



SCWDS BRIEFS

A Quarterly Newsletter from the
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John Fischer Retires as SCWDS Director

SCWDS Director Dr. John R. Fischer retired January 1, 2019, after a 26-year career with SCWDS. In 1979, John earned his Bachelor of Science degree in Fisheries and Wildlife from the University of Missouri-Columbia (UMC) and went to work for the Missouri Department of Conservation. He proudly lets people know that it was not the degree that got him that first job, but rather his ability to drive a tractor, something he was taught by the caretaker of a summer camp he attended. That caretaker was a great friend and John spent many hours outdoors with

him learning the ways of the Missouri forests, streams, and wildlife.

John received his Doctor of Veterinary Medicine degree from UMC in 1986 and worked in private practice until entering a pathology residency and graduate program in 1988. He came to SCWDS in the fall of 1992 as a Postdoctoral Research Associate after receiving his Ph.D. from UMC. In 1996, John became a full-time faculty member as an Assistant Research Scientist and assumed responsibility for overseeing SCWDS' diagnostic services. He soon gained a national and international

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reputation as one of the leaders in the field of wildlife health.

When SCWDS Director Dr. Victor Nettles retired in 2000, John was the obvious choice for the job. The SCWDS Steering Committee, administrators in the University of Georgia's College of Veterinary Medicine, and the SCWDS staff were unanimous in the desire to have him fill the position. During his tenure as Director, John has provided strong, productive leadership for SCWDS and has made major contributions to wildlife disease research, teaching, and public service at regional, national, and international levels. His contributions have been recognized in the form of several awards including the C. W. Watson Award from the Southeastern Association of Fish and Wildlife Agencies, Henry S. Mosby Award from the National Wild Turkey Federation, George Bird Grinnell Award from the Wildlife Management Institute, and Tom Thorne and Beth Williams Memorial Award from the Wildlife Disease Association.

If you have had the chance to talk with John about his retirement over the past year, he likely showed you a photo of his new tractor! Indeed, John is already enjoying retirement with his wife, Lynn, their numerous pets, and of course his new tractor! However, we are fortunate that John will remain Professor Emeritus at the University of Georgia and plans to remain active in wildlife disease policy and management. We are extremely grateful for the years of service John has provided and we look forward to his continued work with SCWDS and the resource. Dr. David Stallknecht is serving as interim SCWDS Director.

CWD Confirmed in Tennessee

Unfortunately, Tennessee has become the most recent state to detect chronic wasting disease (CWD) in free-ranging deer. In December 2018, chronic wasting disease was confirmed in free-ranging white-tailed deer from Hardeman and Fayette counties. Thus far, CWD has been confirmed in 133 of 1,413 deer sampled during this hunting season from these two counties. In response, the Tennessee Wildlife Resources Agency (TWRA) enacted their CWD Response Plan and established a CWD management zone in Hardeman, Fayette, and McNairy counties.

The CWD management zone includes counties within a 10-mile radius of the locations of the 133 confirmed CWD positive deer. Within the CWD management zone, the Tennessee Fish and Wildlife Commission has taken action to establish mandatory deer check stations, restrict deer carcass movements out of the zone, and has placed restrictions on baiting and supplemental feeding. In addition, a new deer hunting season within the CWD management zone was established for January 7-31, 2019, with mandatory deer check stations on weekends. Additionally, freezers were positioned in accessible locations for deer head drop-off during the week. Surveillance efforts are ongoing, both within and outside the CWD management zone.

Surveillance for CWD in Tennessee began in 2002, but TWRA has increased surveillance efforts in recent years. As part of the CWD Response Plan, TWRA aims to determine prevalence and spatial distribution of CWD within the state, and employ management strategies to limit the spread of CWD and maintain a low infection prevalence. Providing accurate and timely information to the public is also an important component of TWRA's efforts. More information and updates can be found on TWRA's website (CWDinTN.com).

Chronic wasting disease is a significant threat to the long-term health of deer and elk populations and continues to challenge wildlife managers. Many of the epidemiologic and pathologic characteristics of CWD make this prion disease a formidable adversary. The sociopolitical climate around CWD only further complicates management of this disease. Unfortunately, CWD continues to be documented in new states and new areas within endemic states. To date, CWD has been detected in free-ranging or captive cervids in 26 states and three Canadian provinces. In recent months, states neighboring Tennessee have confirmed CWD in new counties or in areas outside of CWD management zones, including southwest Missouri, northern Mississippi, and west-central Arkansas. Surveillance efforts are ongoing in all states and an update on CWD in free-ranging cervids will appear in upcoming issues of the SCWDS BRIEFS once results from the 2018/19 harvest season are completed. (Prepared by Mark Ruder and Roger Applegate, TWRA)

First Report of Rabbit Hemorrhagic Disease Virus 2 in the U.S.

On September 17, 2018, USDA APHIS announced the first reported case of rabbit hemorrhagic disease virus 2 (RHDV2) in the U.S. The virus was associated with the death of four domestic rabbits (*Oryctolagus cuniculus*) kept as pets that were housed in a horse stall in Medina County, Ohio. In response to the incident, an epidemiologic investigation was initiated by USDA APHIS and the Ohio Department of Agriculture and a fifth rabbit was placed under quarantine.

RHDV2 is a highly contagious virus (family *Caliciviridae*, genus *Lagovirus*) that can affect wild and domestic rabbit populations worldwide. It can cause fatal, liver necrosis and blood clotting abnormalities. Transmission can occur through direct contact with virus shed in urine, feces, and respiratory secretions, or through contact with fomites such as contaminated food, water, and bedding as well as mechanical vectors. Both juvenile and adult rabbits are highly susceptible to RHDV2. Affected animals often die within 36 hours of showing non-specific clinical signs such as fever, lethargy, anorexia, and vocalization. Rabbits that survive for longer periods may exhibit weight loss, diarrhea, respiratory signs, ocular hemorrhage, epistaxis, and neurologic signs. Treatment of domestic rabbits is limited to supportive care, and fatality rates can be up to 90%.

All domestic rabbit breeds in the U.S. are of the species *O. cuniculus*, which originated in Europe and is now free-ranging on every continent except Asia and Antarctica. These rabbits are often considered agricultural pests and invasive species that compete with native rabbits and hares. Rabbit hemorrhagic disease virus 1 (RHDV1), the original variant of RHDV, was first identified in China in 1984. This virus can have similar clinical manifestations to RHDV2, but has been shown to only affect adult *O. cuniculus*, not juvenile animals or other rabbit species. RHDV1 quickly spread through European rabbit populations around the world during the 1980s and 1990s. Because of its specificity to European rabbits, the virus was intentionally released as a biocontrol agent in Australia in the 1990s to control invasive *O. cuniculus*. The first case of RHDV1 in the U.S. occurred in 2000 in Iowa, but the source of this

outbreak was never identified. Since then, sporadic cases in the U.S. include a 2001 outbreak in Illinois that resulted in death or euthanasia of 4,800 rabbits across four states, and more recently, the first detection in Pennsylvania in pet rabbits in December of 2018.

The RHDV2 variant emerged in France in wild and captive European rabbits in 2010. RHDV2 differs from RHDV1 in that it is capable of infecting multiple rabbit and hare species including European rabbits (*O. cuniculus*), Cape hares (*Lepus capensis*), Corsican hares (*L. corsicanus*), and even other small mammals such as the Mediterranean pine vole (*Microtus duodecimcostatus*) and the white-toothed shrew (*Crocidura russula*). Eastern cottontails (*Sylvilagus floridanus*) and black-tailed jackrabbits (*L. californicus*) are experimentally susceptible to RHDV2. Since 2010, the virus has spread across Europe, Australia, and, more recently, Canada and New Zealand. RHDV2 was first detected in feral European rabbits in British Columbia in March 2018, and New Zealand in May 2018. There is a high degree of genetic similarity between the strain of RHDV2 identified in Ohio in September 2018, and the virus implicated in the Canadian outbreak six months earlier.

Because the RHDV2 recently reported in Ohio is currently considered an isolated incident, no interstate movement restrictions have been enacted. Although vaccines for RHDV1 and RHDV2 are available, the RHDV2 vaccine is not approved for use in the U.S. due to licensing restrictions. USDA APHIS has issued a statement about what citizens can do in response to this foreign animal disease incursion. The public is advised to report wild rabbit mortalities to local wildlife officials. Pet rabbits that die acutely or exhibit signs suggestive of RHDV2 should be brought to a veterinarian. Veterinarians should immediately report these suspected cases to the state veterinarian and USDA APHIS. As always, domestic rabbits should never be released into the wild. Additionally, all pet rabbit owners and others who work closely with rabbits should practice good biosecurity measures.

The spread of RHDV2 in the U.S. has the potential to economically impact the rabbit industry and spill over into wild rabbit

populations. The entrance of this foreign animal disease into the U.S. underscores the importance of continued health surveillance and prompt reporting of unusual diseases in pets, wildlife, and agricultural animals. To read the official USDA APHIS statement on RHDV2, please visit: <https://content.govdelivery.com/accounts/USDAAPHIS/bulletins/2109b9f>. (Prepared by Emily Vincent, Ohio State University and Nicole Nemeth)

An Old Classic: A Case of Chronic Hemorrhagic Disease

During early June 2018, a South Carolina Department of Natural Resources (SCDNR) biologist received a call about a sick and emaciated white-tailed deer in Jasper County, SC. The deer was observed to be lethargic and drooling prior to death. A SCDNR biologist transported the yearling doe to SCWDS for necropsy. Over the preceding months, SCDNR had received increased reports of sick and dead deer from the area, but no carcasses were suitable for diagnostics.

Necropsy confirmed poor nutritional condition, as the doe had poor muscle mass, no subcutaneous or internal fat stores, and yellow gelatinous bone marrow. Multiple lesions indicative of chronic hemorrhagic disease (HD) were documented, including fever lines on all four limbs with prominent separation and sloughing of hoof wall (Figure 1), chronic ulcers on the base of the tongue, and severe blunting and scarring of rumen papillae (Figure 2). The rumen lesions were particularly striking. Approximately 50% of the rumen epithelium was affected, and there were multiple deep ulcers of the lining in the most severely affected areas. Histopathology revealed systemic inflammation suggestive of a secondary bacterial infection, which is commonly observed in cases of chronic HD. The prion that causes chronic wasting disease was not detected in the retropharyngeal lymph nodes.

Hemorrhagic disease of deer is caused by infection with either epizootic hemorrhagic disease virus (EHDV) or bluetongue virus (BTV), and is one of the most significant infectious diseases of white-tailed deer. These viruses cause damage to small blood vessels, resulting in fluid loss, hemorrhage, and tissue

damage, which can clinically manifest as a severe, hemorrhagic fever. Although there is significant variability in outcome of infection with these viruses (ranging from subclinical infection to peracute death), HD has the potential to cause significant mortality on a local or regional scale.

Classically, three forms of HD have been characterized: peracute, acute, and chronic forms. The peracute and acute forms are characterized by fever, fluid accumulation in tissues (edema) or body cavities (effusions), hemorrhages throughout the body, and ulcers in the oral cavity. Many deer succumb during this phase and suspicion of HD based on field necropsy lesions can be confirmed at SCWDS with virus testing of spleen or lung tissue. However, some deer survive the acute disease and clear the virus but health impacts may continue related to tissue damage incurred during the acute infection. These delayed impacts from tissue damage define the chronic form of HD.



Figure 1: Interrupted hoof wall growth and sloughing hoof walls.

This doe from South Carolina is a classic example of chronic HD, which is a common outcome of infection in deer throughout the coastal plain in the Southeast. The observed lesions were ultimately caused by virus-mediated injury to small blood vessels that lead to hemorrhage and necrosis in the affected tissues. The lining of a deer's rumen is commonly damaged by the virus during acute HD and becomes scarred. The rumen lining does not regenerate, and the deer is not able to

efficiently digest food and absorb nutrients. This contributes to poor nutritional condition and can ultimately end in over-winter starvation. Painful ulcers in the oral cavity may lead to bacterial infections and limit food intake, further impacting the animal's condition.



Figure 2: Severe blunting and scarring of rumen papillae. Notice healthy, long papillae on left hand side for comparison.

In addition, virus-induced damage to small blood vessels in the hooves can disrupt the growth of the hoof wall. These are often referred to as fever rings, and they should be present on all four limbs but are often more severe on the front limbs. In severe cases, these fever rings result in cracked or sloughed hooves, which lead to bacterial infections and severe lameness, adding to the malnutrition. Field necropsy of a deer with chronic HD can be rewarding because a diagnosis is made in the field when characteristic lesions are observed. Unlike cases of peracute/acute HD, there is no need to submit samples for EHDV/BTV testing because the virus has been cleared from the body by the time these lesions are observed. This was the case for this deer from SC, as no virus was isolated and we could not confirm if EHDV or BTV was the cause of the observed lesions.

Wildlife professionals often field concerns from hunters and concerned citizens about emaciated deer. There are many potential infectious and non-infectious causes of poor nutritional condition in white-tailed deer. When evaluating an animal for potential causes, it is also important to consider additional factors, such as age, sex, habitat quality, and season. In addition to chronic HD, other underlying disease conditions we have observed in emaciated deer include healed traumatic injuries, chronic bacterial infections, chronic wasting disease,

neoplasia, and dental problems, among others. It is important to approach necropsy of emaciated deer with an open mind and perform a complete necropsy to determine a potential cause. Always feel free to contact SCWDS if you have questions on whether or not you should submit samples for EHDV/BTV testing. (Prepared by Mark Ruder, Martha Frances Dalton, and Dave Stallknecht)

Hemorrhagic Disease 2018—The New Normal

The number of confirmed cases of hemorrhagic disease (HD) diagnosed by SCWDS during 2018 was not excessive and was consistent with the normal activity that we see in most years. Our first isolation of an epizootic hemorrhagic disease virus (EHDV) or bluetongue virus (BTV) was made in early August which corresponds to the late July/early August onset of HD that we see every year. Confirmed cases peaked in September and ended in November which also is consistent with previous years. In all, 63 viruses were isolated in 2018 including: EHDV-2 from Florida, Georgia, Idaho, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Montana, Nebraska, North Carolina, North Dakota, Pennsylvania, and West Virginia; EHDV-6 from Kentucky; BTV-1 from West Virginia; and BTV-24 from Florida. Two additional BTV from Florida are awaiting serotyping at USDA National Veterinary Services Laboratories. Most of these isolates originated from white-tailed deer and were identified as EHDV-2, but EHDV-2 positive mule deer also were detected in Montana, Nebraska, and North Dakota.

Consistent with recent years, however, there were a few surprises. Although normal in many ways, several changing trends were observed during 2018 and included the consistent detection of HD-related mortality in northeastern states, the detection of EHDV and BTV serotypes that historically were not known to be present in the United States, and the detection of these “new” EHDV and BTV serotypes in new states. During 2018, SCWDS confirmed HD in Pennsylvania and West Virginia, two states where reports of HD historically were not common or reported. Of the four EHDV and BTV serotypes isolated in 2018, EHDV-6, BTV-1, and BTV-24 are serotypes that, prior to 2000,

were considered exotic to the United States. This year, the detection of BTV-1 in a deer from Grant County, West Virginia, not only represented the first detection from that state but also the most northern detection of this serotype in North America. It is worth noting that this is not the first example of such an event. Grant County is adjacent to Hardy County, West Virginia where an outbreak of another “new” serotype (BTV-3) was detected during 2016 (see SCWDS Briefs Volume 32(3)). These changes in the epidemiology of HD all point to a new normal but we cannot explicitly explain why such changes are occurring. The HD samples, the viruses that are isolated, and the HD case reports we obtain annually from our collaborating states throughout the United States provide SCWDS with valuable data and isolates to fuel the research needed to better understand the viruses, drivers and potential consequences of this “new normal”. (Prepared by David Stallknecht and Rebecca Poulson)

Blood Parasites in Owls

A recent publication by several SCWDS scientists, in conjunction with the California Department of Fish and Wildlife, California Animal Health and Food Safety Laboratories, University of California at Davis, and the Louisiana Department of Wildlife and Fisheries described clinical disease in eight juvenile great-horned owls (*Bubo virginianus*) infected with *Leucocytozoon* in Louisiana and California.

These young birds were found on the ground and seven of them presented to wildlife rehabilitation facilities; one bird survived and was released from a wildlife hospital, and the other seven birds died or were euthanized due to poor prognosis. The necropsy findings were similar in all birds and included pale subcutis and internal organs, as well as enlarged spleens and livers. Microscopic examination revealed necrosis in multiple organs that was associated with varying life-stages of haemosporidian parasites and, where available, blood smears showed additional features morphologically consistent with *Leucocytozoon danilewskyi* within blood cells. Molecular testing at SCWDS revealed multiple strains of *L. danilewskyi* as well as one co-infection with *Haemoproteus*.

Parasites in the order Haemosporidia, including the genera *Leucocytozoon*, *Haemoproteus*, and *Plasmodium*, generally cause subclinical infections in many avian species across the globe. Clinical disease and mortality are uncommon and is thought to be associated with the introduction of parasites into new areas through the introduction of infected vectors or birds or the translocation of naïve birds into pathogen-endemic areas. Examples include severe declines in native passerines in Hawai'i following introduction of *Plasmodium*, and mortality of penguins placed in zoos in areas where *Plasmodium* is endemic. Clinical disease from a native parasite infecting a native bird is uncommon, although isolated cases and small outbreaks have been reported. However, cases are likely under-detected, especially for young birds.

The *Leucocytozoon* strains in these eight juvenile great-horned owls have been known to subclinically infect multiple owl species, but this report is the first to show that they can cause morbidity and mortality. The publication, in the journal *Veterinary Parasitology: Regional Studies and Reports*, also describes several ante-mortem clinical test results, detailed descriptions of the gross and histological lesions, and tissue distribution of the parasite, all of which will prove to be useful to other research and diagnostic laboratories that have suspect cases. Additionally, the study provides molecular data that will improve our understanding of parasite diversity, host specificity, and potential pathogenicity of specific strains of avian haemosporidians. Future studies to investigate the pathogenicity and epidemiology of these parasites are warranted, particularly for populations or species considered to be at high-risk for infection and clinical disease. The publication can be found at: <https://doi.org/10.1016/j.vprsr.2018.01.008>. (Prepared by Kevin Niedringhaus)

One Health Workshop

In early November 2018, SCWDS co-sponsored the inaugural “Student Workshop on Conservation Medicine, One Health, and Wildlife Diseases.” Nearly 200 wildlife students

and professionals gathered in Athens for three days of educational seminars, hands-on labs, and social and professional networking. The workshop participants were largely students, almost equally split between undergraduate, graduate, and veterinary students. Students represented 29 different institutions or organizations. Over half came from outside the state of Georgia and three from outside the United States!

The workshop was organized by Dr. Sonia Hernandez and combined laboratory and lecture-based content to provide students with knowledge and skills for future careers in wildlife health. The event was co-organized by Dr. Shannon Curry, Ethan Cooper, and three UGA student clubs, including UGA's student chapter of the Wildlife Disease Association, Zoological Medicine Club, and Warnell Pre-Vet Club. Numerous students spent months helping to organize the workshop, and provided support during the event. Sponsorship was provided by UGA's Warnell School of Forestry and Natural Resources, UGA's College of Veterinary Medicine, and SCWDS.

The Dean of the UGA College of Veterinary Medicine, Dr. Lisa Nolan, provided the first of two keynote talks, followed by Dr. Mark Ruder. They discussed the history of the One Health framework, and challenged animal, human, and environmental health professionals to address the links between wildlife, domestic animal, human, and environmental health in their work. Following keynote talks, students enjoyed dinner and a panel discussion, where they had the opportunity to ask career-related questions of six wildlife professionals.

Day two featured a full day of seminars about critical wildlife and public health issues. These seminars highlighted relationships between

human activities (e.g., urban development, land use changes, pollution), zoonotic diseases (e.g., influenza, tuberculosis, and salmonellosis), and ecosystem health (e.g., diminished water quality). The seminars also discussed solutions in the One Health framework. These included bolstering our understanding of infectious disease dynamics in human-altered systems, and engaging both professionals and members of the public to implement solutions that benefit people, but also protect animal and ecosystem health. After the day of lectures, students, speakers, and volunteers gathered for a dinner and networking.

Day three consisted of several hands-on labs or workshops focused on multiple aspects of wildlife health. Participants practiced methods of capturing and monitoring wildlife, including darting, trapping, mist netting, and telemetry; worked together to investigate and solve disease scenarios based on current wildlife-related issues; learned techniques to administer emergency care to sick or injured wildlife; or discussed current wildlife health projects with UGA researchers. A full list of events, speakers, and topics is available at the workshop website (<https://hernandezlabuga.wixsite.com/onehealthwkwshp>).

Feedback after the workshop was excellent. Students expressed excitement that an event like this was available, as it presented a unique opportunity to broaden their education. The format allowed students to more easily network with fellow students and instructors than the typical large professional conferences. In keeping with SCWDS's mission to build capacity in this field, we hope to hold this event on a biannual basis. (Prepared by Shannon Curry and Sonia Hernandez)

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