

Outbreak Modeling of an Amphibian and Reptilian Emerging Infectious Disease

A.C. Barthel, R.C. Lacy, and M.C. Allender

College of Veterinary Medicine, University of Illinois, Urbana, Illinois

Ranavirus has caused mass mortality events in wildlife populations of reptiles and amphibians worldwide, and is proposed as a significant threat to biodiversity. It is a World Organization for Animal Health (OIE) reportable disease known to infect fish, amphibians, and reptiles with the potential for interclass transmission via skin-skin contact, ingestion of diseased tissue, or through contact with contaminated water. Local epizootics have led to outbreak mortality rates as high as 90-100%; hence, Ranavirus can be catastrophic if introduced to a local community of ectotherms. In particular, free-ranging Eastern box turtle populations (*Terrapene carolina carolina*) have demonstrated increased susceptibility to Ranavirus with mass mortality events. Utilizing data from a long-term surveillance study of a closed population of *T. carolina carolina* in Tennessee, population viability analysis (PVA) will be completed. PVAs bring together ecology and statistics to provide information on population health, stability, and extinction risk under various conditions. The Tennessee focus population has undergone thorough mark-recapture collection and monitoring for the past eight years, resulting in population estimates of 1655 individuals. Outbreak scenarios will be modeled in the presence of a Ranavirus outbreak by meta-modeling utilizing both the software Vortex for individual-based demographic modeling and the software Outbreak for epidemiological modeling. Model estimates will be used to influence management decisions that aim to minimize the impact of this disease on biodiversity.

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West Nile Virus Risk Perceptions and Preventative Behavior

Claire Behnke and Marilyn O'Hara Ruiz

College of Veterinary Medicine, University of Illinois, Urbana, IL

Public health efforts to reduce mosquito-borne disease originated with the work of Dr. Ronald Ross in the late 1880s, who recognized the role of mosquitoes in transmission of malaria. Through his work and that of others who followed, epidemiologists developed models to show that the control of malaria could be achieved through mosquito control. The evidence from these experiences led to the creation of mosquito-control programs across

the United States in the early 1900s. By 2002, with the introduction of West Nile Virus (WNV) into Illinois, local mosquito-control programs were challenged to mitigate this novel disease, and both organizational and epidemiological impediments became apparent. In DuPage County, Illinois, as many as 45 different entities carry out mosquito control at an institutional level. For many decades prior to WNV in the region, many of these mosquito-control programs focused on control of nuisance mosquitoes, rather than disease vectors. The objective of this project was to evaluate risk of WNV, control strategies and public health responses to vector mosquitoes in DuPage County, in the Chicago metropolitan region. The suburban environment of DuPage County provides ideal breeding habitats for *Culex* species mosquitoes, which are the main vector for WNV. Between 2002 and 2013, there were 231 human WNV cases in the County. The different entities governing mosquito control in the County differ in the level of government at which they are organized and by characteristics of the land that they cover. By comparing data from interviews with personnel involved in governing mosquito control, and quantitative mosquito infection and human infection numbers within each entity, this project examines surveillance methods and resulting perceptions of WNV risk in these different entities in order to understand mosquito control decisions and their effect on WNV mitigation across the County.

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Effects of Isoflurane on the Hematology of Wild Raptors Following Serial Anesthetic Episodes

Kyra Berg, Kelly Wiggen, Julia K. Whittington, and Mark A. Mitchell
College of Veterinary Medicine, University of Illinois, Urbana, IL

Isoflurane is an inhalant anesthetic agent commonly used in veterinary medicine. Volatile inhalant anesthetic agents, like isoflurane, have significant effects on multiple biological parameters in anesthetized patients. Hematological effects include changes in total cell counts and circulating cell distribution. Clinical management of free-living raptors is complicated by the need to minimize stress and to provide secure restraint to avoid potential injury to both patient and handler. Inhalant anesthesia is often implemented in these patients to facilitate medical and surgical treatments. A previous study found no significant difference in hematological parameters between manually restrained owls and anesthetized owls. The purpose of the current study was to evaluate the hematological effects of isoflurane anesthesia in owls during serial administration. Healthy native North American owls that

were presented to the University of Illinois Wildlife Medical Clinic were anesthetized for 15 minutes on 3 consecutive days. Blood was collected at times 0 and 15 minutes. Blood was collected within 3 minutes of handling to prevent any confounding factors caused by stress-induced catecholamine release. A final sample was collected 24 hours after the last anesthetic episode to detect effects on the leukogram that can be delayed 24 hours or longer. Preliminary results demonstrated an overall leukopenia characterized by heterophilia and lymphopenia. This result is similar to the hematological changes that are often attributed to a stress response in birds. It is undetermined how the leukopenia affects immune function in these patients. In all cases to date, the white blood cell count did not return to pre-anesthetic levels within 24 hours. Our results suggest that owls requiring serial administration of isoflurane anesthesia may be at increased risk for immune compromise and opportunistic infections.

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Effects of Thiostrepton on the FOXM1 Transcriptional Pathway in Canine Lymphoma

S. Goldschmidt, H. Pondenis, and J. Wypij
College of Veterinary Medicine, University of Illinois, Urbana, IL

Forkhead box M1 (FOXM1) is a transcription factor regulating cell cycle progression, angiogenesis, and apoptosis. Increased FOXM1 is observed in human lymphoma/leukemia. Thiostrepton, an antibiotic used in commercial veterinary topicals, is a putative FOXM1 inhibitor. We hypothesize that canine lymphoma cells express FOXM1 and that thiostrepton has anti-cancer activity via FOXM1 inhibition. Four different canine lymphoma cell lines (17-71, GL-1, CL-1, and OSW) were treated with thiostrepton (0-100 μ M). Expression of FOXM1 and FOXM1 pathway proteins cyclin B, survivin, and Cdc25 were assessed by Western blotting. Cell viability was monitored using the tetrazolium compound MTS and by Trypan Blue exclusion. Preliminary results demonstrated that FOXM1 and downstream pathway proteins were expressed in canine lymphoma cell lines and that thiostrepton decreased cell viability in the 17-71 cell line in a dose-dependent manner. Follow-up experiments will use flow cytometry to assess cell cycle progression, with an expected arrest at G2/M. Vascular endothelial growth factor (VEGF) will be detected by enzyme-linked immunosorbent assay (ELISA). We predict that thiostrepton would decrease VEGF secretion in vivo, with a concomitant decrease in angiogenesis. Therefore, the FOXM1 pathway may be a viable target in canine lymphoma and thiostrepton may have anti-cancer activity

via FOXM1 inhibition. These results warrant further evaluation of the potential to treat cutaneous lymphoma with topical drugs containing thiostrepton.

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Evaluation of Impulsivity, Attention, and Coordination in High-Active Mice: a Model for ADHD

Gabrielle Hofmann, Petra Majdak, and Justin Rhodes

College of Veterinary Medicine and Department of Psychology, University of Illinois, Urbana, IL

Attention deficit-hyperactivity disorder (ADHD) is a common developmental disorder characterized by increased levels of hyperactivity, impulsivity and inattention. Though ADHD is highly heritable, the specific risk factors and genes involved largely remain undefined, in part due to lack of animal models. One emerging neurobiological correlate of ADHD is decreased cerebellar volume. From an initial population of eight diverse mouse strains, a High-Active line was selectively bred for high locomotor activity. The purpose of these experiments was to evaluate the High-Active line as a potential model for ADHD. Previous studies indicated that low doses of amphetamine (the active ingredient in Adderall, a common ADHD medication) decrease the activity of High-Active mice while paradoxically increasing the activity of randomly bred Control mice, encouraging further examination of the High-Active line as an ADHD model. We evaluated attention with the Y-maze paradigm, in which intact attentional capabilities prompt spontaneous alternation behavior. High-Active mice tend to exhibit lower percentages of spontaneous alternations during the first 20 arm entries than Control mice. We indirectly assessed cerebellar function (coordination) via performance on the accelerating rotarod. High-Active mice performed significantly worse than Controls, with lower average and maximum latency to fall. We examined impulsivity by quantifying nose-pokes during the Go/No-go task. We administered amphetamine or saline to High-Active and Control mice to determine whether amphetamines ameliorate the impulsivity inherent in High-Active mice, as they do for many humans with ADHD. We expect that High-Active mice will display more inappropriate nose pokes than controls, but that this trend will be less significant in High-Active mice treated with amphetamine. Use of this animal model will advance our understanding of the risk factors and genes involved in ADHD.

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Effects of Water Management and Quality on the Ecology of Vector Mosquitoes

Matt Holland, Andrew Mackay, and Brian Allan

College of Veterinary Medicine and Department of Entomology, University of Illinois, Urbana, IL

In urban environments, stormwater management infrastructure provides an abundance of aquatic habitats that are utilized by *Culex restuans* and *Culex pipiens*, the primary vectors of West Nile Virus in Illinois. Habitats enriched with decomposing plant detritus can greatly affect the potential to produce these mosquitoes. The overall objective of this study was to examine how two common plant substrates, turfgrass and cattail, influence the potential of aquatic habitats to be colonized by, and to support the juvenile development of, vector mosquitoes. The study tested two hypotheses: 1) oviposition site selection is influenced by the type and amount of plant substrate enrichment in aquatic habitats, and 2) oviposition site selection by *Cx. restuans* is positively associated with the capacity of these habitats to support juvenile development. We first performed a field assay to assess oviposition response. At five study sites in Urbana, IL, oviposition of *Cx. restuans* and *Cx. pipiens* in ovitraps representing seven (three turfgrass, four cattail) discrete densities were randomly assigned to sheltered locations at least 10 m apart along the margins of woody vegetation. We measured *Cx. restuans* egg quantity of each ovitrap each day for three weeks. In a parallel laboratory experiment, we evaluated how the potential of these type of decaying plant infusions (turfgrass vs. cattail) and concentration of plant substrate present in the aquatic environment influences juvenile development of *Cx. restuans* and their effects on adult *Cx. pipiens* mosquito fitness. Preliminary data from these experiments support the hypotheses. Preventing juvenile mosquito development is considered one of the most effective strategies for reducing adult mosquito abundance and public health risk due to mosquito-borne disease. Municipalities may use results from our experiment in their urban mosquito control programs.

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Analysis of Putative Serum Biomarkers in Canine Multicentric Lymphoma

K.A. Jacobs, H. Pondenis, and J. Wypij

College of Veterinary Medicine, University of Illinois, Urbana, IL

Canine multicentric lymphoma is one of the most common types of canine cancer. Current methods to predict survival time, guide treatment choices, and determine remission status are based on clinical staging tests that are limited in predicting outcome. Thus, there is a need for alternative methods to differentiate patient status in a clinical setting. Molecular markers including serum levels of interleukin 10 (IL-10), IP-10, LR-11 (SorLA) and IL-2R are biomarkers in human lymphoma/leukemia. We hypothesize that these proteins will also serve as biomarkers for canine lymphoma. Our experimental plan involves using Western blots to evaluate basal protein expression in four canine lymphoma cell lines: CL-1, GL-1, 17-71 and OSW. Enzyme-linked immunosorbent assays (ELISA) will be used to compare abundance of the four putative biomarkers in serum samples from dogs diagnosed with varying stages of lymphoma, compared to normal dogs. This work may identify a differential, measurable biomarker in canine serum that will aid disease identification and prognosis.

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Contamination Rate of a Battery Operated Drill During Orthopedic Surgery

J. Karnia¹, T.A.M. Harper¹, J.J. Biskup², and K.S. Aulakh¹

College of Veterinary Medicine, ¹University of Illinois, Urbana, IL and

²University of Tennessee, Knoxville, TN

Background: Surgical site infections (SSIs) are a major concern for surgeons as they can result in increased duration of hospital stay, increased patient morbidity and increased overall cost to the client. There are different potential sources of contamination leading to SSIs, including surgical instruments.

Methods: In this clinical study, samples for aerobic bacterial culture were collected as follows: sterile saline (to moisten swabs prior to sampling); drill handle (battery casing) prior to draping the patient, battery, drill handle after battery placement and drill handle after completion of surgery.

Preliminary Results: 55 samples were collected from 11 cases. The mean age of the patients was 3.5 years with 3 males and 8 females. The most common diagnosis was cranial cruciate ligament rupture (45.5%), and the most

common procedure was tibial plateau leveling osteotomy (36.4%). Six out of eleven (54.5%) cases had bacterial growth at some point during the procedure, and 10/55 (18.2%) samples were positive for bacteria. Staphylococcus spp., Bacillus spp., and Corynebacterium spp. were recovered, with Staphylococcus spp. being the most common (60.0%). Three out of eleven (27.3%) cases had bacterial growth on the drill handle upon completion of surgery, although only two of these cases had a previous positive culture. Three out of eleven (27.3%) cases had positive cultures from the battery, and only one case had a positive culture at the end of surgery. Susceptibility results for bacteria identified are pending.

Conclusions: Bacterial contamination of the drill handle in this study was 27.3%. Loading of non-sterile batteries may not be a cause of contamination of the drill during orthopedic surgery.

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Synergistic Enhancement of Anticancer Activity with DNQ and glu4j

*A. Lee, B. Parkinson, H.Y. Lee, and P.J. Hergenrother
College of Veterinary Medicine and Department of Chemistry, University of Illinois, Urbana, IL*

Drug combination therapies are often utilized in the clinic for anticancer regimens to exploit drug synergy. Synergy occurs when drug combinations are more efficacious than the sum of their individual components. Deoxyxyboquinone (DNQ) is a NQO1 substrate that is reduced in cancer cells to a hydroquinone that undergoes spontaneous reduction-oxidation cycling producing toxic reactive oxygen species that cause cell death. Glu4j is a lactate dehydrogenase inhibitor that kills cancer cells by depriving them of ATP. Because both NQO1 and lactate dehydrogenase are overexpressed in cancer cells, DNQ and glu4j have potential to serve as highly notable anticancer compounds due to their selectivity. Previous in vitro experiments demonstrated significant synergy between DNQ and glu4j in non-small cell lung cancer cell line A549. Current work discovered a similar synergy between these compounds when tested using a breast cancer cell line. These results demonstrate a powerful synergistic effect between DNQ and glu4j across multiple types of cancer. In vivo efficacy studies will be conducted to determine the synergistic effects of DNQ and glu4j in vivo, using murine models xenografted with A549.

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Exploring TrkA Signaling in Canine Osteosarcoma Cell Proliferation and Survival

*Alison R. Masyr, Holly C. Pondenis, and Timothy M. Fan
College of Veterinary Medicine, University of Illinois, Urbana, IL*

Tropomyosin-related kinase A (TrkA) and its ligand, nerve growth factor (NGF) are involved in neuronal growth, differentiation, and maintenance. Additionally, TrkA and NGF are expressed in other cell types (e.g. developing osteoblasts). Autocrine and paracrine signaling of the TrkA/NGF axis has an antiapoptotic effect in these bone forming cells, leading to tumorigenesis. AZ-23, a highly selective inhibitor of TrkA, is novel in its oral bioavailability. This study sought to determine if AZ-23 hinders proliferation and antiapoptotic pathways in canine osteosarcoma (OSA) cells. All methodologies were performed in vitro. The presence of TrkA in canine OSA cell lines was verified through western blotting. The effect of AZ-23 on cell proliferation was investigated using commercially available assays. The effect of AZ-23 on TrkA phosphorylation was evaluated through western blotting. Across five cell lines, one human OSA and four canine OSA, all expressed TrkA as well as the other two members of its receptor family, TrkB and TrkC. AZ-23 did not have a significant inhibitory effect on cell proliferation in any of these lines. To determine the effect of AZ-23 on TrkA phosphorylation, preliminary experiments were conducted to first establish that the presence of NGF leads to TrkA activation. OSA cells will be stimulated with human recombinant NGF and lysed for use in a western blot. Once the receptor is phosphorylated, AZ-23 will be added with NGF. Cells will be collected and evaluated in the same manner. It is anticipated that the addition of AZ-23 will reduce phosphorylation, perhaps dose-dependently. The results of this study continue to explore the implications of a novel and potentially powerful inhibitor of the TrkA/NGF axis in canine OSA cells. AZ-23 did not inhibit the unregulated proliferation for which cancer cells have gained notoriety. However, AZ-23 may inhibit TrkA phosphorylation and potentially impede the downstream antiapoptotic effects of the receptor.

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The Effects of Prenatal Di(2-ethylhexyl) Phthalate Exposure on MHC II Expression in the Mouse Spleen

*Kelly M Patchett and Sidonie N Lavergne
College of Veterinary Medicine, University of Illinois, Urbana, IL*

Background: Phthalates are widely used industrial chemicals that are found ubiquitously, including vinyl floors, plastic kitchenware, food packaging, cosmetics, shoes, toys, and medical devices. They are not chemically bound to the products in which they are found, and thus leach into food, water, and air. Di(2-ethylhexyl) phthalate (DEHP), the most commonly used phthalate, causes developmental and reproductive toxicity. DEHP also appears to affect the immune system, but little is known about this toxic effect.

Objective: The goal of this study was to evaluate the effect of prenatal exposure to DEHP on the Major Histocompatibility Complex class II (MHC II) expression in mouse spleens. MHC II was used as a marker of inflammatory status and innate immune activation.

Methods: DEHP doses were administered orally to the dams throughout pregnancy as follows: 20 µg/kg/day; 200 µg/kg/day; 200 mg/kg/day; 500 mg/kg/day; 750 mg/kg/day; or corn oil (vehicle). The pups were humanely euthanized at post natal day (PND) 1, 8, 21, and 60, and dams at PND 21. Spleens from both male and female mice of each PND group were collected, immediately frozen in liquid nitrogen, and stored at -80°C. Western immunoblotting will be performed using a mouse anti-rat MHC II monoclonal antibody that cross-reacts with the mouse protein (AbDSerotec).

Results: Our results will indicate whether prenatal exposure to DEHP affects neonatal and prepuberty MHC II levels in mouse spleens. Because the study included both males and females, we will also be able to determine whether this effect is sexually dimorphic.

Conclusion: To fully determine the immune effects of DEHP, future studies should explore a variety of inflammatory markers, including cytokines. These markers should be measured in different immune organs, like the thymus or blood, and in other species, possibly the rat or human.

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What's in a Personality? The Relationship between Individual Steroid Profiles, Learning and Behavior in Three-spined Stickleback Fish

Laura Pereira, Miles Bensky, Ryan Paitz, and Alison Bell

College of Veterinary Medicine and Department of Animal Biology, University of Illinois, Urbana, IL

Many animals including mammals, fish and birds exhibit consistent individual variation in behavior. In some species, individuals exhibit consistent individual differences in how they respond to changes in the environment, known as

coping styles. Some individuals (proactive) are relatively exploratory, aggressive and routinized relative to other individuals (reactive), which tend to pay more attention to environmental cues and are more responsive to changes in the environment. It is thought that differences in coping styles reflect differences in the stress response system. Here, we evaluate evidence for the proactive-reactive axis in three-spined stickleback fish (*Gasterosteus aculeatus*), a species well-known for its consistent individual variation in behavior. We repeatedly measured the steroid production, exploratory behavior, antipredator behavior and performance in a learning assay on individual fish. We observed the time it took each individual to emerge from a shelter and counted the number of unique areas they visited in a pool, both before and after an attack by a model predator. The learning assay involved training each fish a color discrimination task, and then conducting reversal learning trials once the initial learning criterion was met. Preliminary analyses of the data show that individuals that emerged faster from a refuge were more exploratory of a novel environment both before and after a model predator was present. If stickleback behavior is consistent with the proactive-reactive axis, we predict that highly exploratory individuals will perform relatively well on the initial discrimination task, but then struggle with the reversal learning. We also predict that proactive individuals will have high levels of androgens and relatively low levels of glucocorticoids, while reactive individuals will have cortisol and relatively low androgens. This research may show a relationship between steroid production, learning and behavior.

Publication: [*Testing the predictions of coping styles theory in threespined sticklebacks*](#)

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Host Factors Contributing to Restriction of Canine Influenza Virus Infection in Canine Respiratory Tissue Explants

A.E. Pohly and E.A. Driskell

College of Veterinary Medicine, University of Illinois, Urbana, IL

Influenza virus is widely studied because of its high impact in endemic populations and broad range of host species. Canine influenza virus has made a recent evolutionary jump from equine influenza virus, providing a model for the study of viral mutation and transmission. In a previous study, we observed that canine influenza virus replicated poorly in tracheal explant tissues compared to nasal and bronchial explant tissues. In the current study, we examined the effects of local mucus production on efficiency of viral infection in different canine respiratory tissues. Because mucus glycoproteins

are similar to those on the cell surface receptor of the virus, mucus binds the virus and prevents its attachment to the host. Therefore, we hypothesized that virus would not replicate as well in areas that had a greater amount of mucus production. Using PAS/Alcian Blue staining, we compared the ratio of surface area of mucus (μm^2) to length of basement membrane within the respiratory epithelium of nasal, tracheal, and bronchial tissues 1 hour, 24 hours, and 48 hours post infection with canine influenza virus isolate A/Ca/CO/6723-14/08. Our results showed that 3 of 5 dogs had higher mucus levels in their bronchial tissue compared to nasal tissue suggesting other factors play a role in influenza virus's infection of the host. We will explore induction of the innate immune response to viral infection using ELISA Canine Immunoassays, quantifying the production of IFN- γ , IL-6, and IL-8 in the inoculated canine respiratory explants 1 hour, 24 hours, and 48 hours post infection. Correlation between differences in cytokine levels and a robust or poor viral replication in the tissue may allow for development of diagnostics or treatments for canine influenza virus infections.

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Sex Differences in Attention Measured in Rats by the 5-Choice Serial Reaction Time Task

*Audrey Robertson, Rekha Balachandran, and Paul Eubig
College of Veterinary Medicine, University of Illinois, Urbana, IL*

The ability to pay attention is a vital aspect of cognitive functioning, but impaired attention is a key deficit in neurobehavioral disorders such as attention deficit hyperactivity disorder (ADHD). Sex differences affect the manifestation of attention-related disorders such as ADHD. While ADHD is more common in males, males exhibit a more impulsive phenotype as opposed to a more inattentive phenotype that females exhibit. The 5-Choice Serial Reaction Time Task (5-CSRTT) is a well-established behavioral model for measuring different aspects of attention. Baseline performance of this task requires rats to identify a light cue in one of five ports and respond with a nose-poke in the correct port within a given time. This study (6 Long-Evans rats of each sex) served as a pilot in which this task was implemented in our laboratory and sex differences in performance were examined. Duration of cue stimulus, inter-trial interval, and the presence of a distractor were individually manipulated throughout the study to increase the difficulty of the task and the type of attention to be measured. The parameters evaluated in this study included percent accuracy, percent of correct and incorrect responses, percent premature responses, and the number of perseverative

responses. We hypothesized that there would be sex differences in performance across these parameters. With baseline testing conditions, preliminary analyses suggested that males performed better than females with greater percent accuracy and greater percent correct responses. Females had greater percent of omitted responses, meaning they failed to respond within a given time after the cue stimulus, and a greater percent incorrect. Females had a greater latency to respond both correctly and incorrectly. This information about sex differences in 5-CSRTT performance is important for planned studies to investigate influences of environmental factors on attention.

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Characterizing the Role of Blanding's Turtle in the Epidemiology of *Leptospira* spp.

Kelly E Rockwell, Dan Thompson, Carol Maddox, and Mark A Mitchell
College of Veterinary Medicine, University of Illinois, Urbana, IL and DuPage County Forest Preserve, Glen Ellyn, IL

Leptospira spp. is a bacterial pathogen that is ubiquitous in nature and considered a re-emerging zoonotic disease. Previous research found that Blanding's turtles experimentally infected with *Leptospira interrogans* serovars became leptospiremic and shed leptospire in their urine, suggesting that they could play an important role in the transmission of leptospire in an aquatic ecosystem. The purpose of this study was to determine whether Blanding's turtles could become infected with an actively shed *Leptospira* spp. under natural conditions. The hypotheses tested were that: 1) Blanding's turtles would actively shed leptospire in their urine and 2) that infected turtles would show no clinical signs of disease. A cross-sectional study was performed using a population of Blanding's turtles previously found to be exposed to *Leptospira* spp. within the Forest Preserve District of DuPage County, IL. Thirty-four turtles were sampled for the study. Each turtle was given a physical exam to assess its general health status. Blood samples were collected from the jugular vein or subcarapacial vein for complete blood counts, chemistry profiles, and serologic testing. Free catch urine produced during the examination was collected for polymerase chain reaction (PCR) testing. All 34 of the turtles were seropositive for *Leptospira* spp. and 24 (70.6%, 95% Confidence interval: 55.1-85.9) urine samples were PCR positive. All of the turtles in this study appeared clinically healthy and showed no apparent signs of infection or disease. The results of this study suggest that

the majority of Blanding's turtles shed *Leptospira* spp., making them a significant reservoir for this important pathogen.

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Impact of Phthalates on Emotional Behavior in Mice

S. Scholz, J.S. Kim, and M.M. Mahoney
College of Veterinary Medicine, University of Illinois, Urbana, IL

Phthalates are ubiquitous synthetic chemicals with a wide array of applications. Commonly referred to as plasticizers, phthalates are present in oral drugs, insect repellants, food storage containers, and baby and pet toys. Phthalates are part of a larger group of endocrine disrupting chemicals that can mimic or block endogenous hormones. Phthalates cause deficits in reproductive and developmental processes in both humans and animals. However, very little is known about the effect of phthalates on behavior. Gonadal hormones modulate emotional behaviors, specifically anxiety and depression. Thus, we hypothesize that phthalate mimicry or antagonism of gonadal hormones will affect these behavioral states. In experiment one, adult male and female gonadally intact C57BL/6 (n=7/group) were dosed with oil (control) or the model phthalate at two doses. Di-ethylhexyl phthalate (DEHP) was administered orally as a low dose of 250 µg/kg or a high dose of 250 mg/kg daily. Tests to assess anxiety or depression were administered beginning on day 13. Four different tests were used: forced swim test (day 13), elevated plus maze (day 15), burrowing (day 16), and open field test (day 17). Mice were then gonadectomized and after recovery, DEHP treatment and tests were repeated as in experiment one. Preliminary data analysis suggested that intact females and males treated with a low dose of DEHP had more anxiety (burrowing behavior) when compared to other groups. Data analysis is ongoing for the other assessments of emotional behavior. These data will be among the first to describe the effects of phthalates on anxiety and depression, and will have broad significance for laboratory animals, pets, and humans.

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Pre-Natal Bisphenol A Decreases Expression of Follicle Growth Regulators in the Rat Ovary

Mallory Sczygelski, Liying Gao, and Jodi A. Flaws

College of Veterinary Medicine, University of Illinois, Urbana, IL

Bisphenol A (BPA) is a chemical found in polycarbonate plastics and epoxy resins commonly used in the linings of beverage and food product containers. BPA can be released from these products and consumed by humans and pets. Previous studies have shown BPA exposure during adult life inhibits follicle growth and induces atresia in the rodent ovary. However, little is known about the effects of in utero BPA exposure on the ovaries of the offspring (F1 generation). This study was designed to test the hypothesis that pre-natal exposure to BPA decreases expression of key regulators of ovarian function in the offspring. This study also examined the response of the ovary to BPA when dams are on a high-fat diet because pregnant females are often simultaneously exposed to BPA and a high-fat diet. Pregnant Sprague-Dawley dams were placed on a control or high-fat diet and were orally dosed with either vehicle (tocopherol-stripped corn oil) or BPA (50 µg/kg/day body weight) from gestational day 6 until post-natal day (PND) 21. Ovaries were then collected from the pups. RNA was extracted, transcribed to cDNA, and subjected to quantitative PCR for measurement of expression of genes that control ovarian function. The genes analyzed are known to regulate cell growth (cyclin D2 and cyclin-dependent kinase 4), cell death (B-cell lymphoma 2 and bcl2-associated X protein), or steroidogenesis (cyp450scc, cyp450 17α, cyp450 aromatase, and steroid acute regulatory protein). Results indicate that in pregnant dams on a control diet, BPA significantly decreased mRNA expression levels of cyclin D2 (n=4; p=0.017) in the ovaries of the F1 offspring, but did not affect expression of the other genes. In contrast, BPA did not affect the expression of any of the selected genes in pregnant dams on a high-fat diet. These data suggest that BPA may inhibit factors that

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Effects of Arachidonic Acid and Docosaheptaenoic Acid on Spermiogenesis in Mice

Richard Sheng, Timothy Abbott, and Manabu Nakamura

College of Veterinary Medicine and Department of Food Science and Human Nutrition, University of Illinois, Urbana, IL

Arachidonic acid (20:4n6; AA) and Docosahexaenoic acid (20:6n3;DHA) are highly unsaturated fatty acids (HUFAs) found at high levels in the testes of mammals. These fatty acids are synthesized from the essential fatty acids linoleic acid (LA) and alpha-linolenic acid (ALA) respectively. The gene FADS2 encodes the protein Delta-6 desaturase (D6D), which catalyzes the rate-limiting step in the synthesis of the AA and DHA. AA and DHA play a variety of physiological roles including the inflammation response, vision, and brain function. Furthermore, deficiencies in AA and DHA lead to abnormalities in spermatogenesis specifically the final stages of the process—spermiogenesis. This study used FADS2 knockout mice to determine the level of AA or DHA supplementation required to restore normal spermiogenesis. Wild type mice were fed a diet sufficient in LA and ALA with no supplementation of AA or DHA. FADS2 knockout mice (-/-) were fed the same diet, but were also supplemented with varying concentrations of either AA or DHA: none, 0.1, or 0.2% (grams of fat/ grams of food). Sections of the seminiferous tubules and cauda epididymis were collected and analyzed histologically to check for abnormalities in sperm. Results showed that there was abnormal release of spermatids in the other knockout treatment groups. However, feeding 0.2% DHA to knockout mice fully restored normal spermiogenesis as observed in both the seminiferous tubules and the cauda epididymis. In order to study the process in more detail, immunofluorescence for adhesion proteins between Sertoli cells and spermatids will be conducted. Results from this study demonstrated that HUFAs play a critical role in spermatogenesis, and that diet can be a determining factor for proper sperm production.

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Interaction of *Helicobacter pylori* Vacuolating Cytotoxin with the Host Cell Inflammasome

Matthew R Shockey, Robin Holland, and Steven Blanke
College of Veterinary Medicine and Department of Microbiology, University of Illinois, Urbana, IL

Helicobacter pylori is a human gastric bacterium that can cause serious disease, including peptic ulcers and gastric adenocarcinomas. Nearly 50% of the world's population is infected with *H. pylori*, which underscores its capacity to remodel the gastric environment, establishing a chronic infection that can persist over an individual's lifetime. An important *H. pylori* virulence factor is VacA, a pore-forming vacuolating cytotoxin that binds and alters gastric mucosal epithelial cell functions. To be effective, VacA must be taken into the intracellular environment, where the toxin modulates membrane

permeability, altering mitochondrial function and membrane trafficking within the endolysosomal system. Typically, pathogen-mediated damage to host cell membranes is sensed by intracellular inflammasomes, which are large, multiprotein complexes responsible for the activation of the protein caspase-1 in the initial, cellular inflammatory pathways, specifically those involved in host defense against pathogens. Inflammasome activation requires two signals: one that primes the complex and another that activates caspase-1 cleavage activity. Caspase-1 cleaves the pro- forms of interleukin- 1β and interleukin-18, which function in immunity against bacteria and viruses. We evaluated the relationship between VacA-mediated alterations in intracellular membrane integrity and the capacity of intoxicated cells to respond through inflammasome activation. Preliminary studies showed that VacA alone (e.g. in the absence of *H. pylori* infection), induced gastric damage in a murine model. Gastric tissues collected 24 h after exposure exhibited some blunting of gastric pits and infiltration of leukocytes. Immunohistochemistry will be performed to determine the presence of VacA and expression of IL- 1β in tissue, indicating possible VacA induction of inflammasomes. Understanding VacA effects in vivo and requirements for inflammasome activation may reveal ways to combat *H. pylori* infection.

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Prognostic Parameters in Equine Head Trauma Patients

N.D. Wettstein, D.W. Hague, K.M. Lascola, and S.M. Reed

College of Veterinary Medicine, University of Illinois, Urbana, IL and Rood & Riddle Equine Hospital, Lexington, KY

Background: While the Modified Glasgow Coma Scale (MGCS) and hyperglycemia have been successfully used to establish a meaningful prognosis in humans and dogs with head trauma, little research has been done in horses to assess its prognostic value.

Objective: To correlate the MGCS, Small Animal Coma Scale (SACS), blood glucose concentrations and heart rate at admission to an outcome prognosis in equine patients with head trauma.

Animals: 100 equine patients, 1 day to 27 years of age

Methods: In this retrospective study design, records spanning 1999-2014 from the University of Illinois Veterinary Teaching Hospital (n=56) and Rood and Riddle Equine Hospital (n=34) were selected by the following search terms: "head trauma", "injury of the head", "open head wound", "fracture of bone of head" and "closed wound of head". Information evaluated included: signalment, final diagnosis, medications administered, blood glucose

concentration within 24 hours of admission, heart rate, temperature and outcome. Each case was given a MGCS, a SACS and a modified MGCS (mMGCS) based on information present in the records.

Results: We anticipate the mMGCS to be more accurate at predicting patient outcome, as compared to the MGCS and the SACS. Additionally, we expect to find that hyperglycemia and tachycardia in adult horses correlates with a poor outcome.

Conclusions and clinical relevance: An altered version of the MGCS and SACS that primarily used pupillary light reflex as an indicator of brain stem reflexes and a modified motor scale to accommodate a wider range of motor dysfunction present in horses was useful in determining the prognosis of equine patients. Hyperglycemia and heart rate can also be used as indicators of poor outcome. The mMGCS, hyperglycemia, and heart rate parameters may be applied together in clinical practice in addition to possible prospective studies to further establish these guidelines for patient evaluation.

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Hemoparasites and Hematology of Dickcissels (*Spiza americana*), a Grassland Bird Breeding in Central Illinois

Steven Zachar, Todd M. Jones, and Jeffrey D. Brawn
College of Veterinary Medicine and Department of Natural Resources and Environmental Sciences, University of Illinois, Urbana, IL

Blood parasites impact a number of mammalian, reptilian, and avian species. Previous studies have shown that pathogenic effects from blood parasites may result in decreased fitness and survival of infected wild birds. Although such studies highlight how hematologic references may be useful in monitoring individual and population health, such parameters have been established for only a limited number of avian species. We seek to establish hematologic parameters for the Dickcissel (*Spiza americana*), a migratory songbird commonly found breeding in the grassland habitats of the Midwestern United States. We will use polymerase chain reaction (PCR)-based methods to detect *Trypanosoma* spp, *Haemoproteus* spp, *Plasmodium* spp, and filaroid nematodes, and investigate differences in hematocrit, plasma protein levels, estimated white blood cell count, and white blood cell differentials of 34 adult and juvenile Dickcissels captured in central Illinois. We anticipate that individuals infected with blood parasites will display lower hematocrits and elevated lymphocytes, eosinophils, and basophils in comparison with unaffected individuals. Results of this study will be

incorporated into a larger body of research investigating the breeding ecology and survival of adult and juvenile Dickcissels.

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