SOUTHEASTERN COOPERATIVE WILDLIFE DISEASE STUDY

SCWDS BRIEFS

A Quarterly Newsletter
Southeastern Cooperative Wildlife Disease Study
College of Veterinary Medicine
The University of Georgia
Athens, Georgia 30602

Fall 2024 — Volume 42 — Number 3

Eds. M. Ruder and B. Kurimo-Beechuk

Wild turkey, Marcelo Jorge

In this issue

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Cervid research spotlight

CWD in Arkansas: story of deer 275

A sudden blast pierces the quiet of the mountains in Gene Rush Wildlife Management Area, Arkansas. It is January 2021, and the rocket net fired flawlessly as a team of researchers rush to secure the five female white-tailed deer caught within the net. It is the first year of a five-year study to investigate the impacts of chronic wasting disease (CWD) on white-tailed deer in northwest Arkansas and here we share the story of one of these deer. Deer 275, a small 1.5-year-old doe looked skinny but not uncommonly so. It was the tail end of a rough winter that brought a polar vortex with harsh winds and freezing temperatures. The deer and researchers were all worn down. Despite this, researchers worked quickly to collect samples (e.g., rectal biopsy for CWD testing) and record data on Deer 275. Ear tags and a GPS collar were affixed to monitor her movement and survival before she was then sent on her way. Testing for CWD by collaborators at Colorado State University's Prion Research Center showed no evidence of CWD infection. Days turned to months, winter thawed out to spring and back again. Three days to the year of her original capture date, Deer 275 once again heard the boom of the rockets in January 2022, as she was recaptured and resampled. After watching her move throughout the landscape things seemed great and in fact, she weighed a little more this time compared to a year earlier, image on the right, next page. However, the result of CWD testing

Deer 275's mortality site. Note the undisturbed carcass along a pond's edge and the obvious bony prominences (e.g., shoulder blade, vertebrae) stemming from the loss of body condition associated with CWD. Photo by Marcelo Jorge

on the rectal biopsy sample collected during recapture yielded a different result a year later. Realtime quaking induced conversion (RT-QuIC) assay yielded a positive result, indicating that Deer 275's days were numbered.

Consistent with the long incubation period of CWD, Deer 275 continued to survive, and in the summer, she gave birth to a male fawn on June 11, 2022, below left image. She watched from a distance as researchers took morphometric measurements and affixed a VHF collar to monitor the fawn's survival. Eight months passed without incident. That all changed on April 2, 2023 (430 days after her recapture), as the phrase "Mortality Event Detected" began to flood the researchers' text messages and emails. Researchers rushed to get their equipment and hop into their vehicles because the longer the carcass is out in nature, the less chance there is to determine a cause of death, in part because of robust predator and scavenger communities in the study area. However, Deer 275's death scene was undisturbed, with no evidence of predation, image on the previous page. Her carcass just laid next to a pond as if she lost the will to live while walking back up the slight incline of the pond's bank, nothing compared to the mountains, valleys, and rivers she had moved across during her 3.5 years of life. This is one of the hallmarks of CWD - the slow but progressive decline of infected deer. The disease slowly picks at a deer until there is nothing left to give, and molehills turn into mountains. Mortality from CWD is cryptic, which can lead to confusion among the public. With CWD, dead deer do not pile up suddenly like they can with hemorrhagic disease outbreaks. CWD mortality in a deer population is like a leaking faucet – a slow but steady loss of deer quietly disappearing unnoticed back into the forest, like Deer 275. Her rambunctious male fawn was monitored until his collar fell off in July 2023, right after turning one-year-old. That would be her last fawn, as Deer 275 died before she could give birth to the developing female fetus found during field necropsy. During this final encounter with Deer 275, it was clear to the researchers that CWD had likely caught up with her after a long incubation period (time from infection to exhibiting clinical signs). This was confirmed through postmortem CWD testing of her retropharyngeal lymph nodes, tonsils, and obex by immunohistochemistry. She was visibly emaciated; muscle wasting revealed her protruding spine and there were no fat stores under the skin or surrounding organs, image on the next page. Further, her bone marrow was blood red, lacking typical fat stores. Necropsy findings of Deer 275 were otherwise unremarkable. In fact, the only significant findings during complete postmortem examination

Trail camera image of Deer 275 and her 16-day-old male fawn on June 27, 2022, and another trail camera image of Deer 275 on July 4, 2022, demonstrating her fair body condition typical of many healthy deer in this population. Photos by Marcelo Jorge

were emaciation and confirmation of CWD.

Deer 275 at the time of field necropsy showing the skinned carcass and the prominent loss of muscle mass. Photo by Marcelo Jorge

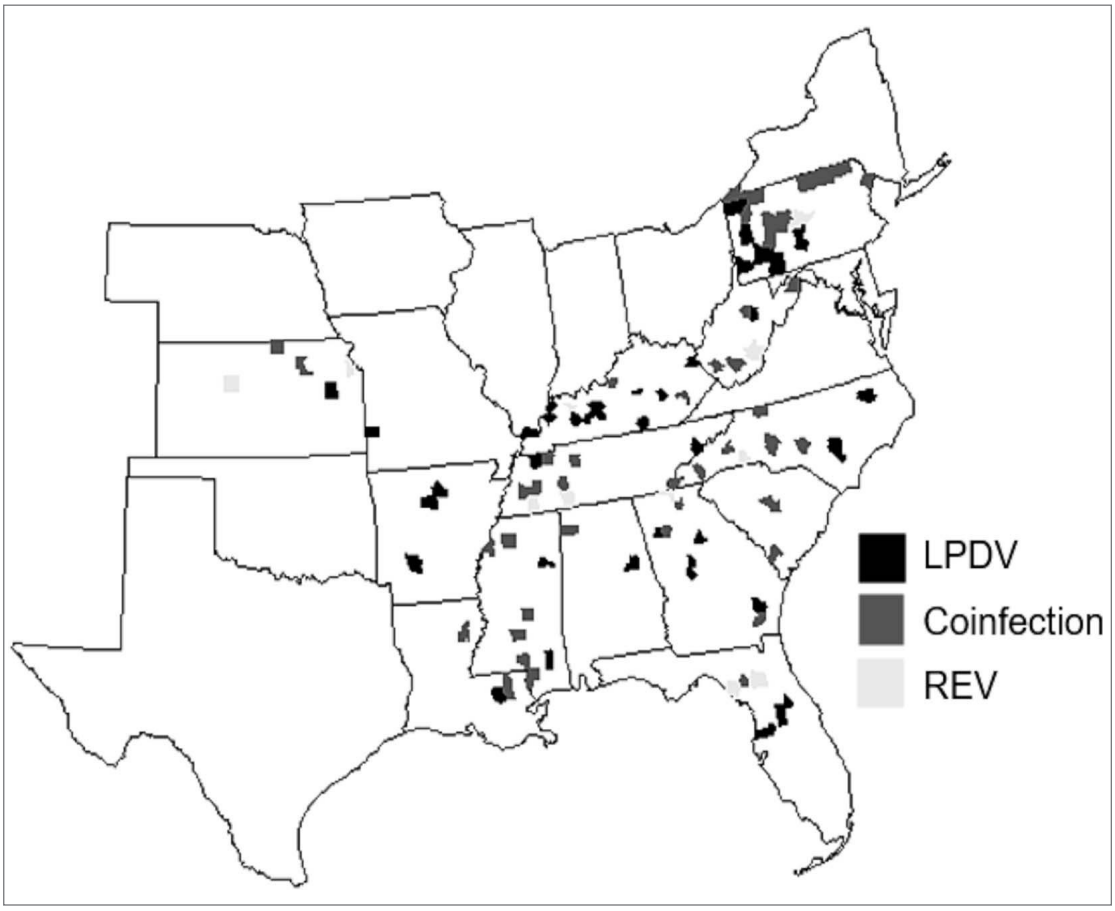
Deer 275 was part of a five-year, collaborative research project to investigate the impacts of CWD on white-tailed deer in Arkansas. The project is currently in the fourth and final field season. This study is a comprehensive, multifaceted research program to estimate deer abundance, evaluate influence of CWD on demographic and behavioral parameters, determine infection rates relative to these parameters, and develop a spatially explicit population model that will forecast effects of agency management actions on the future spread and prevalence of CWD and the consequences to the white-tailed deer herd. This was an expansive study with deer capture in the winter (adults) and summer (fawns) months, as well as >270 game cameras running year-round. Throughout the four years of this study, researchers collected data from 236 adult deer and 172 fawns located across three study sites in Newton and Searcy Counties: Erbie, Gene Rush, Tyler Bend. All mortalities are promptly investigated in the field and carcasses and/or tissues are shipped to SCWDS for diagnostic investigation to determine cause of death. Between 2021 and 2023, only 58% and 37% of collared adults and fawns survived, respectively. To date, average overall CWD prevalence among all deer is 42% with higher prevalence in Erbie (66%, *N*=12), when compared to Tyler Bend (46%, *N*=50) or Gene Rush (32%, *N*=77). Prevalence also differed between sexes with bucks (53%, *N*=55) having higher rates of CWD than does (33%, *N*=74). As we approach the end of this multi-year study, monitoring of collared animals, collection of postmortem samples, and laboratory investigation and analyses continue.

During largescale population studies of this nature, details of individual stories get left behind, stories like that of Deer 275. She was not a unique deer within the study; to date, 17% of collared adult deer have had CWD as the primary postmortem finding. Deer 275's story highlights how CWD can take years to develop in an individual deer but always ends in death. Additionally, her unborn fawn is a stark reminder that not only are adults dying of this disease, but also their lifetime reproductive potential is reduced. With this and other studies, researchers gain a clearer picture of how to mitigate and manage this unrelenting disease. This project, led by **University of Georgia's Warnell School of Forestry and Natural Resources**, is a large collaboration between **SCWDS**, **Arkansas Game and Fish Commission**, the **National Park Service**, **Colorado State University**, and the **United States Forest Service** with funding contributions by the **CWD Alliance**, **Cabela Family Foundation**, **Boone and Crockett Club**, and the **U.S. Fish & Wildlife Service Wildlife Restoration Program**.

Prepared by Marcelo Jorge, Mark Ruder, Lisa Jorge; UGA Warnell authors: Gino D'Angelo, Richard Chandler, and Mike Chamberlain

LPDV and REV in wild turkeys

The wild turkey is a popular game bird species and conservation icon in North America. Recent population declines in some regions have caused concern over the role of disease in these declines. Two oncogenic (tumor causing) avian retroviruses, lymphoproliferative disease virus (LPDV) and reticuloendotheliosis virus (REV), can cause disease in wild and domestic turkeys and some other fowl. Infection outcome can vary widely, ranging from subclinical to fatal disease. LPDV infections are common and widespread in wild turkey populations in the U.S. and east-central Canada, while REV has been detected worldwide in numerous avian species. There have been several studies to investigate the prevalence, distribution, and potential impacts of these viruses in wild turkey populations. Here, we highlight our recent study that aimed to compare LPDV and REV infection (and co-infection) prevalence in wild turkeys throughout much of the eastern U.S. over an approximately three-year period from December 2018 - October 2021. Specifically, we assessed detection rates for both viruses amongst different tissue types, evaluated pathology associated with infection, and investigated various demographic and spatial parameters for their role in LPDV and REV infection. **This research** was published in the **Journal of Wildlife Diseases**.



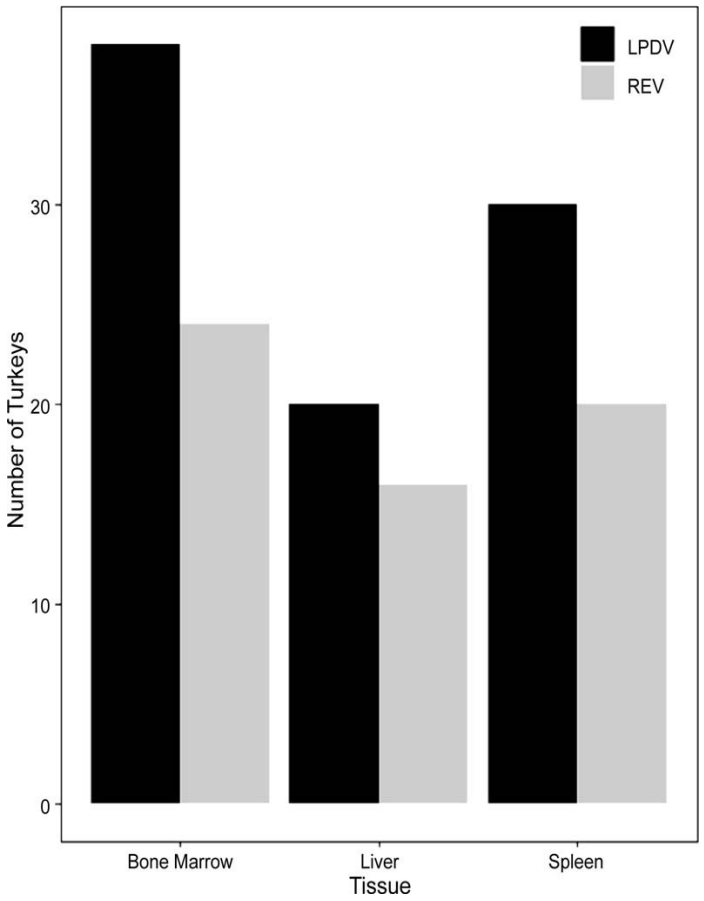
Map showing states with counties where LPDV (black), REV (light gray) and coinfections (medium gray) were detected by PCR in wild turkeys from the USA (December 2018 to October 2021). Some coinfected counties include LPDV-only and/or REV-only–infected turkeys as well, but for simplicity were depicted as coinfections because both viruses were detected. Image, Journal of Wildlife Diseases

Based on **previous SCWDS research**, spleen, liver, and bone marrow are target tissues for LPDV detection in wild turkeys. Therefore, we tested the following tissues (when available) from 172 wild turkeys: spleen, liver, bone marrow, and neoplastic tissue, using polymerase chain reaction (PCR). At least one of these retroviruses was detected in the vast majority (81%; 139/172) of wild turkeys tested from 15 U.S. states, while significantly more turkeys were positive for LPDV (72%; 124/172) than REV (44%; 75/172). Coinfections with both viruses were detected in approximately one-third (35%; 60/172) of turkeys. Among LPDV-infected and LPDV-REV co-infected turkeys, bone marrow had the highest detection rate (38/58; 66%), which was significantly higher than spleen (30/58; 52%) and liver (20/58; 35%), barplot on the next page. The preferred diagnostic tissue type for REV was not previously known, but our findings demonstrated that bone marrow had the highest detection rate (41%) in REV-infected turkeys. Additionally, spleen, liver, and bone marrow concurrently tested positive in most (15/25; 60%) REV-infected turkeys. Our comparison of LPDV and REV detection in these tissues

LPDV and REV in wild turkeys

revealed that bone marrow, although not producing a 100% detection rate, is a better target tissue for diagnostic testing for both LPDV (66% detection rate) and REV (41% detection rate) compared with spleen and liver. These results suggest LPDV tropism or tissue affinity for bone marrow, whereas REV may have broader tissue tropism.

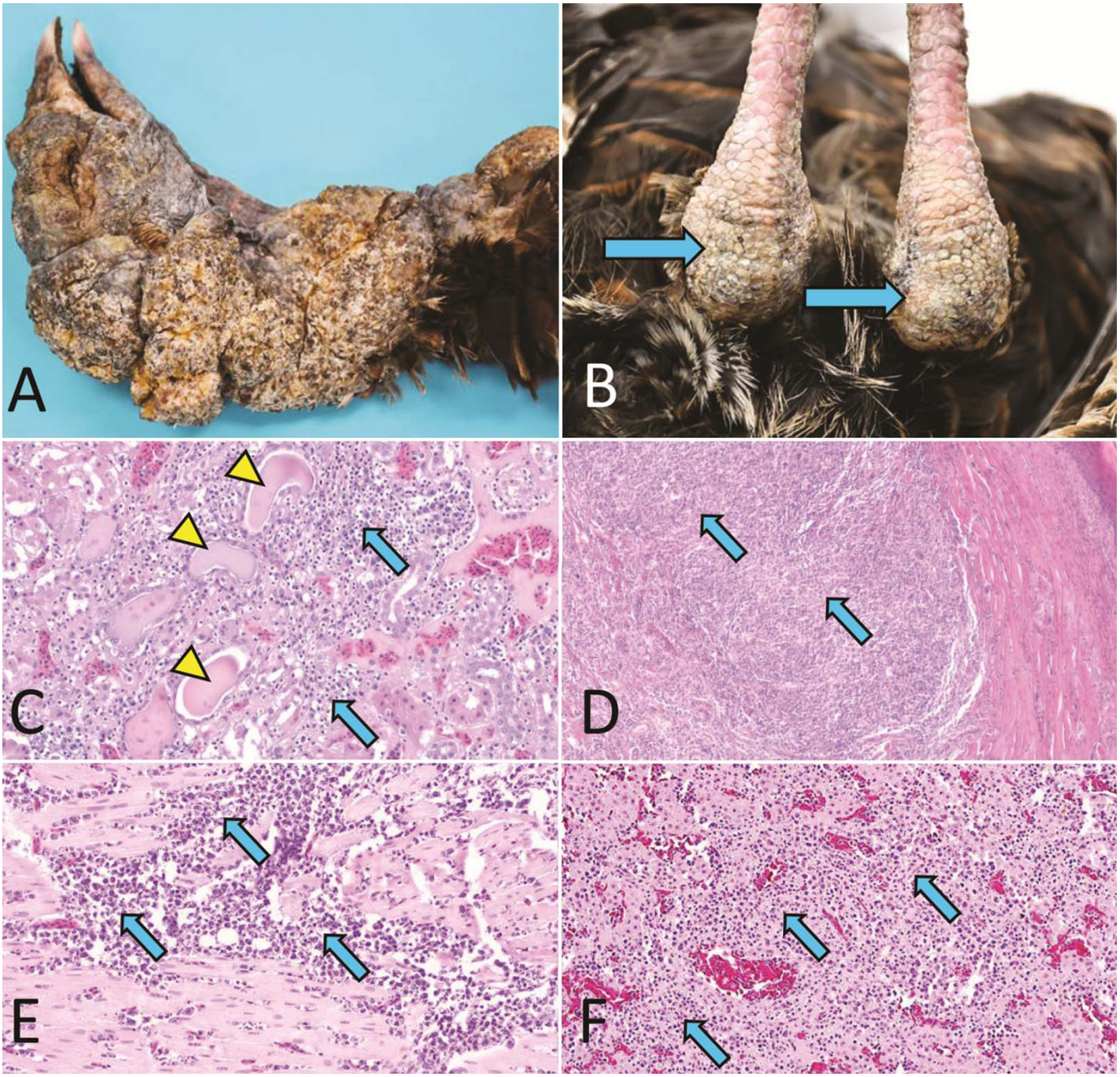
We additionally analyzed pathology associated with LPDV and REV infection, as well as co-infections with other viral, protozoal, and bacterial pathogens. Gross lesions of lymphoproliferative disease are often impressive and can include proliferative skin over the head and/or legs/feet, and rarely, internal organs, image on the next page. Histopathology consistent with lymphoid (i.e., white blood cell) proliferation and/or neoplasia (i.e., cancer) characteristic of lymphoproliferative disease was evident in 29/172 (17%) turkeys assessed, including two REV-only infected turkeys. Furthermore, we documented co-infecting pathogens in the 139 wild turkeys with retrovirus infections. Avian pox and bacterial disease was diagnosed in 28% and 26% of these turkeys, respectively. Parasites, both metazoan and protozoan, were observed in 44 (32%) cases. We also evaluated the relationships between LPDV infection and/or REV infection, and demographic, geographic, temporal and seasonal patterns. Male and female turkeys were evenly distributed at 50%. Most turkeys were adults (86%), followed by 14% juveniles and <1% poults, potentially reflecting submission bias, as SCWDS receives much higher proportions of adult versus juvenile wild turkeys. Turkeys in which retrovirus infections were detected originated in the Northeast (47%), the Southeast (46%), and the West (7%; map on the previous page). Season was significantly associated with LPDV prevalence, which was greatest in winter; year and season were both significantly associated with REV prevalence, which was greatest in 2020 and winter.



Comparison of tissue tropism for LPDV (black) and REV (gray) by PCR in wild turkeys from the USA (December 2018 to October 2021). Only turkeys from which individual spleen, liver, and bone marrow samples were concurrently tested (n=58) are included. Image, Journal of Wildlife Diseases

Our results reaffirm that tissue collection protocols should be tailored to the targeted pathogens based on surveillance or research goals, while considering the distinction between evidence of infection versus disease. These data contribute to optimizing diagnostic strategies that may aid in pathogen monitoring and improve detections to increase our understanding of the potential for population level impacts of these viruses on wild turkeys. Additional ongoing LPDV research at SCWDS includes LPDV diagnostic test development (immunohistochemistry and RNAscope) and an LPDV experimental infection trial in wild turkeys, funded by the **National Wild Turkey Federation** and **Multistate Conservation Grant Program** (**AFWA** and **USFWS**), respectively.

Prepared by Kayla Adcock and Nicole Nemeth



A) Markedly thickened and discolored (tan to yellow) skin over the head and neck corresponding to lymphoma in an adult female wild turkey hen from which both REV and LPDV were detected.
B) Markedly thickened skin and soft tissues over the intertarsal joint (blue arrows) of the same wild turkey in image A.
C) Lymphoma cells in the kidney tissue (blue arrows) of a male, juvenile wild turkey with only REV detected; kidney tubules are markedly dilated (yellow arrowheads).
D) Marked expansion of the dermis of the skin over the leg due to lymphoma (blue arrows) in an adult male wild turkey from which only LPDV was detected.
E) Lymphoma (blue arrows) that invade the heart muscle of an adult male wild turkey that was REV positive.
F) Widespread lymphoma in the liver (blue arrows) of the same wild turkey in image E.
Image, Journal of Wildlife Diseases

Rustrella virus in mountain lions

Staggering disease (SD) and the presence of Rustrela virus (RusV) have been reported for the first time in North America. The case, which involved a mountain lion (*Puma concolor*) in Colorado, was **reported** recently by Dr. Karen Fox and colleagues in **Emerging Infectious Diseases**.

The mountain lion was observed in May 2023 huddled beneath a homeowner's porch in Douglas County, south of Denver. It had difficulty rising and walking. When it was able to move, it demonstrated severe ataxia with hind limb paresis. The animal was tranquilized and humanely dispatched by personnel with **Colorado Parks and Wildlife** and submitted for postmortem examination. Dr. Fox and her team performed a necropsy and ancillary diagnostic testing to determine a cause of death in the ~1-year-old, female mountain lion. No skeletal abnormalities were observed on radiographs taken prior to necropsy. Necropsy revealed poor nutritional condition with mild bruising of the body; the stomach contained pine needles. Microscopic evaluation of tissues revealed severe inflammation in the brain and spinal cord characterized by extensive infiltrations, primarily of lymphocytes, surrounding blood vessels in the meninges and gray matter. Minimal pathological changes were apparent in the white matter. Additional microscopic findings included neuronal cell necrosis and proliferation of glial cells that support nerve cells.

Ancillary diagnostics to rule out possible causes of the lesions, including several viruses and *Toxoplasma gondii*, were not detected in samples from the central nervous system (CNS). Due to the similarity of the clinical signs and microscopic lesions in this mountain lion to those of SD, molecular diagnostics were undertaken to detect the presence of RusV, the causative agent of SD in domestic cats and zoo animals in parts of Europe. Ultimately, molecular diagnostics revealed the presence of RusV RNA in a pooled sample of brain and spinal cord from the mountain lion. Tissue and other samples were sent to the Friedrich-Loeffler-Institut in Germany, which focuses on farm animal health and welfare, and on the protection of humans from zoonoses. Collaborators in Germany demonstrated RusV RNA in all regions of the brain and nearly all levels of the spinal cord. Localized RusV RNA distribution in specific cells and locations in the animal's brain were similar to findings in SD cases in Europe. The viral genome obtained from the mountain lion was similar but distinct from RusV genomes associated with SD in cats in Europe.

Staggering disease has been reported in domestic cats in parts of Europe since the early 1970s, but it wasn't until 2023 that RusV was identified as its cause. Diagnosis of SD is based on clinical signs, microscopic lesions, and demonstration of RusV RNA in the CNS of affected animals. To date, Koch's postulates, which are criteria used to firmly establish a specific microbe as the cause of a particular disease, have not yet been satisfied for RusV because of the inability to culture the virus.

Rustrela virus is related to rubella virus, the cause of rubella (German measles) in humans. It first was identified in the brains of various mammals with neurologic disorders in a zoo in northern Germany. The diversity of affected zoo mammals is broad and includes lions (*Panthera leo*), a donkey (*Equus asinus*), a capybara (*Hydrochoerus hydrochaeris*), and a Bennett's tree kangaroo (*Dendrolagus bennettianus*). In addition to these animals with clinical disease, RusV has been found in apparently healthy small rodents (yellow-necked field mice; *Apodemus flavicollis*) in and near the affected German zoo, and in wood mice (*Apodemus sylvaticus*) in southern Sweden where SD occurs in domestic cats. This suggests that small rodents may serve as silent reservoirs. All in all, the above findings indicate a broad host range with possible zoonotic potential.

It should be recognized that RusV does not play any apparent role in a severe neurological disease (feline leukomyelopathy; FLM) that has been **observed in Florida panthers (*Puma concolor coryi*) and bobcats (*Lynx rufus*) in Florida since 2017**. Based on behavioral observation, FLM is suspected in at least 35 panthers and 40 bobcats and has been confirmed by diagnostic testing in 11 panthers and 12 bobcats. Similar to SD, clinical signs of FLM in panthers and bobcats are characterized by ataxia with hind limb paresis and loss of body condition over time due to difficulty hunting and capturing prey. However, unlike SD, FLM seems to occur more frequently in younger animals and is characterized by microscopic lesions that are degenerative rather than inflammatory and occur primarily in spinal cord white matter. The cause of FLM remains unknown despite extensive, ongoing, diagnostic testing. The lack of inflammatory lesions suggests that an infectious agent may not be involved.

The detection of RusV RNA in the Colorado lion and its association with SD represent another potential etiology in cases of undiagnosed meningoencephalitis in felids in North America. In addition, the broad host range among affected zoo mammals and the apparent role of wild rodents as silent carriers, indicate that investigations are warranted to determine the potential distribution of RusV in a wide variety of species in North America.

Prepared by John Fischer

Diagnostic Case Highlight

Creature feature

In lieu of the traditional diagnostic case highlight, we present some of SCWDS' most ghoulish cases with a special focus on a condition known as hypotrichosis. This condition is associated with the reduction or absence of normal hair and can result in general, regional, or multifocal forms. The condition may involve a hereditary component and can occur in conjunction with other skeletal or congenital defects. Hypotrichosis occurs in a variety of domestic and wildlife species alike.

The first case in this series begins with a citizen report of a completely hairless, but behaviorally normal raccoon lingering around a landowner's property in Franklin county Virginia for several days. The raccoon was dispatched on September 4, 2018, and the carcass was sent to SCWDS the next day for postmortem examination. A diagnostic necropsy with microscopic evaluation of selected tissues was performed. Grossly, the animal was in good nutritional condition and the skin was diffusely smooth and hairless except for a small tuft of hair at the distal end of the tail, image below. There were no other other significant gross findings. A skin scrape revealed no evidence of ectoparasites. Canine distemper virus and rabies virus were not detected.

Microscopic evaluation of the skin revealed that the hair follicles largely

Modern day Chupacabra sighting in Virginia? No, just a raccoon with a severe case of hypotrichosis. The only hair present on this animal was a small tuft on the tip of the tail. Photo, SCWDS

contained debris consisting of keratin or hair shaft fragments. There were also no well-defined, pigmented hair bulbs. Well-defined clusters of spindloid cells formed groups adjacent to sebaceous (oil) glands, and these clusters were occasionally surrounded by inflammatory cells (lymphocytic dermatitis; a build-up of white blood cells in the skin). There was moderate hypertrophy (enlargement) of the sebaceous glands. Given the severe, diffuse, chronic, lymphocytic dermatitis with sebaceous gland hypertrophy and hypotrichosis, this animal was diagnosed with congenital hypotrichosis.

The next case in this series involves an approximately 3.5 year-old, male, white-

tailed deer. The deer had been attacked by dogs and was dispatched by a hunter on November 21, 2020. The deer was reported to **North Carolina Wildlife Resources Commission** (NCWRC) staff since it was almost completely hairless and had multiple skin masses present. NCWRC staff conducted a gross necropsy and determined that the buck was in fair nutritional condition, but small for its age. The deer hide and fresh tissue samples were sent to SCWDS for further evaluation. Grossly, the deer's hide was hairless except for the vibrissae (whiskers), and sparse fine hairs along the ear margins, image, top right. There were multiple round, firm, sometimes ulcerated, raised masses throughout the hide, image, bottom right. Microscopic changes observed in the skin included: decreased hair follicle density, distended follicles lacking hair shafts, and the presence of inflammatory cells (plasma and eosinophils) around hair follicles. Microscopic features of the skin masses were consistent with cutaneous fibroma, a benign tumor frequently reported in deer. No infectious agents were identified in any skin samples. Lymphocytes in the adrenal gland medulla were present in this deer, which can be associated with autoimmune disorders in other species. These findings are suggestive of a widespread inflammatory process and hair follicle destruction, resulting in the generalized hairless appearance. This may have been due to a chronic inflammatory condition; however, the nature of the inflammatory response (plasma cells) was atypical for a chronic infection. Although not commonly diagnosed in white-tailed deer, it is possible that an autoimmune disorder contributed to the hair loss in this deer. However, this could not be verified. Fibromas are caused by fibroma virus (papillomavirus) infection and transmission of the virus is thought to occur between deer via biting insects or potentially direct contact with contaminated material. Fibromas are often transient and not impactful to the animal, but in some cases, may grow large enough to impede function (e.g., sight, respiration, eating, movement) or result in abrasions and inflammation/bacterial infection. Based upon the gross and microscopic evaluations, this deer was diagnosed with hypotrichosis, chronic cutaneous plasmacytic dermatitis (skin inflammation), and cutaneous fibroma.

Things that go bump in the night...an almost completely hairless white-tailed deer with hypotrichosis, chronic cutaneous plasmacytic dermatitis, and cutaneous fibromas. The cutaneous fibromas are visible as small, raised masses on the skin in both images. Photos, SCWDS

Our last, but certainly not least, creature feature may leave readers scratching their heads. On June 19, 2024, a healthy, female white-tailed deer that is part of the research herd at the UGA Whitehall Deer Research Facility gave birth to twin fawns. Upon further inspection by research staff, it was discovered that one of the fawns was stillborn and severely malformed, top right image on the next page. Dr. Gino D'Angelo and Adrianna Mowrer drove the stillborn

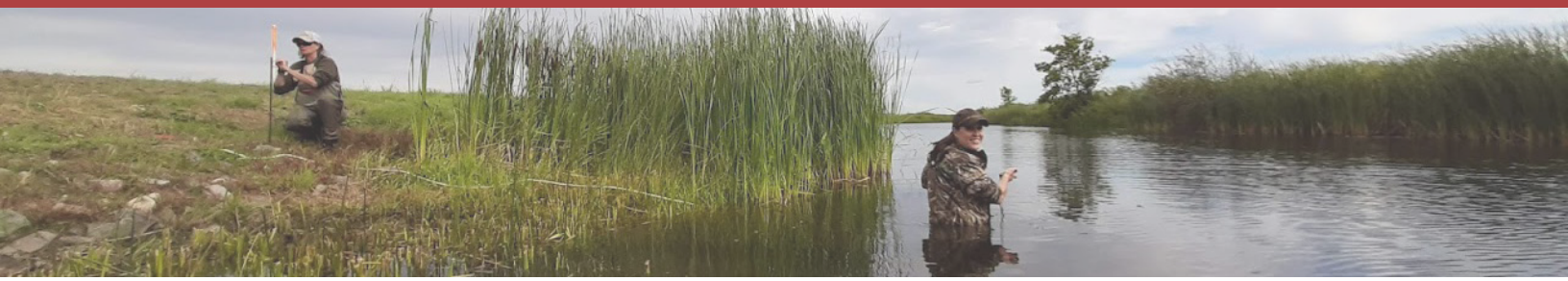
fawn to SCWDS for postmortem examination. Grossly, the skin was devoid of hair except for rare small hairs on the legs, ventral aspect of the neck, and a few sensory hairs on the face. Malformations including kyphosis (curved spine), missing external genitalia, and severe facial deformities were apparent. Specific skull abnormalities included craniofacial dysplasia (abnormal growth and development of the facial bones), palatoschisis (cleft palate), and mandibular prognathism (protrusion of the mandible), image, bottom right. Additionally, the eyes were underdeveloped and misaligned. The findings in this stillborn fawn are similar to congenital hypotrichosis, a disease rarely seen in domestic cattle.

Over a dozen forms of hypotrichosis have been described in cattle with varying levels of severity. They are presumed to occur due to genetic abnormalities, although the specific genes involved have not been clarified for most forms. Microscopically, within the skin, these animals typically have low numbers of primitive, under-developed hair follicles. Developmental anomalies like craniofacial disfigurement, cleft palate, and spinal curvature as seen in this deer fawn are commonly described in the more severe forms reported in cattle. Birth of a healthy, unaffected twin has also been described in some species. We have seen a handful of cases in white-tailed deer and one case in a raccoon at SCWDS over the years, but overall this condition is not commonly reported in white-tailed deer. Although we will keep digging, the ultimate cause of these abnormalities may remain elusive. The twin fawn remains healthy.

Prepared by Betsy Kurimo-Beechuk, Robert Stilz, and Nicole Nemeth

A face only a mother could love: a severely malformed stillborn white-tailed deer exhibiting hypotrichosis, craniofacial dysplasia, palatoschisis, and mandibular prognathism. Photos, SCWDS

Changing faces at SCWDS



The SCWDS family tree, with branches all over the world, continues to change and grow. In recent months, we have had several new staff and students join the SCWDS team.

Dr. Atalani (Lani) Jackson joined SCWDS in August 2024 as our Staff Veterinarian and Diagnostician. She received a BS in ecology from UC San Diego, Master of Conservation Biology from the University of Queensland in Australia, and DVM from Tuskegee University. Immediately prior to joining SCWDS, Lani completed an internship in Wildlife and Conservation Medicine at Tufts University. She brings diverse wildlife health and conservation biology experiences to SCWDS. Lani serves SCWDS member agencies as an integral part of our diagnostic team. We are thrilled to have her at SCWDS and we look forward to our agency partners getting to know her.

Dr. Alainah Bhutta is the 2023-24 Diagnostic Laboratory Medicine Intern at UGA's College of Veterinary Medicine and she elected to have a wildlife focus. In this role, she is contributing her talents to the SCWDS Diagnostic Service through diagnostic case work. Alainah received her DVM from the University of Georgia in 2024 after receiving a BS in Integrative Animal Biology from the University of South Florida. Alainah brings a great deal of diagnostic experience and curiosity to our service, and we are lucky to have her!

Zijing Cao joined SCWDS in August 2024 as a PhD student in the Comparative Biomedical Sciences Program. Zijing is conducting her graduate research on immunological aspects of influenza A virus infection in wildlife under the direction of Dr. Becky Poulson. Zijing received her BA in Biological Sciences from the City University of New York, Hunter College, where she worked as a MARC scholar investigating therapeutic targets for *Trypanosoma brucei brucei*.

Brittany Piersma joined SCWDS in August 2024 as a Master's student under the direction of Dr. Michael Yabsley. She received her BS in Environmental Science through America Public University. Brittany's graduate research involves studying burrowing owls in southwest Florida while concurrently working as a biologist for Audubon Western Everglades.

Dr. Marcelo Jorge joined SCWDS in August 2024 as a Post-Doctoral Research Associate investigating wild turkey pathogens and the associated population-level effects. He earned a BS in Zoology (Neuroscience minor) and BA in Psychology from Miami University of Ohio. Marcelo then received an MS in Fisheries and Wildlife Sciences from Virginia Tech before obtaining a PhD in Wildlife Science from the UGA's Warnell School of Forestry and Natural Resources. His PhD research focused on the impacts of chronic wasting disease on white-tailed deer populations in Arkansas. Marcelo brings a wealth of wildlife biology expertise to SCWDS and our collaborative wild turkey health projects.

Prepared by Mark Ruder

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Parting views from the Southeast

Eastern diamonback rattlesnake, Nick Friedeman