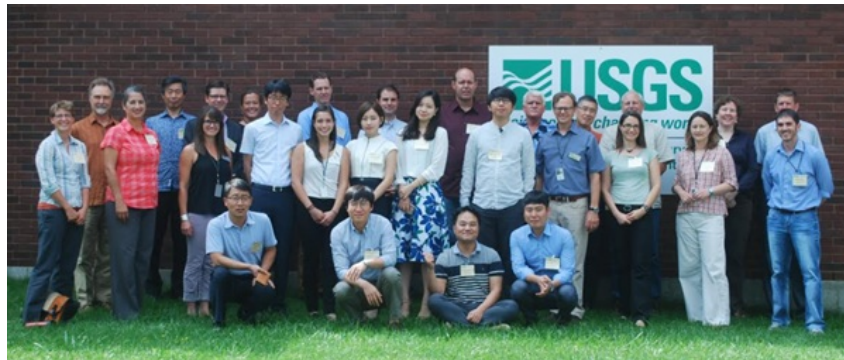




## News and Notes from the USGS National Wildlife Health Center

December 2016



### International Avian Influenza Workshop

The USGS National Wildlife Health Center (NWHC) and the Korea National Institute of Environmental Research hosted a joint workshop on Highly Pathogenic Avian Influenza (AI) and Other Diseases of Wildlife on August 10 and 11, 2016 in Madison, Wisconsin. The two-day workshop included presentations by NWHC staff and visiting scientists on current research. The workshop also included facilitated discussions on research priorities and proposals for future work.

Scientists from the Korea National Institute of Environmental Research presented on AI activity, rabies outbreaks, and the planning for the new National Wildlife Health Center in South Korea. Other international visitors included Dr. Tiggy Grillo, National Coordinator for Wildlife Health Australia and the Australian OIE Focal Point for Wildlife who provided an overview of AI in Australia. Other topics presented at the workshop included: AI research on wild waterfowl, migratory pathways and AI dispersal, and spatial modeling of AI risk factors at the interface of wild and domestic birds in Asia.

The wildlife disease threats we face often have an international origin, and this workshop was an opportunity to continue developing international collaborations. Coordination and collaboration with our international colleagues is increasingly important to prevent and manage wildlife diseases of global concern. This is especially important as other countries increase their capacity and infrastructure to investigate and research wildlife health issues.



### New Branch Chief

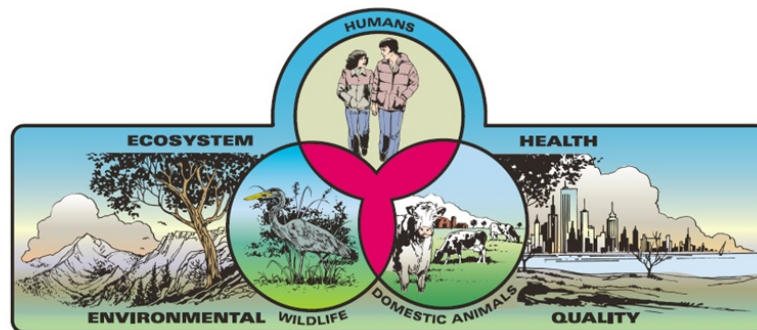
[Dr. Katherine Richgels](#) is now the new chief of the NWHC Applied Wildlife Health Research branch. Dr. Richgels has expertise in spatial and quantitative ecology, wildlife disease, statistics, and geographical information systems (GIS). She most recently completed a post-doctoral position under Drs. Tonie Rocke and Robin Russell at NWHC.

We are happy to welcome Katie to the NWHC team!

## Moving One Health Forward by Center Director, Jonathan Sleeman

The concept of One Health, defined as the collaborative effort of multiple disciplines—working locally, nationally, and globally—to attain optimal health for people, animals, and the environment has been growing in recognition. One Health recognizes that human, domestic animal, and wildlife health are interconnected within the context of ecosystem health and provides a framework for developing solutions to global health challenges. To date, however, health-promoting interventions have focused largely on single sector outcomes. Using the One Health concept, disease management and regulatory strategies should seek to optimize outcomes for humans, animals, and the environment. For example, risk for transmission of zoonotic pathogens from wildlife to bushmeat hunters and consumers is regarded as a public health issue, and current interventions focus primarily on education about hygiene and personal protection. However, bushmeat hunting is complex, with environmental and food security consequences if conducted unsustainably. Thus, there is a need for more holistic strategies to reduce transmission of zoonotic disease while simultaneously addressing food security and safeguarding wildlife populations.

Development of new laboratory technologies and computational methods has facilitated major advances in our ability to detect and characterize emerging contaminants and pathogens, and define disease risks. Advances in molecular biology have opened new avenues for discovery and detection of pathogens, and application of spatially referenced databases allows for risk assessments that assist in targeting disease surveillance in accordance with anticipated disease threats. Development of specific disease-management tools or interventions, however, has proven more difficult. In one developing example, an orally ingestible vaccine is being used to prevent sylvatic plague in prairie dogs and sympatric endangered black-footed ferrets to conserve wildlife populations and potentially protect human health. Such holistic strategies may one day become more common, and continued exploration of novel strategies to prevent disease transmission and allow wildlife and humans to co-exist in the same environment is needed. The ultimate goal will be to focus on long-term action directed at reducing the driving forces for these emerging diseases and provide inter-disciplinary scientific approaches to manage emerging and high consequence zoonotic disease risks that achieve optimal outcomes for human, animal, and environmental health.



### White-Nose Syndrome Multi-State Surveillance Project

The NWHC continues to lead a 3-year surveillance project designed to assist state and federal wildlife agencies nationwide with early detection of *Pseudogymnoascus destructans* (*Pd*) in new areas, and to address specific research priorities identified by partners



### Bsal: an Emerging Disease of Salamanders

*Batrachochytrium salamandrivorans* (*Bsal*) is an emerging pathogen capable of causing significant morbidity and mortality in salamanders. The U.S. has the largest diversity of salamanders in the world and introduction of *Bsal* to North America could have severe impacts on biodiversity and amphibian

in conjunction with the White-Nose Syndrome National Plan.

During the first two years of the project, swabs from more than 2,100 bats, representing 16 North American species, and 580 environmental substrates from hibernacula in 23 states were sent to the NWHC for analysis. This project has resulted in the detection of *Pd* at 16 hibernacula of previously unknown *Pd* status in six states, including nine sites where there was no physical or behavioral evidence of WNS observed in the bat population. Nearly all detections of *Pd* originated from swabs collected from bats rather than from environmental substrates collected inside of hibernacula. Information on biotic and abiotic factors continues to be collected at all hibernacula surveyed to assess the potential importance of various parameters in contributing to presence of *Pd*.

For more information on recent White-Nose Syndrome developments, see our two most recent Wildlife Health Bulletins: [WNS Updates for the 2015/2016 Surveillance Season](#) and [WNS Confirmed in Washington State](#).

Contact: Anne Ballmann, 608-270-2445, [aballmann@usgs.gov](mailto:aballmann@usgs.gov)

conservation. The NWHC is collaborating with multiple federal and state partners, including the multi-agency [Bsal Task Force](#), to better understand the fungus and to raise awareness about this threat to our native salamanders.

In support of ongoing efforts for early detection of introduction of *Bsal* to North America, the NWHC is partnering with the USGS Amphibian Research and Monitoring Initiative (ARMI) to implement national surveillance for *Bsal*. The NWHC is performing the diagnostics for *Bsal* and helping guide a risk-based surveillance design that follows the results of the recently published risk assessments by Richgels et al. and Yap et al. The NWHC and ARMI plan to test up to 10,000 salamanders for *Bsal* in 2016. In pilot work with USGS ARMI, the NWHC tested over 500 salamander swabs from 37 sites on the West Coast, Gulf Coast, and Mid-Atlantic region in 2015 and no *Bsal* was detected.

For more information, please see the Wildlife Health Bulletin titled [Bsal: An Emerging Disease of Salamanders](#).

Contact: Daniel Grear, 608-270-2478, [dgrear@usgs.gov](mailto:dgrear@usgs.gov), or Natalie Nguyen, 608-270-2400 x2394, [ntnguyen@usgs.gov](mailto:ntnguyen@usgs.gov).

## Wildlife Health Information Sharing Partnership - Event Reporting System (WHISPers)

Beta testing of the data entry and management tools of the Wildlife Health Information Sharing Partnership - event reporting system (WHISPers) developed at the USGS National Wildlife Health Center (NWHC) is underway. WHISPers, a partner-driven, web-based repository for sharing information about historic and ongoing mortality and morbidity events in wild animals, provides natural resource managers with timely, accurate information on these events to facilitate disease management and planning. The site can be found at [www.nwhc.usgs.gov/whispers](http://www.nwhc.usgs.gov/whispers).

WHISPers can be searched by species, disease, location (to county level), and event start and end dates. The system currently contains the verified (laboratory diagnosed) records that the NWHC has maintained on wildlife mortality events, including event information shared by tribal, state, and federal partners.

The system contains one of the largest wildlife disease databases available in the U.S.; however, since information is opportunistically collected and voluntarily reported, it does not contain all the mortality events documented in North America. Input by partners will improve the temporal, spatial, and biotic coverage of this long-term dataset available to the entire wildlife health community.

Contact: Neil Baertlein, 608-270-2460, [nbaertlein@usgs.gov](mailto:nbaertlein@usgs.gov)

WHISPers

## OIE and Other International Activities

o Two NWHC scientists were lead instructors for a World Organization for Animal Health (OIE) workshop that took place in Minsk, Belarus, July 5 - 7, 2016. The workshop was a regional seminar for OIE National Focal Points on Wildlife and provided participants with information and training on the role of

## Avian Influenza Surveillance

The NWHC is continuing to accept mortality and morbidity event submissions for HPAI testing under our expanded submission criteria.

To date, no humans or other mammals have shown signs of disease from these

veterinary and wildlife professionals during wildlife disease surveillance, including outbreak investigations, and diagnostic and reporting procedures.

o Center Director Jonathan Sleeman and Research Wildlife Biologist Dan Walsh presented a Wildlife Disease Epidemiology Workshop at the Korea Research Institute of Bioscience and Biotechnology in Daejeon, Korea, October 24 - 28, 2016. They provided technical and management expertise regarding strategies and techniques for wildlife disease surveillance.

o NWHC scientists will participate in another OIE Focal Points on Wildlife seminar coming up in Kenya in late November.

particular viruses but field personnel handling live or dead wild birds should take appropriate precautions.

For more information, see the [USGS Role and Response to Highly Pathogenic Avian Influenza fact sheet](#).

The Interagency Steering Committee for Surveillance for Highly Pathogenic Avian Influenza in Wild Birds recently developed [FAQs on HPAI and North American Wild Birds](#).



### Zika Virus Research

Zika virus is a zoonotic flavivirus transmitted by mosquitoes that has spread from Central Africa through Southeast Asia, the southern Pacific islands, and most recently to South and Central America. Humans are affected by the virus and serve as the principal reservoir of infection.

NWHC scientists will be developing several diagnostic tests to monitor Zika virus in wildlife and, experimentally, will test the ability of the virus to infect birds. Mutation rates are high in flaviviruses and may result not only in increased virulence, but also in the ability of the virus to be acquired by other mosquitoes, such as *Culex* spp. mosquitoes, the primary vector of West Nile virus (WNV) in North America. Mutations may also result in other species becoming reservoir hosts, such as birds, the primary reservoir host of WNV in North America.

Contact: Erik Hofmeister, 608-270-2476, ehofmeister@usgs.gov.





## Spring Viraemia of Carp Virus Found in Imported Newts

The USGS National Wildlife Health Center (NWHC) scientists have identified spring viraemia of carp virus (SVCV) in Chinese firebelly newts (*Cynops orientalis*) imported to the U.S. through the international pet trade and have published this study in the journal *Emerging Microbes and Infections*.

Spring viraemia of carp virus is a fish pathogen of economic importance to the commercial aquaculture industry, and its detection in fish must be reported to the World Organisation for Animal Health (OIE). Additionally, this discovery represents the first time that this viral pathogen has been detected in a group of animals other than fish (i.e., amphibians).

Spring viraemia of carp virus was first reported in the U.S. in 2002 in both farmed and wild fish populations experiencing mortality events. Despite screening for SVCV and regulating live fish imported into the U.S. since 2006, new detections continue to be reported. This discovery raises the question as to whether translocated amphibians may be cryptic hosts for this exotic viral pathogen and are contributing to its global spread.

The susceptibility of amphibians worldwide to SVCV is not known, but of particular concern is whether SVCV could act as a potential pathogen in already imperiled amphibian populations. If Chinese firebelly newts coevolved with SVCV, they could be asymptomatic hosts for this viral pathogen which is thought to have originated in Southeast Asia. Under such a scenario, salamanders from other parts of the world, including the U.S., could represent potentially naïve hosts at risk for developing more severe disease upon exposure to this virus. Thus, the potential threat presented by SVCV to native salamander populations outside of Southeast Asia remains uncharacterized.

Contact: Hon Ip, 608-270-2464, [hip@usgs.gov](mailto:hip@usgs.gov)

## Meet the NWHC Pathologists

We are proud to introduce our Center's pathologists, four of which are Diplomates of the American College of Veterinary Pathologists. We also have a veterinary fellow who is a Diplomate of the European College of Veterinary Pathologists.



Diagnostic Pathologist, **Valerie Shearn-Bochsler**, joined the NWHC team in 2002 after completing her Veterinary Medical Residency in Pathology at the University of Tennessee - Knoxville's College of Veterinary Medicine and her Master's Degree in Public Health from the



**David Green** has been a Veterinary Medical Officer at NWHC since 1999. Prior to coming to Madison, Dr. Green was the Staff Veterinary Pathologist at the National Institutes of Health in Bethesda, Maryland and the Chief Veterinary Pathologist for the Maryland Department of Agriculture in College



A recovering English major, **Julia Lankton** worked with wildlife in a clinical setting before attending veterinary school at Virginia-Maryland Regional College of Veterinary Medicine and completing an anatomic pathology residency at the University of Tennessee. After working as a clinical

University of California, Berkeley. Her professional interests include wildlife pathology, infectious disease epidemiology, and harmful algal blooms. Dr. Shearn-Bochsler received her Doctorate in Veterinary Medicine from the University of California - Davis and is a Diplomate of the American College of Veterinary Pathologists. Hailing from Glastonbury, Connecticut, her other hobbies and interests include gardening for wildlife and doing rescue work with the Dutch Shepherd and Belgian Malinois dog breeds.



Park, Maryland. Dr. Green specializes in diseases of amphibians and reptiles. He developed his interest in amphibian diseases and wildlife pathology while earning his DVM in Veterinary Medicine from Colorado State University. His other professional interests include diseases of amphibians, reptiles, and caged birds.

instructor at the University of Florida College of Veterinary Medicine in Gainesville and Disney's Animal Kingdom in Orlando, Dr. Lankton made her way to Madison to work at the NWHC in 2013. Her professional interests include avian pathology and toxicology, and she is currently working on projects involving effects of environmental contaminants on wildlife species, bat white-nose syndrome, and Zika virus. When not diagnosing wildlife diseases, she enjoys spending time outdoors, rock climbing, canine agility, and improv comedy.



**Susan Knowles** holds both a Doctorate of Veterinary Medicine from Virginia-Maryland Regional College of Veterinary Medicine (VMRCVM) and a Ph.D. in Veterinary Pathology from the University of Georgia. She joined the NWHC in 2013 where her interests include wildlife, aquatic, invertebrate, and toxicologic pathology, and pathogen discovery. She gained a variety of experience in and around her native Maryland, including Research Extern at VMRCVM studying shortnose sturgeon; a Veterinary Officer for the United States Public Health Service stationed at the National Institutes of Health; Natural Resources Biologist/Maryland Marine Mammal & Sea Turtle Stranding Coordinator for the Maryland DNR; Marine Mammal Fisheries Observer for the University of North Carolina at Wilmington; and Toxicology Laboratory Technician at Wildlife International. Outside of NWHC, you can find Dr. Knowles bird watching, hiking, kayaking, snowshoeing, cooking, exploring caverns, fossil hunting, or just hanging out on the beach.

**Marcos Isidoro Ayza** moved to Wisconsin from Valencia, Spain and now awaits those rare sunny days when he enjoys wandering in the woods, observing nature or gardening. Additionally, he enjoys playing the guitar and cooking for his family and friends. But it's not all fun and games for him. This Doctor of Veterinary Medicine Diplomate by the European College of Veterinary Pathologists is particularly interested in the understanding of wildlife diseases from a holistic point of view. He is currently leading two projects with the purpose of understanding the epidemiological, pathological and microbiological components that contribute to Perkinsea infections in frogs and pigeon paramyxovirus-1 infections in doves and pigeons across the U.S. "The NWHC provides the opportunity of studying nationwide events and applying my medical knowledge to discover the causal factors leading to wildlife mortalities with the support of a fantastic multidisciplinary team."

**The NWHC wishes the best of luck to these recent retirees!**

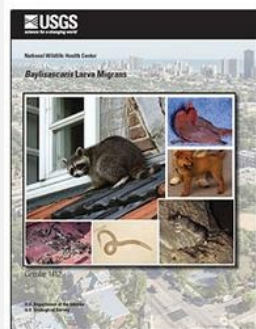
Joanne Bosch - Executive Assistant to the Director

Chris Brand - Applied Wildlife Health Research Branch Chief

Skip Sterner - Lead Technician of the Diagnostic Parasitology Laboratory

## Zoonotic Circulars

The NWHC has produced the following USGS Circulars on zoonotic diseases, which are diseases that can be passed between animals and humans. The material in these circulars is presented for the general public, but is also useful for scholars. Numerous illustrations and tables provide easily understood summaries of key points and information, and citations are provided if readers wish to delve further into certain topics. Please click on the links to download or for information on how to obtain hard copies.



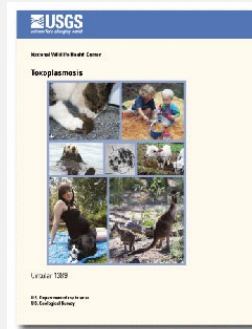
### Baylisascaris

Baylisascaris larva migrans 2016, Circular 1412



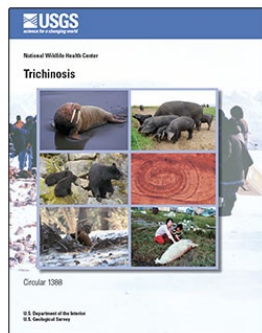
### Anisakiosis

Anisakiosis and pseudoterranovosis 2014, Circular 1393



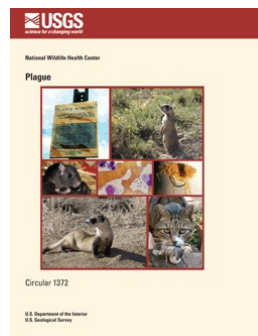
### Toxoplasmosis

Toxoplasmosis 2014, Circular 1389



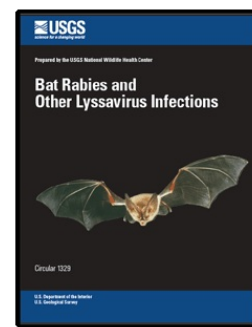
### Trichinosis

Trichinosis 2013, Circular 1388



### Plague

Plague 2012, Circular 1372



### Bat Rabies

Bat Rabies and Other Lyssavirus Infections 2009, Circular 1329

## Recent Selected NWHC Publications

Widespread detection of highly pathogenic H5 influenza viruses in wild birds from the Pacific Flyway of the United States. S.N. Bevins, R.J. Dusek, and others. 2016, Scientific Reports (6).

Recording and submitting specimen history data. B.L. Bodenstein, and others. 2016, USGS Techniques and Methods 15-C3.

Gut content analysis of Lake Michigan waterbirds in years with avian botulism type E mortality, 2010-2012. D.A. Essian, J.G. Chipault, and others. 2016, Journal of Great Lakes Research.

Blood selenium concentrations in female Pacific black brant molting in Arctic Alaska: Relationships with age and habitat salinity. J.C. Franson, and others. 2016, Marine Pollution Bulletin.

No evidence of infection or exposure to Highly Pathogenic Avian Influenzas in peridomestic

wildlife on an affected poultry facility. D.A. Gear, and others. 2016, Journal of Wildlife Diseases.

U.S. Geological Survey science strategy for highly pathogenic avian influenza in wildlife and the environment 2016–2020. M.C. Harris, J.M. Pearce, D.J. Prosser, C.L. White, and others. 2016, Open-File Report 2016-1121.

Survey for West Nile virus antibodies in wild ducks, 2004-06, USA. E.K. Hofmeister, and others. 2016, Journal of Wildlife Diseases (52).

Susceptibility and antibody response of Vesper Sparrows (*Pooecetes gramineus*) to West Nile virus: A potential amplification host in sagebrush-grassland habitat. E.K. Hofmeister, and others. 2016, Journal of Wildlife Diseases (52).

Retrospective analysis of the epidemiologic literature, 1990–2015, on wildlife-associated diseases from the Republic of Korea. J. Hwang, K. Lee, Y. Kim, J.M. Sleeman, and others. 2016, Journal of Wildlife Diseases.

Detection of spring viraemia of carp virus in imported amphibians reveals an unanticipated foreign animal disease threat. H.S. Ip, and others. 2016, Emerging Microbes & Infections (5)

High rates of detection of Clade 2.3.4.4 Highly Pathogenic Avian Influenza H5 viruses in wild birds in the Pacific Northwest during the winter of 2014/2015. H.S. Ip and others. 2016, Avian Diseases (60).

First detection of bat white-nose syndrome in western North America. J.M. Lorch, and others. 2016, mSphere (1).

Snake fungal disease: An emerging threat to wild snakes. J.M. Lorch, and others. 2016, Philosophical Transactions of the Royal Society B: Biological Sciences (371).

Evaluation of *Yersinia pestis* transmission pathways for sylvatic plague in prairie dog populations in the western U.S.. K.L.D. Richgels, and others. 2016, EcoHealth.

Spatial variation in risk and consequence of *Batrachochytrium salamandrivorans* introduction in the USA. K.L.D. Richgels, and others. 2016, Royal Society Open Science (3).

Infectivity of attenuated poxvirus vaccine vectors and immunogenicity of a raccoonpox vectored rabies vaccine in the Brazilian Free-tailed bat (*Tadarida brasiliensis*). B. Stading, J.E. Osorio, A. Velasco-Villa, M. Smotherman, B. Kingstad-Bakke, and T.E. Rocke. 2016, Vaccine (34).

Optimized methods for total nucleic acid extraction and quantification of the bat white-nose syndrome fungus, *Pseudogymnoascus destructans*, from swab and environmental samples. M.L. Verant, E.A. Bohuski, and others. 2016, Journal of Veterinary Diagnostic Investigation (28).

*Toxoplasma gondii* antibody prevalence and two new genotypes of the parasite in endangered Hawaiian Geese (nene: *Branta sandvicensis*). T.M. Work, and others. 2016, Journal of Wildlife Diseases (52).

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