

SCWDS BRIEFS

A Quarterly Newsletter from the
Southeastern Cooperative Wildlife Disease Study
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2016 Hemorrhagic Disease Update

Colder temperatures are reaching many regions of the country and another hemorrhagic disease (HD) season is coming to a close. During summer and fall each year, SCWDS receives wild ruminant samples from throughout the U.S. for bluetongue virus (BTV) and epizootic hemorrhagic disease virus (EHDV) testing. While no geographically widespread outbreaks occurred during 2016, there were several interesting findings and some 'hotspots' of virus activity. From May through October, SCWDS received more than 100 submissions from 21 states for HD testing and isolated 41 viruses from white-tailed deer (WTD), mule deer, or pronghorn in 12 states. This includes EHDV-1 from one state, EHDV-2 from nine states, EHDV-6 from five states, BTV-2 from one state, BTV-3 from three states, and BTV-17 from one state. Like most years, EHDV-2 was the most commonly detected virus, representing 60% of our 2016 isolates. The majority of EHDV-2 isolates were from states on the East Coast, including a focus in eastern Virginia and central North Carolina, and a smaller cluster in Georgia and South Carolina.

One of the noteworthy findings this season was a BTV-3 outbreak in Virginia and West Virginia. This event was significant because BTV-3 is not historically endemic to the U.S., and it represents the northeastern most detection of BTV-3 in the country. This adds to existing concerns over the northern expansion of HD viruses in the Midwest and Northeast potentially associated with climate change. Beginning in early August, the Virginia Department of Game and Inland Fisheries (VDGIF) and the West Virginia Division of Natural Resources (WVDNR) received numerous reports of sick and dead WTD in bordering counties in the northern regions of the states. Prompt field investigation

and diagnostic sample submission by agency personnel led to the isolation of BTV at SCWDS, which was confirmed as BTV-3 by the USDA-APHIS' National Veterinary Services Laboratories. Reporting of sick and dead deer continued through late September. Based on these reports and field investigations by WVDNR and VDGIF, the outbreak was intense but appears to have been localized to a mountainous region in extreme eastern Hardy Co, WV, northern Rockingham Co, VA, and western Shenandoah Co, VA. Follow-up investigations are aimed at further evaluating the geographic extent of the outbreak. In total, BTV-3 was detected in samples from 9 of 14 WTD submitted to SCWDS from the region.

The BTV-3 serotype first was confirmed in Florida in 1999, and since then has been detected in domestic and wild ruminants over a broad geographic region, including Florida (1999-2003, 2013), Mississippi (2006, 2009), Arkansas (2008), Oklahoma (2008), South Dakota (2012), and Texas (2015). Many of these detections were in WTD, highlighting the importance of monitoring wild ruminants for orbivirus activity. White-tailed deer serve as an important sentinel for EHDV and BTV activity in many regions of the U.S.

An additional noteworthy observation from 2016 is the isolation of EHDV-6 from a mule deer in New Mexico representing the western most detection of this serotype by SCWDS. Like BTV-3, EHDV-6 is not historically endemic in the U.S. It first was confirmed in Indiana and Illinois in 2006 and has been detected in low numbers of WTD in most years since then. However, during the massive HD outbreak of 2012, we isolated EHDV-6 from 50 deer from 12 states, and it was the predominant serotype detected in Arkansas, Florida, Louisiana, Michigan and Wisconsin. Its continued detection, including the

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recent isolation from New Mexico, indicates that EHDV-6 is here to stay and appears to be expanding its range. (Prepared by Mark Ruder and Clara Kienzle)

HPAI Detection in Alaska, August 2016

In 2014-15, the U.S. experienced an outbreak of highly pathogenic avian influenza (HPAI) in which 48,000,000 domestic turkeys and chickens were killed or culled at a cost exceeding \$5 billion. Wild birds also were infected with HPAI viruses for the first time in North America and are believed to have been involved in viral dissemination in North America during the outbreak. Extensive HPAI surveillance of wild birds before and after the outbreak, which was centered in the Upper Midwest, had failed to detect the viruses in more than 45,000 wild birds, primarily waterfowl. However, in August 2016 the USDA announced the PCR-based detection of HPAI H5N2 virus in a mallard in Alaska. Although virus could not be isolated from this sample, partial RNA sequences indicated that it was a Eurasian/American H5N2 HPAI that was very closely related to the 2014 northern pintail isolate from Washington. From June 2015 to the time of this recent report, there were no confirmed HPAI H5 virus isolations in North America from domestic poultry and more than 27,000 wild birds; however, there were two other PCR-based detections of HPAI H5 (a mallard in Utah in August 2015 and a mallard in Oregon in November 2015). Unfortunately, detection could not be confirmed by virus isolation or genetic sequencing in either case.

Interpretation of these results is difficult when it comes to evaluating the potential establishment of the clade 2.3.4.4 H5 viruses in North American waterfowl. While results may indicate that these viruses have been maintained for an additional year, the extremely low prevalence (1/27,000; 0.0037%) suggests that they are not thriving in North American waterfowl populations and that the risk of transmission to poultry appears low. We do not fully understand the factors that drive the success or failure of introduced viruses to become established in North America, and we do not know the expected short-term outcomes of such

introductions. The recent detection of HPAI H5N2 in Alaska may represent evidence of persistence, but also could be consistent with a slow extinction: HPAI H5N1 failed to establish in Europe following the 2005 outbreak in poultry and wild birds, although limited viral detections in wild birds did continue through 2007.

The recent report of HPAI H5N2 in Alaska raises more questions than it answers, and it will take additional time and data to address them. For this reason, we reiterate our message in the last issue of The SCWDS BRIEFS that understanding the impacts and outcomes of introductions such as these “can only be accomplished with long-term surveillance and research before, during, and after such events.” (Prepared by David Stallknecht)

TB in a Wild Deer in Indiana

In August 2016, bovine tuberculosis (bTB) was confirmed in a free-ranging white-tailed deer from Franklin County, Indiana, marking the first reported case of bTB in free-ranging wildlife in the state. *Mycobacterium bovis*, the causative agent of bTB, is an economically important, zoonotic pathogen with a broad host range that includes domestic livestock and numerous wildlife species, including white-tailed deer.

Bovine tuberculosis once was endemic in U.S. livestock, particularly in cattle, which prompted the implementation of a joint federal and state eradication program in 1917. This program culminated in the “bTB accredited-free” status currently enjoyed by nearly all states. However, surveillance for bTB continues at livestock slaughter facilities, and on the low number of occasions in which it is confirmed in an animal, it is traced back to the herd of origin. Whole-herd testing of the source herd and other herds within the area is performed, and a complete epidemiological investigation is conducted. More recently, confirmation of a positive cattle herd often prompts bTB surveillance in wildlife in the affected area, and this is what led to the recent detection in a wild deer in Indiana.

Bovine TB had been eradicated by 1984 in Indiana; however, *M. bovis* was detected in November 2008 in a domestic cow in Franklin

County. The following year, *M. bovis* was detected again in Franklin County in a captive deer from a commercial cervid operation, and bTB was found in elk, fallow deer, and red deer when the herd was depopulated. In response, multiple agencies began bTB surveillance to determine the status of local wildlife. In 2011, *M. bovis* was detected in a cattle farm in adjacent Dearborn County, and wildlife surveillance was expanded southward. From 2008 through 2015, approximately 1,400 free-ranging deer in Dearborn and Franklin counties had been tested with no detections of *M. bovis*.

In April 2016, *M. bovis* again was detected in cattle, this time from a Franklin County farm consisting of two sites, and surveillance was conducted to determine the bTB status of local wildlife. In August 2016, these efforts identified *M. bovis* in a free-ranging white-tailed deer removed from the affected farm. The *M. bovis* isolates from cattle, captive cervids, and wild deer since 2008 in Indiana, as well as from a cattle farm in 2010 in nearby Fleming County, Kentucky, are all linked, suggesting bTB has been circulating at low levels in the area for several years. This bTB strain has been associated with captive elk and red deer and cattle for several decades and differs from the strain that is endemic in wild deer in a portion of Michigan as well as the strain that was eradicated from wild deer in northwestern Minnesota.

Prior to the 1990s, bTB was detected sporadically and transiently in free-ranging cervids. The isolated cases were considered spillover from affected livestock and the disease did not persist in wildlife. However, *M. bovis* was discovered in 1994 in free-ranging white-tailed deer in Michigan and has since been recognized as endemic in wild deer in the northeastern corner of the Lower Peninsula. The state has been divided into separate areas with differing bTB status according to the presence/risk of bTB in cattle, and *M. bovis* continues to be detected intermittently in cattle (66 herds since 1998) and in other susceptible wildlife species.

It is widely believed that heavy baiting and supplemental feeding of deer in the affected

area of Michigan greatly facilitated the establishment and persistence of bTB in wild deer by increasing the population density and congregating normally dispersed wild deer, which enhanced *M. bovis* transmission. The main focus of bTB control efforts in Michigan has been the reduction and/or elimination of contact between potentially infected wildlife and cattle, and reduction of bTB prevalence in wild deer. Major aspects of this program include banning or restricting supplemental feeding or baiting of deer, reducing deer density, and encouraging ranchers to fence feed storage sites in affected areas. These efforts had reduced the prevalence of *M. bovis* in the endemic area's wild white-tailed deer to less than 2% through 2014, but an apparent increase was detected in 2015. Results from 2016 tests are pending.

In 2005, *M. bovis* was identified in a cattle herd in northwestern Minnesota, prompting surveillance in local wildlife that resulted in bTB detection in a wild white-tailed deer in 2006. As part of aggressive response and control efforts, Minnesota and federal officials reduced deer population density, depopulated cattle herds in the area with indemnification of owners for the cattle that were destroyed, as well as future calf crops, and required ranchers remaining in the area to install deer-proof fencing around feed storage sites. In the three years following initial surveillance efforts, 27 positive white-tailed deer were identified, but the control efforts have eliminated bTB or reduced the prevalence in local white-tailed deer to undetectable levels. No positive cases have been identified in cattle or free-ranging deer since 2009.

Following the August 2016 identification of bTB in a free-ranging deer, the Indiana Department of Natural Resources established a response plan aimed at detection and control of the disease. Current strategies include the establishment of a bTB Surveillance Zone in northern Dearborn County and a bTB Management Zone in all of Franklin County and an adjacent portion of southern Fayette County. Activities in the bTB Management Zone include removing additional deer from affected and surrounding properties; reducing deer population densities through additional hunting and

landowner permits, as well as sharpshooting; banning supplemental feeding of deer; and bTB surveillance of hunter-harvested deer. Wildlife officials in neighboring areas of Kentucky and Ohio also are conducting bTB surveillance in free-ranging deer with a goal of examining large numbers of hunter-harvested animals this fall. (Prepared by Rebecca Richardson, Texas A&M College of Veterinary Medicine; John Bryan, and Heather Fenton.)

Screwworm in the Florida Keys

Wildlife and agricultural agencies, public health officials, and veterinarians are on high alert with the news that the previously eradicated New World screwworm, *Cochliomyia hominivorax*, has re-emerged in the Florida Keys. On October 3, 2016, it was announced that *C. hominivorax* infestations had been confirmed in endangered Florida Key deer (*Odocoileus virginianus clavium*) from Big Pine Key, Florida. This prompted the declaration of an agricultural state of emergency in Monroe County by Florida's Commissioner of Agriculture and a Foreign Animal Disease Investigation by the U.S. Department of Agriculture (USDA) and associated parties. The investigation indicated that cases of screwworm infestation in Key deer and domestic animals may have occurred as early as July 2016, but specimens were not available for identification. Cases continue to be documented in Key deer and a small number of domestic animals, including dogs and pigs. As of late November 2016, at least 132 Key deer mortalities due to screwworm infestation had been confirmed on seven keys and many more mortalities likely have gone undetected.

The Key deer is an endangered subspecies of the white-tailed deer with possibly fewer than 1000 individuals left in the wild. These deer are the smallest subspecies of white-tailed deer and inhabit 20-25 islands in the lower Florida Keys. The National Key Deer Refuge was established by the United States Fish and Wildlife Service (USFWS) in 1967 for the protection and recovery of this species. Protecting these animals from fatal screwworm infestations has become a top priority for wildlife managers.

Cochliomyia hominivorax is a species from the blowfly group that feeds on the flesh in wounds of warm-blooded animals. The primary difference between screwworms and other blowflies is that screwworms feed on living flesh whereas other species feed on dead and decaying flesh. The New World screwworm primarily is a neotropical species of the Western Hemisphere and is considered endemic in several South American and Caribbean countries. The fly can be killed by exposure to long periods of freezing or near-freezing temperatures. Economic losses in the cattle industry due to New World screwworm were severe prior to the fly's eradication from the United States. The larvae are considered zoonotic and can feed on flesh wounds of people as well as on domestic and wild animals.

In the late 1950s, the USDA began releasing male flies that had been rendered infertile by irradiation in an effort to eliminate screwworms from the U.S. When these sterile males mate with fertile females, no offspring are produced, and this eventually resulted in eradication of self-sustaining screwworm populations in the U.S. by 1966. Occasional re-infestations occurred in the U.S. from Mexico, but by 1982 expansion of the eradication program had impacted screwworm populations along the border in Mexico and there were no further re-infestations. Mexico was declared free of screwworms in 1991, and the eradication program has since eliminated screwworms southward through Panama. Outbreaks in non-endemic areas have been attributed to the introduction of animals with active screwworm myiasis (fly larval infestation of flesh) or the transport of adult flies in vehicles.

Screwworms can infest an array of wounds including tick bites, traumatic injuries, open navels of newborn mammals, and wounds from production practices such as shearing, dehorning, or branding. The wounds in affected, male Key deer are thought to be associated with rut behavior and typically are observed at the antler base, head, and neck (Figure 1, Photo by A. Emerick, USFWS). Infested animals typically separate themselves from the herd and stop eating. Infested wounds grow as the maggots

feed, resulting in extensive soft tissue damage that may be associated with bloody or serous discharge. Untreated wounds can become fatal in 7-10 days, or sooner in smaller mammals.

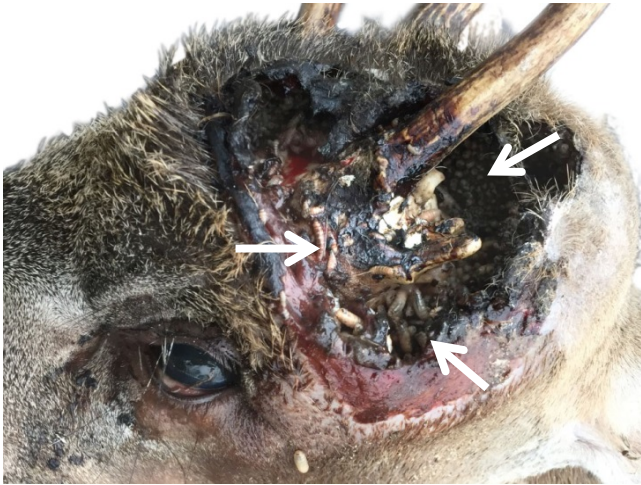


Figure 1

The screwworm shares many taxonomic features with other blowfly species, which can make identification difficult. The adult screwworm fly is 8-10 mm long and iridescent blue to green with orange complex eyes. The larval stages resemble a whitish screw with a flat anterior end, a tapered posterior end, and complete rings of dark spines that mimic screw threads. The late larval stage has a pair of dark tracheal spines that protrude slightly from the posterior end. Fully-grown maggots are 15-17 mm long (Figure 2, photo by H. Walden, University of Florida).



Figure 2

Common myiasis treatments include anti-parasitic medications such as avermectins and insecticidal sprays containing organophosphates or neonicotinoids. These treatments kill the maggots and aid in their expulsion from the wound. Once the maggots have been removed, it is advised to flush the wound, debride necrotic tissue, and prescribe appropriate antibiotics to address secondary bacterial infections. Early in the outbreak, severely infested deer were euthanized; however, treatment now is being used as an additional management tool. Ingestion of avermectin in baits that are hand-fed or available at feed stations, remote topical avermectin application, and treatment of chemically immobilized deer currently are in use.

In the current Florida situation, personnel from the USFWS have been collaborating with professionals from the USDA, the Florida Department of Agriculture and Consumer Services (FDACS), and the Florida Fish and Wildlife Conservation Commission to determine the best options to treat infested Key deer and prevent the infestation of healthy Key deer as well as other species on the island. While treatment of affected animals is important, the key to controlling *C. hominivorax* is containment and eventual eradication. The FDACS set up an animal health checkpoint on October 3rd that requires examination of all animals traveling north of mile marker 106 on U.S. Highway 1. Officials have released millions of sterilized, male flies over Big Pine Key, Big Torch Key, Middle and Little Torch Keys, Cudjoe Key, Ramrod Key, and Summerland Key. For more information about screwworms in Florida, please refer to: <http://www.freshfromflorida.com/News-Events/Press-Releases/2016-Press-Releases/Screwworm-Detected-on-Additional-Florida-Keys> (Prepared by Claire Butkus, University of Illinois College of Veterinary Medicine and Heather Fenton.)

Anthrax in 2016

An outbreak of anthrax in July and August of 2016 on the Yamal Peninsula in the Russian Federation killed more than 2,600 reindeer. Human cases, including at least one fatality, were reported in the popular press but could not be verified through official sources. Large-scale

vaccination of reindeer appears to have been effective in controlling the disease, and the outbreak was resolved in August according to reports to the World Animal Health Organization (OIE). In Sweden, three moose succumbed to anthrax as did several cattle, one sheep, and one horse. Anthrax also was reported this year in Italy and Kazakhstan, as well as in white-tailed deer within a high-fenced ranch in Kinney County, Texas.

The Yamal Peninsula is in northwestern Siberia and is home to nomadic reindeer herders whose livelihood depends on grazing reindeer. Approximately 2.4% of 111,000 reindeer in the region were affected; the case fatality rate was 100%. Historically, frequent anthrax outbreaks killed 1.5 million reindeer in Siberia between 1897 and 1924, and the disease occurred among people or cattle in numerous Siberian settlements. However, the 2016 outbreak is the first reported in this region since 1941 and is believed to be a result of abnormally high temperatures that melted the permafrost, making anthrax spores available in the soil where they were ingested by grazing reindeer.

Anthrax is a potentially fatal disease that can affect most mammals, including humans, and some species of birds. The disease is caused by infection with the spore-forming bacterium *Bacillus anthracis*. Transmission occurs by ingestion or inhalation of spores rather than bacteria. Entry through skin lesions also can occur. *Bacillus anthracis* bacteria are thought to multiply almost exclusively inside the body; in the environment, the organism exists only as dormant spores that persist for long periods of time. Heavy rains, alternating with dry periods, may concentrate the spores in the environment and lead to outbreaks among grazing animals. Herbivores become infected when they ingest sufficient numbers of spores in soil or on plants as they graze or browse, or by consumption of contaminated bone meal and other feed. Management of outbreaks in domestic animals may include quarantine, proper handling and disposal of carcasses, and vaccination.

Human cases usually develop after exposure to infected animals and their tissues. In most countries, human anthrax occurs infrequently

and sporadically, mainly in people with occupations that put them at risk through exposure to animals and their products. Groups at higher risk of infection include veterinarians, agricultural workers, and textile workers who process hides, wool, and bone products. Vaccines are available to protect humans from anthrax.

Although *B. anthracis* can be found in the environment worldwide, anthrax outbreaks typically occur in limited geographical areas. Outbreaks are most common in regions with a warm environment, periodic flooding, and soils that are alkaline and contain calcium carbonate. The disease is particularly common in parts of Africa, Asia, and the Middle East. In the United States, anthrax has been reported from most states, but it occurs most often in the Midwest and West.

The recent cases of anthrax in reindeer in the Russian Arctic have increased concerns regarding the possible re-emergence of long forgotten diseases of previous centuries. This highlights the importance of surveillance, including investigation of morbidity and mortality of free-ranging wildlife, for disease agents with implications for human, domestic, and wild animal health. (Prepared by Caitlin Cossaboum from the Virginia-Maryland College of Veterinary Medicine and Heather Fenton)

SCWDS Folks Recognized

Several SCWDS-affiliated students, faculty, and staff have received awards in recent months. Dr. Michael Yabsley is the major professor or a member of the advisory committee of many of the students who have received awards, and we are happy to report that Dr. Yabsley was promoted to full professor in July. Catherine Welch, who recently received her MS in Wildlife Ecology and Management and worked on the project investigating urbanization's impacts on wildlife health using the white ibis as a model, won a University of Georgia (UGA) Graduate School Teaching Assistant Award. These awards are provided to a small number of graduate students who have demonstrated excellent teaching skills. Shannon Curry, a PhD student also working on the white ibis project,

won 1st place at the annual Warnell School of Forestry and Natural Resources (WSFNR) Graduate Student Symposium and was a finalist in the Three Minute Thesis presentation competition. Sebastian Ortiz, a PhD student studying impacts of anthropogenic food supplementation on wildlife and their pathogens, received several awards including WSFNR's Robert W. and June C. Porterfield Memorial Scholarship, which is given annually to a married graduate student in support of research excellence; an Innovative and Interdisciplinary Research Grant, which is a UGA initiative to support innovative, interdisciplinary research being conducted by doctoral students; and the J.W. Fanning Fellowship, which is awarded by UGA's Graduate School to a student who has excellent leadership qualities and a demonstrated financial need. Jenny Bloodgood, a recent PhD graduate who worked on health issues of sea turtles and is now a veterinary student at UGA, won the Martha Love May Scholarship, which is provided annually to an outstanding student who is actively involved in extra-curricular activities, inside and outside of the WSFNR.

Kayla Buck, working on her MS on *Babesia* in raccoons, won 2nd place for her presentation at the Georgia Chapter of The Wildlife Society. Christopher Cleveland, a PhD student and Research Professional, recently was awarded a scholarship from the Shikar Safari Club that recognizes wildlife students who have excellent grades, leadership abilities, and who recognize the utility of hunting in wildlife and land management. Chris also was recognized as a 2016-2017 ARCS Foundation Scholar by the Achievement Rewards for College Scientists Foundation. This award recognizes students who have demonstrated significant accomplishments in biomedical and public health-related research directed towards preventing, treating, or curing human disease. The recognition of Chris and his research on *Dracunculus* parasites by these two organizations illustrates the "One Health" approach to many of our projects at SCWDS.

Betsy Elsmo, former wildlife pathology resident at SCWDS and the Pathology Department of the

UGA College of Veterinary Medicine (CVM), successfully completed the American College of Veterinary Pathologists' certification examination in anatomic pathology. Brittany McHale, a former SCWDS extern and current UGA pathology resident, received 1st place at the ENDIVET conference in Salvador, Brazil, for her poster on necrobacillosis in two fawns.

SCWDS Director John Fischer received the Henry S. Mosby Award in February at the annual meeting of the National Wild Turkey Federation. The award is named after Henry S. Mosby, Ph.D., whose research during the mid-1900s set the standard for wild turkey management, and was given to Dr. Fischer for disease research and other work with wild turkeys. In October of this year, John received the C. W. Watson Award at the annual conference of the Southeastern Association of Fish and Wildlife Agencies (SEAFWA). This is SEAFWA's highest honor and is presented to the career individual who, in the opinion of the Award Committee, has made the greatest contribution to wildlife or fish conservation during the previous year or years. This award is presented jointly by the Southern Division of the American Fisheries Society, the Southeastern Section of The Wildlife Society, and SEAFWA. When receiving both awards, Dr. Fischer accepted them on behalf of SCWDS and recognized the great work done here over the past 59 years. This is the third Watson Award for SCWDS; it was received by Forest Kellogg in 1970 and by Frank Hayes in 1980.

Undoubtedly, the most deserved award went to SCWDS Administrative Specialist Ms. Cindy McElwee when she received the Staff Appreciation Award from the UGA CVM in May. Cindy's enviable work ethic, boundless enthusiasm, unending attention to detail, and unequalled cheerfulness and helpfulness made the work of the awards committee very easy. We are extremely happy that Cindy has been recognized for the great work she has done since coming to SCWDS in 1997, and we congratulate all of the SCWDS students, faculty and staff for the honors they recently received. (Prepared by Michael Yabsley)

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