

Report of the Committee on Public Health and Rabies
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The Committee met on October 27, 2015 at the Rhode Island Convention Center in Providence, Rhode Island from 1:00 PM to 5:30 PM. There were 25 members and 13 guests present. Dr. Crnic welcomed members and guests and provided introductory comments.

Presentations & Reports

Wildlife Services, National Rabies Management Program Update

Kathy Nelson, Wildlife Biologist & Operations Staff Supervisor
United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS), National Rabies Management Program (NRMP), Concord, NH

An overview of the National Rabies Management Program (NRMP) was provided by Kathy Nelson, NRMP Operations Staff Supervisor for USDA, APHIS, Wildlife Services (WS). In FY15, WS distributed >10.1 million oral rabies vaccination (ORV) baits over 192,000 km² (an area larger than the State of Washington) in Alabama, Georgia, Maine, Maryland, Massachusetts, New Hampshire, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Texas, Vermont, Virginia, and West Virginia. Bait distribution included RABORAL V-RG® and ONRAB vaccines targeting raccoons, coyotes, gray fox and skunks. More than 7.4 million baits were distributed to prevent raccoon rabies from spreading beyond the eastern US; >1 million to prevent canine (dog-coyote) rabies from reemerging in Texas along the Mexico Border; approximately 235,000 to prevent gray fox rabies from reemerging in central Texas; and >1.4 million baits targeting skunks in the Houston area as part of an effort led by the Texas Department of State Health Services (TDSHS). In cooperation with the Centers for Disease Control and Prevention (CDC), The Wistar Institute and state agriculture, health, and fish and wildlife agencies, the NRMP continued to expand use of the direct rapid immunohistochemical test (dRIT), a rapid diagnostic test that can confirm rabies in 50 minutes and allows for real-time rabies management decision-making based on the best available surveillance data. To date, WS has sent 73 personnel from 20 states for dRIT training and certification at the CDC and Wistar Institute. From 2005 through August 31, 2015, WS collected 85,443 animals (from 27 states) to enhance rabies surveillance. Of those, WS tested 70,980 (83%) samples (from 23 states) using the dRIT, while the remaining animals were submitted to local public health laboratories or the CDC; 1,324 of the dRIT tested animals were confirmed rabid. Field trials using ONRAB (a recombinant oral rabies vaccine that uses a human adenovirus5 as the virus vector to express the rabies glycoprotein) have been conducted by WS since 2011. A trial in New York, Vermont and New Hampshire conducted from 2012-2014 showed a 3-year average rabies virus neutralizing antibody (rVNA) response in raccoons of 70%. Some of the trapping cells within this field trial were in rural forested areas of eastern Vermont with known low raccoon density (WS has conducted 66 raccoon density studies in Vermont with densities in this area of 2-3 raccoons/km²). During the 2012-2014 trial, these cells had rVNA levels of 90-100% which prompted WS to look at a field trial in 2015 to test ONRAB at low density (37.5 baits/km², half that of the previous trial) and see if high levels of rVNA can still be

achieved with fewer baits. A separate field trial in the Burlington, VT area was designed in 2015 to look at increased ONRAB density (150 baits/km²) in an urban area, while also testing our ground ORV distribution methods. Trials targeting raccoons in New Hampshire, New York and Ohio continued in FY15; and the second year of a trial targeting skunks in West Virginia also continued in FY15. During July pre-ONRAB trapping, >1,200 raccoons were captured and sampled for baseline rVNA analysis. In August, nearly 2 million ONRAB baits were distributed in the 5 states. Post-ONRAB trapping will take place in October. All 2015 results are pending from laboratories.

Raccoon Rabies management in Québec, Canada

Marianne Gagnier MATDR

Coordinator - Monitoring and Control of Rabies

Biodiversity and Wildlife Diseases Branch

Ministry of Forests, Wildlife and Parks

In June 2006, the first case of raccoon rabies was detected in the province of Québec, Canada. Between June 2006 and April 2009, 104 cases were confirmed. They were all found in the Montérégie region, which is located south of Montréal and neighboring Vermont and New York states. This raccoon rabies incursion, coming from Vermont state, was immediately considered a serious threat to public health. For this reason, as soon as the first case was found, a rabies control program was implemented to control the outbreak, to avoid its entry in Montréal and highly populated surrounding cities and eventually to eliminate this zoonotic disease of Québec. This control program was developed and improved under the collaborative work of Health, Wildlife, Agriculture and Public safety ministries as well as Canadian Food Inspection Agency (CFIA) and University of Montréal representatives. Many improvements have been made to the plan over 8 years, allowing a significant reduction of direct expenses. The cost of Quebec Rabies Control program went from 2,8 M\$/year in 2008 to 1,8 M\$/year in 2015. The control and elimination plan was very successful; from May 2009 to May 2015, no cases were reported. The key of this success is mainly based on the use of ONRAB baits vaccine, on an enhanced surveillance program (about 1000 samples tested/year) and on targeted apply research. Whereas we were able to avoid a new entry of rabies in Québec, we were also able to reduce the cost of our program by using less baits while being more efficient. Through several field studies and monitoring, the results helped us improving our baits distribution techniques according to habitat quality and raccoon density. In March 2015, a rabid raccoon was found in Franklin county (NYS), about 5 km from the Quebec border. Unfortunately, the vaccine bait used in this county (V-RG) is not as effective as the one used in Québec and in the neighboring counties of New York state. Thereby, a total of 13 rabid raccoons were confirmed in Franklin county from March to August 2015. This outbreak has spread out towards Quebec and a case was found in Akwesasne reserve on May 29 2015. This section of the province had never been vaccinated with ONRAB baits before. This new threat of raccoon rabies entry in Quebec is taken very seriously and Quebec control plan has been adjusted in June to reinforce the immunity barrier close to Franklin (NY) outbreak. Since reaching the goal of raccoon rabies elimination in North America requires collaboration from all concerned jurisdictions, Quebec is available and open to collaborate such as under the North American Rabies Management Plan.

25 years of RABORAL V-RG as part of US wildlife rabies control: A manufacturer's perspective

Emily W. Lankau, DVM, PhD and Joanne Maki, DVM, PhD

Merial

This year (2015) marks the 25th anniversary of the first use of RABORAL V-RG® in the United States. RABORAL V-RG was initially considered for use in the U. S. to vaccinate raccoon populations in response to a multi-state epizootic that brought wildlife rabies to the forefront of veterinary public health initiatives. Early experimental US field trials targeting raccoons during 1990-1991 led to the first US commercial oral rabies vaccination (ORV) program in Cape May, New Jersey during 1992. Soon other wildlife rabies control programs followed at the federal, state, and local levels. Milestones of ORV use in the U. S. include: establishment of the USDA-Wildlife Services program preventing the western spread of raccoon rabies beyond the Appalachian Mountains; success in controlling or eliminating raccoon rabies

virus circulation on the smaller scale by intensive efforts such as the Long Island, NY ORV program; and achievement of regional rabies control in both coyotes and grey foxes in Texas. Acquiring approval for environmental release of this recombinant vaccine was the first of many challenges for applying this product to control rabies in the U.S. Such challenges were met through real-time collaborations and risk analyses. The combined efforts of governmental and commercial entities paved the way for organized regional distribution of this unique vaccine in sufficient volumes to address rabies outbreaks in multiple species. The production process and delivery pipeline for RABORAL V-RG have grown and evolved over time in partnership with US ORV program demands to ensure efficient cold-chain delivery of vaccine to often remote locations for airplane distribution. Merial remains committed to supporting the evolving US wildlife ORV program as field parameters and product needs shift from creating barriers to elimination of raccoon and skunk rabies variants. Merial's commitment to rabies control extends well beyond simply providing vaccine, technical and logistical support. Sanofi-Pasteur and Merial are global One Health leaders in the fight against rabies.

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Skunk Oral Rabies Vaccine – Proof of Concept Study

Tom J. Sidwa, DVM, MPH
State Public Health Veterinarian
Manager, Zoonosis Control Branch
Texas Department of State Health Services

Since 1995, The Texas Department of State Health Services (DSHS), in cooperation with USDA/APHIS/Wildlife Services and other federal, state, and local partners, has implemented an oral rabies vaccination (ORV) program to combat domestic dog/coyote (DDC) and Texas fox (TF) variants of rabies. This program resulted in the elimination of DDC from the United States, with the last reported case occurring in 2004. The last reported case of TF rabies was in 2013. The last remaining terrestrial variant of rabies in Texas is the South Central skunk (SCS) variant.

Since the initiation of the TF ORV program, skunks have been collected from within ORV zones as non-target species. A total of 62 skunks were collected from counties involved in this program during 2002, 2003, 2011, and 2012. Serum samples were evaluated for the presence of rabies antibodies by the diagnostic laboratory at Fort Sam Houston, TX. In this laboratory, a titer ≥ 0.04 IU/ml indicates immune response to the rabies virus antigen. From this data set, 36 of 62 (58%) of skunks had detectable rabies antibody titers. It is hypothesized that the rabies antibody seropositive skunks collected from within the gray fox ORV zones are most likely vaccinated due to consumption of the RABORAL V-RG baits distributed for gray foxes.

Based upon historical data from Texas, a proof of concept study was developed in 2012 to determine if the same vaccine that had led to success with DDC and TF rabies virus variants would be efficacious in controlling SCS rabies. The study has provided an opportunity to develop equipment and techniques necessary to efficiently apply RABORAL V-RG coated sachets in a suburban environment to hopefully vaccinate a new target species, the striped skunk.

The 2012 application was in Fort Bend County, Texas in September. In the first year of this protocol, coated sachets ($n = 37,500$) were distributed by helicopter and hand baiting at two different baiting densities: 64 baits/mi² (25 baits/km²) and 150 baits/mi² (58 baits/km²).

In 2013, a study area in a contiguous county (Waller) was added at a baiting density of 300 baits/ mi² (116 baits/km²) using helicopter and hand baiting.

In 2014 and 2015, baiting densities of 150 baits/mi² (58 baits/km²) and 300 baits/ mi² (116 baits/km²) were evaluated. The study was incorporated into the annual project that is carried out in January to maintain

control of DDC and TF variants. The study area was significantly expanded (all or part of 17 counties) making the distribution by fixed wing aircraft necessary; supplemented by hand baiting.

Preliminary data thus far suggests successful vaccination of skunks in the study area with RABORAL V-RG. However the titer levels, percentage of seropositivity in the population sample, and the ongoing reporting of rabid skunks in the study area, support the conclusion that the cycle of transmission is not being interrupted by ORV as currently structured.

DSHS has committed resources to continue the study for an additional year. In January 2016, the flight line separation in an area within the 150 baits/mi² (58 baits/km²) zone will be reduced from 0.5 mile to 0.25 mile in an effort to improve bait presentation to skunks. The 300 baits/ mi² (116 baits/km²) zone will once again be flown using 0.5 mile flight line separation with two passes, with lines perpendicular to each other.

National Association of State Public Health Veterinarians Compendium of Animal Rabies Prevention and Control, 2015

Tom J. Sidwa, DVM, MPH
State Public Health Veterinarian
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Texas Department of State Health Services

Rabies is a fatal viral zoonosis and a serious public health problem. The disease is an acute, progressive encephalitis caused by viruses in the Genus Lyssavirus. Rabies virus is the most important Lyssavirus globally. In the United States (U.S.), multiple rabies virus variants are maintained in wild mammalian reservoir populations such as raccoons, skunks, foxes, and bats. Although the U.S. has been declared free of transmission of canine rabies virus variants, there is always a risk of reintroduction of these variants.

The virus is usually transmitted from animal to animal through bites. The incubation period is highly variable. In domestic animals it is generally 3-12 weeks, but can range from several days to months, rarely exceeding six months. Rabies is communicable during the period of salivary shedding of rabies virus. Experimental and historic evidence document that dogs, cats, and ferrets shed virus a few days prior to clinical onset and during illness. Clinical signs of rabies are variable and include inappetance, dysphagia, cranial nerve deficits, abnormal behavior, ataxia, paralysis, altered vocalization, and seizures. Progression to death is rapid. There are currently no known effective rabies antiviral drugs.

The recommendations in this compendium serve as a basis for animal rabies prevention and control programs throughout the U.S. and facilitate standardization of procedures among jurisdictions, thereby contributing to an effective national rabies control program. This document is reviewed and revised as necessary. These recommendations do not supersede state and local laws or requirements

Modifications of note in this updated version of the Compendium are: clarification of the language; explicit encouragement of an interdisciplinary approach to rabies control; recommendation to collect and report additional data elements on rabid domestic animals to the national level; changes to the recommended management of dogs and cats exposed to rabies that are either unvaccinated or are overdue for booster vaccination; reduction of the six month quarantine period for dogs and cats; and updates to the list of animal rabies vaccines licensed and marketed in the U.S.

The most recent version of the Compendium of Animal Rabies Prevention and Control is posted at: <http://www.nasphv.org/documentsCompendia.html>

Excerpts (not reflective of all changes):

Part I, A (6) Domestic Animal Vaccination

“...An important tool to optimize public and animal health and domestic animal rabies control is routine or emergency implementation of low cost or free rabies vaccination clinics. To facilitate implementation,

jurisdictions should work with veterinary medical licensing boards, veterinary associations and the local veterinary community, animal control officials, and animal welfare organizations.”

Part I, A (9) Rabies Surveillance

“...A comprehensive surveillance program should not be limited to testing only animals that have potentially exposed people or domestic animals to rabies.”

“...To enhance the ability to make evidence-based recommendations using national surveillance data, additional data should be collected and reported on all rabid domestic animals. Essential data elements include age, sex, intact/not intact status, ownership status, quarantine dates (if any), date of onset, and complete vaccination history.”

Part I, B (1) Preexposure Vaccination and Management

Following initial vaccination and booster vaccination one year later:

- a) “Thereafter, booster vaccinations should be given in a manner consistent with the manufacturer’s label. If a previously vaccinated animal is overdue for a booster, including the one-year booster, it should be revaccinated. Immediately after revaccination, the animal is considered currently vaccinated and should be placed on a booster schedule consistent with the label of the vaccine used...”

Part I, B (2) Stray Animals

“...mechanisms should be put in place to facilitate voluntary surrender of animals to prevent abandonment.”

“...Stray and feral cats serve as a significant source of rabies exposure risk.⁴⁶ If communities allow maintenance of feral cat colonies despite this risk, they should safeguard the health of the cats and the communities in which they reside by requiring that cats receive initial and ongoing rabies booster vaccinations.”

Part I, B (5) Postexposure Management

- a) “Dogs, Cats, and Ferrets...

- (2) Dogs, cats, and ferrets that have never been vaccinated and are exposed to a rabid animal should be euthanized immediately...If the owner is unwilling to euthanize, dogs and cats should be placed in strict quarantine for 4 months and ferrets for 6 months...Rabies vaccine should be administered upon entry into quarantine to bring the animal up to current rabies vaccination status as defined in Part I.B.1. Administration of vaccine should be done as soon as possible. It is recommended that the period from exposure to vaccination not exceed 96 hours. If vaccination is delayed, public health officials may consider increasing the quarantine period for the animal from 4 to 6 months, taking into consideration factors such as the severity of exposure, the length of delay in vaccination, current health status, and local rabies epidemiology.
- (3) Dogs and cats that are overdue for a booster vaccination and with appropriate documentation of receiving at least one previous USDA licensed rabies vaccination, should immediately receive veterinary medical care for assessment, wound cleansing, and a booster vaccination. The animal should be kept under the owner’s control, and observed for 45 days. If booster vaccination is delayed, public health officials may consider increasing the observation period for the animal, taking into consideration factors such as the severity of exposure, the length of delay in booster vaccination, current health status, and local rabies epidemiology.
- (4) Dogs and cats that are overdue for a booster vaccination and without appropriate documentation of receiving at least one previous USDA licensed rabies vaccination, should immediately receive veterinary medical care for assessment, wound cleansing, and consultation with local public health authorities.
 - (a) The animal can be revaccinated immediately and placed in strict quarantine as defined above in section I.B.5.a.2, and observed for 4 months.
 - (b) Alternatively, prior to boosting, the attending veterinarian must contact the local public health authorities for guidance in the possible use of prospective serologic monitoring. Such monitoring would entail drawing paired serum samples to document prior vaccination by providing evidence of an anamnestic response to boosting. If an adequate anamnestic

response is documented, the animal can be considered to be overdue as in Part I.B.5.a.3 above and observed for 45 days. If there is inadequate evidence of an anamnestic response, the animal is considered to have never been vaccinated and should be placed in strict quarantine as defined above in section I.B.5.a.2 and observed for 4 months.”

Part II, C Adverse Events

“...While an ill animal may not have a full immunologic response to vaccine, there is no evidence to suggest that adverse events are more likely to occur with rabies vaccination than in a healthy animal. A veterinarian choosing to temporarily delay vaccinating an animal with an acute illness or condition should ensure that the animal is vaccinated as soon as possible. Animals with a previous history of anaphylaxis can be medically managed and observed after vaccination. Severe adverse events related to rabies vaccination are extremely rare in animals. Decisions concerning rabies vaccination in animals with well-documented severe adverse events to rabies vaccine must be made within the context of a valid veterinary-client-patient relationship. Due consideration should be given to the attendant risks and benefits of not vaccinating including regulatory noncompliance. Animals not currently vaccinated that experience a rabies exposure are at greater risk for infection and death, and also put their owners and the community at risk.”

Chagas disease ecology at the intersection of human, animal, and vector populations

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Chagas disease is a cause of cardiac disease and death in humans and dogs across Latin America that is increasingly recognized in the southern United States. The disease is caused by infection with a protozoan parasite (*Trypanosoma cruzi*) that is spread by blood-feeding triatomine ‘kissing’ bugs and maintained by diverse wildlife species in nature. Starting in 2013, we implemented a citizen science program in Texas that is empowering the public and medical community with knowledge about the disease and its ecological determinants, and has resulted in the submission of over 2,000 kissing bugs from across the southern states to our laboratory. These bugs are characterized by over 70% infection prevalence with *T. cruzi*. We have found over 10% of dogs at animal shelters across Texas are exposed to the parasite. Our studies of the wildlife community in central Texas have revealed that nearly 50% of hunter-harvested raccoons, but few coyotes, bobcats, fox, bats, and urban rats, have *T. cruzi*-infected cardiac tissue. Additionally, we have initiated a new prevalence study of humans and dogs along the US-Mexico border in impoverished communities that may be at high risk for colonization by kissing bug vectors. We hypothesize that the parasite strains implicated as the cause of disease and death in humans and dogs represent only a subset of the strains that circulate among wildlife reservoirs and vectors in nature. Ecological studies of *T. cruzi* across different vector species, host populations and environments will provide data useful for assessing disease risk and developing disease intervention strategies.

Development of Anti-Rabies MAbs for Post-Exposure Prophylaxis

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SYN023 is a mixture of two anti-rabies humanized monoclonal IgG1k antibodies which bind to distinct and non-overlapping antigenic sites on the rabies virus glycoprotein. The proposed indication for SYN023 is the post-exposure prophylaxis of rabies virus infection, in conjunction with rabies vaccine.

SYN023 has been shown to neutralize more than 15 contemporary clinical isolates of rabies viruses collected in China, and the 10 predominant strains in the US. Protection against virus challenges was demonstrated in various animal models. The development, manufacturing, as well as results from in vitro and in vivo studies will be presented.

Table 1. Broad spectrum neutralization against the North American strains

Rabies Virus Isolate	CTB011	CTB012	Cocktail	HRIG
E Pipistrelle	+	+	++++	++++
Eptesicus Fuscus	+	+++	++++	+
Tadarida	+/-	+	++	++++
Lasiurus Borealis	+	++++	+++	+
Lasiurus Cinerus	+	++++	++	++++
SW Eptesicus Fuscus	+/-	+++	++++	++
NC Skunk	++++	+++	++++	+
SC Skunk	++	+	++++	+
Texas Grey Fox	+	++++	++	+
Florida Raccoon	+/-	++++	+++	+
CVS-11	++++	+	++++	+

Table 2. Broad spectrum neutralization against the Chinese Strains

Rabies Virus Isolate	CTB011	CTB012	Cocktail	HRIG
HN10, Human	+++	++	+++	+++
HuBei, Dog	++	++	+++	+++
ZJ-QZ, Dog	++	++	+++	+++
SX-HZ-6, Dog	+	+	+++	+++
BD06, Dog	+	+	+++	+++
JX13-189, Ferret Badger	+	+	+++	+++
JX08-45, Ferret Badger	+	+	++	+++
JX13-235, Ferret Badger	+++	++	++	+++
JX12-234, Ferret Badger	+++	+++	+++	+++
JX09-17, Ferret Badger	+++	+	+++	+++
JX13-417, Ferret Badger	+	++	+++	+++
JX10-37, Ferret Badger	+++	++	++	++
JX13-228, Ferret Badger	+++	++	+++	+++
ZJ12-03, Ferret Badger	+++	+++	+++	+++
ZJ13-431, Ferret Badger	+++	+++	+++	++

Figure 1. PEP in Syrian Hamsters challenged with U.S. Tadarida bat strain

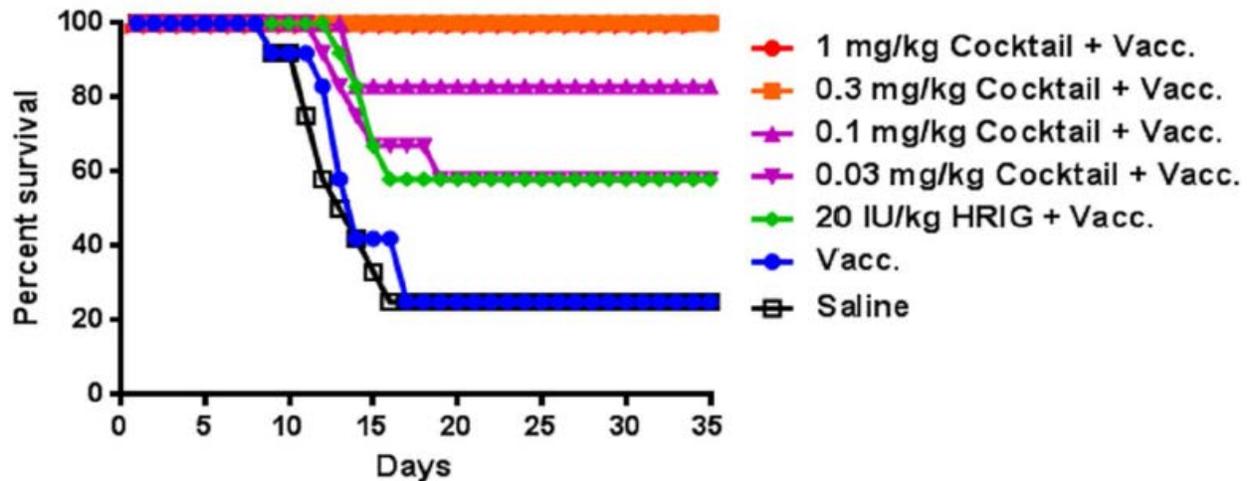
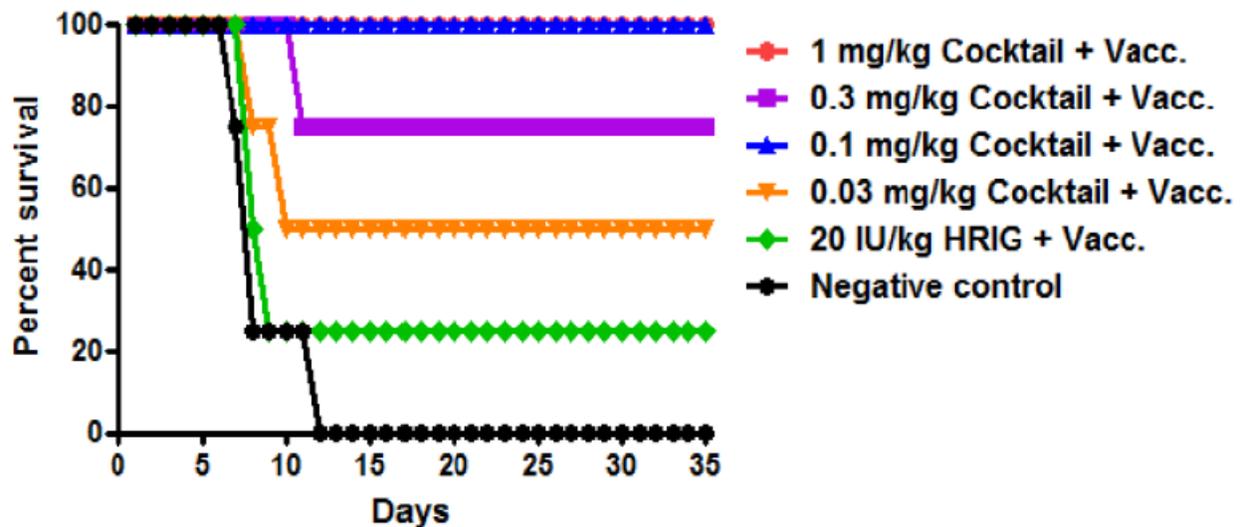


Figure 2. PEP in Beagle dogs challenged with Chinese BD06 dog strain



A One-Health Path to Prevent Zoonotic Disease

Steve Zatechka, PhD, MBA
 Chief Operating Officer
 US BIOLOGIC

According to the CDC, scientists estimate that more than 6 out of every 10 infectious diseases in humans are spread from animals. As such, utilization of safe, effective, and cost-efficient prevention methods becomes a necessary endeavor. Recognizing the complexities of addressing a range of species (human, animal, insect) diseases, and ecologies, a One Health approach is best suited to cause an effective change. This talk will focus on an example of a One Health program – effective oral delivery of vaccines and therapeutics to wildlife and food animals. Data will be presented from successful approaches, including a Lyme-disease reservoir-targeted vaccine, and a novel vaccine/antiparasitic solution to address the growing concern of antimicrobial resistance in vaccine and antiparasitic solutions to coccidiosis.

West Nile Virus - Impact of the 2012 epidemic in Texas

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West Nile virus (WNV) is a flavivirus maintained in a cycle between mosquitoes (primarily *Culex* species) and birds. Mosquitoes with WNV can also bite and infect people, horses and a range of other animals. WNV is found in Africa, India, Australia, the Middle East, Europe, and most recently, North America. Since its arrival in 1999, WNV disease has been reported throughout the continental U.S. causing a spectrum of disease ranging from asymptomatic infection (75%), to West Nile Fever (WNF) ($\approx 20\%$), to West Nile neuroinvasive disease (WNND) ($<1\%$).

WNV arrived in Texas in 2002. It easily surpassed Saint Louis encephalitis virus as the most common cause of arboviral disease in the state. The nadir of annual case counts in Texas was 2011 with 27 cases reported. There was nothing to suggest the magnitude of WNV's impact the following year.

In 2012, 1,403 WNV-positive mosquito pools, 211 birds, 121 horses and 1,868 human disease cases were reported. A total of 103 presumptive viremic blood donors (PVD) were identified by blood collection agencies. Eighty-nine Texas residents succumbed to the disease.

Of the 1,868 human WNV disease cases, 844 (45%) had WNND and 1,024 (55%) had WNF disease. Of the cases with WNND, 58% presented with encephalitis, including meningoencephalitis, and 42% presented with meningitis only. The median age of onset was 54 years (range: 1-100 years) for all cases. Cases with WNND tended to be older (median=63 years, range: 1-100), while cases with WNF were younger (median= 52 years, range: 3-94). The majority (67%) of all WNV disease cases were non-Hispanic whites, followed by Hispanics (17%). The most common symptoms reported by WNND cases were fever (99%), headache (77%), nausea or vomiting (64%), and stiff neck (59%). The most common symptoms reported by WNF cases were fever (99%), headache (85%), nausea or vomiting (57%) and myalgia (58%). The majority of WNND cases (97%) were hospitalized compared to 23% of WNF cases. Eighty-nine (5%) of all reported human WNV disease cases died, including 83 (10%) WNND cases.

In Texas, outbreak response is a local activity unless or until local resources are exhausted. This threshold was reached early in this epidemic. North Central Texas was heavily impacted and reached out through traditional emergency management channels to access regional, state, and federal assets.

Once it became clear that state involvement would be needed, the Texas Department of State Health Services engaged in a comprehensive approach to provide support.

Successes:

- Public Information and Communication: Multi-faceted communication campaign to reach the public and healthcare providers
- Coordination and Communication Among Response Partners: utilized emergency response structure and incident command system
- "Four Ds" Campaign: Dusk and dawn - stay indoors; Dress – long sleeves, light color; Defend – proper use of repellents; Drain – reduce mosquito habitat
- Laboratory – response to surge demand for mosquito and human testing: supplemental staffing through contracts; modification to methodologies employed

Challenges:

- Aerial Mosquito Adulticiding – controversial and costly, but CDC Epi-Aid Investigation supported its value in reducing new cases
- Communication complexity related to the Dallas/Fort Worth Metroplex (large number of independent jurisdictions)

- Legal Issues – access to private property for mosquito abatement, e.g. need to address abandoned pools, stacks of car tires
- Lack of Historical and Current Data – needed to inform the creation of a science-based response plan for mosquito control; thresholds for action needed e.g. point at which transition from ground to aerial adulticiding is warranted

Development of a Valuable Tool:

- The volume of electronic laboratory reports (ELRs) can be used as a leading indicator for the trend in case counts over the subsequent 2 weeks
- This information may inform response activities and resource allocation
- Epi-Aid Investigation found value in this tool

***Borrelia miyamotoi*, an emerging vector-borne pathogen**

Sandy Bushmich, MS, DVM

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Section Head, Diagnostic Testing Services, Connecticut Veterinary Medical Diagnostic Laboratory

Borrelia miyamotoi (*Bm*) was identified as a new *Borrelia* species transmitted by hard ticks in 1995 in Japan. It was found to be widely distributed globally, but was not associated with human disease until 2011, when it was linked with significant clinical disease in a group of Russian immunocompromised patients. Since that time, human cases of *Borrelia miyamotoi* disease (BMD) have been reported in immunocompetent human patients in the United States, Europe and Japan. Symptoms include fever, headache, chills, arthralgia, thrombocytopenia and leukopenia, often resembling Human Granulocytic Anaplasmosis, another tick-borne disease. Symptoms were often severe enough to require hospitalization. BMD related meningoencephalitis has been reported in immunocompromised patients. Antibiotic treatment similar to that recommended for Lyme borreliosis has been effective.

Little information regarding *Borrelia miyamotoi* infection in domestic animal species is available.

Borrelia miyamotoi is a member of the relapsing fever group of *Borrelia*. Members of this group, such as *Borrelia hermsii*, a cause of Tick Borne Relapsing Fever, more commonly infect soft ticks (genus *Ornithodoros*). *Borrelia miyamotoi* is unusual in that it shares hard tick vectors (*Ixodes scapularis* and *Ixodes pacificus* in the United States) and rodent reservoir hosts with *Borrelia burgdorferi*, the causative agent of Lyme disease. Its growth, transmission and clinical characteristics remain more typical of the relapsing fever group spirochetes, however. Much remains to be learned about this pathogen.

Borrelia miyamotoi tick infection rates reported in the literature range from 1-3% in regions endemic for Lyme borreliosis and Human Granulocytic Anaplasmosis, which is generally less than the tick infection rates for those two pathogens. Co-infection of ticks can occur. *Borrelia miyamotoi* disease may be underdiagnosed due to lack of awareness on the part of clinicians.

Preliminary results of a study investigating *B.miyamotoi* infection rates in archived ticks submitted for testing to the Connecticut Veterinary Medical Diagnostic Laboratory will be discussed.

Responding to the West African Ebola Epidemic

Barbara Knust, DVM, MPH, DACVPM

CDR, US Public Health Service

Viral Special Pathogens Branch

US Centers for Disease Control

It was late March of 2014 that undiagnosed severe disease in patients in Guinea were confirmed to be Ebola virus (species *Zaire ebolavirus*), and soon after confirmed cases were identified in Liberia. The US Centers for Disease Control and Prevention (CDC) quickly sent staff to provide support along with many governmental and non-governmental organizations, and over the course of the next year has continued to respond to the many challenges that this unprecedented epidemic has posed.

With more than 26,000 cases and 10,000 deaths, this epidemic far surpasses all cases from previously known Ebola outbreaks combined. The presence of widespread Ebola transmission in the capital cities of Guinea, Liberia, and Sierra Leone not only had disastrous impacts on the provision of health services but also meant that the epidemic could spread more easily to other countries. To date, Nigeria, Senegal, Mali, the United Kingdom, Spain, and the United States have diagnosed cases linked to the West African

epidemic; fortunately all transmission in these other countries was eventually contained. CDC was involved in the investigations in all affected African countries and the US, and additionally has sent staff to many unaffected countries across Africa to assist in surveillance and response preparations.

The approach to Ebola epidemic control is unique in that multiple complex aspects must be addressed in an urgent time frame, involving a complex cast of governmental and non-governmental organizations. CDC's efforts overseas included the following major activities: national disease surveillance, case cluster investigation, contact tracing, border monitoring, airport exit screening, infection prevention & control in the hospital setting, laboratory diagnostics, development of national & regional emergency operations centers, health communications, and advancing scientific understanding of the disease. Supporting such complex activities in the field led to the development of large field teams in each of the three "heavily affected" countries, and more than 1000 CDC staff altogether who have deployed to West Africa thus far.¹ The confirmation of the first US-diagnosed Ebola patient in October and 3 subsequent cases led to several additional control measures, most notably the establishment of entry screening of all travelers arriving from Ebola-affected countries at 5 US airports. In the United States, intense focus has been on protecting and preparing the healthcare system for possible Ebola patients. This includes support for clinicians, coordination of diagnostic testing, guidelines for patient care and healthcare worker protection, guidance for movement and monitoring of persons with Ebola exposures, and health communications and media relations. A network of hospitals was established and specifically trained to evaluate and care for Ebola patients. These efforts, in collaboration with state and local health departments, involved many thousands of people.

Ebola is a zoonotic virus. The reservoir species has not yet been identified, although virus RNA has been detected in fruit bats.² Ongoing ecologic investigations are needed to definitively identify the species that can consistently carry the virus and a better understanding of what kind of interactions with a virus-containing animal can lead to spillover into human populations. Similarly, little is known about if there are environmental drivers of spillover events.

Other animal species can be infected with Ebola virus—in nature, primate species and antelopes have been found to have detectable virus in carcasses, and primates have also been observed to develop clinical disease similar to Ebola virus disease in humans. In the Philippines, domestic swine were found to be naturally infected with Reston virus in 2007,³ and experimental infections of pigs with Ebola virus have shown that severe respiratory disease can result, and have raised questions about whether infected swine could be a source of infection to humans.^{4,5}

Less is known about the potential for canines to become infected with Ebola virus. A serosurvey in Gabon detected antibodies but no presence of virus in dogs.⁶ A dog belonging to one US Ebola patient had exposure while the patient was symptomatic, and because of the lack of conclusive information about infectivity the dog was voluntarily confined for 21 days following this exposure. In conjunction with animal health and industry groups, guidelines were developed specifically to cover possible exposures of animals to people with Ebola.⁷

More than 1.5 years after the first confirmation of Ebola in patients from Guinea, the Ebola epidemic has slowed, and recent cases have been sporadic rather than originating from sustained chains of transmission. We also now are considering the next steps beyond response, considering the special health care needs and potential for virus to persist in survivors. The global health community is working to help build the public health infrastructure of Liberia, Sierra Leone and Guinea so they will emerge stronger. This has been an extraordinary effort, and we will continue to work to fight this disease.

1. Frieden TR, Damon IK. Ebola in West Africa-CDC's role in epidemic detection, control, and prevention. *Emerging Infectious Diseases*, 2015 Nov;21(11):1897-905.
2. Olson SH, Reed P, et al. Dead or alive: animal sampling during Ebola hemorrhagic fever outbreaks in humans. *Emerging Health Threats*, 2012.
3. Barette RW, Metwally SA, Rowland JM, et al. Discovery of swine as a reservoir for *Reston ebolavirus*. *Science*, 2009; 325:204-6.
4. Kobinger GP, Leung A, Neufeld J, et al. Replication, pathogenicity, shedding, and transmission of *Zaire ebolavirus* in pigs. *Journal of Infectious Diseases*, 2011.
5. Weingartl HM, Embury-Hayatt C, Hfon C, et al. Transmission of Ebola virus from pigs to non-human primates. *Scientific Reports*, 2012.

6. Alella L, Boury O, Pouillot R, et al. Ebola virus antibody prevalence in dogs and human risk. *Emerging Infectious Diseases*, 2011.
7. Spengler JR, Stonecipher S, McManus C, et al. Management of a pet dog after exposure to a human patient with Ebola virus disease. *J Am Vet Med Assoc*. 2015.

Committee Business:

The committee passed three resolutions during the business portion of the meeting. One resolution requested an increase in funding for the USDA APHIS WS oral rabies vaccination program. The next resolution requested the Secretary of Agriculture to encourage the USDA focus resources and build strong linkages with the Global Health Security Alliance. This resolution was also to be presented to other committees for review. The final resolution, submitted by the Northeast United Animal Health Association, requested that USDA APHIS WS initiate Phase 2 of the terrestrial rabies elimination with a raccoon rabies elimination program in the Northeastern United States. All resolutions were forwarded to the executive committee for approval. Don Lein provided background information and rationale behind all three resolutions.

At the close of the business meeting, Dr. Crnic encouraged committee members to send recommendations on topics for a 2016 One Health Symposium and annual committee meeting to either the chair or vice chair.

With no further business before the committee, the meeting was adjourned at 6:05 pm.