

VIMES 2003

Science in Service to Animals



AGROTERRORISM

Veterinary Medical Experiment Station
College of Veterinary Medicine
The University of Georgia
Athens, Georgia



Our Cover

The everwatchful eyes of scientists monitor the threat of a bio-terror event to our nation's food supply. Research in the detection, treatment, and preventive vaccines must be a state and national priority.

V MES 2003

Veterinary Medical Experiment Station
College of Veterinary Medicine
The University of Georgia
Athens, Georgia 30602

July 1, 2002 to June 30, 2003

27th Annual Report

Enhancing animal production, profitability, and well-being by improving animal health.

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VMES Objectives

The Veterinary Medical Experiment Station (VMES) supports a wide range of research that impacts on many aspects of our lives; the food we eat and the clothes we wear, our physical, emotional, and economic health, and the quality of our environment. VMES research includes efforts to improve the productivity and health of poultry and livestock, to better the quality of life for companion animals, and to improve public health through disease surveillance. This year's research is profiled in our 2002 - 2003 VMES annual report.

VMES funds help support short-term applied research that directly benefits the health of animals and livestock in Georgia and are used to develop extramurally funded research programs at the College of Veterinary Medicine. Projects supported by VMES funds are evaluated for scientific merit, importance to animal health, consideration for experimental animal welfare, and their roles in meeting the research objectives of the VMES.

Our objectives are as follows:

- To improve the health and productivity of domestic livestock, poultry, fish, and other income-producing animals and wildlife through research;
- To assist in preventing disease epidemics by providing laboratory resources and highly skilled scientific personnel;
- To assist in protecting human health through the control of animal diseases transmissible to man;
- To improve the health of companion animals, which serve to enrich the lives of humankind;
- To train new scientists in animal health research in order to provide continuity and growth in this vital area of veterinary medicine.

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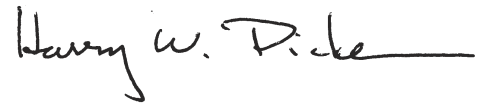
All programs and activities of the Veterinary Medical Experiment Station are conducted without regard to race, color, national origin, age, sex, or handicap.

I am pleased to share with you the 27th Annual Report of the Veterinary Medical Experiment Station (VMES) in which we present a summary of the myriad research activities of the College of Veterinary Medicine. In the face of deepening fiscal restraints, we continue to effectively conduct research on animal health problems of present and future concern to our state's livestock and poultry industries as well as its wildlife resources. Our mission will always remain critical to the people of Georgia. The food animal industries of the state are valued at well over \$3 billion, and sales of livestock, poultry and their products account for more than half of Georgia's annual farm income. A continued commitment at the state level to support research on animal health is a smart investment, particularly in view of the fact that there is limited federal and private funding targeted specifically for animal health research. Moreover, the interface between animal and human health is becoming blurred to indistinction, and basic research on animal diseases often leads to new knowledge that benefits both animals and humans.

The cover of this year's Annual Report is focused on the threat of agroterrorism and the challenges it presents to the veterinary and agriculture communities. The accompanying article by Dr. Corrie Brown, an internationally respected veterinary researcher, discusses these issues and presents a compelling argument for the critical role of veterinary medicine in protection of our nation's agriculture-based economies. Basic and applied research conducted by VMES researchers is important for the development of new diagnostics, therapeutics, and vaccines against pathogens of potential use as agents of bioterrorism.

The 27th Annual Report provides an overview of the VMES-supported projects during the fiscal year of 2003. Additional information on any of these projects can be obtained by contacting the VMES office by phone, email or website, or directly from the investigators themselves. A list of publications is provided. These peer-reviewed papers represent a selection of VMES supported work and other research originating at the College of Veterinary Medicine.

The following table reflects the level of research dollars from federal, state and private sources, the declining VMES budget from FY 2001-2003, and the projected state VMES budget for FY 2005.



Research Funding

Funding Source	FY2001	FY 2002	FY 2003	FY 2004 (Budgeted)	FY 2005 (Requested)
VMES/VMAR Expenditures	\$3,594,225	\$3,927,297	\$3,672,210	\$3,550,080	\$3,357,488
Federal Grants and Contracts	3,452,426	6,962,300	4,768,808		
State Grants and Contracts	4,054,420	4,563,272	4,434,171		
Private Grants and Contracts	2,283,536	1,446,110	715,974		

September 11, 2001, the anthrax events that followed, and subsequent bombings in far-flung segments of the globe, all underscore the vulnerability of our society to attacks from terrorists who are intent upon undermining a way of life. Huge efforts have been made to “harden” many of the more traditional targets, and anyone who has traveled by air, entered a federal building, or attended a major sporting event can appreciate the monumental changes that our society has undergone to improve public protection against terrorist activities. As these more conventional targets become less vulnerable to attack, it is certain that terrorists will begin to focus, and perhaps already are focusing, on other areas of interest and impact. Our national herds and flocks are very difficult to protect and so animal agriculture presents a “soft white underbelly” for terrorists. Attacks against animal or plant agriculture is referred to as *agroterror*.

Agriculture forms the cornerstone of the American economy. Responsible for 13% of the gross national product and 17% of all employment, the value of agriculture is predicated on our ability to export approximately 20% of all agricultural commodities. Not only would the introduction of a disease that made our agricultural products unpalatable to our trading partners devastate exports, but the non-exportable products spilling over into the domestic sector would create a glut that would cause the agricultural economy to implode. Basically, a terrorist event involving agriculture could destroy the American economy.

One need only look at foreign disease incursions around the world over the last few years to appreciate the significant damage caused by spread of infection to a new area. Foot-and-mouth disease (FMD) entered Taiwan in 1997, necessitating the destruction of 8 million pigs, costing the country over \$25 billion and wiping out the entire hog industry. In the same year, classical swine fever was discovered in the Netherlands, and millions of pigs were killed to try to stem the spread of the disease. In 2000, FMD continued its global spread, entering previously disease-free zones of southern Brazil, Argentina, Uruguay, South Korea, Japan, and Russia. The Food and Agricultural Organization of the United Nations termed 2000 as the “year of the global pandemic of FMD.” Then in 2001, FMD made big headlines in our media, as Americans watched British farmers and farming communities deal with an outbreak there.

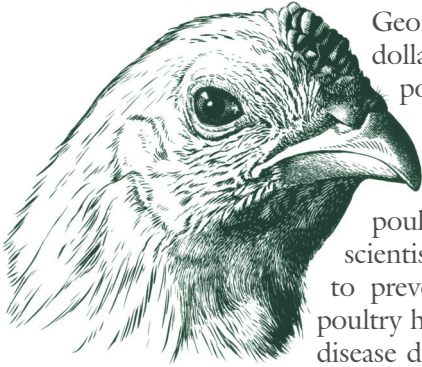
What are the possibilities that diseases could continue to spread globally? Whenever an unexpected disease enters the United States, both consumer and export markets are negatively impacted by increasing prices.

A bioterrorist event could change the disease status of our national herds and flocks in a precipitous way, with devastating results. There is documented evidence that the following agents have been prepared specifically for agroterror: foot-and-mouth disease, classical swine fever (hog cholera), African swine fever, rinderpest, sheep and goat pox viruses, and *Chlamydia psittacci*. Numerous other agents that have been mentioned as making excellent weapons could affect a wide range of species, either as the primary target or through collateral exposure, including captive animals, companion animals, wild animals, food animals, and endangered species.

Compared to bio-terror, agro-terror is appallingly easy. Animal diseases of greatest concern are those that, by nature, are very infectious and spread very rapidly through herds and flocks. Many of the animal diseases that are of greatest concern in terms of their ability to enter a new area and destroy trade are foot-and-mouth disease, classical swine fever, rinderpest, highly pathogenic avian influenza, and exotic Newcastle disease. These agents could be acquired in less developed countries where they are endemic.

What can we in veterinary medicine do to be prepared for either accidental or intentional introduction? First, the amount of economic damage will depend upon how quickly the disease is detected. If the earliest cases are recognized, and adequate control measures implemented immediately, we will likely circumvent severe economic consequences. Therefore, awareness and training are paramount. Second, basic research and a greater understanding of disease epidemiology is needed to develop improved diagnostics and novel vaccines.

Corrie Brown, DVM, PhD



Georgia's poultry industry dominated the state's animal agricultural dollars with nearly \$2.42 billion annual revenue in 2001. The state's poultry industry is continuing to expand as broiler production in Georgia increases. The urbanization of Northern Georgia is causing the broiler expansion to occur primarily in the state's southern section. Because of the intensive management system, poultry producers are emphasizing disease prevention. VMES scientists have responded to industry demands by developing vaccines to prevent infectious diseases. Scientists are also helping to improve poultry health by developing inexpensive, rapid, and accurate methods for disease diagnosis. A major recent effort has been initiated to characterize "silent" laryngotracheitis, which was first detected and described in our laboratories. Researchers are also focusing on the reduction of potential human pathogens on poultry products nationwide and on ways to prevent the development of resistance against antibiotics.

During FY03, avian medicine faculty were investigators or co-investigators in new extramural funding of \$665,857 from 4 projects. This was primarily from USDA, U.S. Poultry and Egg Association, and private sources. Eight intramural projects totaling \$235,350 were funded for FY03. Our faculty and graduate students have been active in presenting their research at national and international meetings. During FY02, there were 51 papers published in refereed journals, and 137 scientific and industry presentations.

Members of the Department of Avian Medicine, The University of Georgia, are involved in a wide range of both basic and applied research involving subjects in the area of poultry health. Many of the projects are designed to solve problems for local companies, but most have a broader application. This report points out a sample of these projects and the people involved.

Molecular Ecology of Tetracycline Resistance Genes carried by Commensal and Pathogenic Strains of *E. coli*

The poultry industry is a significant economic force in the nation. According to USDA statistics, 84% of the total national broiler production is raised in the Southeast, where the state of Georgia produces over one billion of the 8.3 billion birds. An estimated 2.8 million chickens are condemned in Georgia's processing plants because of *E. coli* respiratory disease. There are several antibiotics approved by the Food and Drug Administration for treatment of sick chickens but one group, the fluoroquinolones, has generated some concern about its impact on human health. The tetracyclines have been a commonly used antimicrobial in veterinary medicine; however, its efficacy is impacted by the frequent occurrence of resistant bacteria. Some people believe that the non-pathogenic intestinal bacteria of broiler flocks serves as a reservoir for drug resistance genes for pathogenic bacteria and that resistance is coupled to the usage of antibiotics in meat production. We hypothesized that the microbial ecology of the chicken intestine favors

retention of tetracycline resistance genes among resident *E. coli* irrespective of antibiotic usage patterns. In order to investigate whether tetracycline resistance was less common in chickens that were not treated with antibiotics, we cultured nonpathogenic *E. coli* from several commercial broiler farms with a known history of antibiotic usage. Up to 90% of the *E. coli* isolates were resistant to tetracycline irrespective of the flock's usage. DNA/DNA hybridization revealed a high prevalence of *tetA* or *tetB* genes in the *E. coli* with few isolates positive for *tetC* or *tetD*. Isolates were unlikely to carry more than one type of tetracycline resistance gene. On some farms, tetracycline resistance gene carriage was most common in *E. coli* cultured from young birds while on other farms the resistance increased with age of the bird. These data suggest that tetracycline resistance genes are common among nonpathogenic *E. coli* isolated from broiler chickens and prudent usage of tetracycline may not lower the levels of resistance.

PI: Dr. Margie D. Lee (leem@vet.uga.edu)

Investigation of Natural Disease Outbreaks

This project is an ongoing proposal that provides diagnostic laboratory support for the poultry industry, source material for research, and teaching experiences for students in the Master of Avian Medicine (M.A.M.) program.

Field investigations by professional staff and students typically lead to significant changes in disease and farm management practices which bring solutions to difficult problems.

An example of field investigations includes scenarios such as: serological assessment of broiler operations which may be experiencing severe condemnations at processing due to respiratory disease. Serological testing showed significant titers against a specific strain of infectious bronchitis virus. Addition of the indicated strain of virus to the vaccination program ended the condemnations and the financial losses due to this virus.

Improvements in the lab database continue with functional and additional data search capabilities and simplified maintenance. Lab reports are being sent by email in “.pdf” (Adobe Acrobat) format directly from within the system without the need for an intermediate hard copy. Construction of an e-business web site where accessions and case reports can be managed electronically is being investigated.

The polymerase chain reaction (PCR) technique is an integral part of the diagnostic laboratory as seen by the consistent demand for these tests. PCR techniques for infectious bronchitis virus, Mycoplasma, Infectious bursal disease, Infectious laryngotracheitis virus, and Avian leukosis virus-J provide mostly same-day results. The PCR lab has been expanded for a new bacterial PCR expected to be put online by summer.

Diagnostic Services Laboratory activity is represented by 5,455 accessions, 39,249 bacterial procedures, 180 antimicrobial susceptibilities, 81,746 ELISA tests, 40,018 IBV-HI tests, 24,255 Mycoplasma plate agglutination tests, 2,382 agar gel precipitin tests, 2,038 diagnostic PCR tests, and 2,969 necropsies.

PI.: Dr. Stephan G. Thayer (stthayer@uga.edu)

Co-PI's: Dr. S.H. Kleven, Dr. T.P. Brown, Dr. M. Garcia, Dr. J.R. Glisson, Dr. C.H. Hofacre, Dr. M.W. Jackwood, Dr. J.J. Maurer, Dr. G.N. Rowland, Dr. J.E. Sander, Dr. H.S. Sellers, Dr. S.A. Vezev, and Dr. P. Villegas

Clinical Investigation of Poultry Diseases

This project involves advanced clinical investigation and applied research on current field problems encountered by the PDRC clinicians and M.A.M. students. The studies involve research attempting to reproduce a naturally occurring disease or disease syndrome or field studies evaluating the effect of management/vaccinations. These studies conducted by the PDRC clinicians and M.A.M. students result in publications of case reports, research notes, and are often preliminary data for grant applications for other PDRC researchers.

This past year clinicians and students studied four problem broiler farms to determine the cause of poor performance. Also, studies were completed evaluating the heating of an oil emulsion *Pasteurella multocida* bacterin on tissue reaction/immunity in broiler breeders, the effect of feed restriction on hypoglycemia spiking mortality syndrome in broilers, the incidence of *Salmonella* in litter of North Georgia broiler farms, the prevalence of IBV during the downtime in broilers, and the effect of formaldehyde usage on in ovo injected eggs.

PDRC has also received and are rearing the 3 lines of the 1976 random bred broilers from Aviagen. These GGP broiler breeders will come into production in FY 2003, producing the GP generation moving PDRC closer toward a line of SPF broilers chickens.

PI: Dr. Charles Hofacre (chofacre@uga.edu)

CO-PI: Dr. J.R. Glisson and Dr. J. Sander

Detection of Foodborne Pathogens Using rRNA Signature Sequences and Microarrays

Application of nested PCR to detection of *Salmonella* in poultry environment. Isolation of *Salmonella* from poultry environmental and processing plant samples requires sampling large numbers of

areas within the poultry house or plant. This study examined the use of PCR to identify those secondary enrichments containing *Salmonella*. The unique *Salmonella* virulence gene *invA* was chosen as the target for development of a nested-PCR because of its uniform distribution among *Salmonella* serotypes. Using PCR as a screen of primary enrichments for presumptive *Salmonella* contamination, we improved our efficiency at isolating *Salmonella* upon secondary enrichment by 20 % and no false negatives were observed. This method will not only validate the use of secondary enrichment procedures, but also reduce costs and manpower for surveillance of *Salmonella*.

Detection of *Salmonella* and *Campylobacter* in poultry by PCR-ELISA. Contamination of retail poultry by *Campylobacter* spp. and *Salmonella enterica* is a significant source of human diarrheal disease. Isolation and identification of these microorganisms requires a series of biochemical and serological tests. In this study, *Campylobacter* *ceuE* and *Salmonella* *invA* genes were used to design probes in PCR-ELISA, as an alternative to conventional bacteriological methodology, for the rapid detection of *Campylobacter jejuni*, *Campylobacter coli*, and *Salmonella enterica* from poultry samples. ELISA increased the sensitivity of the conventional PCR method by 100- to 1,000-fold.

A restriction fragment length polymorphism based polymerase chain reaction as an alternative to serotyping for identifying *Salmonella* serotypes. Twenty-four phase 1 flagellin and eight phase 2 flagellin genes could be differentiated among each other using restriction endonucleases in RFLP-PCR analysis. These genes comprise the major antigenic formulas for fifty-two serotypes of *Salmonella* sp., which include the common serotypes found in poultry and other important food animal species. With this knowledge, ninety percent of the *Salmonella* serotypes could be identified using this double restriction enzyme RFLP analysis.

These multiplex PCR assays for detecting specific O and H antigen gene alleles can become a rapid and cost-effective alternative approach to serotyping for the identification of common poultry *Salmonella* serotypes. This multiplex PCR has now become part of diagnostic services offered to poultry indus-

try for identifying *Salmonella* serotypes.

PI: Dr. John J. Maurer (jmaurer@vet.uga.edu)

Co-PI: Dr. M. D. Lee

Avian Mycoplasmosis

M*ycoplasma gallisepticum* strain K5054 has been further developed as a live vaccine strain. A patent has been applied for, and we are in negotiation with 3 companies for potential licensing. (Work in collaboration with Dr. Naola Ferguson).

Techniques for molecular epidemiology of avian mycoplasmas continue to improve. Primers for the *mgc2* gene of *M. gallisepticum* and *vlhA* of *M. synoviae* are about ready for field evaluation. PCR based on both of these genes are promising as diagnostic tests; the PCR products have potential value for preliminary identification of strains. Amplified fragment length polymorphism analysis shows promise as a definitive test for studying relationships among strains. (In collaboration with Maricarmen García, Yang Hong, Sharon Levisohn, David Yogev, and Dusan Bencina).

Diagnostic services included 5765 cultures, 13,451 *M. gallisepticum* HI tests, 13,606 *M. synoviae* HI tests, 163 *M. meleagridis* HI tests, for a total of 27, 219 HI tests conducted. There were 106 cases involving *Mycoplasma* fingerprinting.

PI: Dr. S. H. Kleven (skleven@uga.edu)

Co-PIs: Dr. W. D. Hall and Dr. V. Leiting

Investigation into factors affecting hatch-ability and chick quality

This project has been an ongoing study of disinfectant efficacy, and the effect of disinfectant use in the hatchery on hatchability and chick quality. During this period, studies were conducted using formaldehyde. This product has been studied in previous grants and found to be detrimental to respiratory epithelium at high levels. This study compared a constant rate infusion of a lower dose of formaldehyde to a higher dose given every 12 hours as was previously studied. This project also supported the continued work evaluating some problematic *Pseudo-*

monas aeruginosa isolates that had caused severe chick quality problems as a result of hatchery contamination.

PI: *Dr. Jean E. Sander (jsander@uga.edu)*

Co-PIs: *Dr. J.L. Wilson and Dr. J.J. Maurer*

Detection, Isolation, and Characterization of Avian Viruses

The objectives of this proposal are to provide diagnostic virology services for the U.S. poultry industry, conduct applied research on current avian disease isolates from the field, and improve detection and isolation methods for monitoring avian viruses. During FY03 we processed 327 accessions; 677 samples submitted for virus isolation; 296 virus isolations made from samples submitted; 381 negative samples (no virus isolated).

PI: *Dr. Holly Sellers (hsellers@uga.edu)*

Epidemiological Studies on Infectious Bursal Disease Virus Field Isolates in the Southeastern United States

Despite widespread vaccination, infectious bursal disease virus (IBDV) continues to cause economic losses to the poultry industry. Within serotype 1 there are classic, variant, and very virulent viruses. The U.S. poultry industry is most affected by the presence of antigenic variants that can be responsible for vaccination failures. The VP2 gene of IBDV has been the target for molecular classification of the virus since it is the major host protective antigen responsible for inducing serotype-neutralizing antibodies. Advancements in nucleic acid technology have led to the identification and classification of antigenic variants by RT-PCR/RFLP analysis. The objectives of this proposal are to conduct an epidemiological study of IBDV field isolates from the southeastern U.S. Field isolates will be chosen for the study based on unique RFLP patterns obtained using the current IBDV typing system at PDRC.

During FY03, full-length genome sequencing of IBDV field isolate 9109 and cell culture adapted Edgar was completed and phylogenetic analysis is currently being performed. Sequence analysis is

being utilized to identify whether amino acid changes in locations outside of the hypervariable region of segment A might play a role in pathogenesis. The sequence data obtained will be compared to previously published full length sequences.

PI: *Dr. Holly Sellers (hsellers@uga.edu)*

Development and Characterization of Infectious Laryngotracheitis (ILT) Recombinant Virus

Differentiation of Infectious Laryngotracheitis Virus strains is one of the goals in our laboratory. We have developed a PCR-RFLP assay where the glycoprotein E was amplified by PCR and the amplification product was digested with restriction enzymes. This assay allowed discrimination of vaccines and vaccine subpopulations. A second generation of PCR-RFLP assays has been developed based on initial sequencing of glycoprotein I, and early genes ICP4 and ICP27. Amino acid substitutions specific to backyard flock isolates were detected in the glycoprotein I. These mutations were not present on any of the vaccines analyzed, or in outbreak related field isolates. Sequencing of the ICP4 and ICP27 genes allowed differentiation of two field isolates from vaccine strains. Therefore we have developed a system for ILTV strain differentiation by first using glycoprotein I to identify wild type strains: ICP27 to identify vaccine related isolates, and glycoprotein E to identify vaccine subpopulations.

Because vaccine strains are one source of outbreaks in the field, a second goal of this project was to compare the virulence and transmission of the chicken embryo origin (CEO) ILTV vaccine strain and CEO viral subpopulations. The objective behind this work was to determine if viral subpopulations within the vaccine are more attenuated. Clinical signs and transmission from inoculated to contact birds were recorded. Difference in the transmission and replication between CEO vaccine subpopulations was observed. Measured by the appearance of clinical signs during early stages of infection, one of the subpopulations transmits at a faster rate than the second subpopulation. From this data we have concluded that one of the vaccine subpopulations delays latency while the other enters latent infection faster. Ongoing studies from

this research will focus on determining which of these two subpopulations provides better protection and is more attenuated.

PI: Dr. Maricarmen García (mcgarcia@uga.edu)

Co-PI: Dr. S. Riblet

Advancements in the Isolation, Characterization, and Control of Avian Viruses

Research in the avian virology section has been concentrated on infectious bronchitis virus (IBV), infectious bursal disease virus (IBDV), and avian adenovirus. With IBV, several isolates used in commercial vaccines have undergone numerous passages in various systems (chicken embryos, chickens) in an attempt to attenuate their pathogenicity while maintaining their antigenicity. To date, the pathogenicity of one Arkansas-type strain has been compared with the original strain and no major differences have been found regarding their ability to multiply in tissues of the upper respiratory tract. Quantitative assays are being performed to establish differences between the two viruses.

Group I avian adenoviruses have been used to evaluate the effect of live and inactivated vaccines used to protect chickens against inclusion body hepatitis. Both vaccines provided protection to chickens challenged with homologous isolates obtained from the U.S. Live vaccines have the ability to spread very rapidly among the poultry populations.

The single-strand conformational polymorphism analysis (SSCP) was successfully used to differentiate variant, standard and very virulent strains of infectious disease virus.

PI: Dr. Pedro Villegas (pedrov@uga.edu)

Co-PI: J. El-Attrache

Control of Infectious Bronchitis Virus (IBV)

The main objective of this proposal is to control infectious bronchitis (IB). We propose to do this by continuing to study infectious bronchitis virus (IBV) isolates from the field and by developing and testing recombinant vaccines against IBV. The specific objectives are:

1. To study the molecular and serologic characteristics of new IBV isolates identified by our reverse transcriptase-polymerase chain reaction/restriction fragment length polymorphism (RT-PCR/RFLP) serotype identification test.
2. To develop and test an IBV virus-like particle (VLP) for its utility as a vaccine against IBV.
3. To create an infectious clone for IBV.

Objective 1 is always ongoing in our laboratory; however, last year was a very quiet year for infectious bronchitis. Submissions to the laboratory resulted in typical viruses that have been previously characterized. We are continuing to monitor the heterogeneity of the population of IBV isolates circulating in the field.

The IBV VLP development (objective 2) is progressing, but without demonstration of VLP's to IBV. We have cloned and again subcloned the spike and envelope proteins, which are necessary for VLP formation, and demonstrated expression of each protein in cell culture. Several attempts to visualize VLP's by electron microscopy have been unsuccessful to date. We are looking at more sensitive detection methods and ways to increase expression of spike and envelope in cell culture.

To develop an IBV infectious clone, we cloned the Mass 41 genome into 5 overlapping segments, which represent the entire viral genome. The CMV and T7 promoters were ligated to the 5' end clone, and the BHG poly A signal and a poly A tract onto the 3' end clone. It has been difficult to cut the overlapping segments and ligate the 5 clones into one IBV infectious clone. We need sequence data for the entire viral genome so appropriate restriction enzymes can be identified and used to piece the clones together. Unfortunately we do not have the financial resources to do that at this time.

PI: Dr. Mark W. Jackwood, mjackwoo@uga.edu

Co-PI's: D. Hilt, E. Wade, and S. Callison

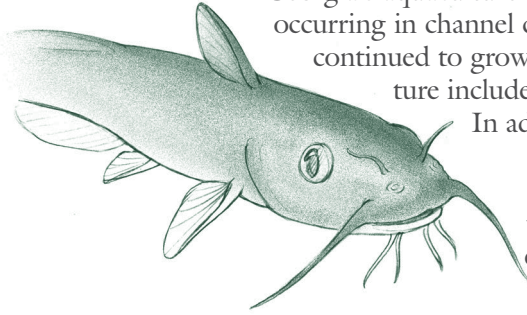
Is Infectious Bursal Disease Virus the Cause of Broiler Proventriculitis?

Proventriculitis is a common naturally occurring disease of commercial broiler chickens that causes proventricular rupture, carcass contamination, and whole bird condemnation during routine processing. Infectious Bursal Disease Virus (IBDV) is implicated as a cause and vaccination for IBDV is marketed as a preventative. However, no direct cause and effect relationship has been established between IBDV and proventriculitis. Our original hypothesis was that immunosuppression caused by IBDV allowed a second opportunistic pathogen to directly produce proventriculitis. Our three-year project was designed to determine any acute or chronic role of

Infectious Bursal Disease Virus (IBDV) in proventriculitis in broilers, and to look for other causative opportunistic agents. We have experimentally reproduced proventriculitis by oral exposure of broilers to proventricular homogenate from naturally affected chickens. We have shown IBDV does not localize in the proventriculus after experimental IBDV infection, and that naturally occurring cases of proventriculitis contain no proventricular IBDV. We have produced a proventricular homogenate that is free of IBDV but remains capable of reproducing proventriculitis. This homogenate will be inoculated into eggs, cell cultures, and proventricular organ cultures to isolate the proventriculotrophic virus that produces proventriculitis.

PI: Dr. Tom P. Brown (tbrown@vet.uga.edu)

Co-PI's: M. Pantin-Jackwood and M. Hamoud



Georgia's aquaculture industry is steadily expanding, with its greatest increase occurring in channel catfish production. Pond acreage for catfish farming has continued to grow every year. Other species being developed for aquaculture include striped and largemouth bass, yellow perch, and tilapia.

In addition to Georgia's developing food-fish industry, there is an increasing interest in ornamental fish production, particularly koi, and cultured shellfish. It is estimated that aquaculture production in all countries will have to expand at least twofold to meet world demand for fisheries products over the next 25 years.

Continued commercial aquaculture success will depend on increased efficiency in resource use, innovative farming methods, and a quality end product. Fish health is an essential issue at every level of fish production. As Georgia's aquaculture industries continue to grow, research aimed at improving the health of aquatic animal species will help growers reduce production costs and improve profits.

DNA Receptors and Innate Immunity in Catfish (II)

A novel approach to amplify adaptive immunity in teleosts consists of the use of oligodeoxynucleotide (ODN) adjuvants. This model suggests that injections of bacterial DNA in conjunction with specific immunogen may significantly amplify adaptive immune responses. We have previously identified molecular pattern ligands in the form of CpG, GpC and single base oligodeoxyguanosine 20-mers that bind to nonspecific cytotoxic cells (NCC). These ligands represent the experimental homologue of bacterial DNA and they specifically bind to DNA binding proteins (DBPs) on NCC. In the present VMES grant we identified three different molecular weight species (i.e. 14, 18 and 29 kDa) of DBPs on NCC. The 14 kDa protein was partially sequenced from tilapia NCC and is similar to histone core proteins. The 18 kDa molecule (from catfish NCC) is histone-1 and the 29 kDa molecule is a novel protein that is similar (but not identical) to histone linker proteins. The 29 kDa molecule was expressed as a recombinant protein and studies were carried out to determine ODN binding, antimicrobial activity and a polyclonal was generated against this molecule. This recombinant (referred to as NCC antimicrobial protein-1/ncamp-1) bound ODN; lysed Gram positive and Gram negative bacteria; and polyclonal anti-ncamp-1 bound NCC by Flow Cytometry analysis. These studies demonstrated that NCC express membrane DNA binding proteins and that in soluble form (ncamp-1) kills bacteria. This indicated that

NCC may directly participate in amplification of innate immune responses to bacteria by recognition of DNA and elaboration of an antimicrobial protein.

PI: Donald Evans (devans@vet.uga.edu)

Identifying Virulence Mechanisms of *Mycobacterium shottsii*: An Emerging Disease of Fish

Striped bass (*Morone saxatilis*) represent an important commercial and recreational fish with significant economic benefits to the boating and tourism industries. In recent years there has been heightened concern regarding the health of striped bass populations in eastern coastal waters of the United States. An epizootic of mycobacteriosis was reported in the Chesapeake Bay which was characterized by lesion prevalence as high as 30-50%. Skin lesions were focal to multi-focal and ranged in severity from small grayish-white depressions to large reddened, hyper-pigmented shallow lesions rendering the fish unattractive and unpalatable. Histological examination of skin lesions and internal organs revealed granulomatous inflammatory responses accompanied by the presence of acid-fast bacilli. A higher prevalence of granulomatous lesions in visceral samples than in skin indicated that many stripers are asymptomatic. Subsequent bacteriological studies revealed that infections were associated with a variety of mycobacteria but were dominated by one unique mycobacterial type (designated as M175), which had not been previously described. Based on prior studies and field studies in progress by Virginia Institute of Marine Science (VIMS) investigators,

mycobacteria have been aseptically isolated from the spleens of >70% of the striped bass, and >70% of these isolates have been type M175. It has been proposed that M175 isolates be designated as a new species, *Mycobacterium shottsii* sp. nov. and thus we have used this name for M175 in this proposal. The significance of heavy mycobacterial infections in native striped bass from coastal waters of the eastern U.S. is currently unknown.

Based on sequence analyses of 16S rRNA gene and phenotypic characteristics, *M. shottsii* is closely related to *M. marinum* and *M. ulcerans*. The former is considered one of the primary etiologic agents of fish mycobacteriosis associated with tubercle granulomas in aquarium, cultured, and wild fish populations. *M. marinum* is also capable of producing disease in humans with the primary clinical syndromes including skin and soft tissue infections, cervical lymphadenitis, and pulmonary disease. Disseminated infections due to *M. marinum* are often limited to immunocompromised persons. *M. ulcerans* produces necrotic skin lesions (Buruli ulcers) in humans and is considered the third most prevalent mycobacterial disease in humans. The high prevalence of *M. shottsii* infections in striped bass could potentially cause human infection in people that handle these infected fish. This proposed research will define the virulence mechanisms associated with this new and emerging pathogen. In association with ongoing epidemiological studies that will define the extent of the spread of this agent along the eastern U.S. coast, the work described here may indicate a direction

towards appropriate treatment and prevention strategies for afflicted fish and potentially human populations.

The primary mission of this laboratory is to identify virulence factors from pathogenic mycobacteria, and with this information, devise methods for treatment and disease prevention. To these ends, virulence studies using mammalian cells and pathogenic species of *Mycobacterium* are routinely performed. These studies will now be extended to include fish-derived cell culture lines and the newly discovered pathogen, *M. shottsii*. We expect these studies to provide new information that will further define the pathogenesis of this emerging species and lead to better control strategies. The specific objectives, using fish monocyte/macrophage, epithelial and fibroblast cell monolayers, will be to: 1) measure intracellular or extracellular bacterial growth, and 2) perform a necrosis/apoptosis analysis of culture filtrate from *M. shottsii*.

At the completion of this study we will have: 1) determined if *M. shottsii* is pathogenic for fish cells and if the organism possesses “intracellular” or “extracellular” virulence traits, and 2) determined if *M. shottsii* causes cellular destruction through necrotic or apoptotic mechanisms.

These findings will be made available to ecologists, fish health specialists, and human public health officials for further investigation of the threat to commercial fish by this putative pathogen.

PI: Dr. Frederick D. Quinn (fquinn@vet.uga.edu)



Cattle, sheep, and goats are three of Georgia's important food-animal ruminants. They are considered ruminants because their four-chambered stomach enables them to digest copious roughage, which is inedible for direct human consumption. These three industries have gone through recent dynamic changes. Today's cattle producers are working with narrow profit margins and must watch their expenses more closely than ever. Consequently, biomedical researchers are providing these industries with ways to maintain healthy animals, which will help reduce production costs. Mastitis, Johne's disease, pasteurellosis, pneumonia, infectious bovine rhinotracheitis (IBR), bovine virus diarrhea (BVD), parainfluenza-3 (PI-3), and leptospirosis continue to challenge the immune systems of Georgia's cattle herds. Ruminant herd health as it pertains to food safety is also a major concern to consumers and producers. Scientists need to investigate pathogenic *Escherichia coli*, *Salmonella*, *Campylobacter*, and other food-borne organisms as to their origin, transmission, and prevalence.

Ca²⁺ entry mechanisms regulating the tone of bovine small laminar arteries

Laminitis is a major disease in cattle. The available treatments are largely ineffective due to our lack of knowledge of the processes causing the dysfunction of small laminar arteries, which underlies this condition. Elucidation of the processes that cause laminitis has been hampered by a lack of techniques to study the functional aspects of the small laminar arteries that control local blood flow. We have directly addressed this issue by developing techniques by which small laminar arteries can be routinely isolated and their function examined in vitro. Calcium plays a fundamental role in the regulation of vascular function. The hypothesis driving this project is that abnormal calcium influx plays a vital role in the expression of microvascular dysfunction in laminitis. The main objective of this project is to determine the importance of calcium entry mechanisms in normal laminar arteries with the view of providing key background information for future studies on small laminar arteries from laminitic cattle. The specific aim of the project is to determine the relative role of voltage-gated, receptor-operated and store-operated calcium entry in regulating the active tone of bovine small laminar arteries. In these studies, small laminar arteries (100-300 μm internal diameter, 1-2 mm in length) are being mounted on small vessel myographs and functional pharmacological studies performed. These studies will define the calcium-dependent mechanisms regulating the tone of vascular smooth muscle in bovine small laminar arteries. The results of this project will provide the

basis for comparative studies on cattle with acute laminitis and for the development of novel strategies to treat laminitis.

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In the past few decades, horses have reemerged as a very important animal species in Georgia. In ages past, horses were concentrated on farms in rural parts of the state and were used primarily as work animals. Today horses assume many roles, ranging from companions to pleasure animals to show animals. They are used for pleasure riding, jumping, dressage, showing, cutting, and barrel racing. Because of the increasing financial and emotional impact of the horse industry on the state, VMES researchers are focusing on the mechanisms responsible for some of the most important diseases that affect horses.



Diagnosis Of Equine Fungal Keratitis Using Polymerase Chain Reaction

Equine fungal keratitis is a common sight-threatening disorder of horses. The number of cases is increasing in temperate regions, such as the southeastern United States. Even with appropriate therapy, 44-45% of the cases of equine fungal keratitis result in blindness. Early diagnosis and treatment is necessary in order to have a successful outcome. The purpose of this study was to evaluate the use of polymerase chain reaction (PCR) as a rapid and accurate tool for early diagnosis of equine fungal keratitis.

Corneal samples for PCR were obtained from equine cases evaluated for fungal keratitis, ulcerative keratitis, and stromal abscess formation. Standard PCR was carried out using universal fungal primers and gel electrophoresis. The PCR results were compared to cytology, fungal culture, and histopathology for the presence of fungal organisms. Fungal PCR (n=22), corneal cytology (n= 22), fungal cultures (n= 22), and histopathology (n=16) were performed in 22

cases of equine keratitis. PCR results were positive for universal fungal primers in 50% (n=11/22). Corneal cytology was positive for fungal hyphae in 59% (n=13/22). Fungal cultures were positive in 50% (n=11/22). Histopathology confirmed the presence of fungi in 44 % (n=7/16). Of the 14 samples positive for fungal organisms by cytology, fungal cultures, or histopathology, 43% (n=6/14) were positive by PCR. Of the 8 samples negative for fungal organisms by cytology, fungal cultures, and histopathology, 63% (n=5/8) were positive by PCR. Of these five cases, four were clinically agreeable with fungal keratitis, stromal abscess (n=3) and deep progressive corneal ulceration (n=1).

Our results support the conclusion that PCR is a fast and sensitive diagnostic tool to aid in the clinical diagnosis of equine fungal keratitis.

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Co-PIs: Dr. A. Neary, Dr. M. Chandler;
Dr. C.B. Mosunic, Dr. K.P. Carmichael,
Dr. U. Dietrich, and Dr. S. Sanchez



Companion animals reside in 55 million U.S. homes. These animals include an estimated 66 million cats, 58 million dogs, 88 million fish, 40 million birds, 13 million small animals (rabbits, hamsters, and gerbils), and 8 million reptiles. The increasing recognition of the close bond between people and their pets has magnified the importance of insuring the quality of our pets' lives. Because of medical advances, companion animals are living longer than their predecessors. Longer life, however, means more age-related diseases and ailments, such as cancer, neural degeneration, kidney dysfunction, poor circulation, and decreased respiratory and cardiac capacity.

However, unlike other research areas, there are no federal funds and only limited state funds to support projects specifically for companion animals. The VMES has been useful in assisting new clinical faculty in their initial research projects, but the vast majority of funding has come from foundations and private industry. Industrial monies have been awarded based upon the potential knowledge gained from studying companion animals with diseases comparable to diseases found in humans. Examples of externally funded projects include urinary incontinence, diabetes mellitus, renal disease, pain relief for arthritis, transdermal fentanyl patches for pain relief, feline bartonellosis and herpes virus, and minimally invasive surgery.

Efficacy of recombinant feline omega interferon on feline herpesvirus 1 (FHV-1) replication in vitro

The use of high dose recombinant human alpha interferon for the treatment of ocular herpes simplex keratitis (HSV-1) in humans is considered an effective topical treatment, if alpha interferons are given in adequate doses before or shortly after infection.

The objectives of this study are to evaluate the efficacy of feline recombinant omega interferon (rFeIFN- ω) on feline herpesvirus 1 (FHV-1)-replication in cell culture and to determine the optimal concentration of this drug that could be eventually used for the treatment of ocular herpesvirus infection in cats.

FHV-1 (strain C-27) will be grown on Crandell-Reese feline kidney cells and virus titers established after multiple passages. Virulence and homogeneity of FHV-1 will be verified by transmission electron microscopy, indirect immunofluorescent antibody testing and a plaque forming assay. Five different dilutions of rFeIFN- ω will be dissolved in culture medium. 10-fold concentrations ranging from 1×10^2 to 1×10^6 U/ml will be used. Antiviral assay will be conducted as a plaque reduction test, and run in triplicates to test the reproducibility of the assay. Feline omega interferon will be added to the cell culture before and after virus challenge and cultured in maintenance medium for 2-3 days. Plaques will be counted and expressed in percent of counts obtained from untreated control cultures.

FHV-1-induced ocular disease is widespread among the cat population. Antiviral treatment is only effective during virus shedding in the active phase of infection; the latent stage of the disease cannot be influenced by conventional antiviral therapy. Interferons might be used for prophylaxis and therapy of FHV-1-related ocular infections in cats.

The following steps of this research project have been completed since start time in April 2003:

- Crandell-Reese feline kidney cells were propagated and cultivated in cell culture medium. The seventh passage was harvested and stored and will serve as our working cell stock.
- FHV-1 virus was grown in cell culture from the originally established virus stock and cytopathogenic effect on cell culture monolayer was readily observed. Virus was verified by electron microscopy. Virus titration for TCID₅₀ was started in 4 x 24 well plates.
- We are currently working on a plaque assay in order to determine virus infectivity. Mean viral titers will be expressed as plaque forming units (PFU)/0.1 ml.
- Antiviral assay using recombinant feline interferon omega will be performed from mid to end of September 2003. First results of this assay should be expected by the end of September/beginning of October 2003.

*PI: Dr. Ursula Dietrich (dietrich@vet.uga.edu)
Co-PI: Dr. N. Siebeck, Dr. M. Garcia, and
Dr. C. Greene*

Comparative biomedicine investigates how a particular disease affects one species versus another; that is, how a disease manifests itself for example in a mouse versus a human or cow. Researchers can compare diseases between species because different species often share substantial genetic information. Scientists study data such as symptoms, disease progression, treatments, mortality, and so on. Thus, one species serves as a disease model for another. And interestingly, both species may benefit. For example, researchers study cardiomyopathy in dogs and humans and both have benefited in the short- and long-term.



Evaluation of Chalcone Derivatives in a Murine Model of Canine Neoplasia

Therapeutic inhibition of angiogenesis as a treatment for cancer has gained much interest in the last 30 years because of the potential for broad-spectrum efficacy, lack of acquired resistance, and low incidence of associated adverse effects. Chalcone is a biologically active flavonoid compound that is widely distributed in edible plants. Chalcone and its derivatives have been identified as anti-proliferative agents and their anti-angiogenic activity has been demonstrated *in vitro*. The purpose of this study was to evaluate chalcone derivatives *in vivo*, using a mouse model of canine cancer, the anti-angiogenic, anti-tumor, and anti-metastatic activity of synthetic chalcone derivatives designed and synthesized by the University of Georgia, Department of Chemistry.

One goal of this study was to standardize our production of reliable, predictably behaving models of both canine prostatic carcinoma and osteosarcoma. Using BALB/c-*nu/nu* (athymic) mice. In the first year of the study, we developed the ability to reliably produce transplanted canine prostatic carcinomas with aggressive, metastatic behavior. The canine osteosarcoma cell line was not reliably tumorigenic in the athymic mice so this cell line was not included in the study.

In preliminary studies, we encountered difficulty in solubilizing the test compounds into a form that would be safe and reliable for administration. Although we were able to administer the compounds orally, poor water solubility and the potential for ineffective drug delivery was a concern. The Department of Chemistry then developed several water-soluble chalcone derivatives that could be safely administered subcutaneously. Based on *in vitro* testing of anti-angiogenic activity at Emory University, the most effective water-soluble agent was selected for evaluation in our murine model of prostatic cancer. Unfortunately, this agent was uniformly hepatotoxic,

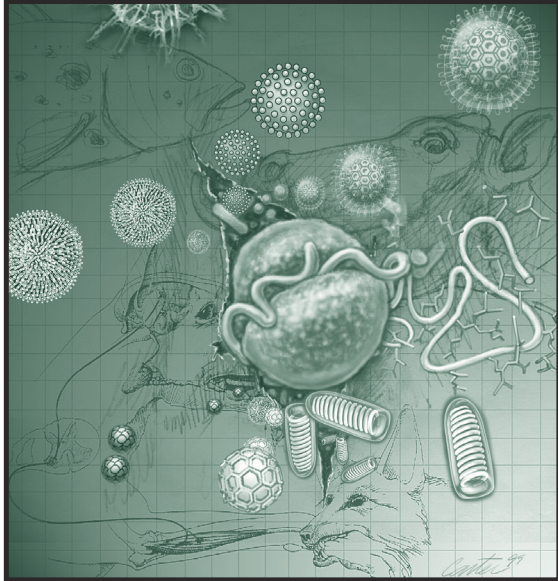
resulting in the death of the mice, even when reformulated and dosed at $\frac{1}{2}$ and $\frac{1}{4}$ of the original dose. It is unclear why a compound that should be safe was so toxic. Consequently, further development of chalcone derivatives has been put on hold pending recruitment of a pharmacologist to this collaborative effort.

Using the expertise in creating mouse models of cancer that was acquired in this study, we have recently initiated a novel study to investigate molecular mechanisms controlling the biologic behavior of injection site sarcomas in cats. This is a particularly aggressive type of cancer that is very invasive locally and will metastasize in approximately 25% of cats. Understanding the mechanisms responsible for the behavior of injection site sarcomas will help to predict the behavior of this tumor in individual cats and allow the development of more specific targeted therapies to prevent or control this cancer.

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Co-PI: Dr. Karen Cornell and Dr. Nancy Stedman

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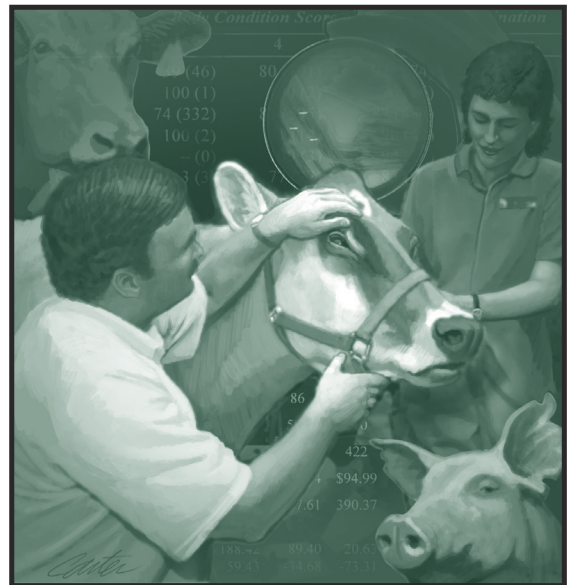
Emerging Diseases
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Genomics
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2001



Food Animal Health and
Management Program
2002

-
- Baldwin, Charles.** *Diagnostic services relative to the control, diagnosis, treatment prevention, and eradication of livestock diseases 2003.* Ga Dept. of Agriculture. \$2,093,866
- Brackett, Benjamin.** *Marker-assisted selection of bovine blastocysts.* Tulane University. \$43,440
- Brown, Corrie.** *Preparing veterinarians to deal with global issues in animal health, trade and food security.* FIPSE - U.S. Dept. Education. \$52,584
- Brown, Corrie.** *Veterinary curriculum and the future: Public health, food security and agroterrorism.* FIPSE - U.S. Dept. Education. \$52,420
- Brown, Corrie.** *Emergency management of agricultural bio-terrorism training curriculum.* GA Tech Research Institute. \$58,880
- Brown, Corrie.** *Veterinary curriculum issues in the next millennium: Emerging diseases, food safety, bioterrorism and food safety.* Texas A&M Research Foundation. \$47,103
- Budberg, Steven.** *Effect of topical diclofenac on an experimental subcutaneous model of inflammation in horses.* Blue Ridge Pharmaceuticals. \$26,311
- Coffield, Julie.** *Neuromuscular Targets of Botulinum Toxin.* National Institutes of Health. \$143,358
- Cole, Dana.** *Quantitative risk assessment of the potential for secondary spread of an agricultural bioterror agent in a rural community.* UGA - Faculty Research Grants. \$9,101
- Davidson, William.** *Human ehrlichiosis surveillance and epidemiology.* National Institutes of Health. \$137,560
- Dickerson, Harry.** *A research training experience for veterinary medical students.* Merck Company Foundation. \$20,000
- Edwards, Gaylen.** *Metabolic regulation of growth and development.* Pennington Biomedical Res Ctr. \$38,213
- Edwards, Gaylen.** *Ingestive peptide controls of alcohol intake.* National Institutes of Health. \$72,400
- Ferguson, Duncan.** *Molecular genetic approach to development of a feline thyrotropin.* Morris Animal Foundation. \$64,823
- Fischer, John.** *Development of scientific information on animal traps for selected wild vertebrate species by providing necropsy data on injuries associated with use of animal restraint devices.* USDA. \$12,650
- Fischer, John.** *Coop. agreement for developing and evaluation of data relative to disease relationships that may ... involve wildlife, domestic livestock and poultry.* USDA. \$350,000
- Fischer, John.** *Cooperative agreement for developing and evaluation of data relative to disease relationships that may ... involve wildlife, domestic livestock & poultry.* USDA-APHIS. \$150,000
- Fischer, John.** *Federal assistance to support the distribution of pseudorabies virus and Brucella suis in feral swine populations in Georgia.* USDA-APHIS. \$50,000
- Fu, Zhen.** *Regulation of rabies virus transcription and replication.* National Institutes of Health. \$253,400
- Fu, Zhen.** *Development of recombinant rabies virus vaccines for animals.* Fort Dodge Animal Health. \$40,000
- Glisson, John.** *Surveillance for West Nile Virus Encephalitis (WNVE) and other arboviral pathogens.* GA Dept. Natural Resources. \$13,400
- Graves, Jonathan.** *Effect of wellness and performance formula on the deleterious effects of a high cholesterol diet.* Platinum Research Foundation. \$40,000
- Graves, Jonathan.** *Menopause, lipids and changes in cardiovascular structure and function.* UGA - Faculty Research Grants. \$7,655
- Hernandez-Divers, Stephen.** *Evaluation of iohexol excretion as a means of measuring glomerular filtration rate and renal function in green iguanas.* Association of Reptilian and Amphibian Veterinarians. \$3,400
- Hernandez-Divers, Stephen.** *Evaluation of endoscopic castration and salpingohysterectomy in pigeons.* Association of Avian Veterinarians. \$4,938
- Hoening, Margarethe.** *Lipoprotein lipase (LPL) and hormone-sensitive lipase (HSL) activity in muscle and fat of lean and obese cats.* Ralston Purina. \$7,770
- Hoening, Margarethe.** *Insulin sensitivity and glucose and fat metabolism in cats.* Nestle Purina. \$243
- Hoening, Margarethe.** *The effect of obesity on the feline immune system.* Ralston Purina. \$32,014
- Hoening, Margarethe.** *Insulin sensitivity and glucose and fat metabolism in cats.* Nestle Purina. \$38,388
- Hofacre, Charles.** *Task Order for "Research Support".* USDA-APHIS. \$18,887
- Hurley, David.** *Comparison of the capacity of in vitro tools to assess the immune response of cattle to inactivated and modified-live vaccines.* Merial Limited. \$75,000
- Hurley, David.** *Comparison of the capacity of in vitro tools to assess the immune response of cattle to inactivated and modified-live vaccines ...* Georgia Research Alliance. \$30,000
- Jaso-Friedman, Liliana.** *The effect of obesity on the feline immune system.* Ralston Purina. \$36,108
- Kaplan, Ray.** *Rotation of pastures with crops to achieve productivity and environmental quality.* USDA-ARS. \$6,384
- Kleven, Stanley.** *Development and validation of a rapid diagnostic test for Mycoplasma infectious bronchitis and Infectious Laryngotracheitis.* USDA-ARS. \$640,000
- Lee, Margie.** *Does Antibiotic Usage Create Drug-Resistant Campylobacter?* US Department of Health and Human Services. \$200,593
- Lewis, Stephen.** *Effects of wellness and performance formula on cardiovascular function, metabolism and longevity in a model of type 2 diabetes.* Platinum Research Foundation. \$37,500
- Lewis, Stephen.** *Ischemia-reperfusion injury in equine laminar arteries.* Grayson-Jockey Club Research Foundation. \$29,000
- Maki, Joanne.** *Ictalurus punctatus: A model to study mucosal immunity.* NIH. \$107,887
- Maurer, John.** *Task Order.* USDA-ARS. \$2,970
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- Maurer, John.** *2002-2003 ARS Funds For Molecular Biological Techniques.* USDA. \$2,970
- McCall, John.** *Supply of Brugia infective larvae.* National Institutes of Health. \$24,973
- McCall, John.** *Filariasis research reagent resource center.* National Institutes of Health. \$409,390
- McCall, John.** *Antifilarial drug screening in dogs.* World Health Organization. \$46,866
- McCall, John.** *Retroviral Transduction and Immortalization of Filaria.* University of Alabama. \$25,000
- McCall, John.** *Furnish Brugia malayi adult worms and/or B. malayi infective larvae.* National Institutes of Health. \$126,077
- Mead, Daniel.** *West Nile Virus surveillance in West Virginia.* West Virginia Dept. Health and Human Services. \$24,800
- Miller, Doris.** *Diagnostic services relative to the control, diagnosis, treatment, prevention, and eradication of livestock disease 2003 - Athens lab.* GA Dept. of Agriculture. \$1,308,581
- Moore, James.** *Synthesis and evaluation of novel endotoxin antagonists.* National Institutes of Health. \$89,776
- Moore, James.** *Three dimensional animations of signal transduction processes.* USDA-CSREES. \$97,530
- Moore, James.** *Microvascular dysfunction in laminitis: Role of free radicals and peroxynitrite.* USDA. \$200,000
- Moore, James.** *LPS-Binding Protein and the Major LPS Receptor in Horses with Colic.* Morris Animal Foundation. \$26,213
- Moore, Julie.** *T-cell memory and protection against placental malaria.* National Institutes of Health. \$324,043
- Murray, Thomas.** *Neurotoxins from marine algae and cyanobacteria.* Oregon State University. \$126,028
- Murray, Thomas.** *Dynorphin analogs as kappa opioid receptor antagonists.* Univ. of Maryland. \$10,500
- Murray, Thomas.** *The equine adenosine A2A and A3 receptors: Potential therapeutic targets for endotoxemia.* Morris Animal Foundation. \$7,500
- Murray, Thomas.** *Hypoxia and the control of fetal breathing movements.* Univ. of California at Los Angeles. \$25,733
- Murray, Thomas.** *Affinity labels for opioid receptors.* Univ. of Kansas. \$65,619
- Murray, Thomas.** *Neuroprotective actions of cannabinoid agonists - Cheryl C. Miller fellowship.* National Institutes of Health. \$38,320
- Okinaga, Tatsuyuki.** *Assessment of recombinant swine PSP proteins on swine monocyte and macrophage function, and replication of porcine reproduction and respiratory syndrome virus in vitro.* UGA - Faculty Research Grants. \$5,982
- Palmarini, Massimo.** *Oncogenesis in retrovirus-induced lung cancer.* National Institutes of Health. \$245,184
- Palmarini, Massimo.** *Distinguished Cancer Clinicians and Scientists Program.* Georgia Cancer Coalition. \$75,000
- Peroni, John.** *Role of oxidant stress in microvascular dysfunction in equine laminitis.* Morris Animal Foundation. \$52,734
- Prasse, Keith.** *Section 1433 Animal Disease and Health Formula Funds.* USDA-CSREES. \$110,062
- Quinn, Fred.** *Characterization of the SigE regulon of Mycobacterium tuberculosis.* National Institutes of Health. \$48,148
- Ritchie, Branson.** *Research Associate In Exotic/Zoo Infectious Disease And Pathology.* Postgraduate program. Zoo Atlanta/Riverbanks Zoo. \$13,000
- Sanderson, Sherry.** *Comparison of two dietary approaches to managing canine chronic renal failure.* Iams Company. \$24,151
- Sellers, Holly.** *Detection of infectious laryngotracheitis virus utilizing a DNA probe and in situ hybridization.* UGA - Faculty Research Grants. \$4,000
- Stallknecht, David.** *Wildlife reservoirs for the H5 and H7 avian influenza viruses.* USDA-ARS. \$79,950
- Stallknecht, David.** *Replication of west nile virus in avian macrophages: A predictor of species susceptibility?* Morris Animal Foundation. \$23,668
- Stallknecht, David.** *Peridomestic avian species as amplifying hosts and sentinels of WN and SLE viruses in Georgia.* Centers for Disease Control. \$185,613
- Stallknecht, David.** *West Nile surveillance in wild birds.* GA Dept. of Human Resources. \$178,340
- Stallknecht, David.** *Determine infectious rate and distribution of avian pathogens in wild birds of midwestern and southeastern U.S. for Homeland Security surveillance.* USDA-ARS. \$100,000
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- Applewhite, A.A., Cornell, K.K., Selcer, B.A. Diagnosis and treatment of intussusceptions in dogs. *Compend. Contin. Educ. Prac.*, 24:110-125, 2002.
- Augsburger, T., Fischer, J.R., Thomas, N.J., Sileo, L., Brannian, R.E., Miller, K.J.G., and Rocke, T.E.. Vacuolar myelinopathy in waterfowl from a North Carolina impoundment. *J. Wildlife Dis.*, 39(2):412-417, 2003.
- Banda, A., Villegas, P., and El-Attrache, J., Molecular characterization of Infectious Bursal Disease Virus from commercial poultry in the United States and Latin America. *Avian Dis.*, 47:87-95, 2003.
- Bentley, A., Barton, M.H., Norton, N., Lee, M., Moore, J.N. Antimicrobial-induced endotoxin and cytokine activity in an in vitro model of foal septicemia. *Amer. J. Vet. Res.*, 63(5):660-668, 2002.
- Bentley, A.P., Barton, M.H., Lee, M.D., Norton, N.A., Moore, J.N. Antimicrobial-induced endotoxin and cytokine activity in an in vitro model of septicemia in foals. *Amer. J. Vet. Res.*, 63(5):660-668, 2002.
- Bischoff, K. M., White, D.G., McDermott, P.F, Zhao, S., Gaines, S., Maurer, J.J., and Nisbet, D. J. Characterization of chloramphenicol resistance in hemolytic *Escherichia coli* associated with diarrhea in neonatal swine. *J. Clin. Microbiol.*, 40:389-394, 2002.
- Bradbury, J.M., and Kleven, S.H. *Mycoplasma iowae* infection. In: **Diseases of Poultry**, 11th edition. Y. M. Saif, H. J. Barnes, J. R. Glisson, A. M. Fadly, L. R. McDougald, and D. E. Swayne, eds. Iowa State University Press, Ames, IA., pp. 766-771, 2003.
- Brewer, L.A., Lwamba, H.C., Murtaugh, M.P., Palmenberg, A.C., Brown, C., Njenga, M.K. Porcine encephalomyocarditis virus persists in pig myocardium and infects human myocardial cells. *J. Virol.*, 75:11621-9, 2001.
- Brown, T.P., and Julian, R.J. Poisons and Toxins. In: **Diseases of Poultry**, 11th ed. B.W. Calnek, H.J. Barnes, C.W. Beard, W.M. Reid, H.W. Yoder, Jr., eds. Iowa State University Press, Ames, Iowa., 2003.
- Budsberg, S.C., Cross, A., Quandt, J., Pablo, L., Runk, A. Evaluation of intravenous meloxicam for perioperative pain management following stifle surgery in dogs. *Amer. J. Vet. Res.*, 63: 1557-1563, 2002.
- Burns, K.E., Ruiz, J., Opengart, K., Hofacre, C.L., Brown, T.P., and Rowland, G.N. Research Note-Hypoglycemia spiking mortality syndrome in broilers with rickets and a subsequent investigation of feed restriction as a contributing factor. *Avian Dis.*, 46:735-739, 2002.
- Burns, K.E., Ruiz, J., and Glisson, J.R. Evaluation of the effect of heating an oil-emulsion *Pasteurella multocida* bacterin on tissue reaction and immunity. *Avian Dis.*, 47:54-58, 2003.
- Burns, K.E., Otalora, R., Glisson, J.R., and Hofacre, C.L. Case Report: B Cellulitis in Japanese quail (*Coturnix coturnix japonica*). *Avian Dis.*, 47: 211-214, 2003.
- Calvert, C.A., Wall, T.M. Evaluation of stability over time for measures of heart rate variability in overtly healthy doberman pinschers. *Amer. J. Vet. Res.*, 63:53-59, 2002.
- Crocker, C. and Miller, D. Persistent elevated blood glucose in the iguana, *Iguana iguana*: a case study. Proceedings from the 9th Annual Conference of the Association of Reptilian and Amphibian Veterinarians. Reno, Nevada 9:7-9, 2002.
- Crowell-Davis, S.L., Seibert, L. M., Sung, W., Parthasarathy, V. and Curtis, T.M. Use of clomipramine, alprazolam and behavior modification for treatment of stormphobia in dogs. *J. Amer. Vet. Med. Assoc.*, 222:744-748, 2003.
- Crowell-Davis, S.L. Social behaviour, communication and development of behaviour in cats. In: Horwitz, DE, Mills, DS & Heath, S. In: **BSAVA Manual of Canine and Feline Behavioural Medicine**. British Small Animal Veterinary Association, Quedgeley, England. 2002.
- Curtis, T.M., Crowell-Davis S.L. and Knowles R.J. Proximity as it relates to familiarity and relatedness in the domestic cat (*Felis catus*). Proceedings of the annual meeting of AVSAB, Nashville, TN, July 2002, p. 43.

*Research publications from independent and collaborative research activities of faculty in the College of Veterinary Medicine and the Veterinary Medical Experiment Station

- Egger, C.M., Glerum, L.E., Allen, S.W., Haag, M. Plasma fentanyl concentrations in awake cats and cats undergoing anesthesia and ovariohysterectomy using transdermal administration. *Vet. Anesth. Analg.*, 29:1-8, 2002.
- Fayrer-Hosken, R.A. Contraception of the stud dog. In: **Small Animal Theriogenology**. Root-Kustritz, M., ed. Butterworth and Heinemann, MA, pp 447-457.
- Fayrer-Hosken, R.A. Emerging technologies in small animal theriogenology. In: **Small Animal Theriogenology**. Root Kustritz, M., ed., Butterworth and Heinemann, MA, pp. 599-612.
- Fischer, J.R., Lewis, L.A., Augspurger, T., and Roche, T.E. Avian vacuolar myelinopathy: A newly recognized fatal neurological disease of eagles, waterfowl and other birds. Transactions of the 67th North American Wildlife and Natural Resources Conference, Session 1:51-61, 2002.
- Fischer, J.R., Lewis-Weis, L.A., and Tate, C.M. Experimental vacuolar myelinopathy in red-tailed hawks. *J. Wildlife Dis.*, 39(2):400-406, 2003.
- Fischer, J.R. and Nettles, V.F. National chronic wasting disease surveillance in free-ranging cervids: Accomplishments and needs. Proceedings, 106th Annual Meeting of the United States Animal Health Association, 78-82, 2002.
- Flatland, B. *Helicobacter* infection in humans and animals. *Compend. Cont. Educ. Pract. Vet.*, 24(9):688-698, 2002.
- Frazier, K.S., Baldwin, C.A., Pence, M., West, J., Bernard, J., Liggett, A., Miller, D. and Hines, M.E. II. Seroprevalence and comparison of isolates of endometriotropic Bovine Herpes virus-4. *J. Vet. Diag. Invest.*, 14(6):457-462, 2002.
- García, M., El-Attrache, J., Riblet, S.M., Ikuta, N., Lunge, R.V., Fonseca, A.S.K., and Villegas, P. Development and application of reverse transcriptase (RT) nested polymerase chain reaction (PCR) test for the detection of exogenous avian leucosis virus. *Avian Dis.*, 47: 41-53, 2003.
- Gaydos, J.K., Davidson, W.R., Elvinger, F., Howerth, E.W., Murphy, M., and Stallknecht, D.E. Cross-protection between epizootic hemorrhagic disease virus serotypes 1 and 2 in white-tailed deer. *J. Wildlife Dis.*, 38(4):720-728, 2002.
- Gaydos, J.K., Davidson, W.R., Elvinger, F., Mead, D.G., Howerth, E.W., and Stallknecht, D.E. Innate resistance to epizootic hemorrhagic disease in white-tailed deer. *J. Wildlife Dis.*, 38(4):713-719, 2002.
- Gerstenfeld, N., Crowell-Davis, S. Agonistic behaviors and social spacing in the llama (*Llama glama*). Proceedings of the annual meeting of AVSAB, Nashville, TN, July 2002, p. 11.
- Glisson, J.R. *Pasteurella* and Other Related Bacterial Infections – Introduction. In: **Diseases of Poultry**, 11th ed. Saif, Y.M., Barnes, H.J., Glisson, J.R., Fadly, A.M., McDougald, L.R., Swayne, D.E., eds. Iowa State University Press, Ames, Iowa, p. 657, 2003.
- Glisson, J.R., and Hofacre, C.L. Fowl Cholera. In: **Diseases of Poultry**, 11th ed. Saif, Y.M., Barnes, H.J., Glisson, J.R., Fadly, A.M., McDougald, L.R., Swayne, D.E., eds. Iowa State University Press, Ames, Iowa, pp. 658-676, 2003.
- Hansen, G.R., Woodall, J., Brown, C.C., Jaax, N., McNamara, T., Ruiz, A. Emerging zoonotic diseases. *Emerg. Infect. Dis.*, 7:537, 2001.
- Hatkin, J., Styer, E. and Miller, D. Inguvial squamous cell carcinoma in a game chicken. *Avian Dis.*, 46:1070-1075, 2002.
- Hartmann, K., Werner, R.M., Egberink, H. A Macska Immunhianyvirus-Fertozottsegenek Kimutatasa a Gyakorlatban (Diagnosis of feline immunodeficiency virus infection in veterinary practice). *Allatorvosok*, 124:95-98, 2002.
- Hartmann, K., Schulz, B., Hirschberger, J. Hypercosinophiles Syndrom Bei Der Katze - Zwei Falle. *Tierarztl. Prax.*, 20:445-450, 2002.
- Hartmann, K., Hein, J. Feline Panleukopenie. Praxisrelevante Fragen Anhand Eines Fallbeispiels. *Tierarztl. Prax.*, 30:393-399, 2002.
- Hartmann, K., Hein, J. Katzenschnupfen. Praxisrelevante Fragen Anhand Eines Fallbeispiels. *Tierarztl. Prax.*, 30:311-319, 2002.

- Hartmann, K., Hein, J. Toxoplasmose Bei Der Katze. Praxisrelevante Fragen Anhand Eines Fallbeispiels. *Tierarztl Prax*, 20:477-484, 2002.
- Hartmann, K., Hein, J. Feline Immunschwachevirusinfektion. Praxisrelevante Fragen Anhand Eines Fallbeispiels. *Tierarztl Prax*, 30:231-237, 2002.
- Hartmann, K., Hein, J. Feline Leukamievirusinfektion. Praxisrelevante Fragen Anhand Eines Fallbeispiels. *Tierarztl Prax*, 30:148-154, 2002.
- Hartmann, K., Hein, J. Feline Infektiöse Peritonitis. Praxisrelevante Fragen Anhand Eines Fallbeispiels. *Tierarztl Prax*, 30:71-78, 2002.
- Hawkins, L.L., Perino, L.J., Kennedy, G., Dikeman, M., Cole, D. Effects of florfenicol injection on the meat characteristics of the cervical muscles of cattle. *Amer. J. Vet. Res.*, 63(1):64-68, 2002.
- Hazariwala, A., Sanders, Q., Hudson, C.R., Hofacre, C.L., Thayer, S.G., and Maurer, J.J. Distribution of staphylococcal enterotoxin genes among *Staphylococcus aureus* isolated from poultry and humans. *Avian Dis.*, 46:132-136, 2002.
- Hernandez-Divers, S.M., Hernandez-Divers, S.J., Wyneken, J. Angiographic, anatomic, and clinical technique descriptions of a subcarapacial venipuncture site for chelonians. *J. Herpetolog. Med. & Surg.*, 12(2): 32-37, 2002.
- Hernandez-Divers, S.J. Diode laser surgery: Principles and application in exotic animals. *Seminars Avian & Exotic Pet Med.*, 11(4):208-220, 2002.
- Hernandez-Divers, S.J. Diagnosis and surgical repair of stifle luxation in a spur-thighed tortoise (*Testudo graeca*). *J. Zoo Wildlife Med.*, 33(2): 125-130, 2002.
- Hernandez-Divers, S.J. Endosurgical debridement and diode laser ablation of lung and air sac granulomas in psittacine birds. *J. Avian Med. & Surg.*, 16(2):138-145, 2002.
- Hernandez-Divers, S.J. Care in captivity - the Thai water dragon, *Physignathus cocincinus*. *J. Herpetolog. Med. & Surg.*, 12(2):41-44, 2002.
- Hernandez-Divers, S.J., Knott, C.D., MacDonald, J. Diagnosis and surgical treatment of thyroid adenoma-induced hyperthyroidism in a green iguana (*Iguana iguana*). *J. Zoo Wildlife Med.*, 32(4):465-475, 2002.
- Hernandez-Divers, S.J., Shearer, D. Pulmonary mycobacteriosis due to *Mycobacterium haemophilum* and *M. marinum* in a royal python. *J. Amer. Vet. Med. Assoc.*, 220(11):1161-1663, 2002.
- Hernandez-Divers, S.J. Pulmonary candidiasis due to *Candida albicans* in a Greek tortoise (*Testudo graeca*) and treatment using intrapneumonic amphotericin. *B. J. Zoo Wildlife Med.*, 32(3): 352-359, 2002.
- Hernandez-Fonseca, H.J., Sirisathien, S., Bosch, P., Hollett, R.B., et al. Offspring resulting from direct transfer of cryopreserved bovine embryos produced in vitro in chemically defined media. *Ann. Repro. Sci.*, 69(3/4):151-158, 2002.
- Hofacre, C.L. The health and management of poultry production. *Intl. J. Infect. Dis.*, 6:353-357, 2002.
- Hofacre, C.L., Beacorn, T., Collett, S., and Mathis, G. Using competitive exclusion, mannan-oligosaccharide and other intestinal products to control necrotic enteritis. *J. Appl. Poult. Res.*, 12:60-64, 2003.
- Hofacre, C.L. Combating coccidiosis in broiler breeders. *Cocci Forum*, Schering-Plough newsletter No. 6., pp. 15-17, 26, 2003.
- Hofacre, C.L. Enhancing Gut Microflora. *Poultry Digest Online*, 3(1):1-3, 2003.
- Horstman, C.L., Eubig, P.A., Cornell, K.K., Kahn, S.A., Selcer, B.A. Gastric outflow obstruction after ingestion of wood glue in a dog: a case report and literature review. *J. Amer. Anim. Hosp. Assoc.*, 39:47-51, 2003.
- Howerth, E.W., Murphy, M.D., and Roberts, A.W. Failure of porcine reproductive and respiratory syndrome virus to replicate in porcine endothelial cell cultures. *J. Vet. Diagn. Invest.*, 14:73-76, 2002.
- Howerth, E.W., Mead, D.G., and Stallknecht, D.E. Immunolocalization of vesicular stomatitis virus in black flies (*Simulium vittatum*). *NY Acad. Sci.*, 969:340-345, 2002.
- Hudson, B.P., Wilson, J.L., Zavala, G., and Sander, J.E. Fertility and sperm quality of broiler breeder males infected with subgroup J avian leukosis virus. *Avian Dis.*, 46:1033-1037, 2002.

- Humberd, J., Garcia, M., Riblet, S.M., Resurreccion, R.S., and Brown, T.P. Detection of Infectious Laryngotracheitis Virus in formalin-fixed, paraffin-embedded tissues by nested polymerase chain reaction. *Avian Dis.*, 46:64-74, 2002.
- Jackwood, M.W., and Saif, Y.M. Bordetellosis (Turkey Coryza). In: **Diseases of Poultry**, 11th ed. Saif, Y.M., Barnes, H.J., Glisson, J.R., Fadly, A.M., McDougald, L.R., Swayne, D.E., eds. Iowa State University Press, Ames, Iowa, pp. 705-718, 2003.
- Jones, C.J., Streppa, H., Harmon, B., Budsberg, S.C. In vivo effects of meloxicam and aspirin on whole blood, gastric mucosal and synovial fluid prostaglandin synthesis in dogs. *Amer. J. Vet. Res.*, 63:1527-1531, 2002.
- Kang, M.S., Gazdizinski, P., and Kleven, S.H. Virulence of recent isolates of *Mycoplasma synoviae* in turkeys. *Avian Dis.*, 46:102-110, 2002.
- Kapczynski, D.R., Sellers, H.S., Rowland, G.N., and Jackwood, M.W. Detection of in ovo inoculated infectious bronchitis virus by in situ hybridization with a riboprobe in epithelial cells of the lung and bursa. *Avian Dis.*, 46:679-685, 2002.
- Kapczynski, D.R., Sellers, H.S., Simmons, V., and Schultz-Cherry, S. Sequence analysis of the S3 gene from a turkey reovirus. *Virus Genes*, 25: 95-100, 2002.
- Keel, M.K., Davidson, W.R., Doster, G.L., and Lewis, L.A. Northern bobwhite and lead shot deposition in an upland habitat. *Arch. Environ. Contam. and Toxicol.*, 43:318-322, 2002.
- Kim, Y.B., Pantin-Jackwood, M., and Brown, T.P. The effects of immunosuppression on the pathogenesis of Avian Leukosis Virus Subgroup J in broiler chickens exposed to Marek's Disease Virus. *Vet. Pathol.*, 39(5) 635, 2002.
- Kim, Y.B., Gharaibeh, S.M., Stedman, N.L., and Brown, T.P. Comparison and verification of quantitative competitive reverse transcription polymerase chain reaction (QC-RT-PCR) and real time RT-PCR for avian leukosis virus subgroup J. *J. Virol. Meth.*, 102(1-2):1-8, 2002.
- Kleven, S.H. *Mycoplasma synoviae* infection. In: **Diseases of Poultry**, 11th edition. Y.M. Saif, H.J. Barnes, J.R. Glisson, A.M. Fadly, L.R. McDougald, and D.E. Swayne, eds. Iowa State University Press, Ames, IA., pp. 756-766, 2003.
- Kleven, S.H. Mycoplasmosis. Introduction. In: **Diseases of Poultry**, 11th edition. Y.M. Saif, H.J. Barnes, J.R. Glisson, A.M. Fadly, L.R. McDougald, and D.E. Swayne, eds. Iowa State University Press, Ames, IA., pp. 719-721, 2003.
- Kleven, S.H. Other mycoplasmal infections. In: **Diseases of Poultry**, 11th edition. Y.M. Saif, H.J. Barnes, J.R. Glisson, A.M. Fadly, L.R. McDougald, and D.E. Swayne, eds. Iowa State University Press, Ames, IA. pp. 772-774, 2003.
- Kleven, S.H. Multicausal respiratory disease. In: **Diseases of Poultry**, 11th edition. Y.M. Saif, H.J. Barnes, J.R. Glisson, A.M. Fadly, L.R. McDougald, and D.E. Swayne, eds. Iowa State University Press, Ames, IA. pp. 1164-1168, 2003.
- Kommers, G.D., King, D.J., Seal, B.S., Brown, C.C. Pathogenesis of six pigeon-origin isolates of Newcastle disease virus in domestic chickens. *Vet. Path.*, 39:353-362, 2002.
- Kommers, G.D., King, D.J., Seal, B.S., Brown, C.C. Virulence of pigeon-origin Newcastle disease virus isolates for domestic chickens. *Avian Dis.*, 45:906-921, 2001
- Krunkosky, T.K., Effects of TNF alpha on expression of ICAM-1 in human airway epithelial cells in vitro. Oxidant-mediated pathways and transcription factors. (In Press).
- Kruppdespain, W.A., Morgan, E. and Crowell-Davis, S.L. Twenty-four hour time budget of a herd of pot-bellied pigs. Proceedings of the annual meeting of AVSAB, Nashville, TN, July 2002, p 42.
- Lee, C.W., Brown, C.C., and Jackwood, M.W. Tissue distribution of avian infectious bronchitis virus following in ovo inoculation of chicken embryos examined by in situ hybridization with antisense digoxigenin-labeled universal riboprobe. *J. Vet., Diag. Invest.*, 14(5):377-81, 2002.

- Liu, T., Liljebjelke, K., Bartlett, E., Hofacre, C.L., Sanchez, S., and Maurer, J.J. Application of nested PCR to detection of *Salmonella* in poultry environments. *J. Food Prot.*, 65:1227-1232, 2002.
- Lohmann, K., McNeill, B., Vandenplas, M., Barton, M., Moore, J.N. Lipopolysaccharide from *Rhodobacter sphaeroides* is an agonist in equine mononuclear phagocytes. *J. Endotox. Res.*, 9(1):33-37, 2003.
- Lu, J., Sanchez, S., Hofacre, C.L., Maurer, J.J., Harmon, B.G., and Lee, M.D. Evaluation of broiler litter with reference to the microbial composition as assessed using 16S rDNA and functional gene markers. *Appl. Environ. Microbiol.*, 69(2):901-908, 2003.
- Lugo, J., Stick, J.A., Peroni, J.F., Harkema, J.R., Derksen, F.J., Robinson, N.E. Safety and efficacy of a technique for thoracoscopically guided pulmonary wedge resection in horses. *Amer. J. Vet. Res.*, Sep 63(9):1232-40, 2002.
- Machen, M.R., Walldridge, B.M., Cebra, C., Belknap, E.B., Williamson, L.W., Pugh, D.G. Diseases of the Neurologic System. In: **Sheep and Goat Medicine**. Pugh, D., ed. W.B. Saunders Company, Philadelphia, PA, pp. 277-316, 2002.
- Majó, N., El-Attrache, J., Banda, A., Villegas, P., Ramis, A., Pagès, A., and Ikuta, N. Molecular characterization of Spanish Infectious Bursal Disease Virus field isolates. *Avian Dis.* 46:859-868, 2002.
- Mathur, S., Syme, H., Brown, C.A., Elliot, J., Moore, P.A., Newell, T., Munday, J.S., Cartier, L., Sheldon, S., Brown, S. Effects of the calcium channel antagonist, amlodipine, in a feline model of hypertensive renal insufficiency. *Amer. J. Vet. Res.*, 63:833-839, 2002.
- Mauel, M.J., Miller, D.L., Frazier, K., Liggett, A., Styer, E., Montgomery-Brock, D., Brock, J. Characterization of a Piscirickettsiosis-like disease in Hawaiian tilapia. *Dis. Aquat. Organ.*, 53:249-255, 2003.
- Mauel, M.J. and Miller, D.L. Piscirickettsiosis and piscirickettsiosis-like infections in fish: a review. *Vet. Microbiol.*, 87(4):279-289, 2002.
- Mauel, M.J., Miller, D.L., Frazier, K.S. and Hines, M.E. II. Bacterial pathogens isolated from cultured bullfrogs (*Rana castesbeiana*). *J. Vet. Diag. Invest.*, 14:69-71, 2002.
- Mauel, J.M., Miller, D.J., Frazier, K.S. and Hines, M.E. II. Bacterial pathogens isolated from cultured bullfrogs (*Rana castesbeiana*). *J. Vet. Diag. Invest.*, 14:431-433, 2002.
- Maurer, J.J., Hofacre, C.L., Wooley, R.E., Gibbs, P., and Froyman, R. Virulence factors associated with *Escherichia coli* present in a commercially produced competitive exclusion product. *Avian Dis.*, 46:704-707, 2002.
- Miller, D.L., Liggett, A., Radi, Z.A., and Branch, L.O. Gastrointestinal cryptosporidiosis in a puppy. *Vet. Parasitol.*, 115(3):199-204, 2003.
- Miller, D.L., Mauel, M.J., Baldwin, C., Burtle, G., Ingram, D., Hines, M.E. II, Frazier, K.S. West Nile virus in farmed alligators. *Emerg. Infect. Dis.*, 9(7):794-799, 2003.
- Miller, D.L., Styer, E.L., Stobaueus, J.K. and Norton, T.M. Thyroid C-cell carcinoma in an African pygmy hedgehog (*Atelerix albiventris*). *J. Zoo Wildlife Med.*, 33:392-396, 2002.
- Miller, D.L., Bossart, G.D., Nadji, M., Tarpley, R., Roberts, B. and O'Hara, T. A note on the possibility of identifying Leydig and Sertoli cells by immunohistochemistry in bowhead whales (*Balaena mysticetus*). *J. Cetacean Res. Manag.*, 4(2):149-153, 2002.
- Miller, D.L., Herron, A.J., and Chavez, W. Characterization of an oronasal squamous cell carcinoma in an African hedgehog (*Atelerix albiventris*). *J. Anim. Vet. Adv.*, 1:183-185, 2002.
- Mizan, S., Lee, M.D., Harmon, B.G., Tkalcic, S., and Maurer, J.J. Acquisition of antibiotic resistance plasmids by enterohemorrhagic *Escherichia coli* O157:H7 within ex vivo rumen. *J. Food Prot.*, 65:1038-1040, 2002.
- Moisan, P.G., Steffen, D.G., Sanderson, M.W., Nietfeld, J.C., Jinley, M.R., Gotelueschen, D.M., Andrews, G., Johnson, G., Williamson, L., Rushton, S.D., Hall, D.G., Harmon, B.G. A familial degenerative neuromuscular disease of Gelbvieh cattle. *J. Vet. Diag. Invest.*, 14:140-149, 2002.
- Moore, J.N. Treatment of endotoxemia. In: **Veterinary Clinics of North America: Equine Practice**, 2003.

- Moore, V.A., Varela, A.S., Yabsley, M.J., Davidson, W.R., and Little, S.E. Detection of *Borrelia lonestari*, putative agent of southern tick-associated rash illness, in white-tailed deer (*Odocoileus virginianus*) from the southeastern United States. *J. Clin. Microbiol.*, 41(1):424-427, 2003.
- Mueller, P.O.E. Rectal examination. In: **Manual of Equine Gastroenterology**. Divers, T.J. and Ducharme, N.G., eds. WB Saunders Co, Philadelphia, pp. 6-9, 2002.
- Navarre, C.B., Lowder, M.Q. and Pugh, D.G. Oral-Esophageal Diseases. In: **Sheep and Goat Medicine**. WB. Saunders Company, Philadelphia, PA, 2002.
- Nettles, V.E., Quist, C.F., Lopez, R.R., Wilmers, T.J., Frank, P., Roberts, W., Chitwood, S., and Davidson, W.R. Morbidity and mortality factors in Key deer (*Odocoileus virginianus clavium*). *J. Wildlife Dis.*, 38(4):685-692, 2002.
- Neuwirth, L. The equine carpus. In: **Veterinary Diagnostic Radiology**. Thrall, D.E., ed. W.B. Saunders, Philadelphia, pp. 227-246, 2002.
- Northrup, N.C., Rassnick, K.M., Snyder, L.A. Neutropenia associated with vincristine and L-asparaginase induction chemotherapy for canine lymphoma. *J. Vet. Int. Med.*, 16:570-575, 2002.
- Olson, M.E., Harmon, B.G., and Kollef, M.H. Silver-coated endotracheal tubes associated with reduced bacterial burden in the lungs of mechanically ventilated dogs. *Chest*, 121: 863-870, 2002.
- Palmer, W.E., Wellendorf, S.D., Brennan, L.A., Davidson, W.R., and Kellogg, E.E. Hunting success and northern bobwhite density of Tall Timbers Research Station: 1970-2001. In: **Proceedings of the 5th National Bobwhite Quail Symposium**, 5:213-216, 2003.
- Pantin, M., and Brown, T.P. Proventriculitis in broiler chickens: Chronic lymphocyte responses in the glandular interstitium. *Vet. Pathol.*, 39(5): 628, 2002.
- Pantin, M., and Brown, T.P. Proventriculitis in broiler chickens: Experimental reproduction and characterization of the acute phase glandular necrotic lesions. *Vet. Pathol.*, 39(5):628, 2002.
- Parks, A.H. Foot Balance, Conformation and Lameness. In: **Diagnosis and Management of Lameness in the Horse**. Ross and Dyson eds., Saunders, Philadelphia, pp. 250-261, 2003.
- Parks, A.H. Shoes and Shoeing. In: **Diagnosis and Management of Lameness in the Horse**. Ross and Dyson eds., Saunders, Philadelphia, pp. 262-271, 2003.
- Parks, A.H. Chronic Laminitis. In: **Current Therapy in Equine Medicine**. 5th edition. Robinson, N.E., ed., Saunders, Philadelphia, pp. 520-528, 2003.
- Pence, M.E., and Liggett, A.D. Congenital erythropoietic protoporphyria in a Limousin calf. *J. Amer. Vet. Med. Assoc.*, 221(2):277-279, 2002.
- Perkins, L.E.L., Campagnoli, R.P., Harmon, B.G., Gregory, C.R., Steffens, W.L., Latimer, K., Clubb, S., Crane, M. Detection and confirmation of reptilian adenovirus infection by in situ hybridization. *J. Vet. Diag. Invest.*, 13: 365-368, 2001
- Peroni, J.F. Laparoscopic Assessment of Abdominal Trauma in Horses. *Compendium on Contin. Educ.*, 24(6):490-494, 2002.
- Peroni, J.F., Stick, J.A. Evaluation of a cranial arthroscopic approach to the stifle joint for the treatment of femorotibial joint disease in horses: 23 cases (1998-1999). *J. Amer. Vet. Med. Assoc.*, 220(7):1046-1052, 2002.
- Quist, C.F., Nettles, V.E., Manning, E.J.B., Hall, D.G., Gaydos, J.K., Wilmers, T.J., and Lopez, R.R. Paratuberculosis in Key Deer (*Odocoileus virginianus clavium*). *J. Wildlife Dis.*, 38(4): 729-737, 2002.
- Radi, Z.A., Miller, D.L. and Thompson, L.T. Ethylene glycol toxicosis in chickens. *Vet. Hum. Toxicol.*, 45:36-37, 2003.
- Rawlings, C.A. Pearls of Veterinary Medicine: Laparoscopic assisted gastropexy. *J. Amer. Anim. Hosp. Assoc.*, 38:15-19, 2002.
- Rawlings, C.A., Howerth, E.W., Bement, S., Canalis, C. Laparoscopic-assisted enterostomy feeding tube placement and full-thickness biopsies with serosal patch in dogs. *Amer. J. Vet. Res.*, 63: 1313-1319, 2002.

- Rawlings, C.A. Pearls of Veterinary Medicine: Colposuspension as a treatment for urinary incontinence in spayed dogs. *J. Amer. Anim. Hosp. Assoc.*, 38:107-110, 2002.
- Rawlings, C.A., Howerth, E.W., Mahaffey, M.B., Foutz, T.L., Bement, S., Canalis, C. Laparoscopic-assisted cystopexy in the dog. *Amer. J. Vet. Res.*, 63:1226-1231, 2002.
- Rawlings, C.A. Pearls of Veterinary Medicine: Effect of monthly heartworm preventatives on dogs with young heartworm infections. *J. Amer. Anim. Hosp. Assoc.*, 38:311-314, 2002.
- Rawlings, C.A., Mahaffey, M.B., Bement, S., Canalis, C. Prospective evaluation of laparoscopic-assisted gastropexy in dogs susceptible to gastric dilatation. *J. Am. Vet. Med. Assoc.*, 221:1576-1581, 2002.
- Rawlings, C.A., Mahaffey, M.B., Barsanti, J.A., Canalis, C. Use of laparoscopic-assisted cystoscopy for removal of calculi in dogs. *J. Amer. Vet. Med. Assoc.*, 222:759-761, 2003.
- Read, M.R., Read, E.K., Duke, T., Wilson, D.G. Cardiopulmonary effects and induction and recovery characteristics of isoflurane and sevoflurane in foals. *J. Amer. Vet. Med. Assoc.*, 221:393-398, 2002.
- Read, E.K., Read, M.R., Townsend, H.G., Clark, C.R., Pharr, J.W., Wilson, D.G. Effect of hemi-circumferential periosteal transection and elevation in foals with experimentally induced angular limb deformities. *J. Amer. Vet. Med. Assoc.*, 221:536-540, 2002.
- Read, M.R., McCorkell, R. Use of azaperone and zuclopenthixol acetate to facilitate translocation of white-tailed deer (*Odocoileus virginianus*). *J. Zoo Wildl. Med.*, 33:163-165, 2002.
- Richardson, L.J., Mitchell, B.W., Wilson, J.L., and Hofacre, C.L. Effect of an electrostatic space charge system on airborne dust and subsequent potential transmission of microorganisms to broiler breeder pullets by airborne dust. *Avian Dis.*, 47:128-133, 2003.
- Rideout, B.A., Brown, S.T., Davis, W.C., Gay, J.M., Giannella, R.A., Hines II, M.E. **The Diagnosis and Control of Johne's Disease: Committee on the Diagnosis and Control of Johne's Disease.** Hueston, W.D. and Hutchinson, L.J., eds. National Academy of Sciences. National Academy Press, Washington, DC. ISBN: 0-309-08611-6. 2003.
- Sanchez, S., McCrackin Stevenson, M.A., Hudson, C.R., Maier, M., Buffington, T., Dam, Q., and Maurer, J.J. Characterization of multi-drug resistant *Escherichia coli* associated with nosocomial infections in dogs. *J. Clin. Microbiol.*, 40(10): 3586-3595, 2002.
- Sanchez, S., Lee, M.D., Harmon, B.G., Maurer, J.J., and Doyle, M.P. Zoonosis Update - Animal issues associated with *Escherichia coli* 0157:H7. *J. Amer. Vet. Med. Assoc.*, 221(8):1122-1126, 2002.
- Sander, J.E., Warbington, M. C., and Myers, L. M. Selected methods of animal carcass disposal. *J. Amer. Vet. Med. Assoc.*, 220:1003-1005, 2002.
- Sander, J.E., Hofacre, C.L., Cheng, I.H., and Wyatt, R.D. Investigation of resistance of bacteria from commercial poultry sources to commercial disinfectants. *Avian Dis.*, 46:997-1000, 2002.
- Seal, B.S., Crawford, J.M., Sellers, H.S., Locke, D.P., and King, D.J. Nucleotide sequence analysis of the Newcastle disease virus nucleocapsid protein gene and phylogenetic relationships among the Paramyxoviridae. *Virus Res.*, 83: 119-129, 2002.
- Specht, A., Chan, D., O'Toole, T., Kent, M. Acute staphylococcal peritonitis following cystocentesis in a dog. *J. Vet. Emer. Crit. Care*, 12(3):183-187, 2002.
- Stallknecht, D.E., Howerth, E.W., and Gaydos, J.K. Hemorrhagic disease in white-tailed deer: Our current understanding of risk. In: **Transactions of the 67th North American Wildlife and Natural Resources Conference**, Session 1:75-86, 2002.
- Staton, V. and Crowell-Davis, S.L. Aggression in domestic ferrets. *J. Amer. Vet. Med. Assoc.*, 222:1709-1712, 2003.

- Stanton, J.B., Poet, S., Frasca, S., Bienzle, D., and Brown, C.C. Development of a semi-nested reverse transcription polymerase chain reaction assay for the retrospective diagnosis of canine distemper virus infection. *J. Vet. Diag. Invest.*, 14:47-52, 2002.
- Stedman, N.L., and Brown, T.P. Cardiomyopathy in broiler chickens congenitally infected with avian leukosis virus subgroup J. *Vet. Pathol.*, 39(1): 161-164, 2002.
- Stiffler, K.S., McCrackin-Stevenson, M.A., Mahaffey, M.B., Howerth, E.W., Barsanti, J.A. Intravesical ureterocele with concurrent renal dysfunction in a dog: a case report and proposed classification system. *J. Amer. Anim. Hosp. Assoc.*, 38:33-39, 2002.
- Streppa, H.K., Jones, C.J., Budberg, S.C. Cyclooxygenase selectivity of nonsteroidal anti-inflammatory drugs in canine blood. *Amer. J. Vet. Res.*, 63:91-94, 2002.
- Sumner, J.W., Yabsley, M.J., Arens, M.Q., Buening, G., Storch, G.A., and Davidson, W.R. Determination of white-tailed deer agent groESL operon sequences for phylogenetic and diagnostic applications. *Ann. NY Acad. Sci.*, 990:1-2, 2003.
- Throne Steinlage, S.J., Sander, J.E., Brown, T.P., Lobsinger, C.M., Thayer, S.G., and Martinez, A. Disseminated mycosis in layer cockerels and pullets. *Avian Dis.*, 47:229-233, 2003.
- Throne-Steinlage, S.J., Sander, J.E., Brown, T.P., and Martinez, A. Zygomycosis in Layer Pullets and Cockerels. *Avian Dis.*, 47(1):229-233, 2003.
- Throne-Steinlage, S.J., Sander, J.E., and Wilson, J.L. Comparison of two formaldehyde administration methods of in-ovo injected eggs. *Avian Dis.*, 46: 964-970, 2002.
- Thurmond, M.C., and Brown, C.C. Bio- and agroterror: The role of the veterinary academy. *J. Vet. Med. Educ.*, 29:1-4, 2002.
- Tidwell, A.S., Specht, A., Blaeser, L., Kent, M. Magnetic resonance imaging features of extradural hematomas associated with intervertebral disc herniation in a dog. *Vet. Rad. & Ultra.*, 43(4):319-324, 2002.
- Vandenplas, M.L., Carlson, R.W., Jeyaretnam, B.S., McNeill, B., Barton, M.H., Norton, N., Murray, T.E, Moore, J.N. Rhizobium sin-1 lipopolysaccharide (LPS) prevents enteric LPS-induced cytokine production. *J. Biol. Chem.*, 277(44):41811-6, 2002.
- Walker, S.E., Sander, J.E., and Wooley, R.E. The in vitro efficacy of hatchery disinfectants against field isolates of *Pseudomonas aeruginosa*. *Avian Dis.*, 46:826-830, 2002.
- Walker, S.E., Sander, J.E., Cline, J.L., and Helton, J.S. *Pseudomonas aeruginosa* isolates associated with mortality in broiler. *Avian Dis.*, 46:1045-1050, 2002.
- Wall, T.M., Calvert, C.A., Greene, C.E. Infective endocarditis in dogs. *Comp. Contin. Educ.*, 24: 614-623, 2002.
- Weeks, J.W., Crowell-Davis, S.L. and Heusner, G. Preliminary study of the development of the Flehmen response in *Equus caballus*. *J. Appl. Anim. Behav. Sci.*, 78: 329-335, 2002.
- White, D.G., Ayers, S., Maurer, J.J., Thayer, S.G. and Hofacre, C.L. Antimicrobial susceptibilities of *Staphylococcus aureus* isolated from commercial broilers in northeast Georgia. *Avian Dis.*, 47: 203-210, 2003.
- White, S.L. Alterations in body temperature. In: **Large Animal Internal Medicine**, 3rd ed. Smith, B.P., C.V. Mosby, eds. St. Louis, Missouri, pp. 36-45, 2002.
- White, S.L. Failure of Passive Transfer. In: *The 5-Minute Veterinary Consult-Equine*. Brown, C.M. and Bertone, J.J., eds. Lippincott Williams & Wilkins, Baltimore, MD, pp. 408-409, 2002.
- White, S.L. Vasculitis. In: **Current Therapy in Equine Medicine**, 5th ed. Robinson, N.E., ed. W. B. Saunders, Philadelphia, PA, pp. 363-365, 2003.
- Wilson, G.H., Ritchie, B.W., Greenacre, C.B., Fontenot, D. *Clostridium*: Passenger or pathogen? *Compendium*, 24(7):550-554, 2002.
- Wilson, G.H., Keir, D. Clinical snapshot. Egg yolk stroke in a plum-headed parakeet. *Compendium*, 24(4):301, 2002.

-
- Wilson, G.H., Graham, J.E. Management of egg-related peritonitis in a blue and gold macaw (*Ara araucana*). *Compendium*, 25(1):42-47, 2003.
- Wolfert, M.A., Murray, T.F., Boons, G.J., Moore, J.N. The origin of the synergistic effect of muramyl dipeptide with endotoxin and peptidoglycan. *J. Biol. Chem.*, 277(42):39179-86, 2002.
- Wooley, R., Ritchie, B.W. In vitro evaluation of the antimicrobial effect of commercially available mastitis medications combined with EDTA-tris on bacteria that cause mastitis in cattle. *Vet. Therap.*, 3:150-156, 2002.
- Woolums, A.R., Siger, S., Johnson, S., Gallo, G., Conlon, J. Rapid onset of protection following vaccination of calves with multivalent vaccines containing modified-live or modified-live and killed BHV-1 is associated with virus-specific interferon gamma production. *Vaccine* 21: 1158-1164, 2003.
- Yabsley, M.J., Gottdenker, N.L., and Fischer, J.R. Description of a new *Eimeria* sp. and associated lesions in the kidneys of double-crested cormorants (*Phalacrocorax auritus*). *J. Parasitol.*, 88(6):1230-1233, 2003.
- Yabsley, M.J., and Noblet, G.P. Biological and molecular characterization of a raccoon isolate of *Trypanosoma cruzi* from South Carolina. *J. Parasitol.*, 88(6):1273-1276, 2002.
- Yabsley, M.J., Varela, A.S., Tate, C.M., Dugan, V.G., Stallknecht, D.E., Little, S.E., and Davidson, W. R. *Ehrlichia ewingii* infection in white-tailed deer (*Odocoileus virginianus*). *Emerg. Infect. Dis.*, 8:668-671, 2002.
- Yan, X., Prosniak, M., Curtis, M.T., Weiss, M.L., Faber, M., Dietzchold, B. and Fu, Z.F. Silver-haired bat rabies virus variant does not induce apoptosis in the brain of experimentally infected mice. *J. Neurol. Virol.*, 7:518-527, 2001.
- Yoon, J.H., Brooks, R. Jr., and Halper, J. Immunoblotting assays for keratan sulfate. *Anal. Biochem.*, 306:297-303, 2002.
- Zavala, G., Jackwood, M.W., and Hilt, D.A. Polymerase chain reaction for detection of avian leukosis virus subgroup J in feather pulp. *Avian Dis.*, 46:971-978, 2002.
- Zavala, G., Dufour-Zavala, L., Villegas, P., El-Attrache, J., Hilt, D.A., and Jackwood, M.W. Research Note - Lack of interaction between avian leucosis virus subgroup J and fowl adenovirus (FAV) in FAV-antibody-positive chickens. *Avian Dis.*, 46:979-984, 2002.
- Zwingenberger, A., Parks, A.H., Downs, M.O. Lateral ear resection and segmental pinnal excision in a horse to remove a sarcoid. *Equine Vet. Educ.*, 4:296-300, 2002.
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