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A JOINT PROJECT
BETWEEN

USDA APHIS
WILDLIFE SERVICES

AND

INDIANA DNR
DIVISION OF FISH AND
WILDLIFE

Indiana Wildlife Disease News



Volume 3, Issue 4

October 2008

Special points of interest:

- Leptospirosis
- BVD in Deer
- EHD update
- The Vector cross over stories
- New publication on lead and natural resources from The Wildlife Society

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Disease in Focus

Leptospirosis

Description and Distribution

Leptospirosis is a group of diseases caused by antigenically distinct members of the bacteria *Leptospira interrogans* that infect humans, domestic animals and wild animals. The diseases vary in severity from unapparent to fatal depending on the host involved and the infective serological group (serovar). The disease is responsible for significant economic losses to the livestock industry, primarily due to abortion, reduction of milk and weight gain, and secondarily due to death. Incidence of leptospirosis in domestic animals is highest in cattle and lowest in sheep and goats. Leptospirosis has little affect on the health of wildlife. Certain species of wildlife, however, may serve as a source (reservoir) of

infection for domestic animals and humans.

There are 184 distinct serovars of *L. interrogans* belonging to 20 serogroups identified worldwide. In North America, the most common serovars associated with disease of domestic animals and humans are *icterohaemorrhagiae*, *autumnalis*, *canicola*, *pomona*, *grippityphosa* and *hardjo*. The first 3 are the most important serovars from the veterinary and public health standpoints. Twenty-five pathogenic serovars have been isolated from wildlife in the United States including 2 (*grippityphosa* and *pomona*) from white-tailed deer.

Leptospirosis has a cosmopolitan distribution, and can be found in domestic and wild animals across the U.S. and worldwide. In Michigan, where white-tailed deer

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Agriculture expansion into wilderness areas not only results in the fragmentation of wildlife habitats but also in increased contact between wildlife and agriculture products that in many cases lead to an inevitable conflict between producers and wildlife advo-

Exploring the Wildlife-Livestock Interface: Bovine Viral Diarrhea in White-tailed Deer

ates. In the case of livestock production the increase in contact is especially alarming due to disease transmission between wildlife and livestock and vice versa. From the livestock sector standpoint the main concern is wildlife being a main reservoir for livestock diseases that can actually undermine any eradication program. Brucellosis in American bison (*Bison bison*) in the Yellowstone National Park and tuberculosis in white-tailed deer (*Odocoileus virginianus*) in Michigan provide vivid exam-

ples of this problem. Both are economically devastating diseases to the cattle industry. Determined to further explore the "wildlife-livestock interface" our research group at Purdue University Animal Disease Diagnostic Laboratory tested in 2006 745 harvested white-tailed deer in Indiana for Bovine Viral Diarrhoea Virus (BVDV), another economically important cattle disease. Infection with the disease can result in abortion and other reproductive problems in cattle and it is

Continued on pg. 3

Leptospirosis (continued from pg 1)

have been serologically tested, 50 of 190 (26.3%) were found to be reactive to *pomona* which suggests a low rate of exposure to the organism. Leptospirosis are easily killed by disinfectants, heat, drying, and pH values below 6 or above 8.

Transmission and Development

Leptospire bacteria are ubiquitous and abundant due to their abilities to infect a variety of animals and to persist outside the host. Transmission occurs through contact with contaminated water or contaminated food, during coitus, or through transplacental transmission. The leptospire bacteria have a predilection for the kidneys and the urinary tract where they may produce a persistent infection. The leptospire organisms may be excreted with the urine resulting in transmission of the bacteria. Infective urine constitutes the major sources of infection for humans, domestic animals and wild animals. Transmission usually occurs when there is direct contact between urine droplets or urine contaminated water and the mucous membranes of the eye, nose and mouth or through abraded skin. Transmission of the leptospire organisms may also occur through the food chain by the ingestion of leptospiral-infected carcasses by carnivorous species. This is the most significant mode of spread of leptospire among carnivores.

Humans usually are exposed by swimming in urine-contaminated water, or occupationally through exposure to an infected animal's urine.

The leptospire organisms can survive outside the body if environmental conditions are favorable. The bacteria prefer moist, slightly alkaline soil, stagnant ponds, and low-flow, slow-moving, slightly alkaline streams. In these conditions the organism can survive for several weeks.

Once infection has occurred, the leptospire bacteria multiply in the kidneys, lungs, reproductive organs and brain. Uterine penetration of pregnant animals results in infection of the fetuses.

Treatment and Control

In humans, a number of antibiotics (streptomycin, penicillin and tetracycline) have been administered to treat acute leptospirosis. Recovery from leptospirosis results in an immunity for the particular serovar that caused the infection. In domestic animals, antibiotic therapy has been effective in reducing leptospiremia and the severity of clinical signs if administered during the acute stage of the infection.

Because cases of naturally occurring disease have not been documented, no wild animals have been treated for leptospirosis. There is very little known about the immunological features of leptospirosis in wild mammals. Antibodies to several serovars have been found in various wildlife species. These animals are capable of being infected with one or several *Leptospira* serovars and can then serve as reservoir hosts. They will have an unapparent and transient infection with no clinical signs of the disease.

In order to control leptospirosis in humans, swimming in stock ponds or slow-moving streams frequented by domestic and wild animals should be avoided. If a worker is in a high-risk occupation, protective gloves and boots should be worn. In domestic animals, strict adherence to disease preventative management procedures will significantly reduce the dissemination of leptospiral infections. Domestic animals should be fenced away from ponds, marshes and streams that may be contaminated by leptospire bacteria. Control in wildlife is not feasible due to the multiplicity of serotypes, the broad range of susceptible hosts, and the extended carrier state of the disease. It is highly unlikely that leptospirosis can be eradicated from wild mammals.

Significance

The significance of leptospirosis in wildlife species that appear to be susceptible to *Leptospira* infections (white-tailed deer,



Coyotes and other mammals can serve as a reservoir for leptospirosis.

raccoon, striped skunk, red fox, gray fox, opossums, rats and mice) is that they serve as reservoir hosts only. Even this status is not clear because very few leptospirosis outbreaks in humans and domestic animals have implicated wildlife species other than rodents (rats and mice). In Michigan, we are concerned primarily with the likelihood of transmission from white-tailed deer to cattle and humans. Investigations have revealed lower prevalences of leptospiral antibodies in deer than cattle; much lower rates of organism isolation from deer than cattle; very few deer with clinical disease; and differences in the frequencies of similar serovars between deer and cattle. While these results indicate that white-tailed deer are exposed to *Leptospira* organisms, the deer play an insignificant role in the transmission of bovine leptospirosis.

Human cases are more common in summer and early autumn (probably due to contact with contaminated water) and in individuals that, either by choice or occupation, have frequent contact with infected animals or contaminated environments. No human cases of leptospirosis have been traced to contact with deer, and the risk of infection from free-ranging, wild animals is virtually non-existent.

Source: Michigan DNR Wildlife Disease Manual found at http://www.michigan.gov/dnr/0,1607,7-153-10370_12150_12220---,00.html (last accessed on August 25, 2008). See article on page 3 for more information about the Michigan Wildlife Disease Manual.

BVD in White-tailed Deer (Continued from pg. 1)

estimated that it causes an approximately of \$300 million loss to the dairy and beef industry nationwide despite massive vaccination programs. Two deer were found to be positive for the disease and the BVD virus was isolated from both animals resulting in a total prevalence of 0.3% among the tested deer. This finding encouraged us to design an experimental study, which aimed to better understand the impact of the virus on deer health as well as the possible transmission between deer and livestock. Four captive white-tailed deer fawns were inoculated with the virus into nostrils. Two other fawns served as negative controls. Blood samples and nasal and rectum swabs were collected 0, 7 and 14 days after inoculation. On day 7 and 14 after inoculation two of the inoculated fawns and one of the control fawns were euthanized for post mortem examination. At necropsy we obtained multiple tissue samples (gastro intestinal tract, lungs, and lymph nodes) for histopathology and *in situ* hybridization (ISH) test. We also performed quantitative RT PCR on blood (serum and Buffy coat), nasal, and rectal swabs. All animals tested negative for BVDV type 1 neutralizing antibodies on day 0 and animals in the control group remained seronegative throughout the study. Although we did not observe any gross lesions at necropsy, BVDV was isolated from lung and pooled lymph nodes from all inoculated fawns on days 7 and 14 post inoculation. Infected deer had lymphoid depletion, apoptosis and lymphoid necrosis in the Peyer's patches and mesenteric lymph nodes. We also could detect the virus in lymphoid tissues of infected animals using ISH. On day 7 post



Research assistant feeding white-tailed deer. Photo: E. Raizman

inoculation, samples from two virus-inoculated fawns were positive for BVDV by virus isolation and RT-PCR from Buffy coat and nasal swab samples. On RT-PCR, one fawn was also positive on a rectal swab, however all swabs were negative on day 14 post inoculation. Although the virus was not isolated from the PCR nasal swab positive sample it is likely that the virus was viable. Serology results did not indicate the presence of BVD neutralizing antibodies on day 14. Results from this experimental study indicate that infection of white-tailed deer with BVDV is possible and leads to histological lesions in a variety of tissues. Different studies have failed to cause clinical signs in deer experimentally infected with BVDV. One experimental study however, from Auburn University (Passler et al, 2007), showed that BVD infection during pregnancy can lead to persistently infected fawns. Epidemiologically, however, the most significant finding is that the virus can be shed into the environment through feces or nasal airdrops. This can be a source of infection to other deer and most importantly domestic cattle. Our group is currently analyzing the results from an experimental study where calves were inoculated with the same virus isolate to evaluate the impact of the virus on bovine health.

Reference:

[Passler, T., Walz, P.H., Ditchkoff, S.S., Givens, M.D., Maxwell, H.S., Brock, K.V.](#) 2007. Experimental persistent infection with bovine viral diarrhea virus in white-tailed deer. [Veterinary Microbiology](#) 122: 350-356.

For Your Information

The Vector and the Indiana Wildlife Disease News

For those of you who don't know, I (Joe Caudell), am one of the editors for the *Indiana Wildlife Disease News*. I am also one of the co-editors for the *Vector*, the newsletter of The Wildlife Society Wildlife Disease Working Group. Occasionally, we will publish an article in the *Vector*, such as the Bovine Viral Diarrhea in White-tailed Deer article on page one, that we feel may be of interest to readers in Indiana. Likewise, I also use articles from the *Indiana Wildlife Disease News* in the *Vector* that may be of interest to a more national audience. If you receive both, then you probably feel doubly blessed. If you don't we hope you continue to enjoy articles from the *Vector*.

If you are a Wildlife Professional and have an interest in wildlife diseases, I encourage you to visit The Wildlife Society web site (www.wildlife.org) and join The Wildlife Society and the Wildlife Disease Working group. If you are currently a member of The Wildlife Society and are not a member of the Wildlife Disease Working Group, please elect to join when you renew your membership this year.

Article by Joe N. Caudell, USDA APHIS Wildlife Services





Upcoming Conference

Mark your calendars for the next Wildlife Disease Association Conference in August

Mark your calendars now for August 2-7, 2009 and we will ensure that you experience the best of the Pacific Northwest! The luxurious, but affordable [Semiahmoo Resort and Spa](#) has been reserved for WDA 2009. This beautiful sea-side resort, set at the end of a mile-long sandy spit, is located about half way between Seattle, Washington and Vancouver, British Columbia. It is easily accessible from either international airport. Rooms are reasonably priced, lunches served outside overlooking Mt. Baker will be included

with your registration and the picnic will be on the beach. In addition to a full week of wildlife disease continuing education and meeting with colleagues, you'll want to be sure to make time for sunrise and sunset beach walks, wildlife watching from the grounds of the resort, whale watching, kayaking, salmon fishing, and hiking in the North Cascades wilderness.

Please keep an eye on the WDA website for more information: www.wildlifedisease.org



Sources and Implications of Lead Ammunition and Fishing Tackle on Natural Resources

The Wildlife Society has a new Technical Review (Number 08-1, Published June 2008) available on its website that focuses on the impact of lead on natural resources. Although naturally occurring, lead is harmful to plants and animals. Its use in ammunition for hunting, shooting sports, and fishing tackle remains widespread, despite well-documented adverse effects on wildlife. This report reviews all relevant scientific studies on lead sources that originate from hunting, shooting sports, and fishing activities and their impact on fish and wildlife. Price for members is \$17.00. Non-member price is \$20.00. Available for purchase through the TWS Website: <http://bookstore.wildlife.org/>

Wildlife Disease Resources in Focus

The On-Line Michigan Wildlife Disease Manual



The Michigan Wildlife Disease News contains a list of diseases, a description of the disease, photos, and species affected. The Rose Lake Wildlife Disease Laboratory monitors diseases in animals in Michigan. We routinely use the information in the Indiana Wildlife Disease Manual (with permission) because it is an excellent source of information and we do not see the need to recreate the wheel. Below is a list of the topics included in the manual. The entire disease manual can be accessed on-line at: http://www.michigan.gov/dnr/0,1607,7-153-10370_12150---,00.html

Parasitic Diseases

Baylisascaris or raccoon roundworm
Bear filarial worm
Blackhead
Brainworm
Cysticercosis
Deer liver fluke
Deer nose bots

Echinococcosis
Heartworm
Leucocytozoonosis
Mange
North American guinea worm
Proventricular or stomach worm
Roundworms
Sarcocystis
Taenia hydatigena
Trichomoniasis
Verminous hemorrhagic ulcerative enteritis
Warbles

Toxins, Poisons, and Pollutants

Botulism
DDT and other chlorinated hydrocarbons
Lead poisoning
Mercury
Organophosphate toxicity
Oil intoxication
Strychnine poisoning
Zinc phosphide

Physiological Diseases

Corn Toxicity
Hydrocyst
Malnutrition and starvation

Bacterial, Viral, and Mycotic Diseases

Abscesses
Aspergillosis
Bovine Tuberculosis
Brucellosis
Canine and feline distemper
Duck virus enteritis (DVE)
Epizootic hemorrhagic disease (EHD)
Fowl cholera
Leptospirosis
Lyme disease
Mycoplasmosis
Rabies
Salmonellosis
Tularemia
Tyzzer's disease
West Nile Virus (WNV)

Tumors

Avian Pox
Deer fibroma
Rabbit fibromatosis
Squirrel pox

Source: Michigan DNR Website
www.michigan.gov/dnr (last accessed on August 25, 2008).

Recent Wildlife Disease Activity

EHD reports down from previous two years

It appears that Indiana has finally gotten a small break from EHD in 2008. Though reports have come in from 19 counties to date this fall, reports in total are down from the previous two years.

EHD is a viral disease carried by a biting midge of the genus *Culicoides*. After a bite from one of these midges transmits the virus to the deer, the virus spends a brief incubation period inside the deer. Shortly thereafter, the animal begins to show clinical signs of the disease. These signs can include loss of appetite and fear of humans, excessive salivation, rapid pulse and respiration, and fatigue. After symptoms occur, the animal can die within 72 hours. Deer infected with EHD often seek out water since they are often fevered and dehydrated; it is there where they usually die. Often, deer afflicted with EHD will have bluish or purplish tinged tongues, gums, or eyelids.

EHD was first positively identified in deer herds in 1955 in deer in New Jersey and Michigan, but reports of deer dying with symptoms similar to EHD have been reported as far back as 1890. EHD is typically called bluetongue, and though similar, they are actually two different viruses. Deer have only tested positive this year for EHD serotype 2 virus, while none have tested positive for bluetongue virus.

EHD can have significant impacts on deer populations over a short period of time. Last year, the southwestern part of Indiana was significantly impacted from EHD. Few, if any, reports of EHD have occurred in these counties in 2008, likely due to the immune response gained by deer who survived last year's infection. Herds are expected to make a full or near full recovery this year, much like the counties affected in 2006 recovered in 2007. However, there still may be some isolated locations where deer are still sparse.



Counties where EHD was reported, tested, and/or confirmed. Map by C. Stewart, current on 10/14/08

Article by: C. Stewart, IDNR Deer Research Biologist

In Focus

Dean Zimmerman - Co-editor, Indiana Wildlife Disease News

Dean developed his love of the outdoors, animals and plants while growing up in Noble County, in northeastern Indiana. Rural farm life included such cool things as fishin' at the river, huntin' squirrels and rabbits in woodlots, leaf collectin' and simply discoverin' things in woods and wetlands around the neighborhood. Early in high school it became apparent that a career as a wildlife biologist was the thing to do.

The fall of '67 was the beginning of a great experience at Purdue University. He earned a Bachelor's Degree in Wildlife Science, graduating in 1971. Along the way he spent a summer working as a forest lookout in central Idaho, and two summers working as a naturalist aide for the Indiana Division of Fish and Wildlife. As a naturalist aide he trapped woodcock, mourning doves, and wood ducks for banding, and assisted with a raccoon movement and habitat study by capturing and ear-tagging raccoons. In October 1971 he was hired as a District Wildlife Biologist, and has covered five to nine counties in west-central Indiana ever since.



As a District Wildlife Biologist, Dean primarily works with private landowners to improve habitat on their property, runs wildlife surveys, inspects deer and goose damage complaints, and handles various public relations duties. This includes answering a multitude of questions from the public, including wildlife disease issues. Significant project involvement has included highway roadside management, reintroduction of wild turkey to Indiana, staying abreast of animal damage and disease issues, and private land wildlife management programs.

Dean has been active in the Indiana Chapter of The Wildlife Society. While president in 1992, he initiated a continuing education program, has been chairman of that committee since, and helped organize 18 continuing education workshops for wildlife biologists and other natural resource professionals. As a result, he was awarded the Hoosier Wildlife Award by the chapter in 1999. Awards have also been received from the National Wild Turkey Federation, the Indiana Fur Takers and Ducks Unlimited. Leisure activities include spending time with family, fishing, hunting, landscaping, and travel.

Article by: D. Zimmerman, IDNR



Midwest Wildlife Disease Update

Midwest Wildlife Disease Update
November 2008

White-Nose Syndrome Update- A previously undescribed, cold-loving fungus has been linked to white-nose syndrome, a condition associated with the deaths of over 100,000 hibernating bats in the northeastern United States. The findings were published the last week of October 2008 in Science.

The fungus - a white, powdery looking organism - is commonly found on the muzzles, ears and wings of afflicted dead and dying bats, though researchers have not yet determined that it is the only factor causing bats to die. Most of the bats are also emaciated. USGS microbiologist David Blehert isolated the fungus in April 2008, and identified it as a member of the group *Geomyces*. This group of fungi live in soil, water and air, and are capable of growing and reproducing at refrigerator level temperatures. (Source- USGS News Release- 10/30/08, edited)



WNS in bats. Photo: Al Hicks, New York Dept of Environmental Conservation

Lyme Disease Imported- Researchers at the University of Bath in England studied eight "housekeeping" genes, which are involved in cell maintenance and evolve slowly, to conclude that the spirochete bacteria *Borrelia burgdorferi* (which causes Lyme Disease) actually originated in Europe millions of years ago. DNA samples were collected across the U.S. and Europe to support the data. The team thinks the pathogen has resided quietly in North America for millions of years, only recently coming into sufficient contact with humans to warrant the medical community's attention.

Lyme disease entered American consciousness in 1975, when a cluster of cases turned up around Old Lyme, Connecticut. Thirty-plus years later, it continues to spread around the U.S., including the Midwest. The spirochete lives in small and medium size mammals, and is transmitted to humans via tick bites. (Source- LiveScience, Internet)

Wolf Virus- New research claims that half of wolf pups born in Minnesota each year die from a highly contagious disease that has stunted the growth of the state's wolf population. The study, published in the Journal of Wildlife Diseases, shows that canine parvovirus kills from 40% to 60% of wolf pups in Minne-

sota. The virus attacks the gastrointestinal tract and can kill pups within a few days.

David Mech, a scientist at the U.S. Geological Survey, said the gray wolf population in other states has jumped substantially, but growth in Minnesota is about 4 percent a year compared to increases of 16 to 58 percent in other states. (Source- ProMed)

Bovine TB Case Traced to Indiana Farm- Staff of the Indiana State Board of Animal Health (BOAH) is investigating a case of bovine tuberculosis (commonly called "TB," or more formally known as *Mycobacterium bovis*) in a beef cattle herd in southeastern Indiana. The TB-positive cow was identified through routine testing at a meat processing facility in Pennsylvania.

BOAH veterinarians are in the very early stages of conducting a thorough investigation of the animal's movements within the state. Few details are known at this time. Indiana has held a bovine tuberculosis-free status since 1984 with the USDA. The last time a Hoosier herd tested positive for the disease was in the 1970's. (Source- BOAH News Release 12/02/08)

Grebe Phenomenon- On October 27, 2008 I received a call from a woman in downtown Lafayette, Indiana who witnessed a horned grebe fall from the sky. Because of the Exotic Newcastle Disease outbreak in Minnesota, Indiana wildlife biologists were advised to be on the lookout for dead or dying migrant waterbirds. I picked up the bird and took it to the Animal

Disease Diagnostic Lab at Purdue University, asking it be tested for that virus along with any other cause of death.

I contacted newsletter co-editor Joe Caudell, and advised him of the discovery. Long story short, Joe reported that it is not unusual for grebes to fall from the sky. Having completed graduate work on grebes, Joe advised that he had read or heard of several accounts of grebes migrating just in front of a cold front, simply losing it, and falling to earth. One account indicated that 1,200 grebes died on one occasion. Their wings are rather small for their body size, and speculation is that they tire, get caught up in up or down drafts, or become disoriented and crash. By the way, the necropsy report indicated no problem viruses discovered, and the bird simply died from injuries due to the impact. Case solved. (Source- Co-editors Dean Zimmerman and Joe Caudell)

Wisconsin Says CWD Can't Be Eliminated- In its first long-term analysis of how to manage Chronic Wasting Disease (CWD) in Wisconsin, the Dept. of Natural Resources (DNR) acknowledged this week that the fatal deer disease can't be eliminated in some Continued on pg. 7

Indiana Wildlife Disease News

A joint project between:

Indiana DNR
Division of Fish and Wildlife

and

USDA APHIS Wildlife Services
National Wildlife Disease Surveillance and Emergency Response Program

to provide information on wildlife diseases in Indiana and surrounding states.

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The Indiana Wildlife Disease News is only published in electronic format. To add or remove you name from the mailing list, please send an e-mail to jcaudell@aphis.usda.gov

Submissions or Participation

If you would like to submit a wildlife disease related article, ideas, comments, or other information, please contact one of the editors.

We welcome individuals or agency representatives to act as reviewers or to provide assistance in the production of this newsletter. To assist, please contact one of the editors.

Providing information on wildlife diseases in Indiana and surrounding states



Indiana Department of Natural Resources Division of Fish and Wildlife

The mission of the Division of Fish and Wildlife is to professionally manage Indiana's fish and wildlife for present and future generations, balancing ecological, recreational, and economic benefits. Professional management is essential to the long term welfare of fish and wildlife resources, and providing for human health and safety. Communication between agency professionals and educating the public are important aspects of professional management.

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USDA APHIS Wildlife Services NATIONAL WILDLIFE DISEASE SURVEILLANCE AND EMERGENCY RESPONSE PROGRAM

The mission of the National Wildlife Disease Surveillance and Emergency Response Program is to provide Federal leadership in managing wildlife disease threats to agriculture, human health and safety, and natural resources by assisting Federal, State, Tribal, and Local governments, private industry, and citizens with management of zoonotic and other wildlife diseases of concern.

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Midwest Wildlife Disease Update (Continued from pg. 6)

parts of the state. Despite six years of work, infected areas such as western Dane and eastern Iowa counties have been growing and are "likely increasing," a new report says. Wisconsin has used longer hunting seasons in the past to reduce numbers in hope of slowing the spread of the disease. But in a 10-year management plan released this week for public comment, officials said political and hunter support for such tactics was declining. Information on that plan may be found at: <http://www.dnr.state.wi.us/org/land/wildlife/whealth/issues/CVWD/plan.htm> State government finances and the loss of federal funding have also played a limiting role the agency said. Since 2002, the state has spent about \$35 million to fight CWD. (Source- Milwaukee, WI Journal Sentinel, 12/03/08)

Human Rabies Case In Missouri- State health officials report Missouri's first human death from rabies in nearly a half century (1959). The victim is identified only as a 55

year-old southern Missouri man who died November 30, 2008. Officials say the latest victim was bitten on the left ear by a bat in mid-October 2008 and became ill with rabies symptoms on November 19. The man did not seek medical attention after being bitten. The Centers for Disease Control and Prevention confirmed last week that the man had a rabies virus associated with silver-haired and eastern pipistrelle bats. Dr. Howard Pue, state Public Health Veterinarian, said, "Unfortunately this sad case is an important reminder that people need to avoid contact with wild animals, and need to report wild animal bites to health officials to determine if they are at risk. It is important that anyone bitten by a wild animal or domestic animal, particularly a stray, should report the incident to their medical provider to receive appropriate wound care, antibiotics and tetanus vaccination as needed, as well as a rabies risk assessment." (Source- ProMed, 12/02/08 Associated Press Report)

Column by D. Zimmerman, IDNR