National Wildlife Disease Surveillance and Emergency Response Program

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COORDINATOR COMMENTARY

By Dr. Thomas DeLiberto

I hope you and your families enjoyed a peaceful Holiday Season; I was fortunate to spend time with my family and friends. As is common this time of year, I found myself reflecting on my personal and professional life. I thought I would take this opportunity to share with you some of my thoughts on the latter as they pertain to our program.

Aerial view of the USDA/APHIS/WS National Wildlife Research Center in Ft. Collins, CO

The NWDP was very productive in 2008 due to the efforts of the wildlife disease biologists, program staff, and our cooperators. We continued our successful wildlife disease surveillance programs for avian influenza, plague, tularemia, and feral swine diseases. Collectively, these programs represent the largest coordinated wildlife disease monitoring programs in the world with over 100,000 samples collected across the United States. In addition to these efforts, the NWDP assisted state agencies in the surveillance for chronic wasting disease, rabies, bovine tuberculosis, E. coli, Newcastle disease, and a number of other diseases of concern.

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SERS, WDBS AND EMERGENCY RESPONSE

By Robert Beach

In an effort to facilitate emergency response requests, APHIS has adopted the ROSS (Resource Ordering & Status System) directory to manage personnel and resources. In the event of an emergency, requests for assistance are submitted to ROSS dispatchers, who search the directory for personnel with the specified qualifications and assign those selected to the incident command. However, if a dispatcher receives a request that requires WS personnel, he/she will first contact the NWDP Surveillance and Emergency Response System (SERS). The SERS assists the dispatcher by identifying the most qualified personnel available in the ROSS directory. The use of SERS in this manner helps minimize confusion and time in responding to emergencies by preventing selection of WS personnel listed in the directory that are unavailable for activation due to ongoing commitments to cooperators.

The SERS wildlife disease biologists (WDBs), are designated as "primary" first responders for WS. As primary first responders, WDBs must be ready and available for emergency

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(*Coordinator Commentary ~ Continued from Page 1*)

Our border surveillance effort was enhanced through additional disease surveillance projects with Canada and Mexico on highly pathogenic avian influenza (HPAI), plague, tularemia, rabies, and cattle fever ticks. Internationally, the NWDP worked with APHIS International Services, USDA Foreign Agricultural Services, US Agency for International Development, Food and Agriculture Organization of the United Nations, and a number of non-governmental organizations to enhance infrastructure and surveillance for HPAI in 29 countries.

During 2008, APHIS continued to enhance its capabilities to respond to emergencies, and the NWDP provided support in development of the Agency's emergency support structure, as well as assisting in several response efforts. The NWDP assisted in developing APHIS' draft mobilization guide, emergency qualifications standards, and the resource ordering and staffing system directory. The program also provided emergency response support for 13 events including the Iowa floods, the New Orleans oil spill, and the South Dakota plague outbreak.

Our program experienced a number of changes in 2008. In August, the program consolidated all our staff into one building. Previously, the administrative staff was located at the Western Regional Office and the technical staff was housed at WS' National Wildlife Research Center (NWRC). While we greatly appreciated the hospitality of the Western Regional Office and will miss seeing them on a daily basis, we determined that our work efficiency would improve if our staff were housed together and, unfortunately, there was not enough space to accommodate all of us in Building B. However, WS' NWRC was able to identify enough room for our administrative staff, so we consolidated our personnel into the Wildlife Science Building on the Foothills Campus of Colorado State University. I am greatly appreciative of the Center's efforts to provide the NWDP staff with offices and work stations. I also appreciate the Center's staff for their patience and understanding during the transition.

There were a number of personnel changes that occurred in 2008. Justin Stevenson moved from Oregon to New Mexico to fill the vacant wildlife disease biologist position there, and Brian Thomas was hired to fill behind Justin in Oregon. Two of our dedicated wildlife disease biologists left the program to pursue other career opportunities in WS. Jane Weiskittel is now an MIS operator for the Eastern Region, and Beth Kabert is the NEPA coordinator for the Rabies Program; we wish them the best in their new positions. Additionally, Hunter Moyles resigned to move to Idaho. California hired Shannon Chandler to fill in behind Hunter. Shannon has been assisting us with HPAI surveillance for a couple of years. We also are close to replacing Jane and Beth in Illinois and New Jersey.

At the Program Office in Fort Collins, we have been preparing for Bob Beach's retirement on 2 January 2009, from over 30 years of services to Wildlife Services. Bob has been a tremendous asset to the NWDP and it is difficult to imagine the program without him. His dedication and commitment to excellence will be a loss not only to WS, but also to APHIS as a whole.

As we start 2009, I wish to thank you all for the tremendous jobs that you do and your part in the past and future accomplishments of the NWDP. I truly am proud and honored to work with you in the continued success of our program. This year undoubtedly will bring a number of new challenges, but with your dedication and professionalism we will turn these challenges into success.

(*Emergency Response ~ Continued from Page 1*)

response at all times. When contacted by a ROSS dispatcher, SERS will attempt to fill a request for personnel using WDBs. Therefore, it is critical that WDBs remain attentive to possible emergency conditions (e.g., stay alert to situations which could result in APHIS being requested to provide assistance) so that they are available when needed (i.e., via email alert or phone).

When the SERS is contacted by the ROSS dispatcher with a Mission Assignment resource request from FEMA, we have a short period of time (generally 4 hours) to respond with the requested resource information. We make selections to fill the requested positions using the best available information in the short time allowed. We review the attributes identified on the request form and consider available resources (e.g., firearms certified, I&E certified, ATV certified, etc.). While every possible consideration is made for previously scheduled assignments in a WDB's calendar, emergency response needs may supersede other activities. If a WDB's calendar does not show scheduled work assignments, no consideration for previously scheduled assignments can be given. Therefore, it is important calendars are kept current and accurate.

Prior to activation, we contact each selected WDB and their State Director to verify their availability. Time is an essential element in an emergency so it is important that all selected first responders are ready to mobilize within 24 hours. Therefore, it is very important that all WDBs recognize and understand their responsibility as a primary first responder.

Once the SERS identifies WS personnel for the response, the ROSS dispatcher activates them in the Directory and contacts them directly. The WDB is responsible for reviewing the information, following the provided instructions and making the identified contacts at the reporting site.

It is important that all personnel mobilized on an emergency response assignment understand that "personnel resource tracking" is a vital component of the ROSS Directory. The ROSS dispatcher will need to know as quickly as possible how you will travel to the reporting site (e.g., GOV, air travel, etc.) and your estimated time of arrival. Additionally, the ROSS dispatcher will need to be notified when you physically depart your duty station (i.e., I am leaving now)

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Comprehensive Feral Swine Disease Surveillance and Monitoring

By Seth Swafford

Damage caused by feral swine (*Sus scrofa*) has been well documented by wildlife damage management professionals, but diseases associated with feral swine and disease management are relatively new areas of concern for the wildlife community. In addition, commercial swine producers, regulatory veterinarians, and trade associations have become increasingly concerned with risks associated with diseases transmitted or harbored by feral swine. In response to the increased concern, WS has become a leader in conducting surveillance and monitoring of feral swine diseases, as well as implementing management and control programs to reduce the possibilities of disease introduction and spread.

Classical swine fever (CSF) or hog cholera is a highly contagious disease of swine that was eradicated from the U.S. in 1978. VS published *CSF Surveillance Risk Factors 2006* to identify possible sources of introduction and high risk areas. Feral swine were one of several factors used to develop the level of risk and serve as one stream of data for a larger CSF surveillance project. Foot-and-mouth disease (FMD) is the most contagious disease of livestock and was eradicated from the U.S. in 1929. WS partnered with VS to draft *CEAH's Pathway Assessment of FMD Risk to the U.S. 2001*. While both viruses have been eradicated from many developed countries, they are still endemic in much of the world. Due to possibilities of reintroductions, developed nations with extensive commercial swine production and feral swine populations conduct surveillance for these diseases.
Two endemic diseases of feral swine are of national interest and importance in the United States. Pseudorabies virus (PRV) causes disease in swine, but can also infect cattle, sheep, goats, and many species of wildlife. The virus was officially eradicated from the commercial swine industry in 2004. Brucellosis is another endemic disease of feral swine. Swine brucellosis (SB), specifically, is an infectious disease of swine caused by the bacterium *Brucella suis,* one of at least 6 closely related species of *Brucella* that cause disease in a variety of wild and domestic mammals, including humans. There are few known reservoirs of *B. suis*, and feral swine have been established as significant reservoirs with apparent prevalence exceeding 30% in some areas. The bacterium *B. abortus* causes cattle brucellosis, and there have been epidemiological investigations indicating cattle were exposed to *B. suis* from feral swine. While brucellosis is zoonotic, the main risk remains an introduction to a commercial herd.

Feral hogs under surveillance for CSF

Adding to the previously mentioned diseases, *Trichinella spiralis* and *Toxoplasmosis gondii* have become important from an international trading perspective. In swine, *Trichinella* rarely manifests with clinical signs in the animals, but in humans the disease most often causes intense muscle aches and gastro-intestinal symptoms. *Toxoplasmosis* is another parasite of concern, with infections in humans being considered common. Both of these parasites are being investigated in a national sample of feral swine through an agreement between the National Pork Board, VS, WS, and ARS to provide scientific data which will improve international trade of commercial swine products.

Through cooperative efforts with many state and federal partners, WS coordinates a comprehensive feral swine disease surveillance and monitoring project in 30 states. Over 2,300 feral swine are sampled annually for CSF surveillance, and more than 2,500 samples are collected for PRV and SB monitoring. Current plans call for WS to support VS and the National Animal Health Laboratory Network in a pilot FMD surveillance project this fiscal year. Wildlife disease biologists in 9 states will collect biological samples and conduct active observational surveillance by screening feral swine for suspect lesions consistent with FMD infection. WS currently utilizes it's National Feral Swine Serum Archive to provide samples to ARS for testing for parasitic diseases. WS is also involved in numerous local projects concerning diseases of interest, such as *E. coli*, porcine circovirus, and porcine reproductive and respiratory syndrome.

By working at the livestock-wildlife interface, these surveillance and monitoring efforts target the front line issues surrounding these zoonotic, foreign animal, and endemic diseases.

What are we sampling and Why?

by Dennis Kohler and Dr. Thomas DeLiberto

In the NWDP's' surveillance efforts, WDBs and cooperators are collecting samples from animals for information on the geographic distribution, prevalence, and trends of diseases in populations of wild animals, for the purpose of protecting humans, agriculture and wildlife. To accomplish this goal, we often are attempting to determine if an antigen is or was present.

Determining if an Antigen is Present

An antigen is any substance capable of inducing a specific immune response and interacting with the products (i.e., specific blood cells and proteins), of that response. Antigens can be soluble substances (e.g., toxins, foreign proteins) or particulate in nature (e.g., micro-organisms tissue cells). Viruses and bacteria are micro-organisms that elicit specific immune responses, interact with lymphocytes and/or antibodies, and, consequently, are examples of antigens.

Most sampling protocols used in disease surveillance programs are designed to either directly detect an antigen or detect the exposure of an animal to an antigen. The Highly Pathogenic Avian Influenza (HPAI) Early Detection System and bovine tuberculosis programs are examples of disease surveillance activities designed to detect the presence of a specific antigen. In the case of HPAI, WDBs use sterile swabs to sample birds for the presence of Type A influenzas. Swabs are inserted into the oropharynx or trachea, and the cloaca because the respiratory and gastrointestinal tracts are the primary routes of viral excretion in infected birds.

In the bovine tuberculosis surveillance program biologists extract lesions from white-tailed deer and elk to determine if *Mycobacterium bovis* is present. When an animal is infected with *M. bovis* (antigen), the bacteria usually invade the cranial or cervical lymph nodes, or the lungs. Sampling lesions associated with these tissues, yield the highest probability of detecting *M. bovis* in cervids.

Determining if an Animal has been Exposed to an Antigen

In some instances, it may not be possible (e.g., lack of a suitable diagnostic test) or necessary (e.g., detection of a foreign animal disease) to directly detect an antigen. Under these circumstances, determining whether an animal has been exposed to an antigen may be sufficient. Antigens, if you recall, elicit a specific immune response in an animal. One such response is the increased production of specific blood cells (leucocytes) by the animal, which produce proteins to help fight off the invasion from antigens; one type of protein produced is antibody. In fact, the word antigen originated from the notion that certain substances (e.g., viruses and bacteria) would stimulate antibody generation. Antibodies (also called immunoglobulin's "Ig's") are proteins that are produced to identify and neutralize foreign objects such a bacteria and virus.

When an animal develops specific antibodies in blood to an antigen as a result of exposure or immunization, the process is termed seroconversion. Prior to seroconversion, the animal is said to be seronegative, and after seroconversion it is referred to as seropositive for the specific antibody. It is important to remember that determining the presence of specific antibodies in blood is only an indication that the animal is or was infected by the antigen in question; it is not a direct measure of the antigen itself. Therefore, it is incorrect to refer to an animal as seropositive or seronegative for virus or bacteria. Alternatively, if we were to use a test that detects antigen in blood (e.g., sandwich ELISA) and the test was positive, we would say that the animal is viremic (viremia is the presence of a virus in blood) or bacteremic (bacteremia is the presence of a bacteria in blood).

There are five known isotypes of antibodies found in mammals: IgA, IgE, IgM, IgG, and IgD. The different types of antibodies differ mainly in their functional location and ability to deal with different antigens. The IgA antibodies are mainly found in mucosal tissues (e.g., the moist tissue lining the oral cavity, intestines, and respiratory tract). The IgE antibodies are mainly produced in response to allergens,

The IgM antibodies (along with IgG) are the main antibodies found in the circulatory and lymphatic systems. The IgM antibodies appear early in the course of exposure and usually reappear, to a lesser extent, after further exposure. This makes them useful in the diagnosis of infectious diseases. Demonstrating IgM antibodies in an animal's serum indicates recent exposure.

IgG antibodies are found in all body fluids and are the most abundant type of antibody. These can bind to many kinds of antigens (e.g., viruses, bacteria, and fungi) and, is the main antibody for long term response to an antigen. In birds, IgG is replaced with IgY, and is found in serum and yolk.

The final type of antibody is IgD, whose function is still not completely understood. It is found in the plasma membrane of immature B lymphocytes (the producers of all antibodies types), where it is usually coexpressed with IgM. IgD's function is to signal when the young B cells in the spleen are ready to be activated and take part in the defense of the body in the immune system.

Determining if an animal has been exposed to an organism through antibody detection in blood is a common practice in disease surveillance. For example, when we collect blood samples with nobuto strips for plague and tularemia, we are attempting to determine if a wild animal is seropositive or seronegative for either antigen. Also, when we collect blood from feral pigs for the detection of Classical Swine Fever or Pseudorabies, the serum derived from the blood is being analyzed for antibodies specific for CSF or Pseudorabies.

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(*Sampling ~ Continued from Page 4*)

Antigen versus Antibody Detection

When collecting samples for the presence of antigens, inferences can be made on the percentage of animals in a population infected with the antigen at the time of sampling, seasonal changes in infection rates, and the distribution of the antigen. Alternatively, when blood samples are collected and analyzed for antibodies, fewer inferences can be made about the disease in the population. When an animal is seropositive for a certain antibody it tells you that at "some point in time" the animal came in contact with a specific antigen. The contact could have been made two weeks or two months ago. Thus, it is difficult to make inferences about the infected population, which could be made by determining the presence/absence of antigens.

So why then would we want to collect samples for antibody detection when detection of antigens provides more useful information? Often, it is more difficult and expensive to detect antigens directly than it is to detect antibodies. Many antigens are only detectable in the animal for relatively short (e.g., days) periods of time, whereas antibodies to those antigens may be detectable longer (e.g., weeks, months, or years). A good example of this is infection of West Nile virus in birds that either survive infection or do not develop clinical disease. In these cases, West Nile Virus is typically cleared from the bird in four to five days on average. However, those same birds could be seropositive for years.

Sampling for antibodies is also valuable in animals that do not develop disease when exposed to an antigen. We often use this type of sampling in coyotes to estimate where and to what level plague occurs in rodents, such as prairie dogs. Coyotes themselves are very resistant to infection (i.e., the detrimental colonization of a host organism by a foreign species) with *Yersinia pestis* (plague), but still produce antibodies when exposed. Sampling antibodies to plague in coyotes provides us with geographic distribution data of plague, and annual trend data on the occurrence of the organism within its range.

In cases of diseases which are not known to occur in a population or a geographic region (e.g. Foreign Animal Diseases), sampling for the presence of antibodies in animals is effective. When we sample for classical swine fever in feral pigs, we sample blood for the presence of antibodies, because we are less likely to encounter pigs that are currently infected and are sick. However, if feral pigs recover from the infection, they will have antibodies to classical swine fever and we are more likely to either capture or kill them.

Another foreign animal disease we conduct surveillance for is HPAI. Why do we sample for the antigen in the HPAI Early Detection System rather than antibodies as we do for classical swine fever? The answer lies in one of the inherent problems in sampling for antibodies. Antibodies, while specific for certain antigen types, are much less specific for antigen subtypes. For example, antibodies to West Nile virus (WNV) and avian influenza are distinct. However, antibodies to different subtypes of (WNV) and avian influenza are not as distinct, making it difficult or impossible to determine the subtype of avian influenza to which the bird was exposed.

In general, tests to determine specific antibody subtypes in serum of wild birds have not been validated. Furthermore, even if these tests were available (e.g., a H5 or H7 specific ELISA), they likely would not be able to determine the subtype (e.g. H5N1 vs H5N2) or pathogenicity (i.e., HPAI vs. LPAI) of the virus. To complicate matters further, all H groups (i.e., H1-16) have been detected in wild birds. Therefore, sampling blood in wild birds to determine seropositivity of influenza viruses does not provide useful information for the purpose of early detection in wild birds.

(*Emergency Response ~ Continued from Page 2*)

and when you arrive at the reporting site (i.e., I have just arrived at the reporting location). The ROSS dispatcher will again need to hear from you when you are demobilized (i.e., begin your travel home) and when you arrive at your home base. It is important that everyone know, understand and fulfill their responsibilities. While these may seem like trivial tasks, they can lead to major complications if not executed properly (e.g., state police looking for you).

Each year the NWDP also conducts a number of "mobilizations" which are not truly emergency response activations. These mobilizations are training actions meant to better prepare SERS participants for actual emergencies. By participating in these "mock" emergency response mobilizations, WDBs have the opportunity to "practice" the mobilization event and also to interact closely with other WDBs in an emergency-like event. During an actual emergency response, WS will dispatch SERS personnel as "Task Force" teams. WDBs need to utilize these exercises to develop an understanding of how to be a Task Force Team member and how to work as a unit. Working together in these mobilizations provides a valuable team training experience not available through other daily activities.

Beginning in January 2009, Dale Nolte will be the designated SERS point of contact. Dale will work closely with the ESF-11 Regional Managers, the ROSS Dispatchers and field personnel to keep everyone alerted to possible emergency management activities. It is also possible that any one of the other Assistant Coordinators or Staff Biologists could be tasked with assisting Dale in emergency mobilizations. WS has an excellent record of being responsive, acting professionally and being the "can-do" program. With everyone's assistance and active participation, we can continue to provide exceptional service.

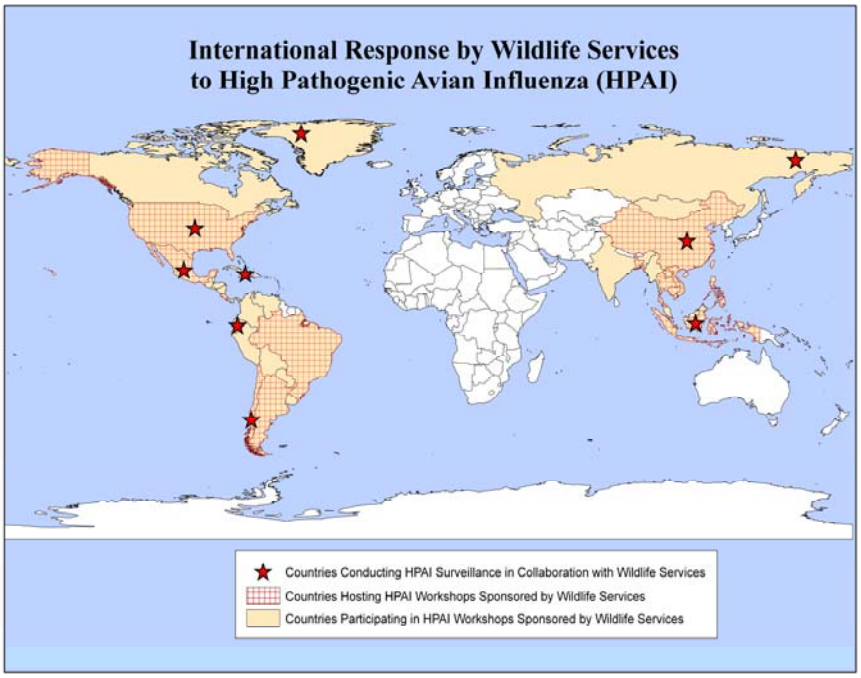
International Activities

By John Baroch and Dr. Dale Nolte

International activities conducted through the NWDP were extensive during 2008. We conducted workshops and training activities on wild bird surveillance to detect avian influenza in Argentina, Chile, China, Costa Rica, Indonesia, Mexico, Philippines, and Vietnam. The Argentine, China, and Costa Rica workshops were regional in scope reaching additional participants from Bolivia, Canada, Columbia, Ecuador, El Salvador, Guatemala, Mongolia, Nicaragua, Panama, Paraguay, Peru, Russia, Uruguay, and Venezuela. We also collaborated with respective governments and non governmental organizations to support wild bird surveillance in Argentina, Canada, Chile, China, Costa Rica, Ecuador, Greenland, Mexico, and Russia.

International activities frequently require persons to work outside their "normal" comfort zone. Foreign languages, which often require working through an interpreter, and cultural variations can be expected. Also, short preparation time and changing agendas are often incorporated in the challenge. Perseverance and plasticity are skills that are equally important as technical expertise. Biologists for the NWDP took their usual "Can Do" approach frequently exhibited in Wildlife Services personnel and applied it to the international perspective. As a result, all our international activities were successful.

Funding limitations are likely to curtail international activities during 2009. We will continue to work through the trilateral agreement to support wild bird surveillance activities in Canada and Mexico. The NWDP will provide administrative and technical support through our cooperative agreement with Wildlife Trust to establish avian influenza diagnostic capabilities at the Conservation Medicine Laboratory in Guasave, Mexico. The NWDP is supporting the government of Denmark for surveillance of wild birds for avian influenza in Greenland. We are working through the Wildlife Conservation Society to develop a South American avian influenza regional workshop and, if funding is available, to conduct further surveillance activity in Chile. Prior year funding will enable us to sponsor an avian influenza wild bird surveillance workshop in Bangladesh and a scientific discourse on avian influenza and wildlife in Thailand. Established prior year agreements also will enable the NWDP to support monitoring of viruses in wild and domestic birds in Indonesia, and to continue our collaborative surveillance efforts with the Chinese Academy of Sciences (CAS). We remain hopeful that fiscal support can be identified to continue surveillance activities on Wrangel Island Reserve in Russia and to implement activities in other targeted areas, particular in Central and South America.



Countries in which the NWDP provided surveillance or capacity building support for HPAI.

Discussions are ongoing to develop a Sino – US Joint Wildlife Disease Consortium (Center). Our goal is to create an acceptable agreement for signatures by late summer. Like the United States, China recognizes the role wildlife species serve as reservoirs, to disperse diseases among regions, and to infect domestic livestock and humans. Many diseases of concern in the United States are also found in China. Initially the consortium will focus on zoonotic diseases. While the list of diseases of common interest is fairly extensive, we will initially restrict efforts to avian influenza, rabies, and plague. The objective of the consortium will be to enhance information exchange. The function of the consortium will be to identify common wildlife disease issues, host an annual meeting and enhance other communication avenues, organize personnel exchanges, and develop joint projects.

The Role of Wildlife in the Epidemiology of Neospora Caninum

By Dr. Thomas DeLiberto

Recently, I received a number of inquiries about the role of wildlife, in particular wolves, in the transmission of *Neospora caninum* to cattle. The NWDP has periodically assisted scientists in *N. caninum* surveys in wild carnivores. Additionally, NWRC and ARS scientists collaborated in experiments to determine if coyotes can serve as definitive hosts, and if domestic and wild cycles of this parasite overlap.

Given the interest in this parasite by our biologists, I thought a brief review of the current science on *N. caninum* would be useful. As you will learn, there is very little information on the parasite in wild animals. Most of the data that does exist is serological and correlative in nature, and does not definitively identify species as hosts, or establish cause and effect. Much more information is needed before such conclusions can be made.

To date, only serological surveys have been published on the parasite in wolves. These studies documented that wolves were exposed to *N. caninum*, not that they shed infective oocysts. It is not unreasonable to

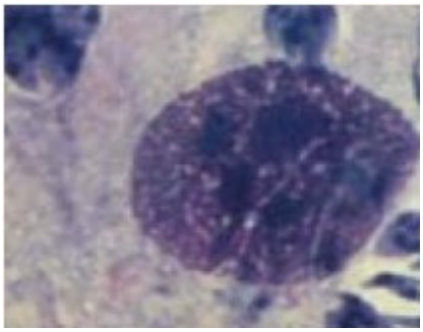


Fig 1. Neosporum caninum

assume that wolves play a role in the sylvatic cycle of *N. caninum* and potentially the crossover of the parasite to the domestic cycle; coyotes have been identified as definitive hosts and wolves are more closely related to dogs than coyotes. It is important to remember, though, there are no published reports on the ability of wolves to shed infective oocysts under experimental or natural conditions.

It has been suggested that wolves be managed to prevent or control neosporosis in cattle. However, given the lack of available information on the role of wolves in the transmission of *N. caninum* and the established risk factors on farms associated with biosecurity and management (see below), wild canid management to control neosporosis in cattle does not seem prudent at this time.

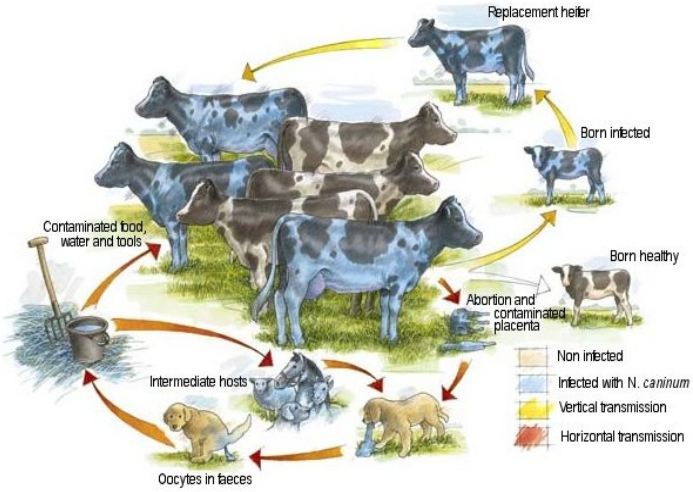


Fig. 2 Domestic Life-cycle of Neospora caninum. From Intervet Schering-Plough Animal Health (http://www.neosporosis.com/life-cycle-neospora.asp)

Taxonomy

Neospora caninum is a protozoan parasite that is a major cause of cattle abortion worldwide (Fig. 1). It is in the Class Coccidea, Family Sarcocystidae, Genus Sarcocystidis, (parasites causing cysts in tissues) of which there are 130 recognized species . Sarcocystis species develop in 2-host cycles, requiring both a definitive (predator) and intermediate (prey) host. Species specific predator-prey life cycles have been demonstrated for dog-cattle (*S. cruzi*), cat-cattle (*S. hirsuta*), human-cattle (*S. hominis*), dog-sheep (*S. capracanis* , *S. hircicanis*), cat-sheep (*S. gigantea* , *S. medusiformis*), dog-goat (*S. capracanis* , *S. hircicanis*), cat-goat (*S. moulei*), dog-pig (*S. meischeriana*), human-pig (*S. suihominis*), cat-pig (*S. porcifelis*), and others. Some wildlife may serve as intermediate hosts (e.g., deer, moose, caribou, raccoon, rabbit) or definitive hosts (e.g., coyote, fox, polar bear, bald eagle,). In all, more than 56 definitive and intermediate hosts of various Sarcocystis species have been identified to date.

Neospora caninum is very similar in structure and life cycle to *Toxoplasma gondii* and until 1988 was misdiagnosed as this species. *Neospora caninum* differs from *T. gondii* in that neosporosis is primarily a disease of cattle, and dogs and related canids are definitive hosts. Toxoplasmosis, though, is a disease of humans, sheep, and goats, and felids are the only definitive hosts.

Life Cycle of Sarcocystis Parasites

Sarcocystic parasites have a heteroxenous life cycle, requiring a definitive and intermediate host (Fig. 2). Eggs (oocysts) are shed in feces of a definitive host. If provided with adequate moisture, moderate temperatures and sufficient oxygen the single cell (sporont) within the oocyst divides into four sporoblasts. The sporoblasts then divides into sporocysts, each of which contains two haploid sporozoites. These sporozoites are the infective cells consumed by intermediate hosts. An intermediate host ingests the sporocysts, which are broken down in the intestinal tract, releasing the sporozoites. The sporozoites enter the intestinal wall and asexually reproduce to form tachyzoites. Tachyzoites migrate to various tissues (i.e., muscle, nervous, uterine) undergo asexual reproduction again, forming bradyzoites, which are encapsulated by the host into cysts.

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(Neospora Canum ~ Continued from Page 7)

When a definitive host eats intermediate host tissue contaminated with cysts, the bradyzoites enter the intestinal lining and reproduce sexually producing oocysts, which completes the life cycle.

With respect to *N. caninum*, the life cycle has three known infectious stages: tachyzoites, tissue cysts, and oocysts. Tachyzoites and tissue cysts are the stages found in intermediate hosts (Fig.3). Tissue cysts are primarily found in central nervous system tissue, but can also be found in tissues (especially muscle) surrounding the central nervous system. Oocysts are excreted in the feces of the definitive hosts and are thought to be environmentally stable, surviving in moist soil and water for months to years. Oocysts in soil can be spread mechanically by flies, cockroaches, dung beetles, and earthworms.

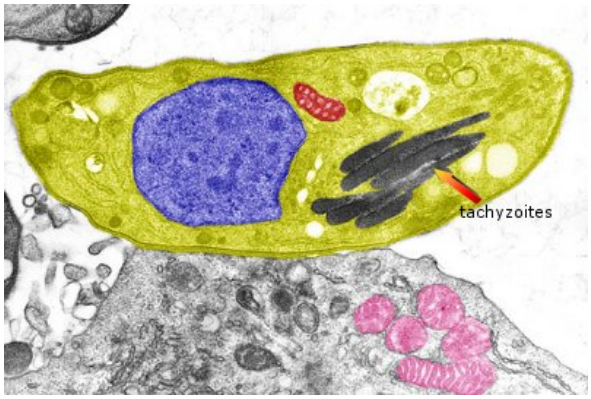


Fig. 3. Intracellular Neospora caninum tachyzoites. From Intervet Schering-Plough Animal Health (http://www.neosporosis.com/immunology.asp)

Host Range

Intermediate hosts for *N. caninum* are cattle, sheep, water buffalo, horse, white-tailed deer, and California black-tailed deer. Definitive hosts (e.g., dogs) can serve as intermediate hosts if they ingest feces with oocytes. When this occurs, the resulting neuromuscular disease can be fatal. While numerous wildlife species (e.g., grey wolf, red fox, grey fox, raccoon, fisher, black bear, bison, musk ox, caribou, house mouse, Norway rat, wild boar, and several marine mammals) have been serologically or DNA (i.e,. PCR) positive for *N. caninum*, these results only provide indication of exposure, and not the individual species status as a host. However, it is important to note that many of these species have not been evaluated for the presence of oocysts, tachyzoites, or bradyzoites.

The only wildlife species demonstrated to be a definitive host for *N. caninum* is the coyote; experimental research co-authored by NWRC scientists demonstrated that when four coyote pups consumed *N. caninum* infected calf tissue, one shed *N. caninum* oocysts. Serological evidence for exposure to the parasite in numerous wild canids including red and grey fox, and wolves has been reported, but evidence of successful infection and reproduction by *N. caninum* in these species has yet to be demonstrated. Given that wolves are more closely related to dogs than coyotes, and that coyotes have been established as definitive hosts, some scientist have postulated that wolves also will be shown to serve this role in sylvatic cycles. Some also have speculated that red and grey fox are also definitive hosts of *N. caninum*. However, infection in either species has yet to be demonstrated, and one experimental study indicated that red fox is not a definitive host. Considerable debate among scientists regarding the roles of foxes and wolves in sylvatic cycles of *N. caninum* continues.

Another species that has been evaluated experimentally is the domestic pigeon. When three pigeons were infected with *N. caninum* tachyzoites, all three pigeons became infected. This does not prove that pigeons serve as natural intermediate hosts, but it is suggestive of such a role and that other bird species should be examined. While natural infection in birds has not been detected to date, two studies documented an association between the presence of poultry on dairy farms and neosporosis abortions.

Raccoons also may play a role as an intermediate host. One study documented the presence of *N. caninum* DNA in the brain of a wild raccoon infected with canine distemper. However, no viable parasites have been isolated from raccoons, and studies examining seroprevalence find very low titers.

Transmission

Transmission in all hosts (definitive and intermediate) can occur horizontally (animal to animal) or vertically (*in utero*). Horizontal transmission occurs by ingestion of infected tissues with tachyzoites or bradyzoites (i.e., cysts), or by ingestion of food or water contaminated with sporulated oocysts. Vertical transmission occurs when tachyzoites from the dam cross the placenta and infect the fetus.

The primary life cycle for *N. caninum* is the domestic cycle using dogs as definitive hosts and cattle as intermediate hosts. Dogs shed oocysts in there feces contaminating cattle feed (i.e., horizontal transmission). Once infected, the primary means of transmission within a cattle herd is vertical. However, transmission from dogs to cattle is believed to be necessary to spread the disease and to maintain the observed levels of infection. It has been demonstrated that an infected dog can shed up to 500,000 oocysts in a single day after consuming infected tissues from a single calf. This oocyst load is capable of infecting hundreds to thousands of cattle.

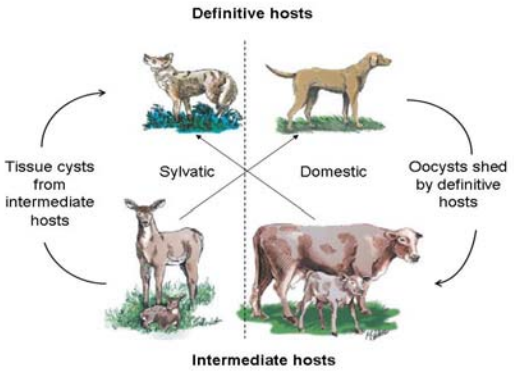
A sylvatic cycle also likely occurs for *N. caninum*. This cycle is similar to the domestic cycle except the main definitive and intermediate hosts are the coyote and white-tailed deer, respectively. While transmission between coyotes and deer has not been documented experimentally, the fact that they are definitive and intermediate hosts, respectively, and that high seroprevalence of infection has been documented in these species is highly suggestive of their role in a sylvatic cycle. High seroprevalence in moose, caribou, wolves, and foxes are also indications that they

(Continued on Page 9)

(Neospora Canum ~ Cont. from Page 8)

may be involved in a sylvatic cycle; however, isolation of the parasite in these species has yet to occur.

Potential crossover of the domestic and sylvatic cycles has been reported (Fig. 4). Transmissions from cattle to coyotes and from deer to dogs have been demonstrated. It is also probable that transmission from coyotes to cattle and from dogs to deer can occur. Scientists have postulated that hunting favors transmission of *N. caninum* from deer to domestic and wild canids, through infected tissues of eviscerated deer left in the field.



Adapted from L.F.P. Gondim. 2006 Trends in Parasitology 22(6):247-252

Fig. 4 Overlap of the domestic and sylvatic cycles of Neospora caninum.

Human Health

Currently, there is no evidence that *N caninum* can successfully infect humans. Seroprevalence in humans is low and *N. caninum* DNA has not been documented in human tissue. Concern for the potential for human infection still exists, though, because a research study has demonstrated successful infection of Rhesus monkeys with *N. caninum.*

Prevention and Control

Implementation of good biosecurity an management procedures is the key to preventing introduction of *N. caninum* and reducing prevalence in infected herds. These procedures include:

1. Quarantine and testing of replacement and purchased cattle

2. Prevention of transmission from dogs through:

   a. Preventing contamination of feedstuff with dog feces (Fig. 5)

   b. preventing access to infected cattle tissues

3. Prevention of drinking water contamination with feces from definite hosts, or discontinuing use pond water and using well or public water supplies.

4. Rodent control

5. Reproductive management (i.e., embryo transfer, artificial insemination) to reduce vertical transmission.

While management of wild definitive hosts (i.e., coyotes) to control contamination of pasture would seem prudent, the effects of wild carnivore management to prevent or reduce infection of cattle herds have not been evaluated. One study documented that the abundance of coyotes or grey fox in different ecological zones of Texas was associated with the seroprevalence of *N. caninum* in beef calves. However, a study of Ontario Holstein dairy herds reported that the presence of wild canids on farm premises seemed to have a protective effect on the likelihood that farms experienced *N. caninum* related abortions; the authors postulated that wild canids reduced domestic dog use of the farm.

Fig. 5. Cows that eat food contaminated by infected dog feces ingest Neospora caninum oocysts. From Intervet Schering-Plough Animal Health (http://www.neosporosis.com/epidemiology-neosporosis.asp)

Summary

Neospora caninum is a protozoan parasite that can result in significant cattle abortions worldwide. The life cycle of *N. caninum* requires both a definitive host (primarily dogs) and an intermediate host (primarily cattle). A secondary sylvatic cycle involving coyotes (definitive host) and white-tailed deer (intermediate host) has recently been proposed. Crossover between the domestic and sylvatic cycle is possible, although direct transmission from coyotes to cattle has not been documented. While the potential of foxes and wolves to serve as additional wild definitive hosts exists, clear data documenting the role of these species in *N. caninum* transmission is unavailable. Prevention and control of *N. caninum* on cattle farms is dependent on implementation of sound biosecurity protocols and reproductive management of the herd. No evidence exists on the effectiveness of wild canid management on preventing or controlling *N. caninum* on farms.

Additional Reading

Gondim, L. F. P. 2006. Neospora caninum in wildlife. Trends Parasitol. 22(6): 247-252

Gondim, L. F. P., M. M. McAllister, W. C. Pitt, L. D. Mech, and D. E. Zemlicka. 2004. Coyotes (Canis latrans) are definitive hosts of *Neospora caninun*. Internat. J. Parasitol.34:159-161.

Gondim, L. F. P., M. M. McAllister, N. E. Mateus-Pinilla, W. C. Pitt, L. D. Mech, and M. E. Nelson. 2004. Transmission of Neospora caninum between wild and domestic animals. J. Parasitol. 90(6):1361-1365.

Dubey, J. P., G. Schares, and L. M. Ortega-Mora. 2007. Epidemiology and control of Neosporosis and Neospora caninum. Clin. Microbiol. Rev. 20:323-367.

USDA/ARS. 2008. Animal Parasitic Diseases: Neosporosis. http://www.ars.usda.gov/Main/docs.htm?docid=11007

STATE HIGHLIGHTS - EASTERN REGION

Alabama assists with raccoon density index studies.
WDB Lovell assisted with two raccoon density index studies in Washington County. One hundred cage traps were run for 15 days in order to validate 4 earlier density measurements collected in the summer and fall of 2007.

Arkansas collects various samples for CWD testing.
WDB Turnage assisted personnel with the Arkansas Game and Fish Commission to conduct a white-tailed deer herd health check. Five adult does were harvested, fetuses were measured to determine time of conception, kidney fat and body weights were analyzed to assess overall health. Brain stems and retropharyngeal lymph nodes were submitted for CWD testing.

USDA/APHIS/WS Nevada Wildlife Disease Biologist Zack Bowers and Sherry Buckley of the Minnesota Department of Natural Resources prepare to sample a white-tailed deer for bovine tuberculosis.

Florida develops feral swine target sampling areas.
WDB Milleson developed a GIS map to target sampling areas based on proximity to airports, and domestic swine operations.

WDB teaches lab in Georgia.
WDB Kavanaugh taught a lab for the University of Georgia, School of Forestry and Natural Resources, Wildlife Damage Management class. Students were taught necropsy and sample collection techniques on a white-tailed deer, bio-safety, data collection and record keeping, and sample storage and shipping procedures.

Illinois assists with tick surveillance.
In addition to collecting samples from white-tailed deer for CWD, black-legged ticks, or deer ticks are being collected for Lyme's Disease testing. Ticks collected by WS will be submitted by the forest preserve to the health department for confirmation of species identification and if appropriate, Lyme's Disease testing.

Indiana WDB facilitates feral swine meeting. WDB Caudell discussed the national surveillance for feral swine disease and future actions for feral swine including assisting DNR with the monitoring of the population size and distribution, collecting disease samples for classical swine fever and education efforts. Follow up actions included establishing a protocol for reporting feral swine and information exchange between the members.

Louisiana reports *Encephalitozoon cuniculi* in rabbits.
Domestic rabbits at the Audubon Zoo in New Orleans were dying from *E. cuniculi*. There was concern that wild rabbits living on the zoo and in an adjacent park might become infected. Zoo officials were interested in capturing and testing wild rabbits for *E. cuniculi*. Wildlife Services will likely assist with capturing rabbits and obtaining blood samples for testing.

Maine utilizes falconry community to assist with avian influenza surveillance.
Although falconry success rates are relatively low compared to other methods of hunting, the falconers in Maine have an extended hunting season for ducks, which goes through the end of February. Collecting samples from the falconry community allows Maine to have an extended hunting season for ducks.

Maryland submits samples from nutria for tularemia.
Wildlife Services trappers collected samples from 10 nutria for submission to CDC for tularemia testing. To date, all samples have tested negative.

Massachusetts presents information at meeting at Tufts University.
WDB Mickley attended the monthly Animal Surveillance and Education Committee meeting at Tufts University. Information was presented by Tufts researchers about common eider die-offs on Cape Cod and about White Nose syndrome in bats. WDB Mickley informed the group about the completion of WS HPAI collecting activities for the season. He informed them as well about his participation in the MI TB deer project and the Annual Meeting of Wildlife Disease Biologists.

Mississippi conducts avian influenza surveillance at 3 morbidity/mortality events.
WDB Cumbee was contacted by 3 different refuges to collect

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(*State Highlights — Eastern Region ~ Continued from Page 10*)

samples from American Black Ducks and Lesser Snow Geese. Preliminary results from the National Wildlife Health Centers in Madison, WI suggest that aflatoxins may have played a role in one of the events.

Rabies suspected in 4 raccoons and 1 gray fox in Michigan.
WDB Marks conducted the direct rapid immunohistochemical test (DRIT) on brainstems collected from these animals displaying signs of a neurological disorder. These animals were submitted as a result of efforts to increase rabies awareness in those that might receive calls from the public. All samples tested negative.

387 animals sampled for tuberculosis in Minnesota.
From March 10-March 31st, 384 deer and 3 elk were removed and tested for tuberculosis. Of these, 3 were considered to be bTB suspect, and 2 clinical cases and 1 abscessed lymph node were found. Sampling continued into late April.

Missouri WDB presents feral hog workshop.
WDB Hutton presented a feral hog workshop to approximately 50 staff of New York's Department of Environmental Conservation, Ag Markets and Regulation and Wildlife Services. The workshop included information on feral hog status and distribution, damage and diseases, varieties and sources of feral hogs, feral hog biology and behavior, and control methods as well as an outdoor demonstration of corral traps, cage traps and cable restraints.

New Hampshire collects samples for giardia and tularemia testing.
WDB Musante collected samples from two beavers for testing. The beavers were trapped in cooperation with a NWCO as part of an ongoing study through the NH Department of Health and Human Services to test for prevalence of giardia in a local beaver population.

New Jersey discusses plans to begin prebaiting for feral swine trapping.
WDB Kabert and SD Sullivan met with the New Jersey Department of Agriculture (NJDA), New Jersey Division of Fish and Wildlife (NJDFW), and USDA VS to discuss NJ WS' upcoming plans to begin prebaiting for feral swine trapping within a NJDFW Wildlife Management Area (WMA) and adjoining golf course. Feral swine are suspected of being present on these sites for possibly the past ten years and previous trapping attempts by the NJDFW have proven unsuccessful.

Reovirus determined to be cause of death in crows in New York.
WDB Gansowski coordinated a response to a concerned citizen's calls about a large number of dead crows in Albany and Renssalear Counties, NY. Crows were collected from various locations in the counties and delivered to the NYS Department of Environmental Conservation pathology unit for testing where all of the crows tested positive for reovirus.

North Carolina cooperates with NWRC researcher.
Plans were finalized for a visit by Dr. Richard Engemann to tour commercial swine areas and make recommendations for a population index study using trail cameras and passive track technique.

Ohio receives confirmation of results for crow die-off.
Samples were collected from an urban crow roost die-off in January in Ohio. It is estimated that as many as 150 American crows died during this event with the cause of death being identified by the NWHC as enteritis, hemorrhagic, viral infection suspect.

Pennsylvania works to correct information on pot belly pigs.
WDB Van Why collected samples from feral hogs released on Pennsylvania Game Commission lands while other WS personnel worked with the Pennsylvania Game Commission, Pennsylvania Department of Agriculture and other organizations when media attention centered on false reports that these hogs were pot belly pigs.

South Carolina collects coots for AVM testing. WDB Owen assisted the SC Department of Natural Resources with routine monitoring of area reservoirs for signs of avian vacuolar myelinopathy (AVM). Two sick and one dead American Coots believed to be infected with AVM were collected. Several aquatic vegetation samples were also collected in order to detect toxins found in algae growing on the vegetation. These toxins are suspected to be the cause of AVM.

Pesticide poisoning suspected at morbidity/mortality event in Tennessee. The state office responded to several calls about dead birds scattered throughout Orlinda, TN. Common grackles and red-winged blackbirds were found in the middle of streets, yards, ditches, etc., in a "shotgun-like" pattern within a four block radius. Twenty birds were submitted for necropsy and tested positive for chlorinated pesticides.

Virginia WDB collects samples for AI surveillance in Guantanamo Bay.
WDB Puckett and other WS personnel conducted AI surveillance on Guantanamo Bay Naval Station (GTMO) in Cuba and obtained 52 AI samples the first day of sampling. A VS import permit allowing AI samples entry into the US from Cuba was finally obtained the day before leaving Cuba.

Wisconsin submits samples from feral swine.
Sixteen feral swine were trapped in Wisconsin using corral traps and night shooting. Blood samples for pseudorabies, swine brucellosis, and classical swine fever were collected and all tested negative.

West Virginia discovers escaped population of domestic swine.
WDB Hill and SD Croson met with representatives of the WV Department of Agriculture to conduct a site visit at the location where feral swine were determined to be based on complaints from the public regarding damage to agricultural crops and private/hobby gardens. Samples will be submitted from feral swine for classical swine fever, pseudorabies, and swine brucellosis.

STATE HIGHLIGHTS-WESTERN REGION

Principal Investigator's meeting held at the USFWS building in Anchorage, AK. WDB Sinnett gave a 20 minute presentation on what USDA/WS and cooperators have accomplished in their efforts towards HPAI surveillance in Biological Year (BY) 2007 and the tentative plans for HPAI surveillance in BY 2008. Approximately 30 people were in attendance.

Arizona feral swine activity observed to be reduced compared to previous years. On March 28 – April 4, 2008, Wildlife Disease Biologists Lewis, Bowers and WS pilot/volunteer Rigden conducted feral swine sampling on Havasu National Wildlife Refuge. During a week of snaring, spotlighting and opportunistic shooting, WS removed 20 feral swine from the refuge. The feral swine activity was observed to be relatively slow this year and numbers are believed to be down from previous years.

California expands state-wide disease surveillance in feral swine. WDB Moyles and other WS personnel continued to collect feral swine samples for classical swine fever (CSF), pseudorabies (PRV), and swine brucellosis (SB) testing. Sera were collected from nine feral swine for CSF surveillance and submitted to the Foreign Animal Disease Diagnostic Laboratory (FADDL). Sera for PRV and SB testing were sent to the CAHFS Diagnostic Lab at UC Davis. Hair, nobuto strips, and muscle tissue were collected for DNA testing and sent to UC Davis Veterinary Genetics lab.

Trail camera photo of several of the 19 pigs captured in a single trap on a hog farm

Feral swine disease surveillance initiated in Colorado. WDB Felix coordinated with Veterinary Services, the Colorado Department of Agriculture, and WS National Wildlife Disease Program to produce a disease sampling protocol for feral swine in Colorado. Sampling will include swine brucellosis, pseudo-rabies virus, and classical swine fever, as well as archiving serum in the National Feral Swine Serum Archive in Fort Collins. These planning activities were initiated due to increased reports of feral swine in Colorado, increased hunter harvest of feral swine, and potential future feral swine control work which we anticipate starting in June 2008.

Hawaii working towards completing the Pacific Region HPAI Surveillance Field Report. WDB Goldstein met with State and Federal partner agencies to assist them with their HPAI-surveillance sample collection and to discuss the compilation of a Pacific Region HPAI Surveillance Field Report. WDB Goldstein also participated in a final discussion of last year's HPAI Emergency Response Table Top Exercise After Action Report at the Hawaii State Civil Defense bunker. Topics of discussion included carcass disposal, bird risks to the general public, access issues related to private property during a FAD event, and the ongoing issue of feral/commensal chickens.

Idaho prepares for Aleutian Disease Surveillance. WDB Stopak and the Idaho Fish and Game (IDFG) Wildlife Veterinarian conducted onsite visits to three mink farms. The purpose of the visits was to present the Aleutian Disease (AD) surveillance project to the ranch managers/owners and receive any feedback they may have. All of the individuals contacted were overwhelmingly in favor of moving forward with the project.

National Feral Swine Mapping System (NFSMS) was updated for the state of Kansas. The main objectives of the NFSMS are to provide a direct means for continual collection of data on the distribution of feral swine in the United States, and to make these data easily accessible for users. Kansas currently has feral swine in 18 counties with an estimated 1,500-2,000 individuals state wide. The Kansas WS program removed 423 hogs last year and 333 in February, 2008 alone.

Montana wolves opportunistically tested for disease. WDB Wiscomb and other WS personnel removed seven wolves responsible for livestock depredation, this month. All seven wolf carcasses were recovered by WS and delivered to the MT FWP lab in Bozeman where biological samples are collected from each animal and tested for Canine Adenovirus-1, Canine Distemper, Canine Parvovirus, *Brucella abortus*, *Brucella canis*, Serovars of *Leptospira interrogans,* Q Fever, and Rabies. According to FWP reports, gray wolves in MT have shown evidence of exposure at a rate of 90% for Canine Distemper, 100% for Canine Parvovirus, 76% for Canine Adenovirus, no evidence of rabies exposure, and 4% were seropositive for Brucellosis but showed no evidence of actual infection.

Nebraska completes HPAI H5N1 surveillance of hunter-harvested, captured live wild birds, and agency-harvested birds 2008 season. Nebraska Game and Parks Commission and USDA WS Nebraska jointly

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(State Highlights — Western Region ~ Continued from Page 12)

reached the goal of 1500 birds. Environmental samples were also completed with 704 samples for the season. Surveil lance of morbidity and/or mortality events continues.

Cannon netting yields efficient captures of waterfowl in Nevada. In February 2008, WDB Bowers worked in cooperation with the University of Nevada-Reno (UNR), and the United States Fish and Wildlife Service (USFWS) trapping wood ducks in Churchill County. The net cannon enables UNR to effectively catch large numbers of birds with one shot. This allows UNR to collect a large amount of data in a short amount of time, and minimizes handling of the ducks.

New Mexico finished the AI surveillance season. WDB Griffin left Wildlife Services in December to move on to a new career in teaching. WB Bowers and the rest of the New Mexico Wildlife Services program remained vigilant and finished out the 2007-2008 HPAI surveillance season in February of 2008.

Feral swine show up in North Dakota. In March 2008, WDB Powers and SD Mastrangelo met with personnel from the North Dakota Game and Fish Department after receiving a confirmed report of feral swine in Sheridan County. WS personnel met with landowners and received permission to remove feral swine from their respective property. On March 31, WS personnel initiated eradication efforts and 21 feral swine were removed from the area. Blood samples were collected from all 21 animals for pseudorabies, swine brucellosis, classical swine fever, plague, and tularemia testing. In addition, blood samples were collected for genetics testing in cooperation with the University of North Dakota.

Oklahoma feral swine disease surveillance efforts continue. WDB Marlow conducted surveillance for Classical Swine Fever (CSF) in feral swine harvested during damage management operations by WS in Oklahoma. Methods included trapping and aerial hunting. Classified as a foreign animal disease, CSF could severely impact the U.S. swine industry if it was to make its way into the country. Oklahoma WS's surveillance is part of an enhanced national CSF surveillance plan.

Oregon gears up for feral swine disease surveillance: WDB Thomas spent time working with ranchers in north central Oregon to trap, remove, and sample feral swine. The state goal was to sample 30 feral swine in 2008. WDB Thomas has also made contact with one other land owner group that manages 40,000 acres of tribal ground that is suspect of having feral swine.

National Park Service to help collect plague and tularemia samples in South Dakota. WDB Powers was contacted by personnel from Badlands National Park in South Dakota regarding plague and tularemia surveillance. Park personnel are interested in cooperating with Wildlife Services on this surveillance effort by collecting and submitting blood samples from carnivores. Badlands National Park is bordered by the Conata Basin to the south where WS assisted the U.S. Fish and Wildlife Service with plague dusting efforts in 2005 and 2008.

Texas small mammal die-off sampled. WDB Romines received a call from the Texas Parks and Wildlife Department requesting help with a small mammal die-off occurring in Llano County. Romines contacted the local police department, which began receiving calls from residents concerning sick and dying animals including: 16 raccoons, 15 skunks, 6 gray fox, 5 opossums and 1 beaver. Romines was able to collect brain tissue for rabies testing as well as blood, a liver sample and internal parasites. Although there is skunk rabies in the area, results were negative for rabies. Brain tissue, serum and liver sample were submitted to the Texas Veterinary Medical Diagnostic Lab for Distemper and Borrelia screening. Test results are pending.

Utah raccoons tested for *Neospora caninum*. WDB Zscheile was contacted by a Veterinarian in Utah County after several aborted fetuses, from a local dairy farm, test positive for *Neospora caninum*. The Veterinarian was certain raccoons, which had been feeding and defecating in the hay, corn and cattle feed bins, were responsible for the *Neospora caninum* transmission. WDB Zscheile conducted raccoon trapping activities at the Utah County dairy farm. All trapped raccoons were sent to the Utah State Veterinary Diagnostic Laboratory for full necropsies and *Neospora caninum* testing and confirmation.

Washington reviews HPAI response with table top exercise. WDB Bruning attended a AI Tabletop Exercise to review and test the Washington Multi-Agency Response to a HPAI animal emergency. The exercise was designed to simulate the challenges that would be faced by industry, government, and emergency responders if HPAI expressed itself or was detected in Washington. This meeting was attended by USDA APHIS VS and WS, USFWS, US Geological Survey National Wildlife Health Center, WA Animal Disease Diagnostic Laboratory, State of Washington Departments f: Ecology; Emergency Management; Fish and Wildlife; Health; and Agriculture, the British Columbia Ministry of Agriculture and Lands, US Army Veterinary Corps, County Animal and Human Health Officials, multiple private poultry producers, and private veterinarians.

Wyoming coyotes and foxes are screened for canine heartworm. WDB Pipas was recently requested by a PhD student from the City University of New York to provide canine heartworm samples from wild canids (coyotes and red foxes) in Wyoming. The working hypothesis of this research is that heartworm treatment efforts are altering the pattern of heartworm evolution and producing population bottlenecks. Knowledge of these occurrences and their genetic consequences can help manage infected canid populations more efficiently.

National Wildlife Disease Surveillance and Emergency Response Program

For more information on the Wildlife Services Wildlife Disease Program in your state, please call 866-4 USDA WS, or contact the following staff:

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For All-Hazard Emergencies Involving Wildlife Call: 970.266.6363 or toll-free

Introduction of NWDP web page

By Erika Kampe

The National Wildlife Disease Program's official website is now available at

http://www.aphis.usda.gov/wildlife_damage/nwdp.

The website will be a valuable tool for providing information to our fellow Wildlife Services personnel, other collaborators and the public.

The site has a page describing the mission of the program and a page for each major wildlife disease surveillance project that NWDP is currently involved in. These pages include the following:

- Highly-pathogenic Avian Influenza (domestic and international)
- Diseases of Feral Swine
- Plague
- Tularemia
- NWDP's Surveillance and Emergency Response System (SERS)
- An interactive map with state-by-state contact information, updates, and accomplishments.

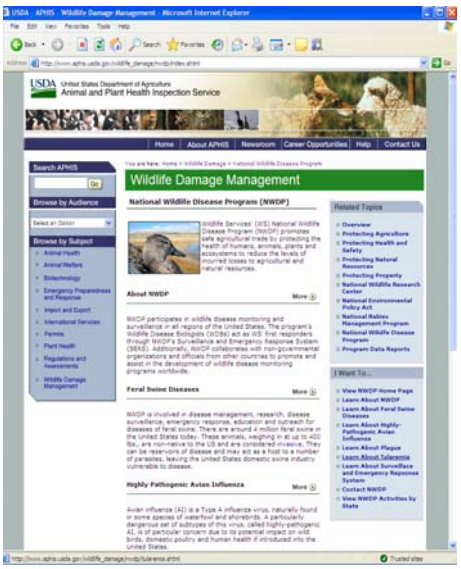
Each page contains links to additional information from sources like the Center for Disease Control, Southeastern Cooperative Wildlife Disease Study, US Department of Homeland Security and other APHIS branches.

Coming Soon

This site will reflect the expanding accomplishments of the NWDP.

Please contact Erika Kampe for more information or with any suggestions on how to make our site better!

Updates on special state accomplishments for the interactive map are always appreciated.



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