Prospectus

PEIIAD: Program of Economically Important Infectious Animal Diseases

Dedicated to advancing research and outreach activities for economically critical infectious animal diseases to prevent their introduction and spread in US animal populations.

Research strategies unite diagnostic measurements and surveillance systems through an integrated, broad-based approach. Findings are synthesized so an animal disease concern is piloted from its roots in basic science to policy development and outreach programs.

Colorado State University

2/23/2009

National Importance of PEIIAD

Applied knowledge of infectious animal diseases on a global scale is vital to US public health and security. The need for infectious disease research is underscored by possible human health impacts of food-borne and zoonotic diseases, the capacity for agricultural economic devastation resulting from uncontained animal disease outbreaks, and potential negative homeland security outcomes due to intentional or unintentional importation of disease through animals and animal products.

PEIIAD was conceived, designed and initially funded in 1998. Its creation filled a national void; no single entity had provided timely, multidisciplinary research focused entirely on animal diseases that either threaten the US food supply or have the potential to cause serious economic losses for animal agriculture on a local, national, and international scale. Since its inception, PEIIAD has been continually at the forefront addressing the most challenging questions about animal disease surveillance systems, the detection of and response to emerging and re-emerging animal diseases, diagnostic strategies for infectious animal diseases, food safety concerns, risk analysis models and protocols, and trade economics.

PEIIAD researchers have extensive international infectious disease experience that promotes a necessary global perspective.

PEIIAD's Five Priority Research Areas

Global, emerging infectious animal diseases
Diseases designated as in need of immediate action and response*

Risk and decision analysis epidemiologic models
Infectious disease spread in animal populations
Food-borne disease agents

Endemic animal diseases
Diseases that impact animal movement, marketing and food safety~

Biosecurity
Feedlot, auction protocols
Exotic animal & zoonotic diseases outreach

Antimicrobials
Drug use & resistance in animals

* Avian Influenza (AI), Animal Transmissible Spongiform Encephalopathy (TSE), Foot & Mouth Disease (FMD), bluetongue serotype 8.

~ West Nile Virus, Chronic Wasting Disease (CWD) in ungulates, scrapie in sheep, vesicular stomatitis, *Mycobacterium bovis* infection, *E. coli* O157 infection, brucellosis, Johne's disease, Bovine Viral Diarrhea (BVD), Equine Herpes Virus, Equine Metritis.

The Colorado State Difference

Colorado State University recognized its research expertise and productivity in infectious diseases through the 2007 creation of the Infectious Disease Supercluster (www.infectiousdisease.colostate.edu). Bringing together this multidisciplinary alliance of researchers in infectious disease not only created

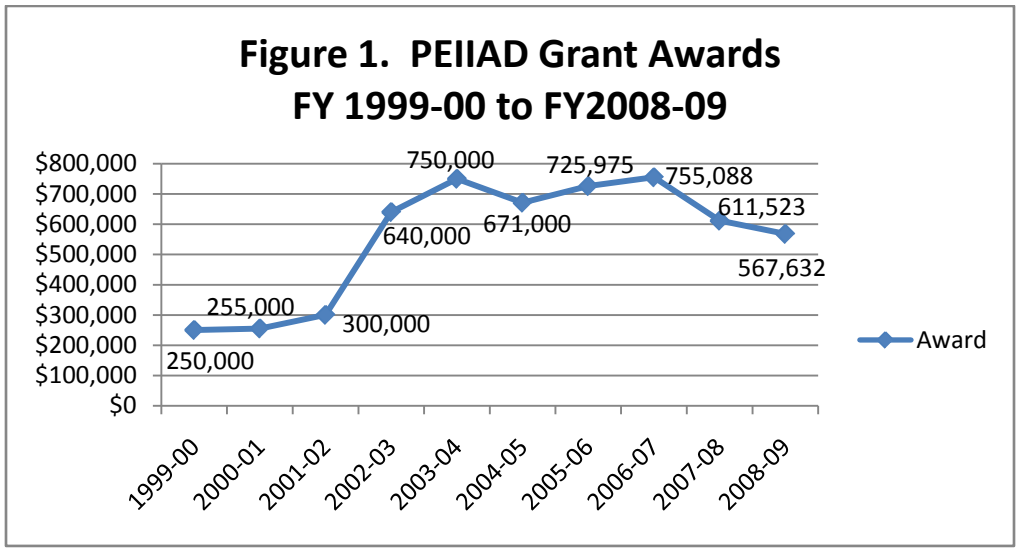
academic infrastructure but also highlighted *infectious animal and zoonotic disease epidemiology as an institutional research focus.* PEIIAD, a core program of the Animal Population Health Institute (www.colostate.edu/aphi), plays an important role in this research area. PEIIAD provides accessible funds for targeted research initiatives and supports groundwork research studies aimed at garnering additional federal grant monies – when they become available. Through this process, economically important infectious animal disease issues are immediately targeted for collaborative research and synthesis within the University setting. See Appendix A for more information on PEIIAD and its research initiatives.

Collaborating US and International Institutions

The Animal Population Health Institute (APHI) is centered in the Clinical Sciences Department within the College of Veterinary Medicine and Biomedical Sciences (CVMBS); it has strong collaborative ties across departments, across colleges, and outside the university. APHI faculty members are directly involved with PEIIAD research activities and bring diverse expertise and strong state, national and international connections. They routinely collaborate with the Colorado Department of Agriculture, faculty from other universities, and several USDA agencies. Memoranda of understanding with several foreign entities enable APHI researchers to maintain their unique, international perspective on animal diseases. Continued integration of activities among scientists provides the multidisciplinary approach necessary to address animal health problems using both basic and applied research agendas. See Appendix B for a list of collaborating institutions and additional information concerning international collaborations.

PEIIAD Productivity & Success

PEIIAD has been funded annually by a special grant from USDA: CSREES since 1999 (See Figure 1). PEIIAD research activities have resulted in greater than 75 publications; more than $9.5 million in funded projects from PEIIAD preliminary research results; several validated diagnostic tests; numerous outreach activities; and a validated risk analysis model. More than 50 scientists and graduate students have been involved in PEIIAD activities since the program's inception. Additional successful outcomes are listed by focus area.



Selected Successful Outcomes

Global, emerging infectious animal diseases

- Extensive involvement in the current global effort to control the spread of Avian Influenza in poultry and other bird species. Activities involve authoring and conducting national and international training programs, participating in risk modeling, and advising government agencies regarding control strategies.
- Participation in the global and national science-based policy making process for BSE and other TSE diseases in animal populations.
- Participation in global animal health and welfare through engagement with the European Union Animal Health Programs.
- Participation in the validation of new, advanced diagnostic assays for animal diseases such as Vesicular Stomatitis (VSV) and FMD.
- Implementation of a FMD-free zone region between Thailand, Myanmar, and Malaysia in conjunction with the OIE regional office. This activity is a model of how to apply a risk assessment process to establish a disease free zone.
- Engagement with the European Commission and European Food Safety Authority in assessing the magnitude and the consequence of the emerging bluetongue serotype 8 in northern Europe.

Risk and decision analysis models

- Creation of a risk analysis model for describing the spread of highly contagious animal diseases. This model is currently being evaluated by Canadian and US animal health authorities for its application in FMD and AI situations. Validation of the model is underway using data collected from the most recent FMD outbreaks in Uruguay, Thailand, and other locations. A similar model approach currently is used for diseases such as avian influenza and pseudorabies.
- Use of two analytical risk models by USDA for assessing animal and animal products importation.

Endemic animal diseases that impact animal movement, marketing and food safety

- Development of a bovine tuberculosis (*Mycobacterium bovis*) assay that is currently used by USDA National Veterinary Services Laboratory.
- Determination of the infection status of dairy cows with Johnes' Disease using associations among postmortem histopathology, multiple tissue cultures, previous fecal culture results, and multiple sera ELISA tests.
- Initiation and completion of three epidemiological WNV assessments in western states. Control strategies, disease spread risk factors, and available vaccine efficacy was evaluated.
- Development of a stall-based diagnostic assay for equine strangles.
- Development of an assay to determine the toxin type of clostridial infection in livestock populations.

Biosecurity

- Development of a nationally and internationally recognized program for objective assessment of the efficacy and value of biosecurity practices.
- Development of a syndromic surveillance method for livestock auction market application with USDA.
- Initiation and continuation of an awareness program in foreign animal diseases for practicing veterinary professionals who are trained to be first responders in the event of a disease introduction.

- Development and implementation of a comprehensive biosecurity training program for controlling avian influenza outbreaks in villages and backyard situations in Indonesia, Turkey, Egypt, Nigeria, Vietnam, Cambodia, Albania, and Kyrgyzstan.

Antimicrobial drug use and antimicrobial resistance

- Development of large-scale assessments of antimicrobial drug use patterns for treatment of animal diseases. Implementation of large-scale investigations concerning association of antimicrobial drug use and antimicrobial resistance in livestock species (especially beef and dairy cattle).
- Collaboration with representatives from the Canadian government and beef industry on longitudinal surveillance for antimicrobial use and antimicrobial resistance in feedlot cattle.

Constituent Support

PEIIAD research foci are guided by an external advisory group comprised of US agriculture stakeholders as given in Appendix C.

Budget Request FY 2009-10

For fiscal year 2009-10, $950,000 is requested. This figure reflects a budget necessary to maintain on-going and implement new research directives.

Expected Outcomes

- Continue the training program in biosecurity in order to avoid the intentional or non-intentional introduction of exotic diseases such as AI to livestock premises.
- Continue the training programs at local, national, and international levels in disease investigations, surveillance systems, and control strategies for highly contiguous animal diseases.
- Contribute to the assessment of global surveillance for infectious animal diseases including AI, FMD, bovine TB, and BSE.
- Address the critical need for a sensitive and specific rapid screening test for *M. bovis* by continuing serological and molecular studies.
- Develop and test a comprehensive plan to enhance the US surveillance system for bovine tuberculosis as a re-emerging disease.
- Participate in the development and implementation of a control strategy to reduce the spread of bovine brucellosis from the Yellowstone Basin Area with USDA:APHIS and other federal agencies.
- Continue FMD research in wildlife species to generate parameters for a decision analysis model that addresses transmission among wildlife and domestic species.
- Finalize the North American Animal Disease Spread Model for use as a decision-making tool in determining the most effective control strategies if foreign animal disease is introduced into the US.
- Investigate the practical efficacy and value of biosecurity measures related to losses due to on-going animal health problems.
- Complete efforts documenting patterns of antimicrobial drug use in animals by veterinarians in the U.S.
- Continue research investigating associations among antimicrobial drug use, antimicrobial resistance, and effects on animal health and production.
- Provide an outreach program in foreign animal diseases for practicing veterinary professionals.

Appendix A

PEIIAD at a Glance

The Program of Economically Important Infectious Animal Diseases (PEIIAD) was conceived, designed and initially funded in 1998 as CEIIAD, the Center of Economically Important Infectious Animal Diseases. It became one of the core programs of the Animal Population Health Institute (APHI) when APHI was formed in February 2002. APHI's formation not only replaced CEIIAD but also a second existing, approved Colorado State University Center -- Center of Veterinary Epidemiology and Animal Disease Surveillance Systems (CVEADSS). This replacement served to consolidate both Centers' activities in order to provide a framework for the integration of additional research, service, and outreach programs. At the time of integration within APHI, CEIIAD was renamed the Program of Economically Important Infectious Animal Diseases (PEIIAD).

Goals

- Initiate, conduct, and promote basic and applied research activities on infectious animal diseases that have local, regional or national trade impacts.
- Use a multidisciplinary, integrated research approach when examining infectious animal diseases.
- Collaborate with experts from different disciplines, other institutions, governmental agencies, and local and regional laboratories solving complex problems, minimizing redundancy and promoting individual expertise. By integrating information gathered through these collaborations, the effectiveness of each research project is maximized.
- Prioritize research topics through the PEIIAD Advisory Group. In this way, issues of practical and timely importance, rather than issues of purely academic interest, are addressed.
- Disseminate results and information to stakeholders in a timely fashion. Research results are available directly to the stakeholders for immediate implementation through the PEIIAD Advisory Group. Information and links related to PEIIAD research are available on the APHI website (www.cvmbs.colostate.edu/aphi).
- Provide training and graduate programs, including international study programs, with a focus on important animal diseases. Industry, international, veterinary, and traditional students from many disciplines receive advanced, short-term or long-term training in a variety of areas.

Targeted Research Initiatives

PEIIAD plays an important role in Colorado State University's research activities by providing accessible funds for targeted research initiatives. Supported projects are required to have both short-term and long-term tangible products in terms of scientific or technical impact on agriculture animals. These products are in the form of publications, pilot research to bolster federal grant applications, or written communications such as pamphlets that are utilized by the agriculture animal industry. Investigators routinely include post-doctoral fellows and graduate students in their research initiatives. See Table 1 for a list of current targeted initiatives; involvement of fellows and graduate students is noted.

PEIIAD prioritizes new research initiatives within the scope of economically important infectious animal diseases according to the following criteria:

- The potential to develop early detection strategies, including development of diagnostic tests that may be performed on the farm and used on a population/herd basis.

- The impact of the presence and/or level of the disease on production at the herd and regional levels.
- The cost and biological efficiency of potential prevention strategies, including vaccination programs.
- The impact of potential spread to/from wildlife populations.
- The potential to make recommendations for trade policy changes according to scientific research findings.
- The ability to utilize analytical tools (including molecular and traditional laboratory techniques, risk assessment modeling, and geographical information systems) to determine the risk of the spread within animal populations.

Table 1. PEIIAD Targeted Research Program – 2008-09 Budget Allocations, Topics, Investigators

PEIIAD Specialized Research Topics	**2008-09 Budget Allocation**	**Principal Investigator(s) Additional Faculty, *Graduate students or Post-doctoral Fellows,* Affiliate Faculty/Collaborator**
Mortality in Adult Dairy Cows – Risk Factors	$2,500	F Garry, *C McConnel,* J Lombard
Equine Herpesvirus in VTH patients	$4,400	L Goehring, PS Morley, *J Sonis*
Molecular Mechanisms / Equine Influenza Transmission	$4,000	G Landolt
EHV1 Myeloencephalopathy Model	$4,300	P Lunn, C Powell, L Goehring, G Hussey
Antimicrobial Resistance – Sampling method for recovery of *Mannheimia haemolytica*	$6,500	PS Morley, *K Benedict*
Vaccine marker *Mycobacterium bovis* BCG in White-tailed Deer – Transmission potential	$5,000	MD Salman, *P Nol,* J RHYAN, M PALMER, R WATERS, T THACKER, J Triantis, L Linke
Equine Biosecurity During Sanctioned Events	$2,000	J Traub-Dargatz
Auction Markets Surveillance	$4,300	D Van Metre, PS Morley
Clostridia toxin	$5,500	D Van Metre, MD Salman, J Triantis, R Magnuson, L Linke
Genetic Natural Resistance in Yellowstone Bison	$9,754	MD Salman, *J Figueroa*
Impact of wild-domestic animal interface	$20,000	J Rhyan, *P Nol*
Strangles Project	$20,000	J Traub-Dargatz, MD Salman, AE Hill, R Magnuson, J Triantis
TB & Brucellosis in Animal Populations	$23,500	MD Salman, J Rhyan, *P Nol,* J Triantis, L Linke
siRNA Interference for Avian Influenza	$31,000	MD Salman, L Linke, J Triantis

Educational Impact

One of the goals of PEIIAD is to "provide training and graduate programs, including international study programs with a focus on important animal diseases". This goal is achieved using two different mechanisms – directly through the use of PEIIAD funds for outreach and for research activities and second, indirectly through separate, additional APHI funds. PEIIAD funds the research that graduate students perform as part of their training, while other, separate APHI funds provide graduate student stipends using other avenues and generated indirect costs. This model has been successful since the start of PEIIAD and can be demonstrated by listing the names of former graduate students who are impacting infectious disease research in their current positions.

Table 2. Selected Former Graduate Students and Current Positions

Name	Current Position
Michelle M. Dennis, DVM, DACVP, PhD, 2007	Senior lecturer and farm animal pathologist for the Farm Animal Health, Faculty of Veterinary Science, University of Sydney
Cristobal Zepeda, DVM, MS, PhD Candidate	Coordinator of International Activities Centers for Epidemiology and Animal Health, OIE Collaborating Center for Animal Disease Surveillance Systems and Risk Analysis, USDA-APHIS-VS-CEAH
Kachen Wongsathapornchai, DVM, PhD, 2006	Veterinary Epidemiologist for the Thailand Livestock Department
Stefano Tempia DVM, PhD, 2006	Field International Epidemiologist in Somalia for the European Union Contractor
Kristy Pabilonia DVM; currently an MS student	Coordinator, Colorado Avian Disease Surveillance Program
Brian McCluskey DVM, MS; Ph.D.; 2003	Leader, National Surveillance Unit, USDA:APHIS:VS:CEAH
Bruce Wagner, BS, MS, Ph.D.; 2003	Senior scientist in the National Center of Animal Health Information
Zara Llewellyn Ph.D.; 2002	Molecular epidemiologist in the Department of Defense bioweapon research laboratory
Feliciano Milian Suazo DVM, MS, Ph.D; 1998	Research leader in the Mexican Agriculture Research Agency
Jenny Hutchison DVM, MS, Ph.D.; 1997	Research Associate in AusVet, a private international consultant company
Wiku Adisasmito, DVM, MS, Ph.D.; 1994	Vice President for research in an Indonesian University
Tom Wittum, MS, Ph.D.; 1992.	Professor, The Ohio State University
Jorge Hernandez De Ande, DVM, MPVM, Ph.D.; 1990	Associate Professor, Florida State University

Appendix B

Collaborating US and International Institutions

US Institutions

- USDA: APHIS: VS Centers for Epidemiology and Animal Health (CEAH) – a Collaborating Center in Animal Disease Surveillance and Risk Analysis for the World Animal Health Organization (OIE), located in Fort Collins, CO.
- USDA: APHIS: VS Western Regional Office, located in Fort Collins, CO.
- USDA: ARS Arthropod-borne animal diseases research laboratory, located in Laramie, WY.
- USDA: APHIS Wildlife Research Center, located in Fort Collins, CO.
- USDA: FSIS, located in Denver, CO
- USGS, located in Fort Collins, CO.
- CDC Arthropod-borne infectious disease laboratory, located in Fort Collins, CO.
- Colorado Department of Agriculture, located in Denver, CO.
- University of California, Davis, CA

International Institutions

- Institut fur Viruskrankheiten und Immunprophylaxe, Switzerland
- Universidad Autonoma de Chihuahua, Mexico
- University of Sarajevo, Bosnia-Herzegovina
- Universidad de la Republica, Uruguay
- Omsk State Agrarian University, Russia
- Universidad de Chile, Santiago, Chile
- National Institute of Industrial Technology, Argentina
- Tokyo University, Japan.
- Terra Nuova, East Africa Regional Office, Kenya
- Konkuk University, South Korea
- Kazakh Scientific Research Veterinary Institute, Kazakhistan

International Collaborations Description

PEIIAD personnel assist developing countries in formulating and implementing regional and national animal health monitoring and disease control programs. They continue to participate in national and international coalitions for the promotion of animal health and development of control plans for specific diseases of global economic importance. These activities serve to promote a positive collaborative spirit between researchers in the United States and in international arenas, to maintain a position as experts in these topics, to continually update and advance knowledge of international animal disease issues and solutions, and to offer a venue for the promotion of North American interests in import/export regulations and international markets.

Current national and international affiliations not only include memoranda of understanding with universities and research institutions but also recognition by UN-FAO as a reference center in veterinary epidemiology and surveillance methods.

Appendix C

PEIIAD External Advisory Group

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