



USAHA

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United States Animal Health Association Newsletter - Vol. 30, No. 4, October, 2003

Plum Island Lab Program Critical to U.S. Diagnostic & research programs are first line of defense against catastrophic foreign animal disease

Modernizing America's Animal Health & Food Safety Security System

USAHA/AAVMC partnership will provide national forum for urgently needed change

by Bennie Osburn, DVM, PhD¹
• President-elect, Association of American Veterinary Medical Colleges
• Dean, School of Veterinary Medicine, University of California, Davis

Many recognize that a new approach for addressing animal-related infectious disease problems in the United States is long overdue. The United States Animal Health Association, in partnership with the Association of American Veterinary Medical Colleges



Bennie Osburn

(AAVMC), can bring animal health representatives, government agencies and industry together with the expertise of veterinary medicine and sci-

¹ See bio at end of article

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by Dick McCapes

• Editor, Special Edition
• Past Chair, Secretary's Advisory Committee on Foreign Animal & Poultry Diseases, USDA

The core of the federal government's scientists, support staff and laboratories dedicated exclusively to research and diagnosis of foreign animal diseases (FADs) that threaten our mammalian livestock and equine populations with catastrophic illness

Dedicated scientists & staff, prolonged underfunding & laboratory obsolescence

is located at the Plum Island Animal Disease Center (PIADC) on Plum Island, New York. This coastal island, 840 acres in size, is 1.5 miles north-east of the tip of Long Island, NY.

The PIADC FAD research and diagnostic programs are critical components of our first line of defense against accidental or deliberate FAD outbreaks in the United States. They are an integral part of our system for delivery of health care to the nation's vast animal populations (see figure 2, page 22).

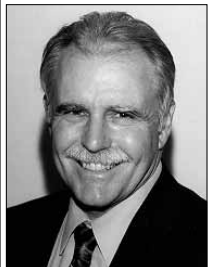
A visit to Plum Island

I had the opportunity to travel to Plum Island last March with two colleagues, Robert Frost, president of

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President's Corner

THIS MESSAGE is meant to communicate to the United States Animal Health Association's (USAHA) members this nation's foreign animal disease laboratory capacity, capabilities and future at Plum Island, New York.



Bob Frost
President, USAHA

The USAHA encourages stakeholders to strategize, be visionary in planning our future laboratory investments, and influence our

agricultural leaders to provide an integrated laboratory infrastructure to defend against animal diseases in the United States.

The Plum Island laboratory is but one link in the chain of national defense laboratories. We must

assist the United States Department of Agriculture (USDA) and the United States Department of Homeland Security (DHS) in regaining the Plum Island historical foreign animal disease research, diagnostic and educational program capabilities and expertise.

The programs carried out since 1956 by the Plum Island Animal Disease Center (PIADC) and the Foreign Animal Disease Diagnostic Laboratory (FADDL) at Plum Island have been an important part of this nation's laboratory defense system for animal health, food safety and human health.

In March 2003, Terry McElwain, President of the American Association of Veterinary Laboratory Diagnosticians (AAVLD), Dick McCapes, editor of this Special Edition, and I spent time at Plum Island. Our goal was to gather information for a Plum Island newsletter and provide our membership with a snapshot of the facilities, personnel, programs, budget

and administration and illustrate how these programs support delivery of animal health care services to the nation's vast animal populations.

In March 2003, our nation was moments away from invading Iraq and the new DHS with its Science and Technology Directorate was still 10 weeks away from announcing a partnership agreement to transfer the management of Plum Island. There were no Plum Island funds in the President's 2004 budget proposal for new facilities, repairs or research. (Also, there are no funds in the President's '04 budget proposal to complete the Ames Master Plan). There were, and still are, major questions without answers as to how Plum Island would continue the foreign animal disease program this nation has relied on for 50 years.

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Dr. Pamela Hullinger, U.S. veterinarian, reflects on foot & mouth disease outbreak experience in U.K.

by Pamela Hullinger, DVM, MPVM, DACVPM
Veterinary Medical Officer & University Liaison
Animal Health & Food Safety Services
California Department of Food & Agriculture

The time I spent working in the United Kingdom assisting in the eradication of the widespread foot-



Pamela Hullinger

and-mouth disease outbreak in cattle, sheep and swine during March, April, May, October and November of 2001 was a truly memorable and rewarding experience. There are many things that I saw, learned and experienced there that I will never forget. I believe firmly that there is no substitute for first-hand experience in gaining a new respect for the devastation that a foreign animal disease (FAD) can inflict on a country. In my mind the challenge that faces us is to take the experiences and lessons learned in the UK

and utilize them to strengthen and enhance the detection, response, control and mitigation of foreign animal diseases in the United States.

I will never forget my initial image of Cumbria, the county where I spent three months while in the UK. As we crested the Pennines, a central mountain/hill range on the A69, and descended toward the town of Carlisle one late afternoon, we entered, what in my mind resembled a war-zone. Smoke filled the air (and burned my eyes and lungs) and pyres of burning cattle and sheep carcasses dotted the countryside. It was a haunting image and was like nothing I could have



Photo provided by P. Hullinger

Dr. Hullinger in foreground of blazing pyre of cattle carcasses in UK. Disposal of carcasses during the foot-and-mouth disease outbreak was a monumental challenge. Options included burning, burial (on-farm & mass graves) and rendering. At the peak of the epidemic, up to 80,000 carcasses needed to be disposed of daily.

imagined. In the days to follow, the burning of carcasses diminished due to public concerns about the smoke and farmer's fears that it was contributing to FMD transmission. However, even today the smell of the pyres and their smoke are a lasting image in

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Plum Island's Homeland Security Mission

By Marc S. Hollander, Center Director
Plum Island Animal Disease Center
U.S. Department of Homeland Security

Next year marks two watershed dates in the history of veterinary science. It is the 75th anniversary of the last outbreak of foot-and-mouth disease (FMD) on U.S. soil. For three quarters of a century—the span of the modern era in veterinary science—we have successfully protected America's agriculture against the devastating effects of the most dreaded biological threat to livestock.

Next year also marks the 50th anniversary of the Plum Island Animal Disease Center (PIADC), the one-of-



Marc Hollander

PIADC will support DHS biological countermeasures program

a-kind scientific research facility in New York that has made our successful defense against FMD possible. Without Plum Island, we would not now be celebrating 75 years of keeping FMD outside our borders.

PIADC is a unique scientific research facility and a critical national asset. It is currently the only center in the U.S. with biosafety level 3 (BSL-3) laboratories capable of performing research on foot-and-mouth disease virus, including the ability to work with large livestock animals.

On June 1 of this year, Congress transferred the responsibility for operations at Plum Island to the Department of Homeland Security (DHS), as directed in the Homeland Security Act of 2002 (PL 107-296, Section 310).

The DHS mission is to protect America from terrorist threats—including those directed against agriculture. Plum Island was transferred to DHS to support the biological countermeasures program to reduce the probability, and the potential consequences, of a biological attack on the nation's civilian population and its

agricultural system. DHS now has responsibility for PIADC operations, including facilities and grounds, security, fire protection, emergency medical services, environmental management, and maintenance. DHS is also working closely with PIADC scientists and USDA program leaders to develop a joint national research and development (R&D) diagnostic strategy to protect livestock against the introduction of foreign animal diseases.

During the initial phase of the transition, DHS conducted a high-level assessment of PIADC site operations. Independent experts from outside the agency conducted interviews with staff, walk-downs of facilities, reviews of procedures and interviews with external organizations.

What we found is not a surprise given that the facility is 50 years old. Some buildings are relatively new (administration building) while others are reaching the end of design life. The structures are being safely maintained, but upgrades and maintenance are needed to extend useful life. Funding for operations, maintenance, and staffing of PIADC have not kept pace with increasing and unexpected demands of maintaining an aging facility.

We used the findings from this very structured independent assessment to establish an operational baseline for PIADC and to develop an overall facility operations and modernization plan. DHS worked closely with USDA staff at the facility to complete this assessment and set priorities for the facilities to support both Departments' missions within the existing funding profiles.

To meet the new, expanded role for Plum Island, we are committed to investing in critical infrastructure upgrades. We have proposed a budget plan for the next five years that significantly increases our investment in Plum Island to support the Department's mission. We must also make these investments wisely, so we have carefully prioritized our budget allowing us the greatest strength, security, and scientific value.

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Homeland Security's Biodefense Mission

by Dr. Gerry Parker, Director
National Biodefense Analysis and
Countermeasures Center
U.S. Department of Homeland Security

Plum Island Animal Disease Center (PIADC) is a national asset that leverages the Department's science and technology expertise to anticipate and prevent terrorists' use of biological materials and weapons. Plum Island is also contributing its unique scientific expertise to a larger effort within the Department of

PIADC is one of five DHS biodefense research centers

Homeland Security's National Biodefense Analysis and Countermeasures Center (NBACC). This effort allows us to better anticipate, prepare for, detect, respond to, and recover from biological attacks. Plum Island's distinct laboratory and scientific capabilities will continue to investigate and develop high-efficacy diagnostics, vaccines, and anti-virals against intentional or natural introduction of foreign animal diseases.

Under the Department of Homeland Security, the basic research and diagnostic mission that PIADC has maintained for nearly fifty years has not changed; agricultural biosecurity has given it renewed emphasis and importance. We are continuing the first-rate veterinary science programs to help keep foreign animal diseases such as foot and mouth disease out of America. Working closely with United States Department of Agriculture (USDA), The Department of Homeland Security (DHS) is drawing upon the expertise of the staff at PIADC to help in our overall goal to reduce threats of disease and contamination of food and agricultural

Page 30, Col. 3

National Animal Health Laboratory Network created

State veterinary diagnostic labs and USDA's NVSL/FADDL labs formally team up

by Terry McElwain, DVM, PhD
 • President, American Association of Veterinary Laboratory Diagnosticians
 • Professor and Executive Director, Washington Animal Disease Diagnostic Laboratory, Washington State University

United States animal disease diagnosis and surveillance functions most effectively as a shared responsibility of publicly funded state animal health laboratories, represented by the American Association of Veterinary Laboratory Diagnosticians (AAVLD), and federal animal health laboratories administered through the USDA Animal and Plant Health Inspection Service (APHIS). This partnership is essential for safeguarding the



Terry McElwain

health and well being of our nation's livestock and poultry, companion animals, wildlife, zoo and exotic species, and for protecting the public health from diseases common to animals and humans.

A national strategy, melding the nation's federal, state, and local resources, would be capable of responding to any type of animal health emergency, including bioterrorist events, newly emerging diseases, and foreign animal disease agents that threaten the nation's food supply and public health.

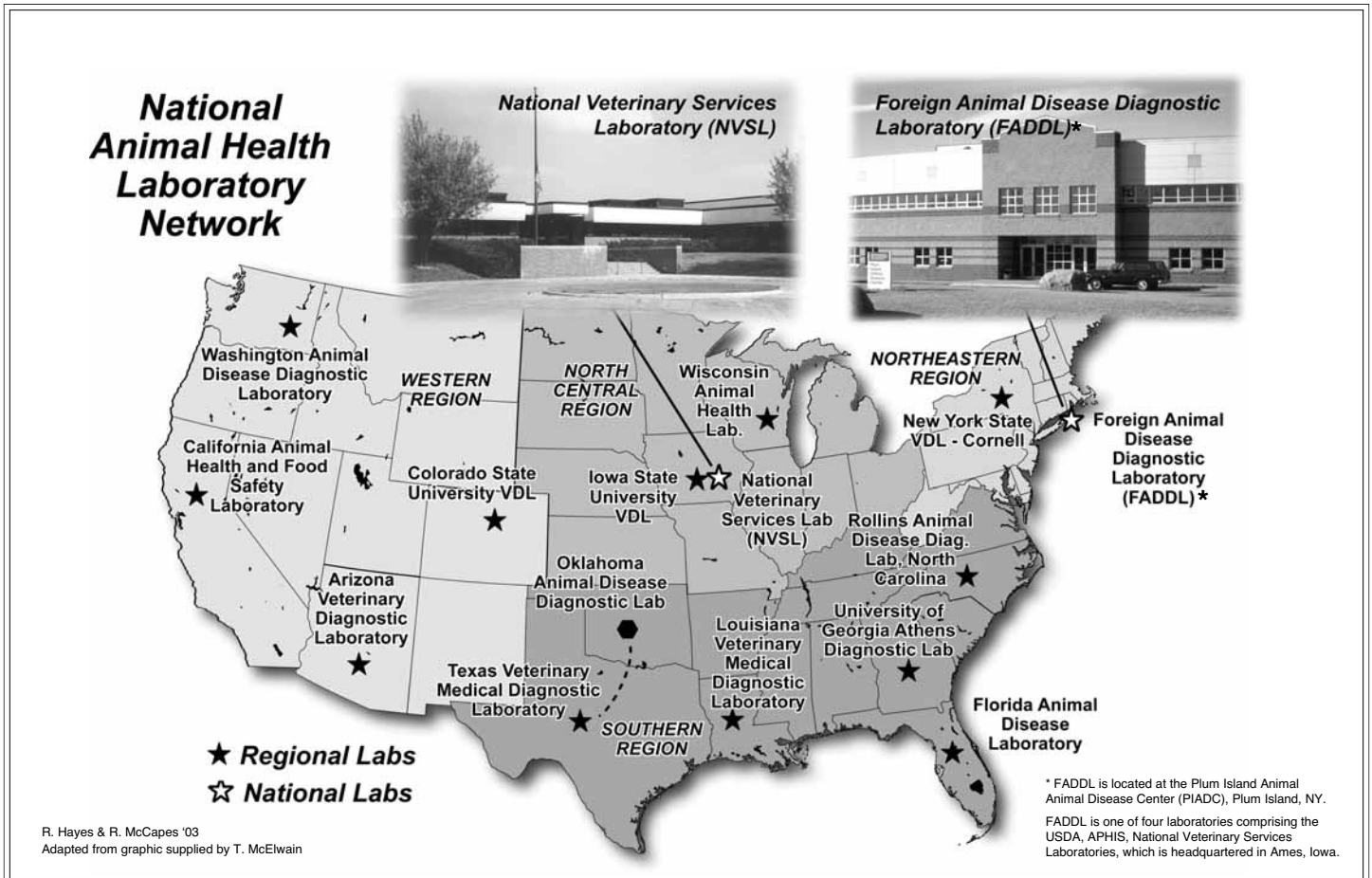
As identified in the Safeguarding Review, National Research Council Report, "Countering Agricultural Bioterrorism," GAO reports on foot-and-mouth disease, and multiple other studies, the need to develop and maintain a state-of-the-art national animal health laboratory network (NAHLN) has never been more critical.

What are the benefits?

Animal industries, regulatory agencies, and public health all benefit from the activities of a coordinated national network for laboratory diagnosis and response. Full implementation would enhance early detection of bioterrorist events; natural or intentional contamination of our food supply; animal disease outbreaks involving agents that impact human health such as anthrax, West Nile virus, and monkeypox; and early recognition of newly emergent and economically important diseases such as foot-and-mouth disease, exotic Newcastle disease, and bovine spongiform encephalopathy. Importantly, the NAHLN also would strengthen current state-based laboratory testing for export of animals and live animal products, ensure that testing meets international quality standards, and enhance surveillance for diseases of internation-



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1669-2003: A Partial History of Plum Island

Including laboratory modernization projects

Plum Island, located off the north-eastern tip of Long Island^b, New York, is a part of the Town of Southold, in Suffolk County.^a

The island has an area of 840 acres (1.3 square miles). It is about 1.5 miles northeast of Orient Point^b and 9 miles southwest of Old Saybrook, Connecticut.

The bodies of water surrounding Plum Island include Long Island Sound on the north^c, Block Island Sound on the south^d, and Plum Gut^e, separating the island from Orient Point on the west.

Access to Plum Island is by US Department of Homeland Security (DHS)-owned boat service to the Plum Island harbor^f from the DHS harbor at Orient Point and a harbor located at Old Saybrook, Connecticut.

Early Years

Formerly known as the Isle of Patmos, Plum Island was renamed by early explorers for the profusion of native plum trees on its beaches.

Samuel Wyllys of Hartford, Connecticut, acquired Plum Island in 1669 from the Corchough and Mantuk tribes. In 1688, the island was sold to Joseph Dudley of Roxbury, Massachusetts, who later became governor of the Massachusetts Colony from 1702 to 1715.

The island was divided into two parcels in the early 1700s. Joseph Beebe farmed the west half, and Daniel Tuthill farmed the east half.

During the American Revolution, the island became a rendezvous for British warships, which attacked and made off with about 20 sheep. On August 18, 1775, the Continental Congress ordered all livestock off the island to stop such raids.

In 1805, Benjamin Jerome began purchasing parcels of the island. His son continued to buy land and by 1834, he owned the entire west half and some of the east half, using the land for agriculture and raising cattle until his death in 1869.

The U.S. government purchased three acres in 1826 to build a



Photo by PIADC
 Foreground-Plum Island, New York: a) Southold, Suffolk County, Long Island, NY; b) Orient Point, Long Island, NY; c) Long Island Sound; d) Block Island Sound; e) Plum Gut; f) Plum Island harbor; g) Plum Island lighthouse; h) Fort Terry; i) De-commissioned coastal gun batteries; k) Buildings 100 & 101

lighthouse.^g That lighthouse was replaced in 1869 by the present structure (see page 26).

Around 1890, A.S. Hewitt, a former mayor of New London, Connecticut, acquired the entire island to develop it as a summer resort. However, his plans did not materialize.

1897: The War Department moves onto the island

In 1897, Hewitt sold 150 acres on the east end to the War Department for \$25,000 for the creation of Fort Terry^h and associated coastal and harbor defenses. Construction of the first batteryⁱ of coastal guns started in the same year. The first battery was in service during the Spanish-American War.

In 1901, the War Department acquired the rest of the island, except for the lighthouse reservation, for \$64,700. By 1914, the fort had 11 batteries, extensive submarine mining capability, and a sophisticated battery fire regulation and position-finding system. Anti-aircraft guns were installed during World War I.

After the end of the war, Fort Terry was placed in a caretaker status under maintenance by personnel from Fort H.G. Wright at Fishers Island, New York. With the advent of World War II in 1941, Fort Terry again became a training camp for the Army and new batteries were constructed. On June 22, 1948, the Army declared Fort Terry as surplus property and Fort H.G. Wright again became the island's caretaker.

1954: Army research facility

On April 25, 1952, Fort Terry was transferred to the U.S. Army Chemical Corps, which had been planning an animal research laboratory on Plum Island since 1951. The new laboratory was planned to be housed within the Combined Torpedo Storehouse and Cable Tanks (circa 1911), also known as Building 257. Remodeling of 18 Fort Terry buildings was contracted out in 1952.

After the completion of all of this construction work on May 26, 1954, the Chemical Corps Plum Island fa-

ARS research at Plum Island

Exotic Viral Diseases Research Unit update

Mission– The mission of the USDA-ARS Exotic Viral Diseases (EVD) research unit is to develop control strategies for high consequence foreign animal diseases (FAD). This includes development of vaccines, diagnostics and novel antiviral strategies with improved efficacy and versatility.

EVD Research team– EVD includes senior scientists Claudio L. Afonso, PhD, molecular biology; Manuel V. Borca, DVM, PhD, immunology/molecular virology; Fred Brown, PhD, virology and biochemistry; Gerald F. Kutish, PhD, bioinformatics and computing; John G. Neilan, PhD, molecular biology; Daniel L. Rock, PhD, molecular virology/viral pathogenesis; and Laszlo Zsak, DVM, PhD, virology; plus eight support scientists, six visiting scientists, and one graduate student. Adriene Larkowitz provides administrative support for the group.

Current Research Activities– FAD continue to be a highly significant animal health concern. Today, the threat posed by these diseases is unprecedented due to the increasing globalization of trade, movement of people and agricultural products and changes in farm practices including movement to more intensive agriculture. Recent FAD outbreaks in Europe and Asia (1997-2001) have been catastrophic, resulting in devastating economic consequences for the countries involved. A similar scenario would be expected should these diseases be introduced into the United States. New disease control strategies are needed to reduce this threat.

EVD research focuses on African swine fever, classical swine fever and advanced animal vaccines and diagnostic applications. The research strategy utilizes modern molecular, genetic and immunologic technologies and convergent disciplines to hasten discovery of novel means for detection, prevention and control of FAD.

African Swine Fever

African swine fever (ASF) is a highly lethal hemorrhagic disease of domestic swine with mortality rates approaching 100 percent. The causative agent, African swine fever virus (ASFV), is a unique and genetically complex DNA virus. It is the sole member of a newly named virus family and the only known DNA arbovirus. Cycling of virus between soft ticks of the genus *Ornithodoros* and wild pig populations (wart hogs and bush pigs) in sub-Saharan Africa provides a natural reservoir of virus that poses a constant threat to domestic pig populations worldwide. There is no vaccine for ASF. Either a vaccine or another novel control method is needed to reduce the threat posed by this highly significant viral disease. Ongoing research is in two main areas.

ASFV virulence and host range genes– Identification of genes associated with viral virulence will permit the rational design and genetic engineering of live attenu-

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Foot-and-Mouth Disease Research Unit update

Mission– The mission of the USDA-ARS Foot-and-Mouth Disease (FMD) research unit is to develop strategies for the prevention and control of FMD and Vesicular Stomatitis (VS) outbreaks in North America.

FMD, an exotic disease of livestock is the number one foreign animal disease (FAD) threat to the United States. Its introduction would have grave economic consequences not only for U.S. livestock producers, but also for many industries such as travel, food retail and tourism.



Luis Rodriguez

The recent FMD outbreak in the United Kingdom resulted in tens of billions of US dollars; most of these losses were associated to tourism and travel industries. VS, a disease that sporadically occurs in the U.S. can be easily confused with FMD with resultant quarantines and economic consequences until FMD is ruled out.

FMD Research team– Senior scientific staff includes Dr. Barry Baxt, PhD, microbiology; Dr. William T. Golde, PhD, immunology; Dr. Douglas Gregg DVM, PhD, pathology; Dr. Marvin Grubman, Ph.D. biochemistry; Dr. Elizabeth Rieder, PhD molecular biology and Luis L. Rodriguez DVM, PhD, animal virology. In addition, eight research support scientists, four post doctoral fellows and four visiting scientists make up the unit research team. Dr. Luis Rodriguez serves as the Unit Leader with the capable help of the unit's secretary Mrs. Penny Rempe.

Facilities– The FMDRU occupies four BL-3 laboratory areas in Building 101. Two were built in the 1960s and two were last renovated in the 1980s. Unit scientists share key areas, equipment and animal resource facilities with other ARS and APHIS scientists in order to avoid costly unnecessary duplications.

Current Research Activities– Research is focused on basic and applied problems in FMD and VS, including efforts at developing faster-acting and more broadly cross-reactive vaccines and antivirals. This work includes understanding immunity to infection, virus evolution, pathogenesis, and disease spread to help predict and control outbreaks of these diseases, if they were to occur in North America.

Vaccine research is oriented toward development of vaccines that can be produced safely in the United States under existing federal law, and companion diagnostic techniques that can differentiate between vaccinated and infected animals, can identify carrier animals, and can be used safely on farms. Initiatives to develop safer vaccines include recombinant subunit vaccines and newer candidate vaccines based on infectious clone technology. Fundamental research on viral replication, viral particle as-

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APHIS diagnostics at Plum Island

Foreign Animal Disease Diagnostic Lab update

The USDA-Animal and Plant Health Inspection Service (APHIS) diagnostic program at the Plum Island Animal Disease Center (PIADC) is carried out by the Foreign Animal Disease Diagnostic Laboratory (FADDL), one of the four laboratories comprising the National Veterinary Services Laboratories headquartered in Ames, Iowa (see graphic, page 4).

FADDL team— FADDL is comprised of two sections with a total of 32 personnel. These include 10 veterinarians (six have PhD and two MS degrees), seven microbiologists, 11 technicians, and four administrative support personnel. Dr. Thomas McKenna serves at the Chief of FADDL.



Tom McKenna

Facilities— FADDL occupies BSL-3 Ag and BSL-3 laboratory space and shares BSL-3Ag and BSL-3 animal space with ARS scientists in Building 101, as well as a BSL-2 laboratory in Building 100.

Diagnostic Services Section

This section is staffed by a Section Head, Samia Shawky, D.V.M., Ph.D., two veterinarians, three microbiologists, six biological laboratory technicians, and one laboratory control technician, and carries out the following activities:

- Diagnose suspected foreign animal disease (FAD) cases: Perform diagnostic testing on samples collected from U.S. livestock in the field that have clinical signs consistent with an exotic disease.



Samia Shawky

- Perform importations and safety testing: Safety testing and safety treatment of animals or animal products entering the United States from countries with exotic diseases. This includes live animals (usually wildlife for zoos, but has included llamas and alpacas in the recent past), commercial items (products for test kits being imported by commercial companies), viruses or other agents being imported by university and commercial scientists. Safety testing includes injecting a portion of a bulk lot into live animals, looking for clinical disease, and testing for any immune response to specific exotic diseases of concern. Safety treatment can include irradiation or other chemical treatment as outlined by NCIE in consultation with FADDL scientists.

- Directed surveillance for FAD: At the present time, the laboratory is concentrating on testing for classical swine fever (CSF) in the United States. Over the past few years, this has consisted of serosurveillance (i.e., looking for antibodies for CSF in high risk populations). Surveil-

Laboratory Biosafety Levels

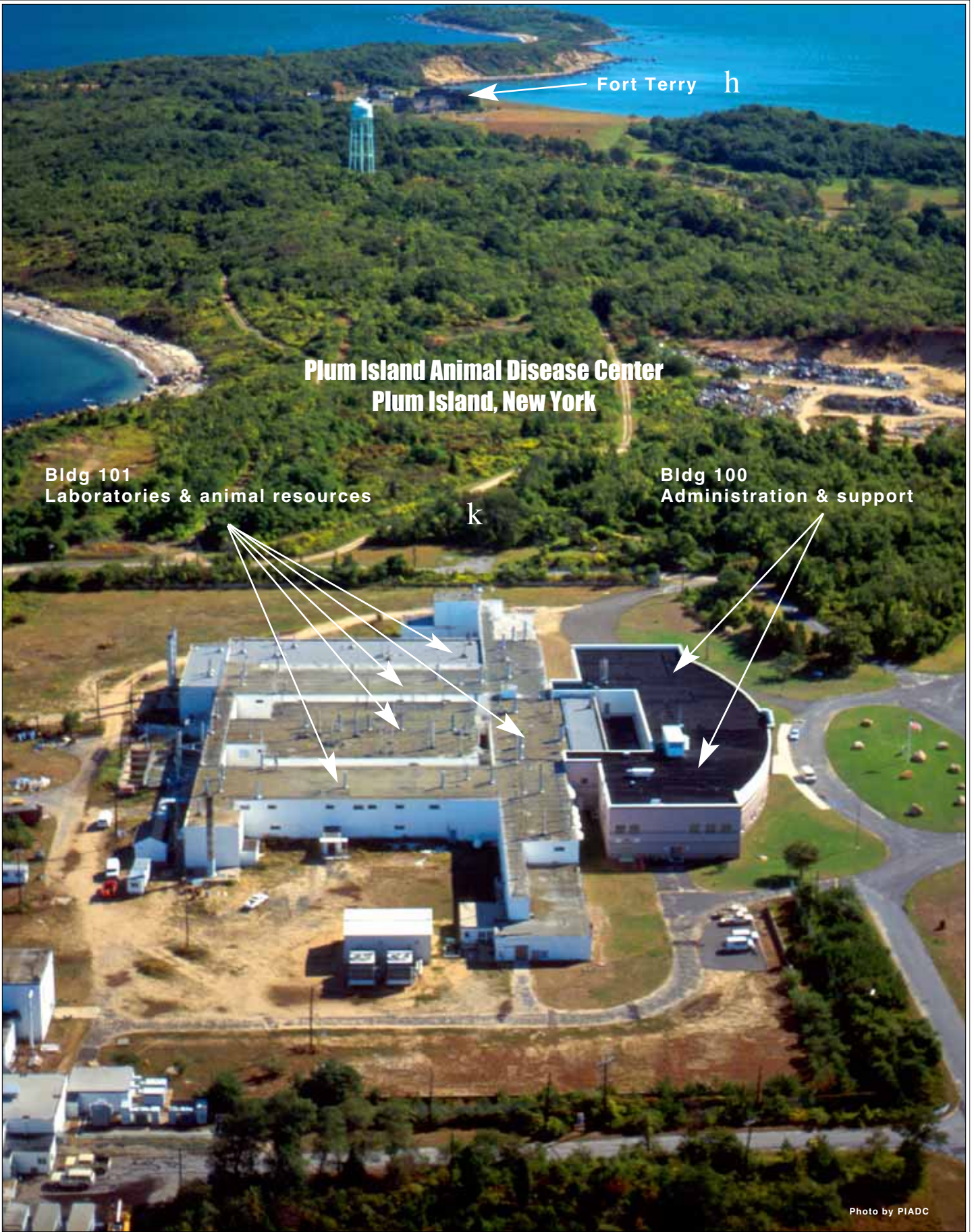
- **Biosafety Level - 1 (BSL-1).** Microbiological agents are not known to cause disease in healthy adult humans or in animals and are of low risk to the environment. Basic microbiology laboratory of conventional design without special engineering features for containment. Potential hazards readily controlled by standard microbiological practices.

- **Biosafety Level - 2 (BSL-2).** Microbiological agents are of moderate risk to humans, animals, or the environment. Similar in design to biosafety level-1 facility except that access to the laboratory is restricted and work that may cause splashes or aerosol generation is conducted in primary containment equipment (biological safety cabinets). Plants and animals not related to research project are not allowed in the laboratory; and laboratory clothing, gloves and eye protection may be required for wear by personnel who work in the laboratory.

- **Biosafety Level - 3 (BSL-3).** Microbiological agents that may cause serious disease in humans from exposures by inhalation. The laboratory is separated from remainder of the building, often by a personnel change room (shower optional). Access to the laboratory is restricted. Biological safety cabinets and personal protective equipment are used. The laboratory should be constructed to allow it to be sealed for gas decontamination. The ventilation system is designed to provide directional air flow from uncontaminated to potentially contaminated areas. Air is not recirculated. Filtration of exhausted air is optional.

- **Biosafety Level - 3 Agriculture (BSL-3Ag).** Required for certain high risk microbiological agents that infect livestock or plants. Mandatory building design includes personnel change rooms with showers; personnel and equipment air locks; a double door autoclave; single pass, directional, and pressure gradient air system; HEPA filtration (or equivalent) on supply and exhaust air with electrical interlocks to prevent pressurization of the laboratory during electrical or mechanical breakdowns; central liquid/solid waste sterilization; and sealed interior surfaces. The facility requires special testing and certification procedures.

- **Biosafety Level - 4 (BSL-4).** Required for extremely hazardous biological agents with high risk to human life. The distinguishing characteristic of this type of facility from the biosafety level-3 agriculture facility is the provision of a secondary barrier for workers (one piece positive pressure personnel suits ventilated by life support system to prevent human exposure). The Agricultural Research Service does not have this level of facility.



Letter key: c-Long Island Sound; d-Block Island Sound; e-Plum Gut; f-Plum Island harbor; g-Lighthouse; k-Plum Island Animal Disease Center (PIADC); h-Fort Terry; i-Decommissioned coastal gun batteries; m-Connecticut coastline; n-Two of PIADC boats



Nature cites PIADC research

Foot-and-mouth strategy strengthened: Interferon could cover vaccine's weak spot

Helen Pearson
Nature Science Update
 January 10, 2003

An antiviral drug could avert future foot-and-mouth disease (FMD) epidemics, scientists say. Combined with vaccination, the drug gives slow-acting vaccines time to kick in.

More than six million animals were slaughtered in 2001 as Britain struggled for seven months to stop FMD tearing through farmyards. Vets shunned animal vaccination because the virus jumps from herd to herd before vaccines can take effect.

The antiviral drug interferon protects pigs from infection for at least 24 hours, says Marvin Grubman of Plum Island Animal Disease Center (PIADC) in Greenport, New York. Crucially, it starts working within a day. "No vaccine can protect animals so quickly," he says.

"It's potentially hugely significant," agrees FMD epidemiologist Mark Woolhouse of the University of Edinburgh, UK. At the time of the British outbreak, experts favoured culling over vaccination. Taking seven days to provide immunity, a vaccine strategy might have worsened the epidemic, they feared.

Recent inquiries such as those by Britain's Royal Society have recommended well-planned emergency

vaccination—alongside culling—should FMD return. "This finding tips the balance towards vaccination," says Woolhouse.

Interferon—normally a chemical cry for help from virus-infected cells to the body's immune system—is used to treat patients with hepatitis B and C. But unlike human interferon, no system exists for synthesizing large quantities of the animal protein.



Marvin Grubman

To deliver the interferon, Grubman and his colleagues engineered harmless viruses to carry a pig interferon gene. High doses of the virus delivered enough interferon to protect pigs from clinical FMD. It seems to stop the virus multiplying. And in unpublished work, Grubman's team found that a shot of interferon alongside conventional vaccination completely protected pigs from the disease for up to five days.

David Paton, who heads the Institute for Animal Health in Pirbright, UK, points out that the studies must be repeated in cattle—the main target for vaccination programmes. Even so, "the work is very exciting and offers hope for the future," says Paton. The Plum Island researchers are already talking with commercial vaccine manufacturers.

References

1. Chisangaram, J., Moraes, M.P., Koster, M. & Grubman, M. J. Novel viral disease control strategy: adenovirus expressing alpha interferon rapidly protects swine from foot and mouth disease. *Journal of Virology* 77, 1621-1625, (2003)

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FMD research update

from page 6

sembly and release, virus/cell receptor interaction, the infectious process, the 3-dimensional structure of viral capsid epitopes, and the basic host cellular immune response to various stages of infection are required to develop practical methods for vaccination, antiviral treatment, diagnosis and other novel approaches to FMD control strategies. Among the novel approaches for FMD control, unit scientists are exploring the use of non-specific therapy with cytokines (e.g., interferons) and substances (e.g., integrins) blocking the interaction between the foot-and-mouth disease virus (FMDV) and viral receptors on host cells.

Research Projects

Research is organized in three USDA-ARS funded research projects (CRIS projects). Activities in all projects revolve around four main areas: a) genomics, epidemiology and rapid diagnosis; b) molecular mechanisms of viral replication; c) virus-host interaction and immune response; and d) outbreak interventions (fast-acting vaccines and antivirals).

• **CRIS 034** focuses on novel control methods against FMDV and is led by Dr. Marvin Grubman. Dr. Grubman has ample expertise on FMD research and has worked at PIADC for the last 27 years. Among his major contributions are the description of FMDV's mechanisms of inhibition of host response particularly interferon response. He discovered that FMDV's lacking the 5' leader proteinase (Lpro) grew to lower titers in vitro and were attenuated in animals due to the lack of inhibition of translation of cellular factors, including type I interferons which in turn inhibited virus growth.

In recent years he showed that an adenovirus vector containing the structural proteins of FMDV and the 3C protease, could produce virus-like empty capsids that were not infectious but that could induce an immune response similar to that induced by inactivated vaccines, without inducing antibodies to non-structural viral proteins hence making vaccinated animals easily distinguishable from infected ones. Dr.



Photo by R. H. McCapes

USAHA president Robert Frost meets with researchers with the PIADC Foot-and-Mouth Disease unit. From left: Elizabeth Rieder, Frost, Marvin Grubman, Bill Golde, Luis Rodriguez (FMD unit leader), and Barry Baxt. March, 2003



PIADC Foot-and-Mouth Disease Research Unit, 2002

Front row, from left: Steve Pauszek, Luizinho Caron, and Mike LaRocco. Second row: Josh Wu (former postdoc), Charles Scherer, Sonia Botton, Hernando Duque, Vivian O'Donnell, and Juan Pacheco. Standing: Penny Rempe, Marvin Grubman, Doug Gregg, Sabrina Boetcher, Jose Barrera, Tina Henry, Antonio Ramirez, Qizu (former postdoc), Luis Rodriguez, Mario Brum, Barry Baxt, William Golde, and Geoff Ferman

FMD research update
from page 10

Grubman has shown these empty capsid vaccines to be efficacious in protecting swine against viral challenge.

More recently, Dr. Grubman has showed that type I interferons delivered in adenovirus vectors are effective in controlling FMDV infection. (See *Nature Science Update* article, page 10).

One research support scientist, microbiologist Marla Koster, works in this project area. In addition, there is one post doctoral fellow: Teresa de los Santos, PhD, molecular biologist; and three visiting scientists: Luizinho Caron, DVM, MSc; Mario Brum, DVM; and Sonia Botton, DVM, who also works with Dr. William Golde.

• **CRIS 035** focuses on molecular disease mechanisms of FMDV and is



Sonia Botton at work in PIADC Foot-and-Mouth Disease research unit laboratory.

led by Dr. Barry Baxt in close collaboration with Dr. Elizabeth Rieder. Dr. Baxt has worked on FMD at PIADC for over 26 years and has made important contributions to understanding the virus – cell interactions (See article, page 12).

CRIS 035 studies the virus-host interactions at the cellular and molecular levels. These interactions, critical in the replication cycle and spread of FMDV, start with the interaction between the virus and receptor molecules on susceptible cells and follow intracellular pathways of viral replication and mechanisms of viral exit. This information will be useful in finding targets for novel anti-viral therapeutics and means to prevent infection of susceptible animals. In addition, knowledge of the genetic basis of viral transmission and spread will be obtained to help us better cope with the disease, if it is introduced into the United States.

One research support scientist, Mike LaRocco, microbiologist, and one post doctoral fellow, Vivian O'Donnell, PhD, molecular biologist work in this project area.

• **CRIS 040**, dedicated to vesicular stomatitis genomics and pathogenesis, is led by Dr. Luis Rodriguez. This project has two separate components both aimed at minimizing the occurrence of VS in the United States. Objective 1 addresses animal pathogenesis aspects specifically

the role of local, non-specific immunity in determining the outcome of viral infections. This could result in the development of therapeutic agents capable of preventing clinical disease during outbreaks not only of VS but also of FMD. Objective 2 utilizes viral genomics for diagnosis and molecular epidemiology to rapidly detect, identify and track the origin of VSV strains causing outbreaks.

Two research support scientists, George Smoliga and Steve Pauszek, molecular biology, and post doctoral fellows, Jose Barrera, DVM PhD, virologist and visiting scientist Charles Scherer, DVM, work in this project area.

Besides the three lead scientists, the unit has three other senior scientists working on various aspects across CRIS projects.

• **Molecular virology**– Dr. Elizabeth Rieder leads the molecular biology laboratory with two support scientists, molecular biologists Tina Henry and Sabrina Boetcher. Dr. Elizabeth Rieder is a molecular biologist, who, as PIADC Post Doctoral Research Associate in the 1990s, generated an infectious cDNA clone for FMDV that is still in use today. She also developed receptor-binding, site-deleted, and antigenic chimeric viruses using genetic engineering. Her laboratory is involved in the analysis of the pathogenic characteristics of FMDV. Using the knowledge of molecular virology



Elizabeth Rieder

and expertise in virus replication, she is identifying both viral factors (proteins and genetic elements) and host factors that might influence how the virus causes disease. In addition, she is also developing cell-free assays to analyze anti-viral compounds by high-throughput methods. This involves engineering non-replicating viral genomes, called replicons, which can be used in laboratories outside of biocontainment, meaning they would be appropriate for use in pharmaceutical companies developing anti-viral drugs.

• **Immune response**– Dr. Golde leads the immunology laboratory and has one postdoctoral fellow, Elida Bautista, Ph.D., one support scientist,
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Understanding how FMDV gets into cells: A potential novel approach to prevent infection?

As part of the Foot and Mouth Disease (FMD) Research Unit's study of possible anti-viral intervention strategies, Dr. Barry Baxt is engaged in basic research on how FMD virus gets into the cells and replicates. Dr. Baxt is beginning his 27th year at Plum Island and his laboratory studies the very first step in the viral replication cycle, namely how the virus interacts with the cellular surface.

Studies in his laboratory have shown that in order to infect cells, the virus makes use of proteins in the cellular membrane called receptors. These receptors perform functions related to cellular processes in normal uninfected cells, but the virus subverts them for its own entry.

The receptors are absolutely necessary for the virus to infect cells; and therefore, they are important determinants in the species that the virus infects, and in the tissues and organs that are involved in the disease. In addition, it is clear that interfering with the virus' ability to interact with its receptor would affect its ability to cause disease.

In his early work, Dr. Baxt analyzed the events involved in the binding of virus to cells and the steps the virus goes through to cross the cell membrane into the interior of the cell to begin replication. Following these studies, he began to perform experiments aimed at identifying the proteins in the cell membrane.

In 1995, his laboratory was the first to demonstrate that FMDV utilized a class of cellular membrane

proteins called "integrins" to infect cells. There are 24 known mammalian integrins. These proteins control how cells interact with each other and with their surrounding environment.

We now know that the virus can utilize three integrins as receptor proteins. Using genetic engineering techniques, each of these viral receptors from cattle have been now cloned in Dr. Baxt's lab. This has made it easier to study the role of the receptors in how FMDV causes disease. For example, in collaboration with Dr. Douglas Gregg, a veterinary pathologist in the Unit, different bovine tissues and organs are being examined for the expression of the FMDV receptor proteins. By analyzing this data, insight will be gained into how the virus can spread so rapidly within the infected animal and which organs are most likely to be involved in this process. A second project underway involves using viral receptors as anti-viral agents in tissue culture.

Dr. Baxt has now shown that soluble receptors made by genetic engineering can interfere with the virus' ability to infect cells in tissue culture, probably by binding to the receptor binding site on the virus. He is now engaged in determining whether this approach can be applied to protecting animals against FMD. This approach is part of an intervention strategy being developed to control FMD outbreaks.

Editor's note: We thank the PIADC FMD Research Unit for providing this information.



Barry Baxt

FMD research update from page 11

Geoff Ferman, M.Sc., and one visiting scientist, Juan Pacheco, DVM, Ph.D. This group has developed many reagents and assays necessary to study the immune responses of cattle and swine. Among their recent discoveries, is the fact that FMDV infection causes depletion of lymphocytes and therefore it disrupts the immune response against



William Golde

the virus. Not only that, but the virus disrupts the ability of immune cells to synthesize important molecules involved in initiating immunity, namely interferon gamma. This indicates the virus has evolved a mechanism to specifically inhibit this interferon. To more clearly understand this aspect of immune evasion by the FMD virus, they also demonstrated for the first time that porcine interferon gamma is acts against FMDV, blocking virus infection in vitro. Therefore, the evolution of mechanisms to inhibit interferon production allows this virus to evade early immune responses. This work is fundamental to designing intervention strategies in antiviral therapy against FMD.

• **Histopathology**– Dr. Douglas Gregg is a veterinary pathologist who has greatly improved the unit's ability to study the pathogenesis process in the animal by establishing a highly functional histopathology laboratory. He has developed assays that allow detection not only of viruses, but also various molecules such as integrins and interferons in the tissues of FMDV and VSV infected animals.



Douglas Gregg

Dr. Gregg along with research support scientist, Amy Kozer actively collaborate with all unit members in understanding the mechanisms of disease for FMD and VS.



Luizinho Caron (left) and Amy Kozer (right) in PIADC Foot-and-Mouth Disease Research Unit laboratory

Rapid Pathogen Detection: New Tools for FAD Emergency Disease Management

The major outbreak of foot-and-mouth disease (FMD) in the United Kingdom in 2001 made evident the advantages that rapid diagnostic methods would have provided in controlling the disease. Until recently, reliance was placed on the identification of the FMD virus (FMDV) infectious agent by serology, with confirmation by virus isolation. These procedures were required to be done in a laboratory dedicated to the handling of the virus. In the United States, the only laboratory allowed to handle the virus is at the Plum Island Animal Disease Center on the East Coast, which would mean an inevitable delay in obtaining a result. Alternative tools are needed to minimize the economic burden caused by FMD and other high consequence pathogens. Most significantly, it is critical for emergency disease management to rapidly determine whether animals are infected or not.

The EVD research group has pioneered development of rapid diagnostic tests for FAD. Real-time PCR-based diagnostic tests for FMD and CSF have been developed that can detect virus in clinical samples well before the appearance of clinical

signs.* Tests have been optimized to work with nasal and oral swabs, which are readily accessible clinical samples. Each assay is performed in a single tube pre-packaged with standardized dried reagents. Results are generated using a portable detection instrument and computer, allowing real-time distribution of data from any remote location via the Internet.

The simplicity and portability of the assay enables pen-side use for rapid, on-site diagnosis of disease. The performance of these assays in early pathogen detection suggests two uses for control of FMD and CSF: 1) a surveillance tool in areas free of the disease and 2) a screening assay for monitoring outbreaks in real-time. Similar diagnostic tests are currently being developed for other high consequence animal pathogens, including ASFV, exotic poxviruses, rinderpest virus, and *Mycoplasma mycoides* sc, the causative agent of contagious bovine pleuropneumonia.

* Callahan et al., 2002. JAVMA, 220(11):1636-1642

Risatti et al., 2003. J. Clin. Micro., 41(1):500-505

Editor: We thank the EVD research unit for providing this information.

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ated viruses for use as vaccines. Additionally, an understanding of these genes and their functions may permit development of novel approaches for disease control that exploit aspects of viral host range. Current work here is focused on: 1) Identifying and characterizing viral genes responsible for viral virulence, latency and host range in both swine and tick hosts; 2) Identifying host cell genes associated with host susceptibility and/or resistance; 3) Developing vaccines and/or other novel approaches for disease control that exploit virulence and host range mechanisms; and 4) Developing genomic-based methods to rapidly identify and phenotypically characterize viruses.

Protective immunity to ASF—Research focuses on vaccination as a potential control strategy. Research involves defining the protective immune response to ASFV, providing both the theoretical and practical basis for subsequent vaccine development. Current work includes: 1) Evaluating genetically engineered ASFV with deletions of virulence/host range genes as vaccines for ASF; 2) Identifying and characterizing ASF viral proteins that induce a protective immune response in swine; 3) Defining ASFV antigenic variability; 4) Defining critical protective host immune responses; and 5) Developing new methods for effective vaccine delivery in swine.

Notable recent accomplishments:

- Identified and characterized ASFV swine virulence and host range genes using genetic-based strategies. A number of pathobiologically significant viral genes, many of them novel and/or affecting macrophage host range, regulation of apoptosis, evasion of host immune responses and swine virulence, have been identified.

- Demonstrated the feasibility of using genetically engineered live attenuated ASF viruses as vaccines for homologous and geographically related heterologous virus strains. A live attenuated ASF vaccine will have immediate socio-economic benefit for areas of Africa where enzootic disease makes it impossible to raise swine while at the same time

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USAHA president, Bob Frost meets with Exotic Viral Diseases researchers. From left: Consuelo Carrillo, microbiologist; Edan Tulman, microbiologist; Guillermao Risatti, microbiologist; Dan Rock, research leader; Manuel Borca, microbiologist; Lazlo Zsak, microbiologist; Frost; and Claudio Afonso, microbiologist. March 2003

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reducing the global threat posed by ASF at the point source.

- Demonstrated importance of the humoral immune response in protective immunity to ASFV infection, including nonneutralizing antibodies that mediate a novel anti-viral mechanism, monocyte infection-inhibition (M-II).

- Identified an ASFV protein responsible for M-II related protection and potentially suitable for construction of second generation ASF subunit vaccines for emergency use in the



EVD Genomics Laboratory
Front to back: Consuelo Carrillo, Zhiqiang Lu and Abigail Carreno

developed world.

- Contributed novel concepts of viral virulence/host range, viral persistence and pathogen-swine host-vector interactions which are applicable to other viral pathogens of swine.

Research Team: C.L. Afonso, G.F. Kutish, J.G. Neilan, D.L. Rock, and L. Zsak; visiting scientists Gustavo Delhon, DVM, PhD, Richard French, DVM, PhD, and Maria-Elisa Piccone PhD; and support scientists Thomas Burrage PhD, Christina Gooch, Zhiqiang Lu, PhD, Kristin Zaffuto and Aniko Zsak.

Classical Swine Fever

Recent outbreaks of classical swine fever (CSF) in Europe and the Caribbean (1997-2001) have had devastating economic consequences for the countries involved. A similar scenario would be expected should the disease be introduced into the United States. Improvements in diagnostics and vaccines are needed. Rapid identification and diagnosis of CSF is critical for successfully controlling and eradicating the disease following introduction. Current CSF live attenuated vaccines are effica-

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An ASF Vaccine: Potential for Disease Control both Home and Abroad

African swine fever (ASF) poses a serious threat to the swine industry. It is a highly lethal disease with mortality rates approaching 100 percent. All domestic swine are highly susceptible to infection. There is a large natural reservoir of virus in nature. And, there is no available vaccine for ASF. Failure to generate a vaccine by traditional means has led to speculation that an effective vaccine is unattainable. The continued presence of ASF in many African nations is a constant threat to all domestic pig populations. A vaccine or other novel control strategy is needed to remove ASF as a threat to the swine industry worldwide.

Recent progress by the PIADC Exotic Viral Diseases research unit in understanding the genetic basis of ASFV virulence in the swine host has created opportunities for development of the first ASF vaccine. Functional genomics research has led to an understanding of the genetic basis of ASFV virulence in pigs. ASFV is genetically complex, containing over 160 genes. ASFV genes with important functions in swine virulence and host range have been

identified. Interestingly, a number of these genes have never been seen before in any virus and some of them are completely novel.

Engineered deletions of these genes resulted in mutant ASFV that were safely attenuated in domestic swine while inducing protective immunity not only to homologous virus, but also to geographically related heterologous viruses. Thus, for the first time safe live-attenuated ASFV vaccines with potential utility in regional endemic areas of Africa are available, reducing the threat to the United States at the point source.

For emergency use in the developed world, an ASF marked subunit vaccine is needed. Recent EVD progress has identified an ASFV protein linked with an antibody-mediated protective immune response in pigs. This, for the first time, opens the possibility of an effective ASF vaccine for emergency use in non-endemic regions.

Editor: We thank the PIADC EVD research unit for providing this information.



PIADC Exotic Viral Diseases Group, 2003
Front row, from left: Lauren Holinka, Guillermo Risatti, Kristan Zaffuto, Terika Spencer, Ariel Vagnozzi, and Claudio Afonso. Middle row: Abigail Carreno, Manuel Borca, Christina Gooch, Maria-Elsia Piccone, Mindy Barnett, Aniko Zsak, Consuelo Carrillo, Gustavo Delhon, and Gerald Kutish. Back row: Zhiqiang Lu, Corey Balinsky, Fred Brown, John Neilan, Laszlo Zsak, Dan Rock, Tom Burrage and Edan Tulman.

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cious; however, genetic changes associated with viral attenuation are poorly characterized and there is no way to distinguish vaccinated from naturally infected animals. Current research is directed at: 1) Developing rapid diagnostic tests for CSF; and 2) Rationally designing a marker live at-



Photo by PIADC

Lauren Holinka processing CSF research samples.

tenuated CSF vaccine.

Notable recent accomplishments:

- Developed and evaluated a sensitive and specific field-based real-time TaqMan RT-PCR assay capable of identifying CSFV infected animals up to five days prior to disease onset. The rapid, accurate and deployable nature of this test provides a new diagnostic tool that will redefine management and control strategies during CSF outbreaks.

- Identified and characterized CSFV genetic determinants associated with viral virulence and host range and demonstrated that viruses engineered with alterations in these determinants were capable of inducing a rapid protective immune response in pigs. This represents the first step toward rational design of improved marked live-attenuated CSF vaccines.

Research Team: M.V. Borca, G. F. Kutish and D. L. Rock; visiting scientist Guillermo Risatti, DVM, PhD; and support scientists Lauren Holinka and Z. Lu.

Advanced Animal Vaccines and Diagnostic Applications

New disease control strategies are needed to reduce the threat posed by high consequence FADs. Functional pathogen genomics offers an unprecedented opportunity for addressing this critical issue. High throughput pathogen genome sequencing together with

detailed genome analysis will provide improved tools for pathogen detection, disease diagnosis and epidemiological disease investigations, improved vaccines and therapeutics and in all likelihood, completely novel disease control strategies with increased efficacy and utility. Current research goals includes development of the following for high consequence FADs: 1) Methods for rapid strain identification and epidemiological investigations; 2) Rapid field diagnostic tests; 3) Improved vaccines, and 4) New strategies for efficient and effective disease control.

Notable recent accomplishments:

- Developed high-throughput protocols for rapidly sequencing whole

FAD virus genomes including foot-and-mouth disease virus (FMDV) and rinderpest virus. Large-scale comparative genomic analysis has permitted more comprehensive and informative epidemiological conclusions to be drawn regarding these viruses. Multiple phylogenetically relevant loci and genetic markers suitable for improved diagnostics and forensics have been identified.

- Developed and evaluated sensitive and specific field-based real-time TaqMan PCR assays for FMDV and ASFV.

- Sequenced and analyzed genomes of vaccine vectors of veterinary importance, identifying putative virulence and host range genes

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Comparative Genomics: Reading the Pathogen's Playbook

Modern comparative genomics is conducted on a scale far above that done previously, analyzing all genes in the system under study. This provides unprecedented insight into biological systems and how they operate.

Comparative genomic techniques are currently being used by the EVD group to unravel the complex nature of interactions between viral pathogens and their hosts.

Automated, high throughput DNA sequencing (HTS) in the EVD group can decode two million nucleotides a day. HTS, combined with bioinformatics tools, enables rapid deduction of complete sequences of large, complex viral genomes, revealing their complete coding capacity and providing ability to rapidly predict much biological function.

Recent HTS of ASFV and exotic poxviruses of high consequence revealed the presence of large numbers of genes potentially involved in immune modulation and apoptosis, indicative of novel roles in virus-host interaction. Knowing the complete set of pathogen genes also allows generation of more complex and sophisticated hypothesis regarding mechanisms of disease, such as the relative importance of different components within complex immu-

nological or cellular responses. This information provides a tremendous advantage in understanding how the virus operates in the host, and greatly enhances the ability to predict what viral and host factors and processes are key in development of novel control strategies.

In addition, the ability to sequence and compare multiple isolates of the same or closely related virus greatly enhances this predictive power. Comparative and large-scale genomic analysis of ASFV, exotic poxviruses, and foot-and-mouth disease virus reveal variation in genes very likely involved in variable virulence and host range phenotypes. These comparative genomic data are significant, as they allow rapid pinpointing of the most relevant features from complete genomes.

HTS and comparative genomics have allowed a shift from reductionist, gene-by-gene analysis to global and comparative, gene complement-oriented analysis. In doing so, genes and processes critical for disease are efficiently identified, indicating overall strategies for virus/host interaction and specific gene targets and processes that may be exploited for disease control.

Editor: We thank the PIADC EVD research unit for providing this information.

Virus-Host Cell Interactions: Keys to Understanding & Controlling Viral Diseases

Interactions between host cells and infecting viruses are complex, with many cellular genes and pathways influencing infection outcome. The EVD research group is currently employing functional genomics technologies to discover host genes and pathways relevant during viral infection, including global gene expression analysis and novel methods of mapping genes associated with host-cell resistance to infection.

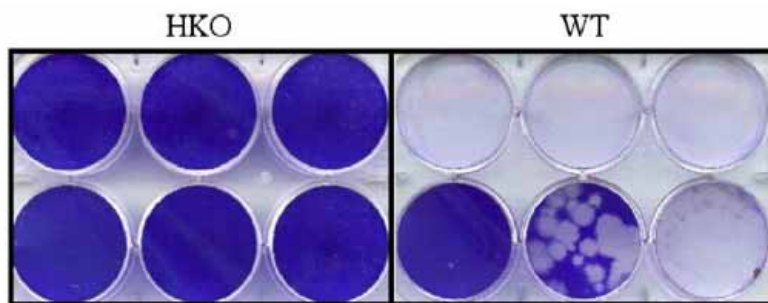
Current global gene expression analyses utilize DNA microarrays, essentially small glass slides with thousands of discrete spots of DNA, each representative of a host cell gene. Differential hybridization to these spots enables relative quantitation of gene expression among these thousands of genes simultaneously during different experimental conditions. The EVD group developed the first DNA microarray to represent cDNA sequences from swine macrophages, important immune and antigen presenting cells that also serve as the primary target cell during infection with many viruses.

Studies with ASFV have identified numerous macrophage genes with altered transcriptional response following infection, including those involved in inflammation, apoptosis, protein degradation and innate immune responses. Microarray studies using viruses engineered to lack specific genes criti-

cal for virulence and host range have enabled identification of the cellular pathways affected by these genes, notably innate interferon responses. The array will be a powerful tool for research in swine disease and basic cellular responses affecting host susceptibility and resistance.

Homozygous knock-out cells, a genetic tool for mapping cellular genes associated with resistance to viral infection is also being used in the EVD group to study virus-host cell interactions. Here, libraries of cells containing altered expression of a single cellular gene are screened for resistance to viral infection. Affected genes are characterized from resistant, surviving clones and lead to directed study of mechanisms of resistance. Cellular genes associated with resistance to ASFV and FMDV infection have been identified. Homozygous knock-out cells and DNA microarray methods are quickly revealing host mechanisms manipulated by viruses, those effective for controlling viral growth, and those critical for host resistance, likely impacting strategies for disease control and direction of animal genetic improvement programs (e.g., selection of resistant animals).

Editor: We thank the PIADC EVD research unit for providing this information.



Homozygous knock-out (HKO) cell cultures demonstrating resistance to FMDV infection. All viral dilutions fail to kill HKO cells as seen in wild-type (WT) cell cultures killed at similar virus concentrations (clear areas in wells).

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through comparative genomic analysis. Improved understanding of pathogen-host interactions will permit the engineering of novel vaccine viruses with enhanced efficacy and greater versatility.

Research Team: C.L. Afonso, M.V. Borca, Fred Brown, Gustavo Delhon, G. F. Kutish, and D. L. Rock; visiting scientists Consuelo Carillo DVM, PhD, Richard French, DVM, PhD, G. Risatti, and Ariel Vagnozzi, DVM; and support scientists Z. Lu, Corey Balinsky, Abigail Carreno, and Edan Tulman.

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lance emphasis is being redirected to include looking for CSF virus in sick pigs from high risk groups. Such surveillance is important for two reasons. First, it gives us confidence that we will identify infected animals sooner than if we were not looking. And second, from a trade standpoint, we can demonstrate active surveillance for the disease with laboratory data to back up our statement.

- Submitting specimens to FADDL: If an exotic disease is suspected. The USDA-APHIS-VS Area Veterinarian-In-Charge (AVIC) and Emergency Programs Staff is contacted to obtain the information necessary to submit samples for FAD testing, and to acquire the Investigation Control Number that must be included with the submission. Approval by a Regional Director or an Emergency Programs Staff member is required for shipment of any specimens originating from animals suspected of having an exotic disease.

Foreign Animal Disease Diagnosticians (FADDs) are strategically located throughout the United States to rapidly respond to any request. These diagnosticians are on call at all times, and are trained to investigate suspicious cases of exotic diseases of livestock and poultry in the field.

After the AVIC or State Veterinarian are notified by the producer of private practitioner an FADD is assigned to the case to visit the farm, take samples, and gather a complete history of the case. The FADD is responsible for the collection and ship-

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Photo by PIADC

Foreign Animal Disease Diagnostic Laboratory (FADDL) group at Plum Island

Front row, from left: Michael Haley, Chad Menard, Hernando Duque, Tammy Beckham. Second row, from left: Kimber Winter, Max Yeh, Gregory Mayr, Bill Cerino. Third row, from left: Samia Shawky, Joan Sawicki, Heather Lomaga, Karen Wickert, Jessica Dio, Brenda Donahue, Carolyn Sinopoli, Caludia Berry. Fourth row, from left: Mary Lou Berninger, Jeffrey Hayes, Barry Latney, and Gordon Ward.

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ment, including possible courier of specimens to a reference laboratory, such as FADDL, for assessment.

Each case is assigned a priority number (either one, two, or three) depending on the level of suspicion that this case is a real FAD, as assessed by the FADD, AVIC/State Veterinarian, Emergency Program staff, and NVLS laboratory staff.

Speed and efficiency in detecting, reporting, and diagnosing a newly introduced livestock or poultry disease are essential in preventing the disease from becoming established and wide-spread in the United States.

Priority 1: Specimens will be shipped to NVSL (either in Ames or Plum Island depending on which diseases are suspected) by the fastest possible means. This usually involves hand carrying the package by

the FADD on the first flight to an airport near the laboratory. The package is then moved to the laboratory as soon as possible, where the staff is waiting. For FADDL this often involves scheduling special ferry runs to the Island (any day, any time). Samples will be processed immediately, and staff will remain in the laboratory until all appropriate tests have been run. Results will be reported to the AVIC, State Veterinarian, Emergency Programs staff, and the Deputy Administrator of VS immediately.



Ming Deng

Priority 2: Specimens will be shipped to the laboratory by overnight Federal Express. Samples will be processed immediately, with the most important tests being setup before the staff departs the lab at the end of the day. Specimens arriving at the close of the workday will be processed the following day. Results will be reported as they are obtained.

Priority 3: Specimens will be shipped the same way the Priority 2 samples are shipped, and processed on a first come, first serve basis; as the work load allows. No overtime will be authorized for Priority 3 samples. A sample arriving at 4:00 PM on Friday will not be processed until the follow-

ing week.

Reagents and Vaccine Services Section

This section is headed by Ming Deng, D.V.M., Ph.D. The activities of this section are as follows.

- Preparing reagents for diagnostic testing by FADDL, and other international laboratories for exotic diseases.
- Maintaining a repository of exotic disease causing agents collected over the years from around the world.
- Developing and improving new diagnostic assays: Evaluate, develop, and improve diagnostic tests available for exotic livestock diseases. This allows the U.S. to keep in touch with what is being done around the world in FAD diagnosis, and for the purpose of making certain that we have the most appropriate tools available to us. For example, the FADDL works closely with researchers from the USDA's Agricultural Research Service (ARS) evaluating newly developed diagnostic technologies for use in FAD diagnosis.

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Diseases diagnosed at the Foreign Animal Disease Diagnostic Laboratory

- African Horsesickness
- African Swine Fever
- Aino
- Akabane
- Bluetongue
- Bovine Ephemeral Fever
- Bovine Herpesvirus Mammillitis
- Calicivirus
- Classical Swine Fever
- Contagious Agalactia
- Contagious Bovine Pleuropneumonia
- Contagious Caprine Pleuropneumonia
- Epizootic Hemorrhagic Disease
- Foot-and-Mouth Disease
- Getah
- Heartwater
- Ibaraki
- Japanese Encephalitis B
- Jembrana
- Lumpy Skin Disease
- Malignant Catarrhal Fever
- Nairobi Sheep Disease
- Pestes des Petits Ruminants
- Rift Valley Fever
- Rinderpest
- Sheep and Goat Pox
- Swine Vesicular Disease
- Trypanosomiasis
- Vesicular Stomatitis
- Viral Hemorrhagic Disease of Rabbits
- Viral identification



Photo by R. H. McCapes

USAHA president Bob Frost (left) and AAVLD president, Terry McElwain (right) meet with Thomas McKenna, Chief of FADDL and Assistant Director, PIADC. March 2003.

6th Edition of "Foreign Animal Diseases" published by the United States Animal Health Association

The following are excerpts from Dr. Lonnie King's review of the 6th and latest edition (1998) of **Foreign Animal Diseases**. Dr. King is Dean of the College of Veterinary Medicine, Michigan State University, and former Administrator of USDA's Animal and Plant Health Inspection Service.

"The United States Animal Health Association has published a new edition of **Foreign Animal Diseases**. This 6th edition has a revised format, a new glossary and an excellent set of colored photographs of lesions, vectors, and clinical signatures of foreign animal diseases (FAD).

"The text is especially well done and successfully blends together essential scientific components of FAD with a practical guide that describes the diagnosis, transmission, prevention, control and eradication features of 40 potentially devastating FAD.

"The new edition clearly and succinctly discusses and describes: etiology, host range, transmission, pathogenesis, vaccination policies, clinical findings and pathognomonic lesions, potential outcomes, public health consequences, and control and eradication strategies. The book's format

is user-friendly and with the colored photographs, **Foreign Animal Diseases** is an easily accessible and immensely useful reference."

"... Because FAD may involve companion animals, horses, wildlife, zoo animals, humans since some are zoonotic, in addition to our livestock and poultry populations, I strongly believe this text should be part of every veterinarian's library next to our medical and surgery books.

"It is not if we will have another FAD outbreak, but rather when; it is our professional responsibility to be prepared and understand our roles and obligations. **Foreign Animal Diseases** is an essential reference for all private and public practitioners and should be fundamental to our intellectual and diagnostic armamentarium and ingrained in our veterinary conscience.

"The USAHA and the many contributors that put the 1998 edition of **Foreign Animal Diseases** together are to be congratulated. I am impressed with this unique, concise and easily useable book and sincerely believe that it is a "must" for all veterinarians and food-animal producers."

To Obtain— The 6th edition of **Foreign Animal Diseases** is 460 pages of text plus 128 color photographs. It is available as a hard copy book for sale or electronically, either online or as a PDF file that can be downloaded, free of charge. To order 1-100 hardcopies, please send a check to USAHA, PO Box K277, Richmond, VA 23288. Cost is \$15 per copy including shipping and handling in the United States. To access electronically, go to the USAHA webpage (www.usaha.org) and click on "Foreign Animal Diseases" or "The Grey Book Online." For more information, contact USAHA at: telephone (804) 285-3210; fax (804) 285-3367; email usaha@usaha.org; webpage www.usaha.org

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• Validation of new diagnostic tests: New diagnostic tests require extensive validation to certify their accuracy in order that the test results can be correctly interpreted. This requires running the tests on many samples of known history (i.e., positive, negative, or positive for another disease caused by a similar agent) and comparing the results of the new tests to the results of accepted "gold standard" tests. A major validation effort is currently underway for the recently developed rapid, or real-time, PCR tests for the detection of several exotic disease agents. These tests need to be validated using samples collected from infected animals in countries where the diseases are endemic. The PIADC houses the only laboratory in the U.S. where this testing can be done. In addition, a portion of the validation testing is performed in laboratories in the countries where the samples originated, allowing for a transfer of this new technology to other international labs.

• Housing the North American Foot-and-Mouth Disease Vaccine Bank (NAFMDVB)— The NAFMDVB is a collaboration among Canada, Mexico, and the United States which provides Vaccine Antigen Concentrate (VAC) for many of the different strains of foot-and-mouth disease virus (FMDV). These VACs are manufactured by commercial vaccines companies, and then are stored, and evaluated at PIADC under the supervision of the Bank Manager, Hernando Duque, D.V.M., Ph.D. In the event of an FMD outbreak in any of the three participating countries the appropriate VAC could



Veterinarians attending foreign animal disease training course at the Foreign Animal Disease Diagnostic Laboratory, Plum Island, NY

be formulated into vaccine in a short time if the decision to vaccinate were made by the regulatory authorities. Fully manufactured vaccines are not stored because of their short shelf life, while the VACs are stable for years when stored properly. The NAFMDVB adds new VACs as important strains of FMDV are identified by a Technical Committee composed of experts from the three countries.

Foreign Animal Disease Training

FADDL has an active training program which centers on hosting the FAD schools. Approximately 30-35 veterinarians (usually Federal, State, or Military employees) per class attend courses in the recognition and diagnosis of FADs. Two to four of these courses are held per year at the PIADC; however other sites can be involved in certain aspects of the training that do not involve the demonstration of FAD agents.

The goal of this training is to develop and maintain a critical core of veterinarians in the country able to recognize and react to FAD outbreaks in as short a time as possible. In addition, graduates of the two-week class become the FADDs who are responsible for leading the "on farm"

FADDL staff also acts as subject matter experts in foreign animal disease and control. They travel to give lectures and presentations on exotic livestock diseases to veterinary schools, practitioner groups, and other forums where exotic livestock disease is of interest; participate on VS teams that evaluate potential trading partners' applications for "disease-free" status so that trade can become established between the U.S. and the applying country; and offer technical expertise to other countries in the areas of diagnosis and control of FADs.

The diseases most often of concern with respect to introduction into the U.S. include: FMD, vesicular stomatitis (VSV), swine vesicular disease (SVD), classical swine fever (CSF), African swine fever (ASF), contagious bovine pleuropneumonia (CBPP), and rin-

APHIS diagnostics at PIADC
from page 18

derpest. The techniques used to look for the agent or antibodies to the agent in the samples submitted to FADDL range from traditional techniques like agarose gel immunodiffusion and complement fixation to immunohistochemistry, ELISA, and PCR. Training in the diagnosis of these diseases is available on a case-by-case basis for a fee, and can be arranged through Joan Sawicki at (631) 323-3256.

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from page 1

the United States Animal Health Association (USAHA) and Dr. Terry McElwain, president of the American Association of Veterinary Laboratory Diagnosticians (AAVLD). Bob Frost's "President's Corner" article on page 2 includes his observations pertaining to the PIADC as well as other issues.

The purpose of our visit to Plum Island was to obtain an update on the status of the PIADC program for a special edition of the "USAHA" newsletter. This is a follow-up to the special edition published in June 2001 (Vol. 28, No. 2) that focused on USDA's Ames, Iowa laboratories, including the National Animal Disease Center (NADC), the National Veterinary Services Laboratories (NVSL), and the Center for Veterinary Biologics (CVB). Bob Frost and I spent five days and Terry McElwain two days.

PIADC transferred to DHS

On June 1, 2003, Plum Island and the PIADC facilities were transferred from the USDA to the newly formed U.S. Department of Homeland Security (DHS), while the scientific staff at the PIADC remain with the USDA. The PIADC is part of the DHS Directorate of Science and Technology (see "What is the Directorate of Science and Technology?" on page 30).

Marc Hollander, Center Director of the PIADC and Gerry Parker discuss the transfer and how the PIADC fits into the mission of the new department (see articles, page 3).

We thank PIADC scientists, staff and management personnel from



Photo by R. H. McCapes

Bob Frost, president of USAHA (fourth from left, upper left side of table), and Terry McElwain, AAVLD president (to the right of Frost at far end of table), meet with management and research unit leaders at the Plum Island Animal Disease Center (PIADC), March 2003. From center of the bottom of the table, clockwise: Dennis Foley, then Contracting Officer; Charles Wenderoth, Facility Engineer; Douglas Moore, Center Safety and Environmental Officer; Jeffrey Hayes, Foreign Animal Disease Diagnostic Laboratory; Frost; McElwain; Carlos Santoyo, then Assistant Director for Management; Joseph Cuciti, Physical Security Specialist; David Huxsoll, then Center Director; Luis Rodriguez, Foot-and-Mouth Disease Research Unit; and Thomas Sawicki, Biological Safety Officer. Not shown: Daniel Rock, Exotic Viral Diseases Research Unit.

both the USDA and DHS for their cooperation and contributions to this special edition. PIADC personnel provided many of the articles and photographs.

Observations

The visit revealed to me a cadre of dedicated individuals (scientists, support staff and management personnel) at the PIADC working hard and successfully in the discovery of answers to incredibly complex scien-

tific questions about FAD agents and strategies for their prevention and control. PIADC research and diagnostic scientists describe their unit goals and summarize recent advancements in articles beginning on pages 6 and 7.

The visit also revealed to me a startling and prolonged underfunding of the PIADC FAD program and obsolescence of laboratory and animal resource facilities.

A substantial increase in PIADC science and operations funding in concert with continued modernization of laboratory and animal resource facilities is, in my opinion, essential for the security of the nation's livestock populations, the agricultural economy, and the protection of our food supply.

Equally important is a timely decision how to effectively integrate the PIADC FAD mission operationally and physically, in the long-term, with newly emerging national disease research and diagnostic capabilities, programs and facilities on the mainland.

Terry McElwain describes one of the newly emerging programs, the National Animal Health Laboratory Network, in his article on page 3.

Dr. Bennie Osburn, incoming president of the Association of American Veterinary Medical Colleges (AAVMC), addresses the need for integration of our nation's animal and

Table 1
Selected daily animal populations living in the United States: Estimate circa 2002

| Daily populations | |
|-------------------|-------------|
| Cattle-1 | 96,704,000 |
| Pigs-1 | 59,804,000 |
| Sheep-1 | 6,685,000 |
| Angora goats-1 | 302,000 |
| Horses-2 | 6,900,000 |
| Deer, WT (wild)-3 | 27,400,000 |
| Elk (wild)-3 | 1,400,000 |
| Total daily pop. | 199,195,000 |

1 "Agricultural Statistics 2003," USDA, NASS, Tables 7-1, 7-81
 2 "The Economic Impact of the Horse Industry in the United States," 1999, American Horse Council.
 3 Southeastern Cooperative Wildlife Disease Study (SCWDS), private correspondence, (2001)



Photo by R. H. McCapes

Twenty three young Holsteins—of the 9,000,000* dairy cows living in the United States each day—enjoy a relaxing meal on spring-time pasture in the Northern California coastal area. (* see Fig. 5, page 25).

Plum Island critical to U.S. from page 19

human health resources. He summarizes disease threats and opportunities facing us today and calls for the USAHA and AAVMC to form a partnership to mobilize the nation into a new approach to animal-related infectious disease problems. His article, “Modernizing America’s Animal Health and Food Safety/Security System” begins on page 1.

Large daily-populations of animals depend on PIADC programs

A selected daily-population of 200 million animals living in the United States depends on the PIADC research and diagnostic program to advance the science and technology necessary to improve prevention and control strate-

gies against the ravages of FAD outbreaks.

This daily-population includes 97 million cattle (beef and dairy), 60 million pigs, 7 million sheep and goats, 7 million horses, and 29 million wild, white-tailed deer and elk living in the United States (see table 1, page 19). Maintaining the health of this population is important to the well being of the country.

In economic terms, the 2001 farm cash-receipts for meat animals and dairy products alone was \$78 billion. For all products of animal origin, farm receipts were \$106 billion, or about 50 percent of total farm cash receipts (see table 2).

The nation’s agricultural crop producers also benefit from and are dependent on our stewardship of animal populations. Approximately \$23 billion of the cash receipts generated by plant agriculture in 2001 was from the production of crops used for animal feed.

The value of goods and services produced by the horse industry was estimated at \$25 billion in a 1996 study commissioned by the American Horse



Photo by D. Gregg

Drs. Terry McElwain, AAVLD president, and Jeffrey Hayes, FADDL veterinary pathologist, examine foot-and-mouth disease lesions on tongue. Holstein inoculated with FMDV as part of ongoing vaccine evaluations, inside animal room of PIADC Building 101, March 2003.

Table 2

Cash receipts from farming in the United States: 2001*

| (millions of dollars) | Receipts | Total | % |
|-----------------------------------|----------|----------------|------------|
| Meat animals | 53,289 | | |
| Dairy products | 24,695 | | |
| Poultry & eggs | 24,577 | | |
| Other | 3,870 | | |
| Total animal origin** | | 106,431 | 52 |
| Food grains | 6,595 | | |
| Feed crops | 23,245 | | |
| Cotton | 4,954 | | |
| Tobacco | 1,880 | | |
| Oil-bearing crops | 14,317 | | |
| Vegetables & melons | 15,512 | | |
| Fruits & tree nuts | 11,742 | | |
| Other | 18,172 | | |
| Total plant origin** | | 96,418 | 48 |
| Total animal & plant** | | 202,849 | 100 |
| Government payments | | 20,727 | |
| Total cash receipts | | 223,576 | |

* Agricultural Outlook tables, July 2003, USDA, ERS

webpage, Table 33.

** Commodity sales

Council entitled “The Economic Impact of the Horse Industry in the United States,” Vol. 1: National Summary” by the Barents Group LLC.

Warning signs

The economic and personal devastation resulting from the recent, widespread foot-and-mouth disease (FMD) outbreak in United Kingdom (UK) livestock is a grim wake-up call for the United States to make absolutely certain the PIADC FAD research and diagnostic mission is fully funded and carried out in state-of-the-art facilities.

Dr. Pamela Hullinger’s article on page 2 relates her first-hand experiences and observations as a participant in the UK FMD eradication program during 2001, a program that necessitated the slaughter of over 4 million animals or roughly 8 percent of the cattle, swine and sheep inventories, affecting more than 9,000 farms. The cost to the UK was estimated to be between 0.3 percent to 0.8 percent

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from page 20

of its gross domestic product, or approximately \$3.6 to \$11.6 billion.^{1,2}

Some PIADC statistics

At the time of our March, 2003 visit, there were 180 employees supporting the PIADC program including: 75 USDA scientific personnel, 20 USDA support personnel, and 85 employees of the private contractor firm handling operations and maintenance.

There are some 15 buildings supporting the PIADC programs, for an estimated total of about 309,000 square feet of space. Two buildings house the offices, laboratories and animal resources for administration and the scientific program.

Building 100, a two-story structure estimated at about 52,000 square feet, provides office space for administration and support services and a small footage of BSL-2 laboratory space (see photo, page 8).

Building 101, a three-story structure estimated at about 189,000 square feet, provides primarily BSL-3 and some BSL-3Ag laboratory and animal resources for the PIADC research and diagnostic programs. The PIADC refers to the BSL-3 space as "BSL-3 enhanced" because the building exceeds BSL-3 requirements, but does not meet all the requirements of BSL-3Ag. The operation procedures utilized throughout Building 101 are those required for BSL-3Ag structures (see Laboratory Biosafety Levels, page 7).

Prolonged under-funding of PIADC programs

The Plum Island science program

experienced, in my opinion, relentless under-funding for much of the 1990s—and perhaps earlier. Combined dollar allocations for science and indirect costs (operations) remained generally flat over this period, while the costs of goods and services as measured by the Consumer Price Index relentlessly increased.

The stark reality facing the PIADC during this period of decreased purchasing power was the necessity to keep the lights on, so to speak; maintain a safe and secure operation; and, in view of decreasing dollars, determine the scope of the science program

One result, it seems to me, has been a starving or hollowing-out, as it were, of the full potential of nation's primary foreign animal disease research and diagnostic program.

Although increased budget allocations have occurred the last couple of years, mitigation of the erosion of the science program has not occurred. In my view, substantial and sustained increased funding is required to realize the full potential of the PIADC.

Marc Hollander discusses DHS' review of PIADC funding as well as facility needs in his article on page 3.

PIADC laboratory obsolescence

There has been continuous maintenance, repair, upgrading, and new construction of PIADC laboratory and infrastructure facilities since 1954, when USDA took over the island. (see "A Partial History of Plum Island: Including laboratory modernization," page 5). However, Building 101, which was built in 1956 and houses the laboratory and animal resource facilities, has reached a state of obsolescence that cannot be addressed effectively by further upgrading.

A summary of the PIADC Modernization Program conclusions regarding Building 101 included the following:

- Renovation of the existing laboratory and animal room facilities (Building 101) is more expensive than construction of new facilities. (words in parenthesis added by editor)
- Renovation would have to be phased in order not to interfere with the science mission.

Page 22, Col. 1



Charles Wenderoth, PIADC Facilities Engineer, briefs USAHA president Robert Frost on construction of new power plant during a review of PIADC facilities, March 2003.

Osprey (*Pandion haliaetus*)

Nearly cosmopolitan in range with a 41/2' to 6' wingspan, the osprey flies with a distinctive crook in its wings and hovers at 100' to 150' on beating wings before plunging into water, sometimes submerging, for fish, its most sought after prey.

Over recent years on Plum Island, ospreys have been provided tall pole-platforms (over two dozen) around the perimeter of the island. The ospreys, in turn, have constructed a bulky mass of sticks for a nest on top of every pole.

The osprey population in North America had been on a dramatic decline since the 1950s



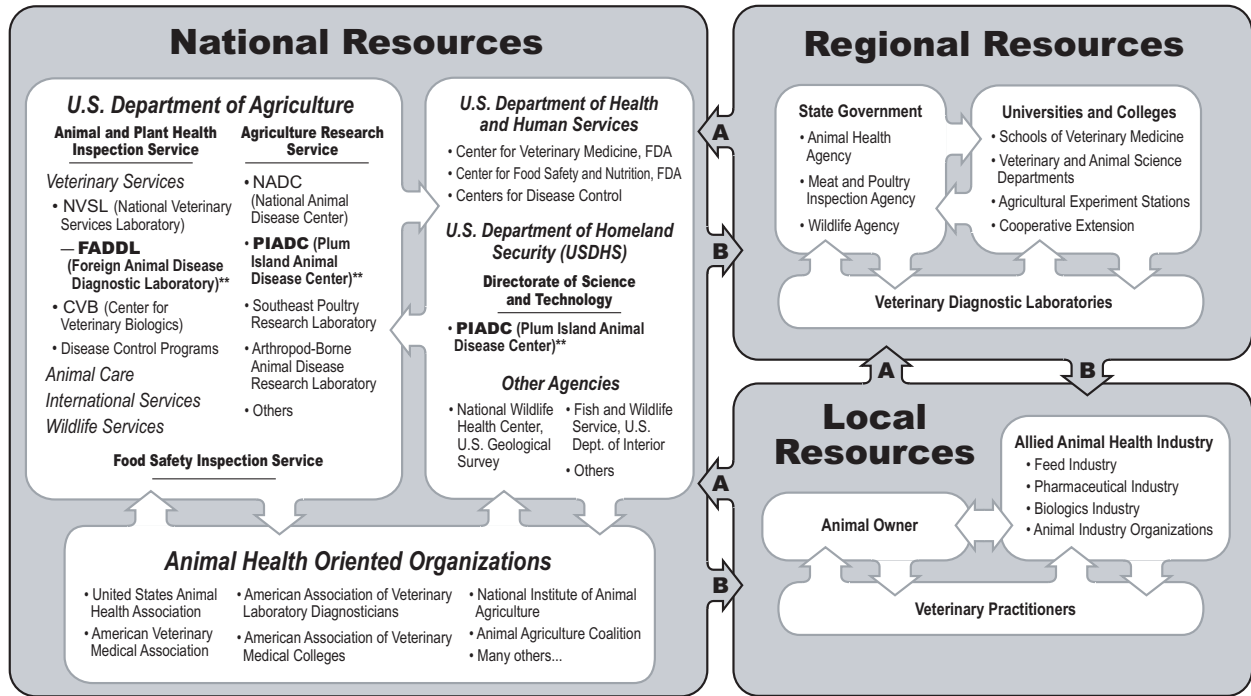
Osprey photo provided by PIADC. Charles Wenderoth, PIADC facility engineer in foreground of one of Plum Island's osprey nesting poles (photo by R. McCapes).

However, in recent years the osprey population has been steadily increasing nationwide. The pole-platforms provided for nesting sites are the main reason for the dramatic rise in osprey numbers on Plum Island.

On a tour around the island in May or June one may see the look-alike adults tending one to four young at every pole nest site. In March every year the sighting of ospreys returning for summer nesting is big news in New York and on Plum Island.

Figure 1

Delivering Health Care to the Nation's Vast Animal Population*



Activity A = Case referrals-Surveillance-Cooperative Programs-Research

Activity B = Referral services-Research-Surveillance-Cooperative & Regulatory Programs-Standards-Certification-Licensing

* Daily number of selected animals living in the U.S. estimated at 1.7 billion plus. See Table #1, USAHA newsletter, Vol. 28, No. 2, June 2001.

** USDHS owns and manages the PIADC facilities housing USDA's ARS, PIADC research and APHIS, FADDL diagnostic programs.

R. McCapes 8/03
R. Hayes

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- Phasing of project would take more than 15 years.
- New facilities to meet BSL-3Ag standards.

The PIADC Facilities Modernization Committee also identified the need to have a large animal BSL-4 facility, since there are none in the United States. A BSL-4 facility would be used to study existing and newly emerging animal diseases, which have the potential or are known to be infectious to humans.

USDA retained a private firm to prepare a strategic facility and utility investigative report on renovation versus expansion of Building 101. The final report, issued in 2001, concluded that renovation of existing laboratories and animal rooms should not be pursued. Rather, new facilities to replace Building 101 should be constructed in the open field in front of Building 100 (see photo on page 8). This would allow continued occupation of Building 101 laboratories and animal resources during construction of the new facilities. Demolition of Building 101 could proceed when new construction is completed.

The report concluded that construction of the new facilities, which would include BSL-3Ag laboratory and animal rooms, could be phased over a four-year period at a cost of \$216 million. The mission of the PIADC would not be interrupted and construction of state-of-the-art facilities could be rapidly completed in four years.

It is my understanding that additional funds and time

would be required for facility design. The report included discussion of BSL-4 facilities.

A DHS webpage fact-sheet (downloaded August 21) describes the PIADC transition and states “DHS has no plans in the near or long-term for a BSL-4 facility.”

1999 USDA facilities task force cites PIADC needs

The 1999 USDA “Report of the Strategic Planning Task Force on USDA Research Facilities: A 10-year strategic plan” included a review, requested by the Secretary, of the four bio-containment animal disease research facilities operated by the Agriculture Research Service. The PIADC was one of the four facilities reviewed.

Public Law 104-127, April 1996, Subtitle D, Section 884, authorized the task force.

Excerpts of Principle 12 of the task force report states:

- “Bio-containment facilities for conducting research on high-risk, exotic (foreign), and invasive animal and plant pathogens and pests are



Photo by R. H. McCapes

Tom Sawicki, PIADC Biological Safety Officer, describes air-flow control within BL-3 containment space of Building #101 to AAVLD president Terry McElwain.

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from page 22

imperative to the safety of workers and for protecting the environment and productivity of domestic populations.

- *“Animal health research, including research on foreign animal diseases and human/animal (trans-species) interactions, is and will continue to be a high priority for the future. Bio-containment facilities capable of operating at Level 3 and Level 4 are required for research for pathogens of highest risk. The ARS currently operates 4 bio-containment facilities for animal diseases, each of which is in severe need of renovation to maintain human and animal health security.*

- *“... Since many existing ARS facilities are aged, they do not provide an adequate platform for seriously addressing these future needs, and they might now seriously compromise U.S. livestock agriculture.*

The task force recommendations

included:

- *“The ARS, in cooperation with the Animal and Plant Health Inspection Service (APHIS), must immediately develop and implement plans for state-of-the-art animal health veterinary services and bio-containment facilities.”*

- *“The ARS must consider upgrading current Level 2 and Level 3 bio-containment units for animals and constructing a Level 4 unit.”*

- *“The ARS should quickly resolve the need for maintaining its primary foreign animal research unit on an island off the mainland and, if needed, utilize it more fully with other high-security research and development programs.” (see “Act of April 24, 1948,” page 31)*

- *“Federal animal bio-containment facilities, to the extent possible, should be consolidated into one or two sites.”*

Providing health care to the nation’s animal populations

Since the founding of our country,

animals have and continue to play an important role in our lives in terms of food, companionship, recreation, work and stewardship of nature. Maintaining the health of these vast populations is important to our way of life, economy and to public health.

Over the decades, we have developed an effective animal health care delivery system in the United States, which is graphically depicted in figure 2, page 22.

The successful delivery of quality health care to animals is dependent on a myriad of cooperative programs and the flow of information and services between and among independent, local, regional and national resources.

Local animal health resources are largely private-sector enterprises, whereas regional and national resources are largely public-sector institutions and agencies at the state and national levels.

Generally speaking, local resources deliver health care to privately owned animals, whereas regional and national resources provide health care for publicly owned animals and wild-life. All use the resources of the allied animal health industry.

Regional and national resources provide additional capabilities vital to delivery of effective health care for all animals, including:

- Animal disease research and diagnostic support services.
- Regulation of animal biologics, drugs and safety of foods of animal origin.
- Leadership, resources and legal authorities for cooperative regulatory disease control and care programs that protect our animal populations and facilitate interstate and international shipment of animals and animal products.

Paramount in this leadership responsibility is the development and implementation of our nation’s plan for prevention of, preparedness for, response to, and recovery from outbreaks of foreign animal diseases. (see 6th Edition of Foreign Animal Disease., page 18). The PIADC research and diagnostic program is central to our FAD preparedness and response.

Developing a national consensus among local, regional and national resources on uniform methods to solve certain animal health problems is crit-



Photos by PIADC
The mission of the PIADC revolves around ocean transport: (Clockwise from top): PIADC researchers and support staff debark PIADC boat; underway to Plum Island; courier debarks with PIADC samples; and pigs being loaded at PIADC harbor.

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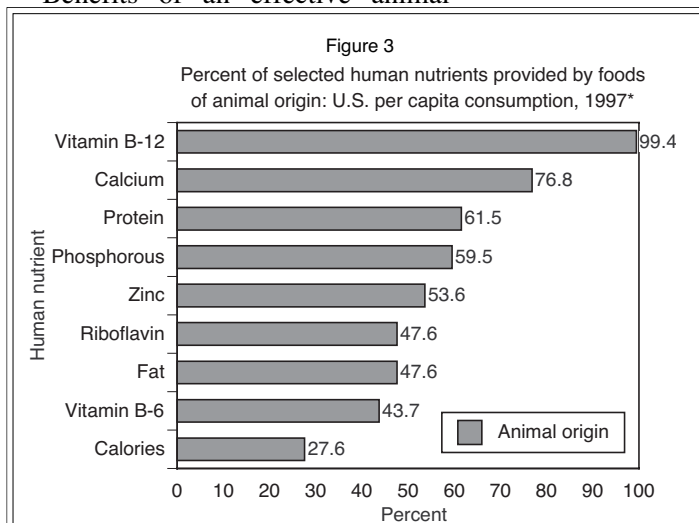
ically important to the effectiveness of our animal health-care delivery system. This can only be accomplished by providing a permanent, dynamic, science-based forum for interested parties at all levels in the private and public sector to discuss and develop solutions to animal health problems.

The United States Animal Health Association has served as the nation's science-based, animal health forum for this very purpose since 1897. (see "What is the USAHA?," page 32)

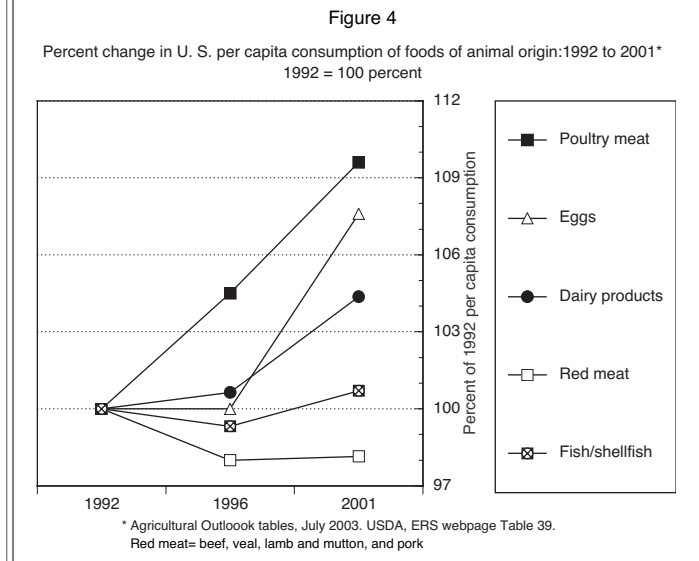
Other national organizations, such as the the American Veterinary Medical Association, Association of American Veterinary Medical Colleges, and the National Institute of Animal Agriculture, have provided a similar, though somewhat different, forum for many years.

Benefits

Benefits of an effective animal



* USDA Center for Nutrition Policy & Promotion, webpage (www.usda.gov/cnpp), Nutrient Content of U.S. Food Supply, Food Supply Database query, 5/1/01



* Agricultural Outlook tables, July 2003. USDA, ERS webpage Table 39. Red meat= beef, veal, lamb and mutton, and pork

health care system include:

- **Economic**– Maintaining the nation's diverse animal populations to meet domestic and international need is a large enterprise in the United States and contributes significantly to the nation's economy. Good health of our animals is central to the productivity and economic viability of this enterprise.

- **Food, nutrition and personal freedom**– Foods of animal origin are a major part of Americans' diet and nutrition. Maintaining good animal health is central to providing plentiful, high quality foods at low cost to the consumer.

Americans enjoy the lowest expenditure for food consumed at home as a percent of total personal consumption expenditures in compared countries³, thus freeing up individual financial resources and priceless time for many citizens to pursue personal interests.

- **Public health**–

The prevention and control of zoonotic diseases (diseases of animals that are transmissible to man) in animals, such as rabies, tuberculosis, brucellosis, west Nile virus, bovine spongiform encephalopathy, E. coli, and salmonella, is important to the health of Americans.

- **Environmental health**– Assuring the safety of foods of animal origin contributes to a safer environment for humans, similar to efforts to assure safe water supplies and sanitary sewage disposal. Animals can serve as important sentinels of the environment and monitoring animals and animal products for microbial and chemical agents provides valuable medical intelligence.

- **Mental health**

| | Pounds |
|----------------|--------|
| Red meats | 111.3 |
| Poultry meat | 66.2 |
| Fish/shellfish | 14.7 |
| Eggs | 32.4 |
| Dairy products | 587.2 |

* Agricultural Outlook tables, July 2003, USDA, ERS webpage Table 39.
Red meat= beef, veal, lamb and mutton, and pork

and humane needs– Animals play an important role in the life of many citizens. The humane treatment and responsible stewardship of our vast animal populations, including the provision of good health care, is important to the nation.

American agriculture's unprecedented productivity over the decades has been a key factor in the lowest cost-of-food advantage we, as citizens, enjoy every day.

Foods of animal origin in the American diet

Foods of animal origin–red meat, poultry meat, dairy products, eggs and fish–are a major choice for Americans and provide us with a wide variety of nutrients, including 28 percent of the calories, 62 percent of the protein, 48 percent of the fat, 77 percent of the calcium, 60 percent of the phosphorous and 99.4 percent of the vitamin B-12 in our diet (see figure 3).

The trend in the United States for consumption of foods of animal origin remains strong. In 2001, per capita consumption of poultry meat was 110 percent of that consumed in 1992, table eggs 108 percent, dairy products 104 percent, red meat 98 percent, and fish 101 percent (see figure 4, and table 3).

Therefore, maintaining a plentiful and efficient supply of foods of animal origin is a vital national goal, and protecting the health of our livestock and poultry populations is a strategy of highest national priority in the attainment of this goal.

World trade & international laboratory standards

The United States is an active par-

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from page 24

Participant in foreign agricultural trade markets and in 2001 exported some \$53 billion of agricultural products, and imported \$39 billion for a net positive trade balance of \$14 billion (see table 4).

Exports of products of animal origin were \$12 billion and imports \$9 billion for a net positive trade balance of \$3 billion.

In order to maintain access to foreign markets, our livestock and poultry populations must remain healthy and free from disruptive domestic and foreign animal diseases; and we, as a nation, must be able to certify their health status according to accepted standards.

Besides the ever-present threat of disruptive disease, the emergence of the necessity for accreditation of laboratories according to accepted international standards may present future roadblocks to trade.

If our laboratories do not meet in-

ternational accreditation standards, other countries can deny the importation of our animals and animal products because of our inability to prove that they are free from disease.

U.S. ranking in the world

In terms of the size of mammalian livestock populations, the United States ranks fourth in the world in number of cattle and buffalo (after India, Brazil and China), third in hogs (after China and the EU) and fifth in milk cows (after India, the EU, Brazil and Russia), (see figure 5).

The United States ranks third in the world in the production of red meat (after China and the EU), and second in milk (after the EU). (see figure 6)

America, then, maintains huge livestock populations of unparalleled productivity in relation to the rest of the world. Protecting the health of these animals is in our national interest and it is a big job. The PIADC and FADDL are critical components of our animal health delivery system dedicated to providing this protection.

1 Countering Agriculture Bioterrorism, National Research Council Committee on Biological Threats to Agricultural Plants and Animals, Washington, DC, 2002.

2 Animal Disease Risk Assessment, Prevent, and Control Act of 2001 (PL 107-9) Final Report, prepared by the PL 107-9 Federal Inter-agency Working Group, Washington, DC, January 2003, pages 9-12 and Appendix 6-3 to 6-4.

3 Food, Consumption, Prices, and Expenditures, 1970-97. Putman, J. J., J. E. Allshouse. ERS, USDA, Statistical Bulletin No. 965.

U.S. Foreign Trade: Agricultural versus non-agricultural, 2001*

Table 4

| (billions of dollars) | Exports | Imports | Balance |
|---------------------------------------|-------------|------------|------------|
| Agricultural-animal origin | 12.2 | 9.0 | 3.2 |
| Agricultural-plant origin | 40.5 | 30.0 | 10.5 |
| Total agricultural | 52.7 | 39.0 | 13.7 |
| Total non-agricultural | 637.3 | 1,113.6 | -476.3 |
| Total agricultural & non-agricultural | 690.0 | 1,152.6 | -462.6 |

* "Agricultural Statistics 2003," USDA, NASS, Tables 15-1, 15-4,15-5; exports = domestic exports; imports = imports for consumption.

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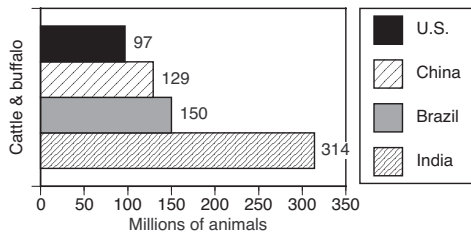
This special edition of the USAHA newsletter will be available for downloading as a Portable Document Format (PDF) file on the USAHA webpage (www.usaha.org).

• Screen-optimized: This is the smallest size PDF file and is suitable for display on the World Wide Web, or for distribution through email for on-screen viewing.

PDF files retain the exact look and feel of the newsletter. To view this file, you must have the application, Acrobat Reader Version 5.0 or later, installed on your computer. Acrobat Reader is available free from the Adobe Systems webpage (www.adobe.com).

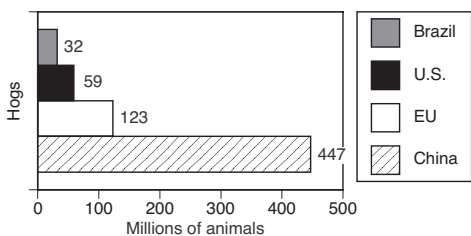
Figure 5

Top four countries with largest daily populations of cattle and buffalo: circa 2001



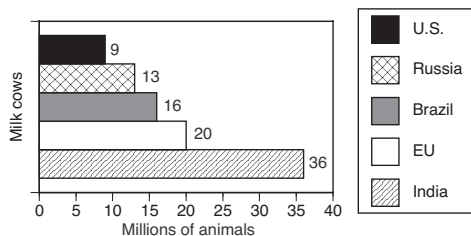
"Agric. Statistics 2003," USDA, NASS, Table 7-5, selected countries.

Top four countries with largest daily populations of hogs: circa 2001



"Agric. Statistics 2003," USDA, NASS, Table 7-29, selected countries.

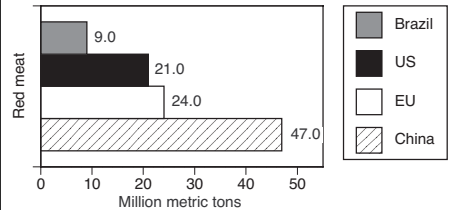
Top five countries with largest daily populations of milk cows: circa 2001



"Agric. Statistics 2003," USDA, NASS, Table 8-14, selected countries.

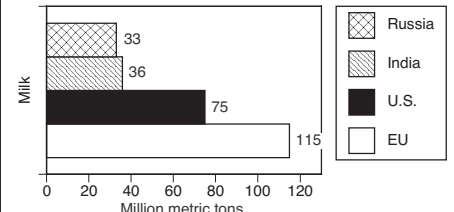
Figure 6

Top four countries with largest annual production of red meat: circa 2001*



"Agricultural Statistics 2003," USDA, NASS, Table 7-67, selected countries; beef, veal, pork, lamb, goat. * Preliminary

Top four countries with largest annual production of milk: 2001



"Agricultural Statistics 2003," USDA, NASS, Table 8-14, selected countries.

History of Plum Island

from page 5

cility was officially deactivated, without ever having been used as the new laboratory facilities.

1954: Plum Island turned over to USDA

After the eradication of foot-and-mouth disease (FMD) from the United States in 1929, there were no facilities in the country with the authority or the ability to work with this highly contagious virus.

An outbreak of FMD in Mexico in December 1946 created the sense of emergency that prompted the Congress to authorize the Department of Agriculture's Bureau of Animal Industry to construct a facility on an offshore location to study this disease (see Act of April 24, 1948, page 31). It took another outbreak of FMD, this time in Canada in 1952, for Congress to appropriate the necessary funds for the new laboratory.

The USDA was designated to receive the transfer of Plum Island in 1952, about the time when the Chemical Corps was initiating the laboratory building process. Planning for an entirely new research laboratory to be built on Plum Island by the USDA began in 1953, and it was contracted out in 1954.

On July 1, 1954, just as the construction of the new laboratory Building 101^k (see photos, pages 5 and 8) was taking place, the Army officially transferred the property of Plum Island to USDA. At this time, the Bureau of Animal Industry's scientists were already working in Building 257. The new Animal Disease Laboratory Building 101 compound was dedicated on September 26, 1956. All of the 18 Fort Terry buildings renovated by the Chemical Corps were occupied by the new Plum Island Animal Disease Center (PIADC).

1977-1997: Modernization at Plum Island

Plans for the modernization of PIADC facilities began in 1977 with a

master plan that recommended the construction of new facilities to house most of the functions being located in the Fort Terry post buildings and batteries.

A series of events that included construction of new animal supply facilities, a decrease in the need for large laboratory animals, and an outbreak of FMD on Plum Island in 1978, led to the abandonment of the large animal holding facilities in the gun batteries.

Expansions of laboratory Buildings 101 and 257, initiated in 1977, were halted in 1979 due to irregularities in the construction contract.

In 1984, the diagnostic and training missions of the PIADC were transferred from USDA's Agriculture Research Service (ARS) to the USDA Animal and Plant Health Inspection Service (APHIS). This new unit, the Foreign Animal Disease Diagnostic Laboratory (FADDL), became one of the several laboratories of the National Veterinary Services Laboratories, which are headquartered in Ames, Iowa. Most laboratory activities of FADDL were confined to Building 257.

Facilities basically remained the same until a new modernization facilities plan study was developed in 1990. Decreases in research activities and personnel, and the age of Building 257, led to the consolidation plan completed in 1995 with the inauguration of Building 100 attached to the front of laboratory Building 101.

The consolidation project included remodeling of nearly two-thirds of the laboratory space within Building

101 and the closing of Building 257 and most of the Fort Terry-era buildings.

In October 1991, all operation and maintenance activities were privatized, transferring to a contractor under USDA supervision, all personnel involved in these activities.

2001: A New Facilities Modernization Plan

A new facilities modernization plan report was completed in 2001 and recommended construction of a new BSL-3Ag (see Laboratory Biosafety Levels, page 7) laboratory and large animal room complex in front of Building 100 to replace Building 101.

As of the publication date of this newsletter, the fate of this plan to construct the BSL-3Ag facilities is unknown to the editor.

2003; Plum Island and facilities turned over to Department of Homeland Security

On June 1, 2003 the PIADC was transferred from USDA to the newly formed Department of Homeland Security (DHS). USDA scientists will continue research and diagnostic programs in the PIADC under a partnership agreement between USDA



Plum Island lighthouse (see g, pages 5, 9)
Constructed in 1869



Lobby of main entrance to the Plum Island Animal Disease Center, Building 100
Constructed in 1995

and DHS (see two articles on page 3 for details of the transfer and DHS plans for Plum Island).

Note: This article was largely prepared utilizing information and wording obtained from the 2/26/03 PIADC web site, including "About the Island," "History of Plum Island," and information obtained during a visit to the PIADC on 3/9-14/03. Photographs were provided by the PIADC audiovisual office.

We thank PIADC personnel for their assistance.

Hullinger

from page 2

my mind. The challenge of dealing with carcass disposal (up to 80,000 a day at the epidemic's peak) was monumental.

Most impressive was the overall magnitude and impact that FMD had on the UK, and specifically its farming community, livestock populations and tourism industry. While the direct impact of FMD was largely regionalized within the country, the indirect effects (primarily loss of tourism) and largest economic losses were felt throughout the UK. In the end, the livestock on 9,677 farms were destroyed during efforts to control the spread of FMD. Two thousand and thirty of these farms were actually declared infected premises and the remainder designated as dangerous (direct or indirect) contacts with the infected premises. Estimates are that from 6-10 million animals were slaughtered as a result of the epidemic (approximately 10 percent of the national herd). The rapid wide spread dissemination of FMD throughout the UK highlighted the need for continual vigilance in both the public and private sector, and the importance of early detection of disease in minimizing the overall scale of an outbreak. In this case, sale yards played a major role in the overall magnitude of the outbreak and highlighted the need and benefit of accurate movement records and animal and premises identification.

My initial arrival in Carlisle occurred at a time when the regional

MAFF (Ministry of Agriculture, Fisheries and Food, now called DEFRA: Department for Environment, Food and Rural Affairs) office was expanding from a normal staff of 10-12 to well over 300 veterinarians plus support staff. It is an understatement to say that things were chaotic at times. The logistical support necessary to effectively manage and support a field staff of that magnitude was mind-boggling.

Heading out on one of my first assignments to inspect some potentially infected cattle, I was a bit apprehensive about how a "Yank" would be received by British farmers under these circumstances, but I soon learned that the British farmers were an incredible group of warm, generous and gracious individuals, even in the face of personal and national tragedy. These farmers and their families lost animals, herds and flocks that had been in their families for many generations. Most situations were very emotional and stressful as individuals struggled with their grief and sense of hopelessness at losing their animals and their livelihoods. Although farmers were eventually able to restock, they all suffered immeasurable losses that will never be quantified.

For veterinary diagnosticians in the field there was an unusual challenge. In most cases veterinarians were asked to make a decision on whether or not a flock/herd was infected based solely on clinical signs seen at the time of the initial visit without the aid of any testing or laboratory support. This was due in large part to the lack of timely diagnostic laboratory support and the feeling that waiting for laboratory confirmation of disease would cause unacceptable delays in getting ahead of the disease. The centrally located laboratory at Pirbright was rapidly overwhelmed with case-load and unable to in-

crease capacity in a timely manner. The greatest challenge was in evaluating flocks of possibly infected sheep grazing coarse feed (that caused minor oral ulcerations or trauma) or flocks that may have had exposure greater than three weeks prior to the examination and thus would have healed lesions. It is now known (due to retrospective serology) that many of the sheep that were sacrificed were not infected. The decision was to error on the side of caution by condemning any flock with even minor suspicious lesions and the lack of timely diagnostic support made these decisions very uncomfortable. These situations emphasized the need for rapid expansion and decentralization



Photo provided by P. Hullinger
"Early in the outbreak, scenes like this were common. Many farmers could not bear to watch as their animals, life's work and livelihoods went up in smoke."
Pamela Hullinger, September 2003

of diagnostic testing capacity throughout the country and the need for improved test methods (increased speed and accuracy) to allow for more accurate assessments of herd or flock status by the veterinary diagnosticians in the field.

As a foreigner working in a regional office in a field position, I was not privy to the centralized decision-making process. However, from the field perspective the need for timely and accurate communications between centralized command, regional offices, producers, the public and the media cannot be under emphasized. Additionally, I believe it is crucial to focus decision making on science-based principles and not let eradication efforts be driven by politics.

I must also comment on my British colleagues, who day after day, week after week, and month after month, fought an invisible opponent that would not stop. I admired their hard work, professionalism, and dedication. People rose to the occasion

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Photo provided by P. Hullinger

Effective biosecurity, including power spraying with disinfectants before and after entering a farm premises, was the key to controlling the spread of the disease, especially among dairies in Cumbria.

Hullinger

from page 27

and pulled together to do what was necessary to get the job done. Unlike many of those who worked one or two 30-day rotations, they were there for the duration. While the epidemic started on February 18, 2001, and the last infected case was found September 30, 2001, the UK was declared free on January 21, 2002, but the recovery is still occurring today.

Finally, I would like to express my gratitude to all those who made this opportunity possible both home and abroad. I hope that the animal health agencies and livestock industries in the United States realize how grateful we should be to the UK for the opportunity to send so many veterinarians to participate and learn from their experiences in the UK FMD control efforts. This was not only an opportunity to enhance the field experience of U.S. veterinarians, but also to heighten the awareness of the agricultural industry to the importance of vigilance and early detection of foreign animal diseases. I sincerely hope that here in the United States that we can take full advantage of the lessons so many individuals learned in the UK.

"The greatest tragedy is one that nobody learns from."

NAHLN created

from page 4

al concern to expand global markets.

The National Animal Health Laboratory Network

The United States responded quickly and appropriately to new public health threats by creating and funding a comprehensive public health Laboratory Response Network for Bioterrorism (LRN) coordinated through the Centers for Disease Control. A similar comprehensive, coordinated, and modernized federal and state animal health laboratory network was urgently needed to address the same emergent biological and chemical threats to animal agriculture and the security of our food supply. While the basic infrastructure of a national laboratory network was in place, critical features to rapidly address new threats were missing, including:

- a secure communication, report-

ing and alert system;

- standardized, rapid diagnostic techniques;
- modern equipment and experienced personnel trained in the detection of emergent, foreign, and bioterrorist agents;
- a training, proficiency testing, and quality assurance system to ensure that all laboratories meet quality standards;
- facility upgrades to meet biocontainment requirements; and
- periodic scenario testing to ensure coordinated function when a true emergency arose.

In June 2002, President Bush signed HR3448 into law as the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. This law authorized the Secretary of Agriculture to develop an agricultural early warning surveillance system enhancing the capacity and coordination between state veterinary diagnostic laboratories and federal and state facilities and public health agencies, and provided authorization for Congress to appropriate funding to the NAHLN. A pilot NAHLN involving 12 State/University diagnostic laboratories was funded through supplemental funding of over \$15 million provided to USDA for a two-year period to develop capacity and surveillance programs for eight high-priority foreign animal disease agents considered to be bioterrorist threats.

While these funds provided critical pilot project startup costs, they fall short of developing a true national network that will effectively provide surveillance for zoonotic and foreign diseases, bioterrorist agents, and newly emergent diseases like west Nile virus. Federal funding to expand the pilot program and address these deficiencies is critically needed. Both additional startup costs and continuing funding have been requested to expand and maintain an enhanced, coordinated, and modernized NAHLN.

What does the future hold?

The development of a pilot NAHLN has broken new ground and created new paradigms for animal disease surveillance and response in the United States. It has forced us to re-examine our individual roles and responsibilities. A genuine partnership between federal and state labora-

tories has emerged, and the vital role of our federal laboratories in providing leadership for assay development, proficiency testing, and disease reference has been affirmed. Significant progress has been made in developing business policies guiding operation of the pilot NAHLN, and ensuring the confidential and seamless reporting of suspect results. Modern technology allowing reliable real-time detection of disease agents has stimulated development of new assays with participation of all partners in validation, ensuring mutual buy-in and ownership.

Now is the time to expand the NAHLN. It is time to involve additional states, and to extend the model to additional biological agents and chemical toxins. It is time to formalize partnerships with the LRN and Food Emergency Response Network. The time is right for creating a truly integrated national laboratory network working for the benefit of animal agriculture. Our livelihoods depend upon it, and our goal should be nothing less.

Osburn

from page 1

ence to effect this change.

The global emergence of rapidly spreading diseases, such as foot-and-mouth disease (FMD), Nipah virus, Severe Acute Respiratory Syndrome (SARS), monkeypox, west Nile virus, anthrax and foodborne disease outbreaks involving salmonella-related disease and E. coli O157:H7, underscores the insufficiencies of the nation's existing response system for foreign animal disease, emerging zoonotic pathogens, and foodborne illness outbreaks that threaten human health and animal well-being. Reporting procedures, control policies, regulations, research priorities, the proliferation of agencies responsible for ensuring animal and human health—all have been challenged by outbreaks of immediate and far-reaching impact never imagined when the system was instituted more than 100 years ago.

Meanwhile, science itself has rocketed forward. We have taken huge strides in vaccine research, diagnostics, informatics, global positioning technology, and our basic understanding of animal disease.

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Osburn from page 28

However, funding for scientific research lags. Furthermore, USDA is not effectively utilizing the cadre of research scientists in the 28 veterinary colleges, 22 veterinary science departments, and 15 comparative medicine departments in U.S. universities. This underutilization of academia by public agencies slows the development of science-based tools and strategies and discourages recruitment of veterinary students into careers in animal agricultural research and regulation.

Furthermore, the U.S. government has authorized a mere handful of scientists to work on the most important animal disease, foot-and-mouth disease, at Plum Island, an outdated, underfunded federal laboratory. This stance places our country at significant risk for a catastrophic event when FMD virus finds its way into the United States.

The U.S. Department of Human Health Services (DHHS), the Centers for Disease Control and Prevention (CDC), and others have recognized these problems, especially after the unprecedented demand for laboratory support during the 2001 anthrax attacks. Earlier that year, difficulties became evident in the United Kingdom when foot-and-mouth disease broke out; officials and the animal industry were overwhelmed for months during response and recovery. In 2002-2003, a costly exotic Newcastle disease outbreak in backyard game birds and commercial poultry farms in California tested the ability of regulators to respond to these ever-increasing threats where vaccination programs, rapid diagnosis, traditional control policies, public perception and related issues were brought under greater scrutiny.

DHHS and CDC have initiated a major overhaul of the diagnostic and disease response system as the National Institutes of Health have moved to establish at least two national biocontainment laboratories with BSL-3 and BSL-4 capabilities and four to six regional BSL-3 biocontainment laboratories (see Laboratory Biosafety Levels, page 4). The laboratories will involve a greater number of academic scientists conducting human and zoonotic disease research. These scientists will also

have the diagnostic capabilities to identify animal and human diseases and respond with immediate management decisions for effective containment.

Revolutionary advancements in molecular biology empower diagnostics experts to accurately identify infectious diseases in a matter of minutes rather than days or weeks. Technology tools also allow testing with mobile and, in some cases, hand-held units in the field rather than in a laboratory where samples must be transported dozens or even thousands of miles. These technologies will engender new vaccines and therapeutics.

Regionalization is the wave of the future in controlling emerging disease threats for agricultural and human health overall.

The USAHA and AAVMC can help USDA, DHS and DHHS in developing a new paradigm capable of coordinating all responsible agencies, availing itself of modern technologies and veterinary expertise, and employing regional laboratories at their full potential.

A strategic planning committee needs to develop the following components of such a plan:

Establish an immediate partnership among members of USAHA, USDA, DHS, DHHS, academic veterinary medicine and diagnostic laboratories. We will instantly gain sophisticated resources of veterinary colleges, veterinary science departments and diagnostic laboratories throughout the country strengthening disease identification and control.

Coordinate planning efforts with all federal and state agencies responsible for animal health and food safety, including the National Animal Health Laboratory Network, integrating response to and research on animal, zoonotic and foodborne diseases now regulated by separate groups. Current federal reference labs could provide confirmatory diagnosis and expand quality control and quality assurance of testing methodology. The Regional and National Biocontainment Laboratories could be incorporated into planning for emerging diseases, bio- and agro-terrorism emergency response and research programs. This would enhance the opportunity for the academic research community to be more in-

involved in response and research activities on these diseases.

Establish a National Institute of Agriculture that would combine funding from ARS, CSREES and FDA and through Congress augment funding for competitive proposals from federal, academic veterinary medicine and other interested researchers.

Establish substantial federal agency funding for veterinary professionals to obtain certificate, graduate and postgraduate training in epidemiology, public health, food safety, diagnostic techniques and research applicable to regulatory issues, emerging diseases and foodborne illnesses. This strategy would also support recruitment of new researchers and new knowledge.

Ask Congress to establish a National Veterinary Corps funded through Cooperative Extension and dedicated to infectious disease emergency response and disaster preparedness. Veterinarians from public, private and academic sectors would undergo annual training for certification on appropriate emergency response methods and procedures. Corps members would also conduct frequent modeling exercises and be available for emergencies.

Now is the time for USAHA and AAVMC to accomplish this task by communicating with our members and extensive contacts. Let's quickly move to the table for discussion and strategy. Together, we will bring all related parties together and ensure that each necessary component is incorporated into a strong, flexible and cohesive public health and food safety infrastructure that is capable of responding to emerging, zoonotic and foodborne outbreaks regardless of origin.

¹ Bennie I. Osburn earned his BS and DVM degrees from Kansas State University in 1961. In 1965, he completed his PhD in Comparative Pathology at the University of California, Davis. From 1964 to 1968 he served on the faculty at the College of Veterinary Medicine at Oklahoma State University. He was a post-doctoral fellow at Johns Hopkins University Medical School from 1968-1970, when he returned to the Davis campus as a faculty member in the School of Veterinary Medicine. Dr. Osburn served as associate Dean for Research and Graduate Education Programs from 1976 until he became dean in 1996.

Dr. Osburn's scientific career focuses on the health and welfare of food animals, particularly cattle and sheep. He has been involved
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Osburn

from page 29

in key discoveries about food animal viruses, developmental immunology, congenital infections and more recently, food safety. He has published more than 270 peer-reviewed publications. Dr. Osburn is a member of the Johns Hopkins Society of Scholars, Fellow in the American Association for Advancement of Science, Diplomate of the American College of Veterinary Pathologists (DACVP) and Past President of the ACVP and the American Association of Veterinary Immunologists. He was a member and chair of the American Veterinary Medical Association's Council on Research. He is President-elect of the Association of American Veterinary Medical Colleges and chair of the Strategic Planning Committee. Dr. Osburn is a member of USAHA and the American Association of Veterinary Laboratory Diagnosticians (AAVLD).

As Dean he has oversight of the animal health research and extension programs, the California Animal Health and Food Safety Laboratory, the Veterinary Medical Teaching and Research Center in Tulare, and the Western Institute for Food Safety and Security. Dr. Osburn has served on numerous USDA Special and CSREES Research Grant Panels; reviewed programs at the National Animal Disease and Plum Island Animal Disease Centers; served on the Blue Ribbon Panel for USDA/APHIS; and was chair of USDA's Agricultural Biotechnology Research Advisory Committee. He has participated in issues relating to international trade; and also in planning or reviewing of animal health programs for U.S. and international agencies in over 30 countries.

Plum Island's Homeland Security Mission

from page 3

Today, as a vital part of the DHS and USDA research program, the 180 employees at PIADC are helping to lead a focused research and development program to protect America's food supply against the intentional or natural introduction of foreign animal diseases. DHS and USDA are working together to ensure that an expanded agriculture biosecurity and animal health mission, underpinned by scientific excellence, continues at Plum Island Animal Disease Center as part of a national strategy within the United States.

Marc S. Hollander became Center Director at Plum Island on June 1, 2003 and is overseeing the facility's transition to DHS. He is also Deputy Director for the Office of Research and Development in DHS' Science and Technology division, and is responsible for all facility and infrastructure programs for the eight laboratories that support the DHS R&D mission.

Mr. Hollander came to DHS from the Department of Energy, where he was the Chief Information Officer for the National Nuclear Security Administration (NNSA). He has also

What is the Directorate of Science and Technology?

The Directorate of Science and Technology (S&T) will become the primary research and development arm of the Department of Homeland Security.

The S&T Directorate will organize the vast scientific and technological resources of the United States to prevent or mitigate the effects of catastrophic terrorism against the United States or its allies. It will unify and coordinate much of the federal government's efforts to develop and implement scientific and technological countermeasures, including channeling the intellectual energy and extensive capacity of important scientific institutions, such as the national laboratories and academic institutions.

One priority of the Directorate will be to sponsor research, development, and testing to invent new vaccines, antidotes, diagnostics, and therapies against biological and chemical warfare agents.

In the war against terrorism, America's already existent science and technology base provides us with a key advantage. The Department will press this advantage with a national research and development enterprise for homeland security comparable in emphasis and scope to that which has supported the national security community for more than 50 years. This is appropriate, given the scale of the mission and the catastrophic potential of the threat. Many of the needed systems are potentially continental in scope, and thus the technologies must scale appropriately, in terms of complexity, operation, and sustainability.

This research and development emphasis will be driven by a constant examination of the nation's vulnerabilities, constant testing of our security systems, and a thorough evaluation of the threats and our weaknesses. The emphasis within this enterprise will be on catastrophic terrorism—threats to the security of our homeland that could result in large-scale loss of life and major economic impact. It will be aimed at both evolutionary improvements to current capabilities as well as the development of revolutionary new capabilities.

Note: This statement was obtained from the Department of Homeland Security web site: www.dhs.gov

served as Budget Director, Office of Civilian Radioactive Waste Management; Chief of Staff, Office of Tritium Production; Director, Office of Information Technologies and Services; and Deputy Director, Office of the National Ignition Facility Project.

Mr. Hollander holds a master's degree in Management, a bachelor's degree in Accounting, and is a Certified Public Accountant and Certified Project Management Professional.

Homeland Security's Biodefense Mission

from page 3

systems.

PIADC is One of Five Centers

The National Biodefense Analysis and Countermeasures Center has three key programmatic focuses: biodefense characterization, risk and vulnerability assessment; bioforensics; and agricultural security. These programs are executed at or through five research and operations centers: Biothreat Assessment Support Center; Biodefense Knowledge Center, Bioforensics Analysis Center, Bio-Countermeasures Testing and Evaluation Center, and the Plum Island Animal Disease Center. These Centers are:

- deepening our understanding of potential bioterrorism pathogens;
- improving protection of human health and agriculture against biological terrorism;
- sustaining homeland security through knowledge of the threat, prevention of surprise, and attribution of use; and
- providing surge support in response to and recovery from a bioterrorism incident.

The Department is working closely with USDA to develop a joint DHS/USDA comprehensive strategic research plan and road map to counter the threat of high consequence foreign animal diseases, including Foot and Mouth Disease. Plum Island Animal Disease Center is a critical national asset, and an important part of our national homeland security infrastructure for research and operational capabilities to anticipate, prevent, respond to, and recover from current and next-generation biological threats the United States' population and agriculture.

Act of April 24, 1948: Chapter 229, 62 Stat. 198, 21 U.S.C. Sec. 113a.

Sec. 113a. - Establishment of research laboratories for foot-and-mouth disease and other animal diseases: research contracts; employment of technicians and scientists; appropriations

The Secretary of Agriculture is authorized to establish research laboratories, including the acquisition of necessary land, buildings, or facilities, and also the making of research contracts under the authority contained in section 427i(a) of title 7, for research and study, in the United States or elsewhere, of foot-and-mouth disease and other animal diseases which in the opinion of the Secretary constitute a threat to the livestock industry of the United States: Provided, That no live virus of foot-and-mouth disease may be introduced for any purpose into any part of the mainland of the United States (except coastal islands separated therefrom by water navigable for deep-water navigation and which shall not be connected with the mainland by any tunnel) unless the Secretary determines that it is necessary and in the public interest for the conduct of research and study in the United States (except at Brookhaven National Laboratory in Upton, New York*) and issues a permit under such rules as the Secretary shall promulgate to protect animal health, except that the Secretary of Agriculture may transport said virus in the original package across the mainland under adequate safeguards, and except further, that in the event of an outbreak of foot-and-mouth disease in this country, the Secretary of Agriculture may, at his discretion, permit said virus to be brought into the the United States under adequate safeguards. To carry out the provisions of this section, the Secretary is authorized to employ technical experts or scientists: Provided, That the number so employed shall not exceed five and that the maximum compensation for each shall not exceed the highest rate of grade 18 of the General Schedule. There is authorized to be appropriated such sums as Congress may deem necessary; in addition, the Secretary is authorized to utilize in carrying out this section, funds otherwise available for the control or eradication of such diseases.

* The proviso clause for Brookhaven was enacted in the Food, Agriculture, Conservation, and Trade Act of 1990, P.L. 101-624, section 1618, 104 Stat. 3733. source

(Note: Source PIADC)

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Information for contacting these officers is available on the USAHA web page (www.usaha.org), by calling the Association office at (804) 285-3210 or email (usaha@usaha.org).

There is no royal road to anything. One thing at a time, and all things in succession. That which grows slowly endures.

Josiah Gilbert Holland

President's Corner from page 2

The main concern about Plum Island is that it is a 1956 model, nearly 50 years old, technologically outdated and having to spend millions a year on upgrades and repairs.

The PIADC and FADDL programs at Plum Island are a mere shadow of what they were 20 years ago. The flat-line budget over the last 10 years is proof that diagnostic capability and research projects have dwindled while maintenance and repairs have risen dramatically. The reasons for this deterioration in laboratory programs and personnel must be addressed and reversed.

For about 20 years, commodity groups and some within government agencies have had concerns whether Plum Island should be relocated to the mainland. The Act of 1948 (see inset on this page) states that no live foot-and-mouth disease virus (FMDV) may be introduced to the mainland. However, the 1948 Act also gives the Secretary of Agriculture the authority to conduct FMDV research and study on the mainland if he/she determines such work "is necessary and in the public interest."

The Plum Island debate about the ratio of maintenance costs to research funds is a growing concern. Today commodity groups along with government agency personnel are weighing the pros and cons concerning the cost of staying on Plum Island versus

moving aspects of the program to the mainland. Within the past few years there has been more talk about moving the Plum Island facilities or parts of the foreign animal disease program to the mainland. However, along with a potential or eventual move to the mainland there will be a need for a transition plan. The transition phase could be a seven to 10 year program if it takes place.

Another point: Agriculture (USDA) has no BSL-4 facility. Where do USDA and DHS stand on the need to respond to new diseases such as Nipah and Hendra viruses? Is now the time, when considering a move to the mainland, to decide how the nation responds to pathogens that require BSL-4 for diagnosis and research? Does the new DHS/USDA partnership have the voice and leadership to convince Congress that such a big ticket item for agriculture and bioterrorism defense is a necessary investment for long-term protection against foreign pathogens and terrorism?

The first line of defense against disease and insuring food safety and human health in the nation is the protection of our vast wild and domestic animal populations. Reinvestment regarding animal health laboratory infrastructure to protect our animal populations, the national food supply and human health must start now.

We have lived off of our laboratory investments of the 1950's to the point of extreme danger to our nation's animals and citizens. It is time to start the infrastructure rebuilding process. New and modernized federal reference laboratories, veterinary infrastructure and an expanded sustained National Animal Health Laboratory Network (NAHLN) is needed to counter natural and deliberate disease outbreaks now and in the future.

The federal reference laboratories at Ames, Iowa, and Plum Island, New York, must take a different role in future decades as opposed to shouldering the burden of surveillance and diagnosis as they have done in the past. The NAHLN, along with new technology that will allow test results in minutes rather than days, must become the national diagnostic and surveillance workhorse.

Federal partnerships with all ani-

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What is the USAHA?

The nation's animal health forum since 1897

The United States Animal Health Association, the nation's animal health forum for over a century, is a science-based, voluntary organization of official state and federal animal health agencies, national allied organizations, regional representatives and individual members founded in 1897 to protect animal and public health.

USAHA's mission is to:

- Serve as a forum for communication and coordination among state and federal governments, universities, industry and other groups on issues of animal health and disease control, animal welfare, food safety and public health.
- Serve as a clearing house for new information and methods that may be incorporated into laws, regulations, policy, and programs.
- Act to develop solutions to animal-health related issues based on science, new information and methods and the



ability to develop a consensus for changing laws, regulations, policies, and programs.

The Association's mission is implemented through deliberations of its 30 science-based committees and the adoption of resolutions and recommendations aimed at solving problems. Committee size varies from 11 to 135 members

USAHA is administered and its policy determined by the Executive Committee and Board of Directors. The Association maintains an office in Richmond, Virginia (www.usaha.org).

USAHA has met annually since its founding in 1897 and produces a printed proceedings of each meeting. The proceedings represent the most complete history of the nation's animal health endeavors over the past century.

The 108th Annual Meeting of the USAHA will be held October 21-28, 2004 at the Sheraton Greensboro Hotel, Greensboro, North Carolina.

USAHA Membership

Official State Animal Health Agency (50)

| | |
|----------------|----------------|
| Alabama | Alaska |
| Arizona | Arkansas |
| California | Colorado |
| Connecticut | Delaware |
| Florida | Georgia |
| Hawaii | Idaho |
| Illinois | Indiana |
| Iowa | Kansas |
| Kentucky | Louisiana |
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| Minnesota | Mississippi |
| Missouri | Montana |
| Nebraska | Nevada |
| New Hampshire | New Jersey |
| New Mexico | New York |
| North Carolina | North Dakota |
| Ohio | Oklahoma |
| Oregon | Pennsylvania |
| Rhode Island | South Carolina |
| South Dakota | Tennessee |
| Texas | Utah |
| Vermont | Virginia |
| Washington | West Virginia |
| Wisconsin | Wyoming |

Official Territory Animal Health Agency

| | |
|-------------|----------------|
| Puerto Rico | Virgin Islands |
|-------------|----------------|

Official Federal Animal Health Agency

USDA-Animal & Plant Health Inspection Service

Official Foreign Animal Health Agency

| | |
|-----------|-------------|
| Australia | Canada |
| Mexico | New Zealand |

National Allied Organization (26)

Alpaca Owners & Breeders Association
 American Association Of Avian Pathologists
 American Association Of Bovine Practitioners
 American Association Of Swine Practitioners
 American Association Of Veterinary Laboratory Diagnosticians
 American Association Of Wildlife Veterinarians
 American Association Of Zoo Veterinarians
 American Farm Bureau Federation
 American Quarter Horse Association & American Horse Council
 American Sheep Industry Association
 American Veterinary Medical Association
 Exotic Wildlife Association
 Holstein Friesian Association
 International Association Of Fish & Wildlife Agencies
 International Lama Registry
 Livestock Exporters Association, U.S.A.
 Livestock Marketing Association
 National Bison Association
 National Cattlemen's Beef Association
 National Institute For Animal Agriculture
 National Milk Producers Federation
 National Pork Producers Council
 National Renderers Association
 North American Deer Farmers Association
 North American Elk Breeders Association
 USDA-Agriculture Research Service
 USDA-Cooperative State Research, Education & Extension Service

Elected Regional Representative (8)

| | |
|-------------------|--------------|
| Northeastern (2) | Southern (2) |
| North Central (2) | Western (2) |

Individual Member (1,111)

President's Corner

from page 31

mal health diagnostic laboratories must become an integrated system. The old adage that only federal laboratory personnel can handle an animal health emergency is as outdated as their laboratories. To accomplish decentralized testing all parties must proceed to the table of discussion and determine who will call the diagnosis and how information will be shared in this new integrated laboratory system. Vigilance is diagnostic speed and a basis of cooperation.

Finally, I want to emphasize the difference between this Plum Island special edition newsletter and other similar reports that have collected dust in Washington, D.C., and elsewhere over the last 20 years. The difference is that this information is being distributed to the nation's stakeholders, discussed and understood, utilized as an educational tool, and made available to decision makers.

No bottom drawers or dusty shelves for this report; rather, thousands of copies distributed across the nation. The result will be stakeholder support and action. There will be a USAHA resolution spelling out the needs of the nation's animal health laboratories.

The resolution document will be forwarded to Congress so that our national elected leaders can see first hand why animal health laboratory investment must start immediately.

There must be action!

USAHA

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Special thanks to: Pat Campbell, Marc Hollander, David Huxsoll, Jeff Hayes, Pam Hullinger, Larry Mark, Terry McElwain, Tom McKenna and the FADDL group, Bennie Osburn, Gerry Parker, Dan Rock and the EVD research group, Luis Rodriguez and the FMD research group, Carlos Santoyo, Tom Sawicki, Charles Wenderoth, Peter Xiques, and Kathy Apicelli and Liz Clark at the Visual Information Service office.