

Appendix E

The Academic Community Bringing One Health to Action

Academic Summary Prepared by the Academic Team¹ of the AVMA One Health Initiative Task Force and Partners²

Introduction

Putting One Health into action requires that professionals from across different disciplines have an understanding and appreciation of the links among human, animal, and ecosystem health, and the importance of and commitment to working together to address health challenges. Additionally, having resources available and mechanisms in place to promote and facilitate multidisciplinary collaborations are essential to make One Health collaborations a reality. Thus, collaborations among professions in academic settings in the areas of education/teaching, research and community service both locally, nationally, and globally provide the foundation for achieving One Health goals and objectives.

At the national level, multiple professional societies of the health professions have endorsed One Health and are committed to building strengthened collaborations and partnerships among their constituent members. The Association of American Veterinary Medical Colleges, Association of American Medical Colleges, the Association of Schools of Public Health, the Federated Association of Societies of Health Professions, the Association of Academic Health Centers, and the National Association of State and Land Grant Universities and Colleges have all recognized the importance of and have endorsed the One Health Initiative (Public Health Reports, Daryl Kirsch, personal communication). These associations, which represent hundreds of Universities, Colleges and Schools of the health professions, and colleges of agriculture and natural resources, are promoting One Health approaches to achieving improved human, animal, and ecosystem health. Many of their member institutions are actively promoting and pursuing collaborations that embody a One Health integrated approach in education and teaching, basic and applied research, and community service to achieve improved health for all.

In this appendix we have highlighted several illustrative examples that demonstrate the leadership that Academia is providing in successfully implementing One Health approaches in teaching, research, and community service. While these illustrate examples of university initiatives, they do not necessarily reflect current AVMA policy. There are many more initiatives and projects among the universities and colleges of the allied health professions that for space reasons are not possible to include, but we hope that the material presented will underscore how a One Health approach is being successfully employed in the academic setting, which is essential in providing future generations of health professionals who will collaborate and bring a One Health approach in all that they do to meet the health needs of society and our environment.

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Examples of One Health Research Funding Opportunities

During the past several years, there have been a growing number of research funding opportunities that have promoted and rewarded a multi-disciplinary, One Health approaches in research that is addressing important information gaps in key areas. Examples of major research initiatives that embody a One Health approach include the following:

- 1) NIH funded Clinical Translational Research Centers (http://www.ncrr.nih.gov/clinical_research_resources/clinical_and_translational_science_awards/), and NIAID Centers of Excellence for Influenza Research and Surveillance (<http://www3.niaid.nih.gov/research/resources/ceirs/>)
- 2) CDC funded Cooperative Research Centers—Avian Influenza at the Human Animal Interface (<http://grants.nih.gov/grants/guide/rfa-files/RFA-CI-06-009.html>)
- 3) National Science Foundation (in collaboration with the NIH Fogarty International Center) funded research projects through the Ecology of Infectious Diseases Initiative (http://www.fic.nih.gov/programs/research_grants/ecology/index.htm).
- 4) Department of Homeland Security funded Centers of Excellence that bring multiple disciplines working together to achieve shared goals and objectives including the National Center for Animal and Zoonotic Disease Defense (<http://fazd.tamu.edu/>) at Texas A & M University, working in collaboration with UC Davis, and the National Center for Food Protection and Defense (<http://www.ncfpd.umn.edu/>) at the University of Minnesota, in collaboration with Michigan State University and several other partners.
- 5) The Bill and Melinda Gates Foundation recently gifted Washington State University with a multimillion dollar grant to establish a School for Global Animal Health, which will focus on the dependence of human health, food security, and economic security on animals, with particular attention to livestock (JAVMA News, Vol 232 (9): 1272-1274).

Examples of One Health Initiatives in Academic Settings

1) Colorado State University Addressing Global Health Challenges Through Superclusters

In 2004, Colorado State University began exploring how to marshal its resources to address the global problems and to transfer innovative biomedical and technical research to help address critical global challenges. The University has established “Superclusters” – an alliance of experts in research, engineering, business and economics– that are focused on improving quality of life, by promoting the application of research outcomes to improve the health of communities and for global society’s benefit. At Colorado State University, three superclusters have been formed to address specific global needs in the areas of infectious disease, cancer, and clean energy.

- **Infectious Disease (<http://www.cvmb.colostate.edu/mip/idsc/#>)**

This supercluster was formed to speed the transition of life-saving research on infectious diseases from the academic world into the global marketplace. Alliances of academic researchers, economists and business experts have come together to facilitate and promote collaboration and bridge the vastly different worlds of business and academia. Multiple colleges of the University are participating, with the College of Veterinary Medicine the lead college.

- **Cancer Research (<http://superclusters.colostate.edu/pages/neotrex.aspx>)**

The Cancer Supercluster is a collaboration between the Colleges of Veterinary Medicine and Biomedical Sciences, Natural Sciences, Applied Human Sciences, Agricultural Sciences and Engineering, and is focused on developing effective treatments and products in the fight against cancer and making the advances available through marketing to people who need them. Funding is provided by NASA, the NIH, the National Cancer Institute, the Morris Animal Foundation and U.S. Department of Energy. An example of successful research by participating human and animal cancer researchers includes the development of a limb-sparing surgical technique to treat osteosarcoma in dogs that has been adopted for treating human cancer. A \$9.7 million NASA-funded Specialized Center of Research is focusing on advancing cancer research and treatment for pets and people by developing innovative approaches to estimate cancer risks from space radiation by identifying genetic changes that are responsible for radiation-induced leukemia. The Cancer Supercluster is built upon a nationally dominant foundation of cancer research at Colorado State and the university's Animal Cancer Center, which is devoted to caring for animals with cancer and researching cures and preventive medical interventions for the disease. The Animal Cancer Center has an international reputation for its collaborations with human cancer institutions such as the Mayo Clinic, the National Cancer Institute and the M.D. Anderson Cancer Center.

- **Clean Energy (<http://superclusters.colostate.edu/pages/clean-energy.aspx>):**

More than 100 faculty members in all eight colleges at Colorado State— from Liberal Arts to Engineering – are participating in developing alternative energy solutions and policies in the areas of biofuels, solar energy, wind power and clean-burning engines, helping Colorado's efforts to lead the nation in creating clean and renewable energy technology and training the "green-collar" workforce. The goals are to collaborate with partners to reduce emissions of greenhouse gases by 20 percent by 2020, and even deeper emissions cuts by 2050.

2) UC Davis -- Avian Flu School, Emergency Preparedness and Response, and Center for One Health

- **Avian Flu School** (http://www.vetmed.ucdavis.edu/whc/flu_school/guidetomodules.html)

Funding: Global Livestock CRSP and the National Center for Foreign Animal and



Zoonotic Disease Defense (Department of Homeland Security)

This program was developed as a collaborative effort with veterinarian and human medical specialists in response to avian influenza outbreaks. The education, research, prevention, and response to avian influenza on the wildlife, poultry, and human side were so closely related that a universal approach was needed. Avian Flu School (AFS), an international train-the-trainer program, covers the key topics and skills important for preventing, detecting and responding to H5N1 HPAI outbreaks. The full AFS course is a four-day course curriculum for training instructors regarding the critical information for H5N1 HPAI emergency management and communications, surveillance in domestic and wild birds, public health and worker safety, outbreak prevention and response, and practical skills (using PPE, packaging diagnostic samples, and swabbing, bleeding, vaccinating, and cleaning a chicken). The AFS course is designed to be adaptable to different countries and environmental conditions. UC Davis and collaborators have given presentations in over 15 countries and faculty includes both MD and DVM trained specialists working together.

- Avian Influenza Research Study group

Funding: Mixed from NIH, CDC, USDA, others

An Avian Influenza group at UC Davis is focused on a One Health Approach to research and public health investigations. The group includes a poultry veterinarian, public health physician, immunologist, respiratory pathogen research scientist, and a molecular detection engineer, and is focusing on novel detection methods along with basic public health epidemiology. Areas of study include live bird markets, poultry farms, and wild life-human interfaces.

- Emergency Preparedness – ESCAPE Project (Enhancing Surge Capacity and Partnership Effort)

Funding: Assistant Secretary for Preparedness and Response (ASPR) in the Department of Health and Human Services

This project is a \$5 Million partnership aimed at developing relationships and plans with regard to public health and disaster preparedness to enhance surge capacity for effective human health response. After the experience of mixed human and animal (companion and livestock) disaster responses following Hurricane Katrina and California wildfires, UC Davis and partners have developed a human –veterinary disaster response partnership, which includes integrated human and animal response, care for humans in prepared veterinary facilities, veterinary specialists providing response to human issues, and an integrated curriculum geared toward both human and animal health specialists. This is a One Health disaster response partnership, integrating teaching, response, and treatment. Two additional partnerships have been developed with animal Medical Reserve Corps (websites <http://medicalreservecorps.gov/detail.asp?State=22&id=362> and <http://www.medicalreservecorps.gov/detail.asp?id=1393&State=6>)

- **Calvin Schwabe Center for One Medicine**

Funding: University of California, Davis and School of Veterinary Medicine

The overall goal of the newly formed Center for One Medicine is to increase diversity at all levels in the future veterinary student body to reflect our nations diverse profile, endorse a broader encompassing veterinary education, prepare and support DVM students in endeavors to secure professional careers in One Medicine in conjunction with the MPH and MD curriculums. The short term goals include 1) Address diversity issues in veterinary medicine, 2) Describe outcome goals for increased diversity in DVM student body using current research in nations diversity literature 3) Curriculum support for expanded education in public health, environmental health, public policy, food safety, biosecurity, epidemiology, ecosystem health, etc, 4) Advocate and actively endorse Rural Heath practice 5) Support student involvement in activities/research associated with production, foreign animal disease, public health, zoonotic disease emergence, etc, 5) Initiate links, 'partnerships' with multidisciplinary professionals/agencies/programs in an effort to establish a 'team' approach to teaching, research, and critical thinking. Collaborators include UCDMC, UCD Betty Moore Nursing School, UCD Law and Business, CDC/DHS/USGS/Plum Island/FAZD, State and local Public Health Departments, Wildlife Health Center, UCD programs: Wildlife, Fish, and Conservation Biology, John Muir Institute for the Environment. Longer term goals include integration of the medical and veterinary pre-sciences curriculum, coordination of the MPVM and MPH curriculum (already done), and the development of a larger One Medicine School at UC Davis.

- 3) **University of Calgary, College of Veterinary Medicine-- Capstone Course on One Health for students in the health sciences and Summer Field Institute in Tanzania (for information, contact: bonnie.buntain@ucalgary.ca)**

The One Health Capstone course provides an opportunity for health science (social, veterinary, and medical) students to assess and analyze the contribution of their specific concentration to global health research. The course is intended to give students an appreciation of the complexity of health research in a developing country context while raising their awareness of the need for multidisciplinary teams to solve complex health problems. The students are introduced via an interactive seminar course to ecosystem, global and one health conceptual frameworks. The course provides a learning environment where students can share and integrate their learning from previous Inquiry Courses and discipline specific studies. The course draws on both Canadian and African examples of research challenges in food safety public health (Brucellosis and TB) by examining the wildlife/animal/human interface. Learning objectives for students include their being able, by the end of the course, to 1) demonstrate knowledge of and be able to make distinctions between the concepts of Global Health, International Health, Globalization and One Health; 2) understand and demonstrate in discussions and in writing the contributions of diverse disciplines within a One Health framework e.g. veterinary medical scientists, social scientists, biologists, ecologists, environmental scientists, biomedical professionals, etc. 3) identify the roles of stakeholders such as government (local, national), NGOs, donors, academia, international organizations (WHO, UN, etc), and the community in research, program and policy development; 4) use the One Health conceptual framework to generate researchable questions; and 5) understand the value of research partnerships.

The Summer Field Institute in Tanzania brings together a One Health team of students



from the disciplines of the social, veterinary and human health sciences to work on priority health concerns of a local community. The richness of this experience is that all of the disciplines learn to collaborate on cross-cutting health issues at the interface of people, animals and the cultural and physical environment. Veterinary students learn how to utilize social sciences in honoring community knowledge and how to improve knowledge mobilization and translation regarding HIV-AIDS, malaria, TB and brucellosis.

4) University of Minnesota – NIAID Center of Excellence for Influenza Surveillance and Research and Summer Public Health Institute

- NIAID funded Center of Excellence for Influenza Research and Surveillance

The Minnesota Center of Excellence for Influenza Research and Surveillance (MCEIRS) is working to rapidly identify and characterize influenza viruses that have pandemic potential by monitoring domestic and international wild bird, poultry, and swine populations. The center is prepared to respond to research and public health needs in a time of increasing concern over the possibility of pandemic flu. The MCEIRS performs animal flu surveillance in multiple countries and states in the US. Domestic research will include: monitoring wild birds in U.S. wetlands; identifying low pathologic influenza strains in Minnesota poultry; characterizing swine viruses in animal populations from Minnesota to North Carolina; and conducting virologic surveillance in live bird markets in the Midwest and Northeast. Internationally, the center will conduct avian influenza surveillance of people, poultry, pigs, dogs, cats, and wild birds in rural Thailand; wild waterfowl in Vietnam; wild bird populations in Laos; and commercial poultry operations in other Asian countries. The majority of diagnostic testing and virus characterization will occur at the University of Minnesota College of Veterinary Medicine's Veterinary Diagnostic Laboratory and Genomic Center. Faculty will obtain and characterize multiple types of influenza viruses, adding to the world database that supports research on how humans become infected with influenza, what factors influence the severity of illness, and the development of vaccines and antiviral medications. The Center is built around the strength of the University of Minnesota's interdisciplinary corridor of research in infectious disease. The University will help pave the way in influenza research and contribute valuable and influential information to the federal government regarding pandemic preparedness. Partners include the University of Minnesota colleges and schools in veterinary medicine, public health, and supercomputing. External partners include: Chulalongkorn University in Thailand (medical and veterinary faculty); Southeastern Cooperative Wildlife Disease Study at the University of Georgia; the Wildlife Conservation Society; the U.S. Geological Survey National Wildlife Health Center; Cargill, Inc.; the Minnesota State Board of Animal Health; the Minnesota Department of Agriculture; and the Minnesota Department of Health.

- **Summer Public Health Institute (<http://cpheo.sph.umn.edu/institute/>)**

The Summer Public Health Institute at the University of Minnesota provides professionals with a unique opportunity to immerse themselves in a chosen field of study for a single day or three weeks. The Institute offers a variety of courses for everyone practicing in or studying public health or fields related to public health. Participants can build or expand their professional expertise, learn best practices, broaden career options, network with other professionals or explore a new area of interest. Course content emphasizes theory to practice with opportunities for field trips, case studies, hands-on labs and simulations. Institute participants have included representatives from public health and other health and human service organizations; city, county, state and federal government agencies; and

private-sector businesses. Previous enrollment has included: Public and environmental health professionals, including nurses, veterinarians, physicians, dietitians, toxicologists, epidemiologists, engineers, sanitarians, inspectors, scientists and hazardous materials specialists; Food production and processing professionals, including microbiologists, food safety specialists, quality assurance personnel and agribusiness professionals; Graduate students enrolled in public health, veterinary medicine, nursing, agricultural, food and environmental sciences, and other postgraduate academic programs. Four of the many courses offered through the Institute and which demonstrate a One Health approach are described below:

Approaches to Infectious Disease Control in Animals and Human Populations

The challenges of infectious diseases in public health and animal health arenas are determined by the interaction of host, agent, environmental and demographic factors. Control of infectious diseases in populations can be pursued with a range of strategies that individually and collectively contribute to reducing the risk of transmission of infectious agents and/or the impact of infectious diseases on affected hosts. Although the fundamental tools for disease control are essentially generic, their practical application is highly variable according to the ecological and epidemiological scenarios involved. The course reviews the basic principles of infectious disease control in populations and examines the evolution of practices employed to reduce intraspecies and interspecies disease transmission in wild animal populations, major domestic food animal populations (swine, poultry and ruminant) and humans. The course is designed to provide broad conceptual knowledge of disease control strategies and a holistic appreciation of the challenges to health maintenance of populations under different and changing demographic circumstances.

Globalization and Health

Global health concerns cross the borders of developed and developing nations. This class focuses on the effect of globalization on social and scientific consequences in public health. Topics include the interplay between global stressors such as population, war, economics, urbanization and environment and their effects on the health of women and children, the spread of infectious and chronic diseases, nutrition and environmental health.

Principles of Public and Animal Health Surveillance Systems

This course focuses on principles, methods and evaluation of surveillance systems for infectious diseases in human and animal populations. In recent years, increased scrutiny has been placed on the scientific adequacy and validity of various public and animal health surveillance systems. The course helps participants understand the purpose of health surveillance, methods employed for surveillance and strategies for evaluating the validity of surveillance systems. Existing surveillance systems are emphasized, with discussion of real and potential connections between animal and human health.

Global Food Safety System Leadership

Since the dawn of civilization, food and beverages have been traded extensively. Currently, food ingredients are sourced, processed, packaged, transported and marketed



through food service and retail outlets in every country on the globe. Animal and plant production and processing practices change to remain economically viable in the face of dynamic harvesting, transportation, processing and consumer demands. A myriad of food safety processes, quality assurance schemes and regulatory mandates exist. Nevertheless, safe food and water remain one of the most pressing global public health challenges. Every country in the world faces new and changing food safety threats. While science provides invaluable results necessary for evidence-based public health, good science alone is not enough. Decisions affecting public health are made daily in the face of significant gaps in our scientific knowledge. This course explores the critical competencies for leadership in industry, government and academia necessary for ensuring an abundant, affordable and safe global food supply.

5) Envirovet Summer Institute: *Leadership for One Health on Earth, Changing lives and Creating leaders around the world*

Since 1991, Envirovet has provided unique-in-the-world, ground-breaking training in ecosystem health practice to more than 400 veterinarians from 44 nations. Each class of the annual Summer Institute (<http://www.cvm.uiuc.edu/envirovet/>) consists of 25 carefully-selected veterinarians and veterinary students from developed and developing countries who have demonstrated their commitment to wildlife, public, and ecosystem health through prior studies and activities. The eight-week Summer Institute runs 8-14 hours a day and 6-7 days a week. Throughout the course, the students draw upon the knowledge, wisdom, and technical expertise of up to 80 world-class “instructor-mentors” for whom Envirovet is a teaching highlight. Envirovet students engage one-one-one with these role models during lectures, discussions, labs, and field exercises, and over meals or during unscheduled times. Such interactions help the students develop and catalyze plans for careers in wildlife health and conservation, public health, and ecosystem restoration and recovery.

The Envirovet Summer Institute begins in mid-June at White Oak Conservation Center in northeastern Florida (<http://www.wocenter.org/>) with two weeks of immersion-style learning about the big drivers that undermine health and biodiversity. Also included are proven intervention methods to yield positive short- and long-term gains. This unit includes: the value of biodiversity, ecosystem economics, and environmental law and policy; epidemiology; and the basis for disease emergence and resurgence, including efficient diagnostic tools. It addresses methods for restoration of populations of threatened or endangered species in the wild, including wildlife capture and translocation—and provision of ample habitat. It also focuses on counteracting overharvest, poaching, invasive exotic species, and predator-prey imbalances. Throughout this unit, ways to reduce risks to public, domestic animal, and wildlife health from shared infectious diseases are strongly emphasized. The Summer Institute continues with two-weeks of intensive instruction in aquatic animal health, ecotoxicology, and ecosystem rehabilitation at Harbor Branch Oceanographic Institution (http://www.hboi.edu/index_05.html). This unit begins with instruction on the dynamics of aquatic ecosystems and how they are assessed. It focuses on the sources, fate, detection and control of contaminants, explains the causes of—and solutions for—declines in major ocean fish communities, as well as fisheries impacts on the food supply of marine mammals. It provides contact with environmentally-beneficial aquaculture, teaches the causes of marine mammal strandings, and first-hand experience in forensic studies. The aquatic unit stresses opportunities for better stewardship of aquatic ecosystems and animal populations to enable recovery of aquatic biodiversity, cleaner water supplies, and more and safer fish and shellfish for human consumption. The third unit of each Summer Institute takes place in a developing country (e.g. Kenya, Brazil, South Africa) and emphasizes ways to accommodate the economic and food security needs of people in the poorest regions of the world through better stewardship of lands, water, wildlife,

and domestic animal populations. The unit addresses prevention of diseases shared between wildlife and humans, as well as between wildlife and either livestock or poultry. It demonstrates proven methods to re-establish self-sustaining wildlife populations in ways that improve the lives of nearby human groups. Leading biomedical scientists, conservation biologists, and environmental managers work side-by-side with the Envirovet group in hands-on work. Tribal leaders share first-hand knowledge about wildlife/livestock conflicts. Throughout this unit, the need to look holistically at the challenges—and solutions—lying at the human/wildlife/domestic animal/environment interface are emphasized.

Former Envirovet participants have gone on to fill important leadership roles in ecosystem stewardship within universities, non-governmental organizations, corporations, private consultancies and governments in the United States and around the world. Moreover, Envirovet students stay connected with each other, forming a global network of like-minded, inspired, highly-motivated and trained professionals providing leadership for one health on Earth. The Envirovet Summer Institute has received financial support from the Geraldine R. Dodge Foundation, Eli Lilly and Company, the Russell E. Train Educational Fund for Nature of the World Wildlife Fund, the Wildlife Conservation Society, the US Agency for International Development, and the Nathan Cummings Foundation.

6) Iowa State University-- Center for Food Security and Public Health

The Centers for Disease Control and Prevention (CDC) provided a three year grant (July 2002 – June 2005) for almost \$3 million to establish the Center for Food Security and Public Health (CFSPH) at the Iowa State University College of Veterinary Medicine. The CFSPH is a CDC Center for Public Health Preparedness and is the only Center to focus on veterinary medicine and zoonotic diseases. The mission of the Center is to:

Increase Awareness

The CFSPH has worked to increase awareness of bioterrorism, agroterrorism and foreign animal diseases among veterinarians, farmers, medical personnel and the general public. CFSPH staff developed a comprehensive set of fact sheets, PowerPoint presentations, and handouts on important diseases which can be found here: www.cfsph.iastate.edu/DiseaseInfo. This information was distributed nationwide through a Train-the-Trainer program partnering with state veterinary medical associations, the Cooperative Extension Service, universities, and federal agencies to recruit trainers. As of March 1, 2006, our trainers have given over 870 presentations in 47 states to 35,600 individuals.

Provide Tools

Since February 2004 the CFSPH has been developing biological risk management tools. Individuals can use these tools to better protect animals (and humans in the case of zoonotic diseases) from infectious diseases. These materials focus on the route of disease transmission and provide practical disease management strategies. The CFSPH is working to encourage veterinarians to use these materials. These tools can be found at www.cfsph.iastate.edu/BRM. The USDA Risk Management Agency funded the development of Biological Risk Management materials for beef and dairy producers. These tools were delivered to extension specialists from 47 states in July 2006.

Prepare for Animal Emergencies

The CFSPH is working with a number of state veterinary teams on training for animal emergency response. The CFSPH helps to organize the training meetings and develop



resource materials for the teams.

Zoonoses Handbook Now Available - February 2008

With support from Bayer Animal Health, the CFSPH has published the Handbook for Zoonotic Diseases of Companion Animals. The Handbook is for veterinary and human medical professionals and addresses the etiology, prevention and liability issues for zoonoses of companion animals. It also contains materials to educate staff and clients. (Zoonoses Handbook; <http://www.cfsph.iastate.edu/About/purpose.htm>)

7) University of Tennessee – Food Safety and Preparedness, Public Health, Human-Animal Bond (<http://www.vet.utk.edu/cafsp/>)

Center for Agriculture and Food Safety and Preparedness - Homeland Security funded course developed by UT College of Veterinary Medicine (UTCVM) and several partners to educate the food industry (from farm, wholesale, transportation, to retail, including law enforcement and public health officials). Objective is to teach how to access vulnerabilities in order to “harden these targets.”

Public health epidemiology certificate course directed at officials in local and state public health departments. Training developed and implemented through partnership between the UTCVM, UT Dept of Public Health, and the State and County Health Departments

Human Animal Bond in Tennessee (HABIT) <http://www.vet.utk.edu/habit/>

H.A.B.I.T. is comprised of representatives from the University of Tennessee College of Veterinary Medicine, volunteers from the community, and private veterinary practitioners. H.A.B.I.T. sponsors programs which foster pet visitation to nursing homes, assisted-living residences, retirement centers, mental health centers, residences for children with special needs, rehabilitation facilities, hospital settings, and other facilities. H.A.B.I.T. offers resources such as trained volunteers, medically and behaviorally screened animals, and guidance regarding pet visitation, program development, and evaluation.

Humans and Animals Learning Together (HALT) <http://www.vet.utk.edu/halt/>

HALT provides a therapeutic intervention for at-risk adolescents through dog obedience training. HALT addresses the following objectives: 1) to offer adolescents an opportunity to develop a positive sense of accomplishment, self worth and pride; 2) to offer adolescents an opportunity to improve specific living skills such as assertiveness, patience, staying on task, communication and commitment; 3) to introduce adolescents to career opportunities in animal related fields; 4) to provide a successful experience for the adolescents and dogs; and 5) to increase the adoptability of selected adult dogs through basic obedience training. Through a series of classes, a canine obedience instructor helps student trainers teach basic obedience commands to dogs from an animal shelter. Suitable dogs are selected from a local animal shelter and medically and behaviorally screened. They are given a standard series of inoculations, neutered or spayed, and boarded at the class site. Student trainers are adolescents from residential centers for treatment of substance abuse, behavioral or alienation problems. They are selected by the staff of their agency and are transported to the class site for the classes. The student trainer commits to one four-week course, meeting two times per week. Up to three agencies may furnish student trainers to work with one group of dogs. They train on different days. The dogs get up to 6 hours of quality attention each week. Each dog is placed in a suitable home after graduation.

Veterinary Social Work - <http://www.vet.utk.edu/socialwork/>

A new sub-discipline in Social Work was developed through and partnership between the UTCVM and the UT College of Social Work. The primary mission is to provide support and education for students, faculty, staff, and clients of the University of Tennessee College of Veterinary Medicine. This education and support is intended to 1) educate students, clients, faculty, staff, as well as the professional and general public about the human animal bond and veterinary social work; 2) provide clinical consultation, support, and referral to students, clients, staff, and faculty of the veterinary teaching hospital; 3) conduct evidence-based veterinary social work practice. This includes both using empirically supported interventions as well as conducting on-going program and clinical practice evaluation; 4) provide service to the community. This service includes work with and integration of both human and animal related professionals.

8) Kansas State University (K-State) – Interdisciplinary Master of Public Health, Veterinary Fellowship, Veterinary Training Program for Rural Kansas, K-State Public Health Group, Kansas Animal Health Corridor

K-State Interdisciplinary Master of Public Health (MPH): The interdisciplinary MPH at K-State is described in detail at <http://www.k-state.edu/mphealth/index.htm>. The MPH degree is an interdepartmental program with faculty participants from many academic departments of the university, and the Director in the CVM. The 42 semester hour program is designed to provide graduate-level education for individuals currently employed or anticipating a career in the field of public health. In addition to the core requirements, students select an area of emphasis in food safety and biosecurity, infectious disease+zoonoses, human nutrition or physical activity. The focus in infectious diseases and zoonoses has specific programs of study that target non-DVM students, post-DVM students and concurrent degree (DVM-MPH) students.

K-State Pathways to Public Health: The future of the interdisciplinary MPH program at K-State depends on the ability to recruit and retain students in the baccalaureate and professional degree programs that feed the four emphasis areas. The coordinating committee that oversees the graduate program has recognized the importance of increasing undergraduate student awareness of public health careers and accepts this responsibility. To this end, we have developed an integrated recruitment and retention strategy that targets community college students who are interested in learning more about public health professions, as well as undergraduate students enrolled in bachelor’s degree programs relevant to public health (for example: biology, food science, human nutrition and kinesiology). The proposed program, “Pathways to Public Health,” consists of four components: 1) an introductory survey course focused on public health topics that will be made available at KS community colleges through distance education; 2) an 8-week summer immersion experience that will expose students to the four public health emphasis areas: food safety, infectious diseases and zoonoses, human nutrition, physical activity; 3) a 5-year concurrent BS/MPH option; 4) a Director of Undergraduate Public Health Programs dedicated to mentoring students. Together, these components should stimulate and increase the number and preparation of students seeking a baccalaureate or higher degree in the disciplines relevant to public health practice. At the present time, funding is being sought from a number of sources to support implementation of “Pathways to Public Health” at K-State. The Kansas Health Foundation has reacted positively towards the proposed program, and a strong partnership is anticipated.

K-State MRCE Veterinary Fellowship: K-State is one of three veterinary schools participating in the Veterinary Fellowship program associated with the Midwest Regional



Center of Excellence in Biodefense and Emerging Infectious Diseases (http://mrce.wustl.edu/index.php?id=dynamic_page&itemid=40). The first fellow focused her MPH in the area of Food Safety and focuses on the use of molecular technologies to compare genetic markers for Shiga-toxin 2 virulence between cattle and human clinical Shiga-toxigenic *Escherichia coli* O157:H7 and non-O157 serotypes. The One Health theme is emphasized heavily in the application for renewal of the K-State Veterinary Fellowship associated with the Midwest Center. Specifically, the proposed fellowship program will provide post-graduate veterinarians with 1) the opportunity to receive biomedical research training focused on emerging infectious diseases and zoonoses. Research programs focused on RNA viruses and food-borne pathogens will be emphasized, because of institutional strength in these areas and because these agents are associated with emerging diseases with significant impact on human health. The research training experience will include participation in a professional development course focused on the principles of biosafety and biocontainment; 2) the opportunity to integrate research training focused on infectious disease with development of competency in core public health core disciplines. Fellows will accomplish this through the pursuit of either a PhD in Pathobiology plus a graduate certificate in core public health concepts, or a Master of Public Health (MPH) degree with a research-based thesis. “Infectious Disease and Zoonoses” is one of four defined areas of emphasis associated with the interdisciplinary MPH at K-State; 3) the opportunity to experience work environments focused on human health care. Veterinary Fellows will spend three weeks shadowing physicians who specialize in emergency medicine, pediatrics and infectious disease in office, clinic and hospital settings. To this end, the fellowship program will partner with a 400 bed acute care community and referral medical center, its outpatient units and medical staff. These components form a well integrated health care system that is based in the state capital, and located near the county health department and the Kansas Department of Health and Environment.

The Veterinary Training Program for Rural Kansas: This debt forgiveness opportunity is made available to five students in each class who are committed to food animal medicine and public health. This program is intended to boost the number of students entering rural veterinary practice. Students are selected for the program during the first year of veterinary college through a competitive selection process. Each student receives \$20,000/year for up to four years. For each \$20,000 a student receives, he/she is expected to spend a year working in the rural community. These students are required to emphasize public health and livestock biosecurity in their professional training. Because it is recognized that veterinarians in rural areas serve as key resources on human health issues, they receive advanced training in rural sociology, public health, and management of emerging infectious diseases. Externship opportunities are provided by the KDHE, the National Veterinary Services Laboratory at Plum Island, and the CDC. In the view of KSU’s Dean, Ralph Richardson: “These students will be our ‘boots on the ground’ in protecting the community from potential public health concerns.”

The K-State College of Veterinary Medicine Public Health Group: This organization was formed in 2007 by veterinary students interested in public health. Students drafted a club constitution and by-laws, and petitioned successfully for recognition and support from the K-State Student Chapter of the American Veterinary Medical Association. The organizational objectives of the newly formed group are: to promote education, awareness, and activities regarding public health; to promote public health careers and networking opportunities for K-State students; and to stimulate veterinary student interest in the field of public health. Active participation is encouraged not only from students in the DVM curriculum, but also from students in the interdisciplinary MPH program and other K-State communities interested in public health. This club plans to seek affiliation with a national public health organization, such as the American Association of Public Health and National Association of State Public Health Veterinarians. This group has also been active in seeking collaboration with the public

health student group at the University of Kansas Medical Center (KUMC). To date, two student-driven events have occurred under the banner of “One Health. First, Nicholas King from McGill University spoke to students from both institutions at the KU campus in the history of medicine library on “What’s Wrong with Health Inequalities?”. Then, Roger Mahr spoke to students from both campuses about “One World, One Health, One Medicine”; this event was held at K-State.

K-State and Animal Health Corridor. Kansas City has acknowledged that our region has a strong cluster of companies engaged in animal health and nutrition research, innovation, business functions and production, by branding the region as the Animal Health Corridor (<http://www.kcanimalhealth.com/>). In this context, the K-State and U Missouri CVM’s work closely with industry to promote “One Health.” This is accomplished through sponsorship of a One Health-related symposium in conjunction with the Central Veterinary Conference, as well as through sponsorship of an afternoon lecture series/social hour. Invited speakers at these events have included: Alfonso Torres, Lonnie King, and Ron DeHaven.

K-State Olathe Innovation Campus (<http://kstateoic.ksu.edu/>): A new K-State campus will anchor the Kansas Bioscience Authority’s Kansas Bioscience Park, bringing research, education, and outreach offerings to meet the greater Kansas City area’s rapidly growing needs in the life sciences. K-State’s Olathe Innovation Campus (KOIC) will focus on experiential learning, applied research and technology discovery in areas relevant to One Health, such as animal health, plant science, food safety and security and bioenergy. In these endeavors, KOIC will collaborate with existing educational institutions at every level including K-12, community colleges, and four-year colleges and universities. The local school district has 21st century science programs focused on biotechnology and geosciences; veterinarians from K-State and the animal health industry have been deployed in these classrooms to talk to students about veterinary careers in public practice and to link the concept of One Medicine to classroom activities.

9) University of Wisconsin-Madison School of Veterinary Medicine-- One Health/One Medicine initiatives with academic health partners

- Master of Public Health (MPH) program

The School of Veterinary Medicine is a partner in the UW-Madison MPH program. The MPH is administered through the Department of Population Health Sciences in the School of Medicine and Public Health (SMPH), but the program integrates the four primary health science schools on campus (human medicine, veterinary medicine, nursing, pharmacy) as well as additional campus partners such as the Nelson Institute for Environmental Studies, the Center for Sustainability and the Global Environment, the LaFollette School of Public Affairs, the law and business schools, and others. The School of Veterinary Medicine is represented at several levels in the MPH program: program faculty, steering committee, admissions committee. A dual DVM-MPH degree program allows students to complete both degrees in 5 years. The MPH program provides multidisciplinary education and training in public health concepts and methods to current and future health professionals. The degree provides a practice-oriented program for students in health professional education programs who want to strengthen general knowledge and skills in public health. Students pursue a combination of required and elective coursework, as well as a 10-week public health field project and capstone experience. Funding for the MPH comes from tuition dollars as well as core funding from the SMPH through its Medical Education and Research Projects (MERC) funds of the Wisconsin Partnership Program. The later funds were derived from the conversion of Blue Cross/Blue Shield United of Wisconsin to a for-profit company.



- Center for Global Health

The Center for Global Health (CGH) is a multidisciplinary, campus-wide enterprise incorporating the Schools of Medicine and Public Health, Veterinary Medicine, Pharmacy and Nursing, as well as the Division of International Studies. The goals of the Center are to: develop global health education programs; advance global health research; facilitate global health partnerships and exchanges; and, foster an interdisciplinary network of global health scholars and practitioners. The CGH sponsors monthly seminars, a yearly global health symposium, and on-campus and in-country educational programs, including a 9-credit Certificate in Global Health that students in the health sciences can take accompanying their primary professional degree (MD, DVM, PharmD, Master of Nursing). Current formal in-country programs occur in Ecuador, Thailand, and Uganda – in each case, multidisciplinary teams of students and faculty from across the health science schools travel, live, work and study together, with a strong sense of one health/one medicine. Additionally, students from across the health science schools on campus have completed a wide variety of independent study programs in many additional countries. In addition, the CGH helps to facilitate international health field projects for our campus MPH students.

Core funding for the CGH comes the five primary campus partners as listed above, as well as philanthropic support from campus and community donors, and grants. The interdisciplinary nature of the Center and its educational programs is largely unique among international health centers; a paper describing the creation of the Center around its interdisciplinary themes has just been published in the journal *Academic Medicine* and can be viewed at: <http://www.academicmedicine.org/pt/re/acmed/abstract.00001888-200802000-00007.htm;jsessionid=LJzTXMnYDJMFgBksT2NhyhMqnv11x5QbLzx8KBGvPJY2mQlIT20n!774718804!181195629!8091!-1>.

10) North Carolina State University -- Annual One Medicine Symposium (<http://www.onemedicinenc.org/>)

The North Carolina State University, the North Carolina Department of Health and Human Services, the North Carolina Department of Agriculture and Consumer Services, and other partners have sponsored an annual One Medicine Symposium the last four years, to educate and provide attendees with take-home tools that will improve and enhance preparedness for a natural or man-made disaster or infectious disease outbreak. The theme of the 2007 symposium was, “Globalization and Emerging Risks: A One Medicine Approach to a Changing World,” which focused on the effects of globalization on agriculture, public health, and animal health. The agendas encourage human and animal health professionals to come together to answer key questions to improve awareness and understanding of issues benefiting from a One Medicine approach.

**11) Texas A & M—Center for Environmental and Rural Health (<http://cerh.tamu.edu/>);
Emergency Response—Surge Capacity**

- Texas A&M University established the Center for Environmental and Rural Health (CERH) in 1998 with a mission to: 1) foster interdisciplinary research focused on understanding the cellular and molecular mechanisms of toxic injury induced by environmental factors and 2) develop and implement strategies for the detection, prevention, and management of environmentally related diseases encountered with high frequency in rural populations in the State of Texas. Since its inception, the

Center has brought together nationally and internationally renowned scientists and has facilitated interdisciplinary collaborations focused on basic and translational research, which is carried out in two Research Cores focused on the Environment & Reproduction and the Environment & Cancer. Research is enhanced by an Integrated Health Sciences Facility Core that provides important infrastructure for carrying out research activities. Interdisciplinary research in the Environment & Reproduction Research Core is focused on birth defects, the third leading cause of infant mortality in the U.S. Interdisciplinary research in the Environment & Cancer Research Core is focused on both basic and clinical/translational research on Cancer, a major public health problem in the United States, accounting for one in four deaths. Both Research Cores incorporate interdisciplinary environmental research to predict toxicity and screening for chemicals posing the greatest risk to human health. The Texas A&M University Center for Environmental and Rural Health has an extensive rural network that provides services to population centers as well as cutting-edge biomedical research support throughout the state. At the present time, both research and clinical activities are concentrated in Houston, San Antonio and the lower Rio Grande Valley.

- Conversion of Large Animal Facility to House Hurricane Rita Refugees— CVM facilities served as a special needs hospital during Hurricane Rita (JVME 32 (4): 562, 2005). After being emptied and sanitized, the Large Animal Clinic facility housed approximately 650 people, including patients, families, and caregivers. 350 patients included badly burned children from Shriners Hospital in Galveston, geriatric patients from nursing homes and physically handicapped children. Partners included TAMUS Health Science Center administration, VMTH staff and faculty, CDC, US Army, FEMA, local human hospital staff members and physicians.

12) The Ohio State University - Public Health Preparedness for Infectious Diseases

This is a collaborative initiative of the colleges of Biological Sciences, Food, Agricultural, and Environmental Sciences; Medicine; Pharmacy; Public Health, and Veterinary Medicine. Its aim is to protect public health by minimizing animal to human, environmental, and food borne infectious disease threats through innovative interdisciplinary research. A program of research excellence that is broad in scope encompassing the full range of relevant sciences from the laboratory bench to the community has been established. An interdisciplinary program has been developed, recognizing that breakthroughs will likely emerge at the interface of scientific disciplines. Thus, this program draws strength from both the diversity of academic programs that underlie it, as well as a unifying focus and direction related to public health preparedness and infectious diseases. Particular research goals include:

- 1) translate scientific discoveries into clinical applications e.g. new diagnostics, therapies, and vaccines for infectious diseases;
- 2) Detect the presence of emerging infectious diseases within communities, the underlying mode of transmission, and strategies for prevention, control and treatment;
- 3) Prevent human infection from antibiotic resistant zoonotic (animal to human) micro-organisms through an understanding of livestock immune systems – particularly the gastrointestinal tract – with an aim to reduce use of antibiotics in animals;
- 4) Address food safety issues during food production, processing, transport, storage, retail, or consumer use, with an aim to decrease infections and associated fatalities caused by food-borne illness; and
- 5) Train professionals in veterinary public health and infectious diseases public health preparedness.

13) Washington State University—The School for Global Animal Health



Funded by the Bill and Melinda Gates Foundation in 2008, this newly established school will focus on three interrelated approaches: 1) Vaccine development and deployment, focusing on vector-borne diseases of livestock that are an impediment to economic development and human livelihoods in Africa, Asia, and Central and South America; 2) Emerging pathogen and disease detection that will lead to early intervention by health care organizations, and 3) Control of disease transmission from animals to humans. The school will be specifically focused on improving human health and well-being by better control of animal diseases (JAVMA Vol 232 (9), News May 1 2008, pgs 1272-1274)

14) AAVMC/ASPH Collaborations-- Joint Symposium, Partnerships for Preparedness: Future Directions for Schools of Public Health and Colleges of Veterinary Medicine, April 22-24, 2007, Emory Conference Center Hotel in Atlanta, Ga. and joint programs in veterinary medicine and public health

- In 2007, the Association of American Veterinary Medical Colleges and the Association of Schools of Public Health held a joint symposium on research and education in veterinary public health to increase the strong connection between public health and veterinary medicine, which includes issues such as population health, zoonotic diseases, food safety, and food security. Over 225 public health and veterinary professionals and deans, faculty and students from schools of public health and colleges of veterinary medicine attended the two day symposium. Papers were presented on Academics, Research and Practice, Workforce and Training, and Public Policy. Selected papers presented at the Symposium have been published jointly by Public Health Reports (Public Health Reports May-June, 2008, Volume 123), and the Journal of Veterinary Medical Education. Built upon the strong connection between public health and veterinary medicine, the symposium focused on how schools of public health and colleges of veterinary medicine can work together to improve academic programs, public policy, workforce training and research. Veterinarians promote both animal and human health by emphasizing population health, comparative medicine, zoonotic diseases, food safety, and food security. Public health professionals study the impact of diseases on populations and promote health by focusing on preventive measures as opposed to curative medicine. The Symposium was funded by the Centers for Disease Control and Prevention of HHS, and the Animal Plant Health Inspection Service of the USDA. Collaborative efforts are underway to plan next steps in strengthening and sustaining this important partnership in One Health. Details on the meeting have been posted on the ASPH (www.asph.org) and AAVMC (www.AAVMC.org) websites.
- CDC has funded a national network of Centers for Public Health Preparedness, collaboration between academic institutions and state and local public health departments and other community partners to provide life-long learning opportunities to the public health workforce. Several of these Centers focus on veterinary public health as a cross-disciplinary issue. These include Centers located with Emory University, Iowa State and University of Iowa, University of Michigan, University of Minnesota, University of Nebraska, and the University of Albany.
- Joint DVM-MPH Programs. Over the past several years, programs in veterinary medicine and public health have been established in AAVMC member institutions. These programs, several of which lead to a joint DVM-MPH degree, are listed in attachment 1.

Conclusion

As the examples included in this appendix clearly illustrate, there are many successful activities underway in the Colleges and Schools of the Allied Health Professions and their partners,

which are bringing multiple disciplines together to improve the health of animals, people, and the environment, locally, nationally, and globally, through education / teaching, research, and community service. The Academic Community is providing important leadership in implementing One Health in local, national, and international settings. As indicated earlier, the examples included in this document are not intended to be a comprehensive list. Many more projects and activities are underway in our colleges and schools than could be included in this appendix. Continued commitment and support are needed to sustain, strengthen, and grow all these and other efforts that are underway and/or planned for the future, to allow the One Health initiative to achieve its greatest potential for improving the health of our fellow humans, the animals that we depend on for food, fiber, companionship, and work, and the environment we all share.

Public Health Programs at U.S. Colleges/Schools of Veterinary Medicine in Collaboration with Schools of Public Health

Colleges/Schools with Professional Public Health Degree Programs

- Auburn University, College of Veterinary Medicine
- Colorado State University, College of Veterinary Medicine
- Iowa State University, College of Veterinary Medicine
- Kansas State University, College of Veterinary Medicine
- Michigan State University, College of Veterinary Medicine
- North Carolina State University, College of Veterinary Medicine
- The Ohio State University, College of Veterinary Medicine
- Texas A & M
- Tufts University, Cummings School of Veterinary Medicine
- University of California, Davis
- University of Georgia, College of Veterinary Medicine
- University of Illinois at Urbana-Champaign, College of Veterinary Medicine
- University of Minnesota, College of Veterinary Medicine
- University of Tennessee-Knoxville, College of Veterinary Medicine
- University of Wisconsin-Madison, School of Veterinary Medicine
- Virginia-Maryland Regional College of Veterinary Medicine

Colleges/Schools with a Public Health Program but Without a Formal Joint Degree Program

- Cornell University
- Louisiana State University
- Oklahoma State University
- University of Florida
- University of Missouri, College of Veterinary Medicine
- University of Pennsylvania

