiently harvest a large portion of captured white blood cells or platelets.

Keywords: bone marrow, stem cells, regenerative medicine, equine

VME - 36

HEAT SHOCK PROTEIN EXPRESSION IN CANINE CORNEAL WOUND HEALING
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Purpose. Heat shock proteins, particularly HSP70, HSP47, and HSP27, have been implicated in facilitating wound healing in multiple tissues. Expression and localization of these three HSPs were assessed in normal and wounded canine corneas to elucidate a role in normal wound healing. **Methods.** Paraffin-embedded tissue obtained from previous studies of normal corneas, acute and repeatedly abraded corneas, and clinical keratectomy specimens obtained from dogs with spontaneous chronic corneal epithelial defects (SCCEDs) were subjected to routine immunohistochemistry. Additionally, four-millimeter axial corneal defects were created in cadaveric eyes. Wounded corneas were excised and incubated in culture media treated with anti-HSP antibodies or an IgG control for 48 hours. Wound healing was monitored with Richardson's stain. **Results.** Normal canine corneas exhibited constitutive epithelial expression of each HSP in specific intracellular locations. Inducible expression was demonstrated in acutely wounded tissues with similar distributions as the normal corneal sections. In contrast, expression in repeatedly abraded specimens was diminished compared to the acutely wounded tissues and localized to different intracellular compartments. No HSP expression was demonstrated in SCCED samples. Inhibition of HSP expression in culture resulted in delayed wound healing when compared to the IgG controls. Corneas treated with anti-HSP70 had significantly larger wound areas compared to all other treatment groups at all time points. When compared to rabbit IgG control corneas, those treated with anti-HSP47 demonstrated significantly larger wound areas at 12 hours only. There were no statistical differences in wound area between corneas treated with anti-HSP27 and the controls. **Conclusions.** These findings suggest expression of HSPs is induced in the normal canine cornea during re-epithelialization. HSP70 expression is likely important for the cytoarchitectural remodeling and migration necessary early in the canine corneal healing response, and suppressed expression may contribute to the pathophysiology of non-healing defects.

Keywords: heat shock proteins (HSPs), canine corneal wound healing, superficial chronic corneal epithelial defects (SCCEDs)

VME - 37

IS APOPTOSIS PRESENT IN THE SPINAL CORD OF DOGS WITH CERVICAL SPONDYLOMYELOPATHY? J Armstrong[1], RC da Costa[1], D Russell[1], P Popovich[2], D McTigue[2] [1]Department of Veterinary Clinical Sciences and Biosciences, College of Veterinary Medicine, and [2]Dpt. of Neurosciences, College of Medicine, The Ohio State University, Columbus, OH.

Cervical spondylomyelopathy (CSM) is a challenging neurologic disease in which, despite a multitude of treatment options, the long-term outcome and survival of affected dogs is poor. We hypothesize that apoptosis is present in the spinal cord of dogs with CSM, serving as an underlying mechanism for continuous deterioration. This study investigated the presence of apoptosis in CSM-affected spinal cords and characterized the cell type undergoing apoptosis.

Spinal cords of 12 CSM-affected dogs and 12 large breed dogs euthanized for unrelated reasons were used. Those without compressive lesions, as identified at necropsy, were used in the control group. Spinal cords were evaluated using hematoxylin-eosin staining to determine the severity of grey and white matter changes. Immunohistochemical evaluation with Caspase-3 was used to document apoptosis. Double labeling with terminal deoxynucleotidyl transferase dUTP nick end labeling and anti-myelin associated glycoprotein (TUNEL+MAG) or anti-neuronal nuclei markers (TUNEL+NeuN) were used to identify oligodendrocytes and neurons. For cell count, 10 areas from white and grey matter were selected. Caspase-3, TUNEL+MAG and TUNEL+NeuN positive cells were counted in a blinded manner and comparisons between groups were performed using a Wilcoxon rank-sum test.

The mean number of Caspase-3 cells in the CSM group was 83.3 (±40.9), and 36.5 (±12.6) in the control group ($p<0.001$). The mean number of TUNEL+NeuN cells was 4.5 (±2.91) and 4.5 (±2.28), for the CSM and control group, respectively ($p=0.83$). The mean number of TUNEL+MAG cells for the CSM group was 4.68 (±2.78), and 1.78 (±0.84) for the control group ($p=0.002$).

The results indicate that CSM-affected dogs have apoptosis in their spinal cords, preferentially affecting oligodendrocytes. This may be related to the demyelinating and remyelinating process associated with chronic compression, and play a substantial role in the long-term survival and outcome of CSM-affected dogs.

Keywords: cervical spondylomyelopathy, apoptosis, oligodendrocytes, neurons

URINARY HORMONE CONCENTRATIONS AND PHARMACOKINETICS/PHARMACODYNAMICS OF HALOPERIDOL IN A FEMALE INDIAN RHINOCEROS (*RHINOCEROS UNICORNIS).*

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Long-acting neuroleptics (LAN) are frequently used during immobilization and transport of rhinoceros. Long-term use (≥3 weeks) of LAN's have not yet been examined in this species. The goal of this study was to assess long-term use of the LAN haloperidol to acclimate a female Indian rhinoceros to novel stimuli. Haloperidol is unique in that it can be administered orally. Specific objectives included validating a urinary haloperidol assay to determine pharmacokinetics and pharmacodynamics. Urinary adrenal and gonadal hormone profiles were compared before and during treatment. Finally, behavioral correlates related to public exhibition and handling for reproductive assessment were evaluated.

During the first 50 days of treatment, the rhinoceros received 50mg PO and then dosage increased to 80mg PO. After 203 days, dosage was tapered for 34 days to discontinue treatment. Urine samples were collected daily. Urine haloperidol was measured using a commercially available enzyme-linked immunoassay (Neogen, Lexington, KY). The assay was validated for Indian rhinoceroses by analyzing urine from two untreated and one treated female (80mg PO). Urinary estrogen conjugate, progesterone metabolite, and cortisol concentrations were measured.

No extrapyramidal side effects were noted during treatment and the female successfully ovulated once. We found no difference (P=0.16) in background concentrations of haloperidol between Indian rhinoceroses and both were similar to background values reported in equine urine. Urine from the treated female (80mg PO) demonstrated parallelism (r=0.99) to the haloperidol standard curve. There was no difference (P=0.32) in urinary haloperidol concentrations between 50mg and 80mg dosages and were higher (P<0.05) than background levels. A dose dependent excretion effect (P<0.05) occured during dosage decline. Concentrations returned to background levels within 2 weeks of treatment ending. A positive correlation (r =0.15; P<0.05) between urinary EC and cortisol was observed. This is the first data on urinary pharmacokinetics/pharmacodynamics of the LAN haloperidol in the Indian rhinoceros.

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Keywords: Haloperidol, Indian rhinoceros, Urinary hormone, Pharmacodynamics, Pharmacokinetics

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ADVANCED GLYCATION END PRODUCT CROSS-LINK BREAKER ATTENUATES DIABETES-INDUCED CARDIAC DYSFUNCTION BY IMPROVING SARCOPLASMIC RETICULUM CALCIUM HANDLING. A.L. Kranstuber[1,2], C. del Rio[5], B.J. Biesiadecki[3,4], R.L. Hamlin[1,3], J. Ottobre[2], S. Gyorke[3,4] and V.A. Lacombe[1,6]
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Diabetic heart disease is a distinct clinical entity that can progress to heart failure and sudden death. However, the mechanisms responsible for the alterations in excitation-contraction coupling leading to cardiac dysfunction during diabetes are not well known. Hyperglycemia, the landmark of diabetes, leads to the formation of advanced glycation end products (AGEs) on long-lived proteins, including sarcoplasmic reticulum (SR) Ca regulatory proteins. However, their pathogenic role on SR Ca handling in cardiac myocytes is unknown. Therefore, we investigated whether an AGE cross-link breaker could prevent the alterations in SR Ca cycling that lead to in vivo cardiac dysfunction during diabetes. Streptozotocin-induced diabetic rats were treated with alagebrium chloride (ALT-711) for 8 weeks and compared to age-matched placebo-treated diabetic rats and healthy rats. Cardiac function was assessed by echocardiographic examination. Ventricular myocytes were isolated to assess SR Ca cycling by confocal imaging and quantitative Western blots. Diabetes resulted in in vivo cardiac dysfunction and ALT-711 therapy partially alleviated diastolic dysfunction by decreasing isovolumetric relaxation time and myocardial performance index (MPI) (by 27 and 41% vs. untreated diabetic rats, respectively, $P < 0.05$). In cardiac myocytes, diabetes-induced prolongation of cytosolic Ca transient clearance by 43% and decreased SR Ca load by 25% ($P < 0.05$); these parameters were partially improved after ALT-711 therapy. SERCA2a and RyR2 protein expression was significantly decreased in the myocardium of untreated diabetic rats (by 64 and 36% vs. controls, respectively, $P < 0.05$), but preserved in the treated diabetic group compared to controls. Collectively, our results suggest that, in a model of type 1 diabetes, AGE accumulation primarily impairs SR Ca reuptake in cardiac myocytes and that long-term treatment with an AGE cross-link breaker partially normalized SR Ca handling and improved diabetic cardiomyopathy.

Keywords: cardiomyopathy, sarcoplasmic reticulum Ca-ATPase pump, diastolic function, type 1 diabetes, alagebrium chloride (ALT-711)