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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 1, Issue 3

July 2006

Special points of interest:

- Special Issue on rabies
- Oral rabies vaccination zone
- Update - avian influenza surveillance in wild birds in Indiana
- Indiana Rabies Task Force
- An update on wildlife disease in Indiana and surrounding states

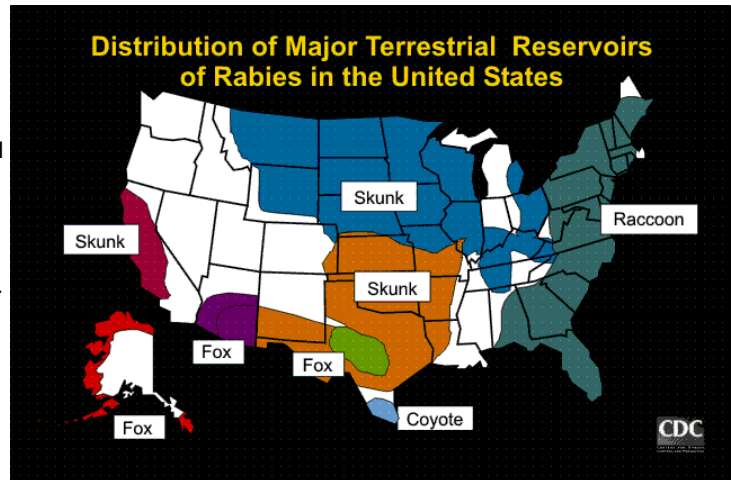
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Rabies 101

Infectious Agent - Rabies is caused by a rhabdovirus of the genus *Lassavirus*. Serologic and molecular biologic tests can distinguish among the different strains, which are geographically distinct and/or are maintained in various animal populations, such as bats, skunks, raccoons, and foxes.

Signs and Symptoms - Rabies in animals can take a variety of forms, but a common, early symptom is a change in behavior. Normally docile animals may become aggressive and vice versa. Animals may progress through a "furious" phase and a "paralytic" phase. Not all rabid animals will exhibit all the symptoms. Wild animals may or may not show symptoms. Nocturnal ani-



Distribution of major terrestrial reservoirs of rabies in the U.S. excluding bats. Bats carry rabies throughout the entire U.S. (Source - CDC)

mals, such as raccoons and skunks, may be active in daylight hours. Wild animals may also lose their fear of humans. Rabies in humans usually begins with generalized anxiety with tingling,

Continued on Pg. 6

The Indiana State Department of Health Microbiology Laboratory

The Indiana State Department of Health (ISDH) Laboratories, Microbiology Laboratory offers a wide variety of analyses to the citizens of Indiana which are available through all physicians, hospitals, clinics, and governmental agencies throughout the state. The Microbiology Laboratory is comprised of 3 laboratory areas: Environmental Microbiology (Water), Consumer Health Microbiology (Food) and Clinical Microbiology/Immunology/Molecular (Clinical). Rabies testing is performed daily by staff in the Clinical

Microbiology area. A complete description of how to submit specimens for rabies testing can be found on page 4. Results are usually available 24 hours after submission if the specimen is not frozen when received. **Unless the test is considered an emergency by the Epidemiology Resource Center**, specimens received late on Friday afternoon are held until the next business day morning, which is usually a Monday unless it is a

holiday. Therefore, please contact Dr. James Howell, DVM of the ISDH Epidemiology Resource Center (ERC) at 317.233.7272 (during normal business hours) or the ISDH Emergency Duty Officer, 317-233-1325 (after hours and weekends) if the circumstances of the test request suggest that a more urgent response is required. The ERC staff will evaluate the request and inform the ISDH Lab staff.

Source: ISDH web site

Oral Rabies Vaccination—Preventing the Westward Spread of Raccoon Rabies

The raccoon strain of rabies has been endemic in the southeastern United States since the turn of the last century. During the 1970's, raccoons were moved from the southeastern states to other states along the east coast by hunters looking for additional hunting opportunities. Since then, raccoon rabies has spread along the east coast through both intentional and unintentional raccoon relocations.

In the 1990's several states agencies began using oral rabies vaccination (ORV) as a method to prevent the westward spread of rabies. In 1998, USDA Wildlife Services received federal appropriations to cooperate with existing state ORV programs and to help expand ORV to states of strategic importance.

The ORV barrier works in conjunction with natural barriers (i.e., mountains and large rivers) to limit the movement of infected animals. The ORV barrier along Ohio, Pennsylvania, West Virginia, and other southeastern states helps prevent raccoons infected with rabies from moving into Indiana and other mid-west states. Wildlife Services conducts routine surveillance along and west of the barrier to determine the effectiveness of the bait drops and to detect rabies in

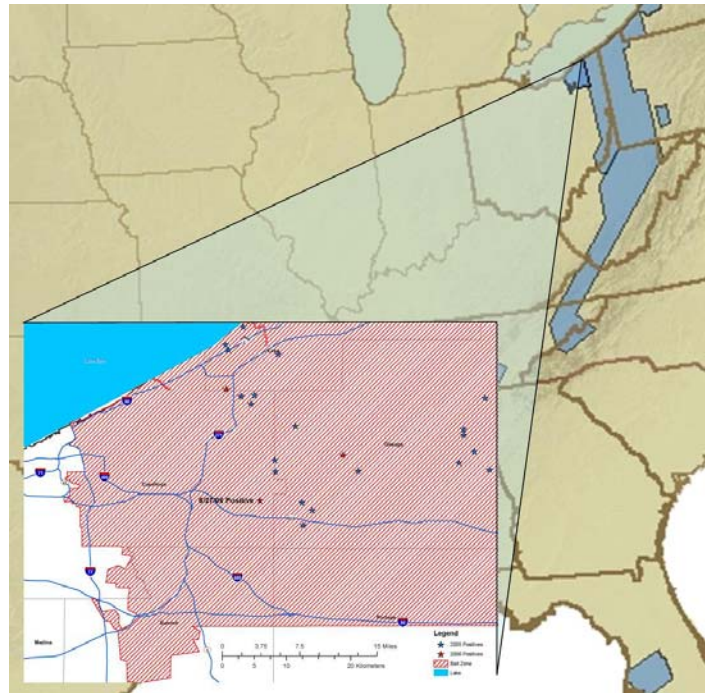
wildlife west of the barrier. Whenever a significant breach (i.e., a case of raccoon rabies) is detected, Wildlife Services dispatches wildlife biologists and technicians to that area where they conduct intensive rabies management, including enhanced surveillance, bait dispersal, and trap-vaccinate-release activities. In fall 2004, a breach was detected in the Ohio barrier. Approximately 18

Wildlife Services personnel were dispatched from 12 states to control this breach. Since then, the ORV barrier has been expanded to include this area, the numbers of positives have decreased within the expanded barrier, and no new

positive cases of raccoon rabies have been found west of the barrier.

Additional details about the USDA Wildlife Services National Rabies Program can be found at <http://www.aphis.usda.gov/ws/rabies/index.html>.

Source USDA



2005 oral rabies vaccination zone (in blue) with recent (2005 - current) Ohio positive cases of raccoon rabies (inset). Source: USDA

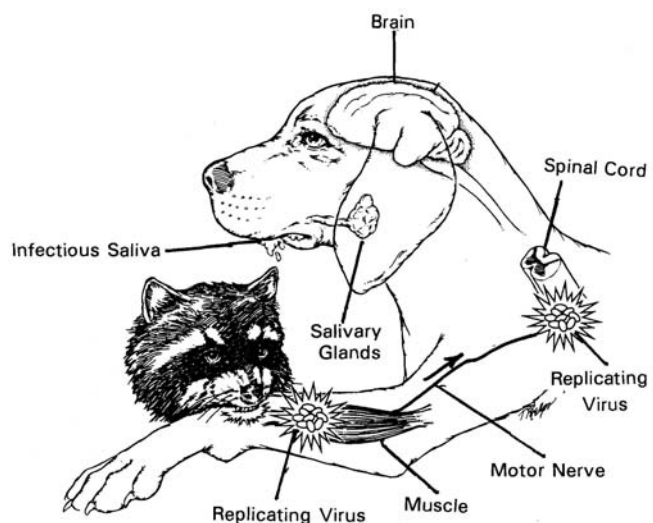
The Mechanics of a Rabies Infection

The rabies virus enters a new host body through a bite wound from an infected animal. The virus replicates in the muscle cells near the wound. Within a few days to a week, the virus spreads to the motor nerves and on to the central nervous system.

For post exposure vaccination to be effective, it has to be administered prior to the virus reaching the nerve cells. The virus continues replicating in the spinal cord and spreads throughout the rest of the nervous system causing paralysis and eventually, coma and death.

Once the virus enters the brain, significant changes in behavior occur, including the "mad dog" type behavior that is often associated with rabies. Once the virus reaches the salivary glands, it can be transmitted to other animals.

Source: Indiana Rabies Control Guidelines



A graphic depiction the mechanics of a rabies infection. Adapted from the Indiana Rabies Control Guidelines (Originally by T. Phelps)

Rabies in Indiana

Rabies, a disease that has struck fear in the hearts of people worldwide since the discovery of the link between the bite of a “mad” animal and the death of its bite victim, still causes fear and even death in untreated people. As recent as the spring of 2006, a Texas teenager died from rabies attributed to a bat exposure. From 1900-1959, there were 129 identified rabies deaths in Indiana. The last Indiana death, which occurred in 1959, was a 4-year-old child bitten by an unknown animal at an unknown time. There are several possible reasons that no known Indiana human cases have occurred since 1959, including reductions in domestic animal rabies cases, better postexposure prophylaxis biologicals, and a population that better understands the need to report animal bites and seek medical care for them.

Historically, rabid dogs exposed more people to rabies than any other animal. Until recently, public health efforts to control rabies in animals have been aimed primarily at dogs. In recent years, success in controlling wildlife rabies with the use of oral rabies vaccine has been demonstrated in both coyotes in Texas and raccoons in Ohio. The impact of the efforts to eliminate canine rabies can be seen in Figure 1. The advent of better canine rabies vaccines coupled with mandatory vaccination and leash laws rapidly reduced canine rabies in Indiana and across the nation. By the mid-1960s, the

be attributed to the rabies laboratory’s ability to test more wildlife as the canine workload decreased. Alternatively, there may have been an absolute increase in wildlife rabies, especially in skunks.

Figure 2. illustrates the rabies cases identified in Indiana’s three major rabies vector species: skunks, foxes, and bats. From 1960 to approximately 1986, rabies in skunks was, at times, epidemic. Skunks in Indiana have been identified as harbors of the North Central Skunk variant virus, with Daviess County reporting more rabid skunks (174) than any other county since 1962. Skunks rabies has become rare in Indiana since 1990 with only eight skunks identified as rabid. All eight skunks were submitted from a four-county area in southern Indiana (Harrison, Washington, Floyd, and Crawford Counties). The fact that some years since 1990 were without any reported rabid skunks from the four-county area suggests that some level of skunk rabies was occurring without human recognition.

The number of rabid foxes spiked between 1955 and 1965, with few or no positive animals since then. Only four raccoons have been rabies positive in Indiana between 1945 and 2005. The raccoon rabies variant has not moved west of the Ohio-Pennsylvania border, so Indiana has been spared the raccoon rabies epidemic of the eastern U.S.

Insectivorous bats were first identified as reservoirs of rabies in 1953 when a 7-year-old Florida boy was attacked by

a rabid bat. Since that time, reports of rabid bats have increased. In 2004, 1,361 bats tested positive in the U.S. Since

1965, Indiana has experienced a gradual increase in both the number of bats submitted for testing and the number testing positive. From 1965-1984, the percentage of bats tested that were rabies positive varied from 5-12 percent.

Table 1 lists the significant animals and the number of rabies positives since 1945 and the last year that a positive occurred.

In spite of the low risk of exposure to a rabid dog or cat in Indiana, most postexposure prophylaxis treatments are for dog or cat bites. Increasingly, postexposure prophylaxis is being given for exposures or contact with bats within or around the home.

Figure 2: Rabies Cases in Wild Vector Species, Indiana, 1945 - 2005

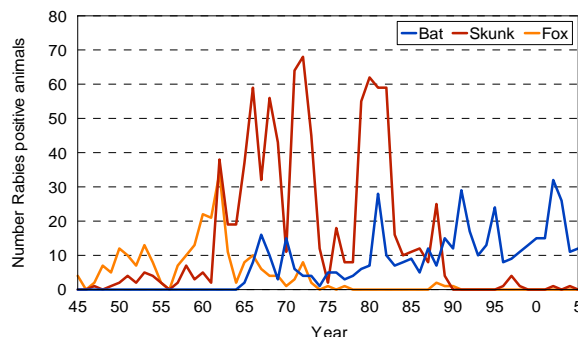
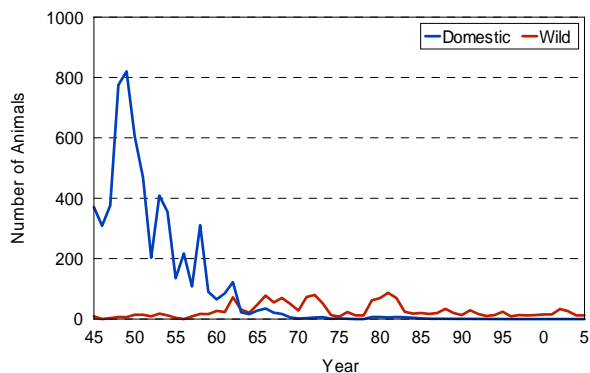


Figure 1: Rabid Domestic and Wild Animals, Indiana 1945 - 2005



number of rabies-positive dogs had been exceeded by the number of rabid wildlife cases. The increase in wildlife cases may

Species	Number of Rabies Positives since 1945	Last Year Positive Occurred
Human	15	1959
Dog	5,404	1989
Skunk	908	2004
Bat	462	2006
Fox	242	1990
Cow	322	1986
Horse	15	2002
Raccoon	4	1979
Woodchuck	4	1983
Pig	4	1967
Sheep	1	1982
Goat	1	1966
Mouse	1	1970
Opossum	1	1968
Rat	1	1969

Table 1: Animal Rabies in Indiana, 1945-2006

Instructions for the submission of animal heads and bats for rabies testing.

SUBMITTING SPECIMENS

Specimens - Since brain tissue is examined in the diagnosis of rabies, submit only the animal's head for diagnostic purposes. For bats, the whole dead animal should be submitted. Animals must be euthanized in a manner that will not destroy the brain. The animal's neck should then be severed at the mid-point between the base of the skull and the shoulders for shipment as follows.

Packaging of Specimens - Place the animal specimens for rabies diagnosis in a leakproof container (jar, can, double plastic bag, etc.) and seal. Place this container in a shipping carton (use Styrofoam if possible) and enclose a refrigerant to keep the specimen cold. Canned ice makes an ideal refrigerant and eliminates the problem of the refrigerant leaking from the shipping container. Specimens should be kept cold but preferably not frozen. **DO NOT USE LOOSE WET ICE.** Freezing the head will delay testing since it takes up to 24 hours to thaw.

Completion of Form - The upper sections (No. 1 thru 6) of the submission form must be filled out. The form should be sealed in a separate plastic bag and enclosed with the specimen. An incomplete form may result in the delay of conveying vital information to the person or persons exposed. The form for rabies head/bat submission is included at the end of this publication .

EMERGENCY SITUATIONS DEFINED

The State Health Department laboratory personnel perform routine rabies testing on animal heads Monday through Friday, excluding holidays. All animal heads received at our location by 2:30 PM will be tested that day. Those received after that time will be tested the following day. Animal heads received after 2:30 PM Friday afternoon, Saturday or Sunday are kept refrigerated until the next normal working day, at which time they are promptly tested. The majority of bites

and/or scratches that are inflicted to humans by animals are not an immediate rabies threat to the wounded individual. Rabies virus, if present, progresses slowly along nerves and does not become systemic. If the biting/scratching animal proved to be rabid, immunization of the patient would be initiated resulting in immunity. Any short term delay in testing caused by holidays or weekends would be negligible with respect to treatment.

Immunized Animals

- Any bite or scratch inflicted by a dog or cat with proof of current immunization, regardless of the wound location on the body, will not be considered a rabies emergency. If, however, the victim was brutally attacked and mauled about the shoulders, head, and neck with extensive tissue damage, the animal would be tested on an emergency basis regardless of its immunization status.

Non Immunized Domestic Animals

- Any bite or scratch inflicted on or above the neck by a dog or cat without proof of immunization will be considered a rabies emergency. If the attack occurred below the neck and was brutal as described above, the attack will be considered an emergency and the brain will be examined within 24 hours after receipt of the animal head.

Household pets such as mice, hamsters, ferrets, rats, etc. are considered low priority for rabies transmission and bites/scratches will not be considered an emergency regardless of the bite location on the body.

Wild Animal - Bites/scratches from wild carnivorous animals, especially skunks, bats, raccoons, coyotes, and foxes, are the most disturbing because

rabies is found most often in those wild animals. In Indiana rabies has been observed most often in bats and occasionally in skunks. Bites/scratches on the neck, head, or face will be treated as an emergency situation and the brain will be examined within 24 hours after receipt of the animal head. If the attack occurred



USDA Wildlife Services biologists collecting a blood sample from an immobilized skunk. (Photo: USDA)

below the neck but was brutal as described above, the attack will be considered an emergency and the brain will be examined within 24 hours after receipt of the animal head. For prophylaxis, physicians have the option to immediately administer the first dose of rabies vaccine to the victim before the laboratory result is known. Bites/scratches from wild mice, rats, chipmunks, and squirrels are not considered to be high priority transmission vectors for rabies and are not a rabies threat to the victim. However, due to the probable emotional nature of the situation, such bites/scratches inflicted on or above the neck will be tested within the 24 hour time-frame described above.

Note - **DO NOT FREEZE THE HEADS** submitted for rabies testing. The 24 hour test time window for emergency situations could be extended for 12 hours or more to allow time for thawing.

Avian Influenza Surveillance in Wild Birds: Update

USDA Wildlife Services and the Indiana Department of Natural Resources (IDNR) implemented the surveillance plan for the H5N1 strain of high path avian influenza in wild birds in May.

One avian mortality event in Johnson County was investigated and determined



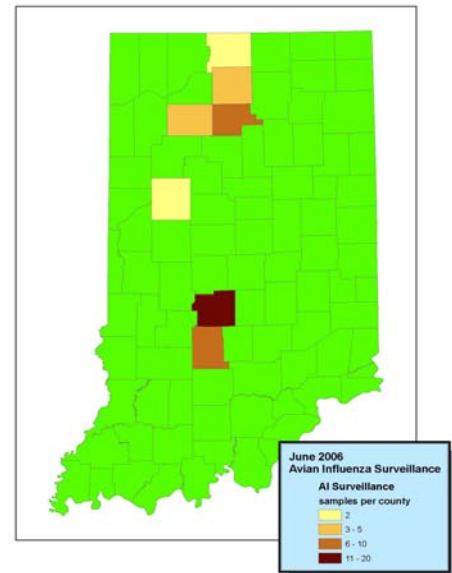
Conducting avian influenza surveillance (Photo: USDA).

that several nests of young birds were overturned during a storm. No samples were collected.

Samples from 50 resident Canada geese were collected in June during several of the IDNR's goose banding projects. After samples were collected from the geese, they were released on-site. Two birds (1 Canada goose and 1 mallard) were also collected during routine mortality investigations which resulted from calls to the dead bird hotline. All results were negative for H5N1.

Sampling of wild birds will continue through the end of December, 2006.

Article by Dr. J.N. Caudell, USDA



Indiana avian influenza surveillance conducted in June 2006 by county (Source USDA).

Canine Distemper

A disease of mammals that is often confused with rabies is canine distemper. Over the years as a wildlife biologist, I've had numerous calls from people reporting a raccoon displaying symptoms that resemble rabies. Those symptoms may include abnormal behavior and apparent lack of fear, aggressiveness, disorientation, convulsive movements of the head and paws, aimless wandering, nasal discharge, eyelids may be adhered together with crusty secretions, and there may be evidence of diarrhea, labored breathing and an unkempt appearance to the fur. In every case where I submitted an animal with these symptoms for necropsy, canine distemper was the diagnosis.

Thankfully, rabies cases continues to be rare in Indiana.

Canine distemper is a viral disease (distinctly different from feline distemper) that affects mostly members of the canine family, but also raccoons and members of the weasel family (e.g., mink, skunks, badgers, and river otters). Transmission occurs via an aerosol-droplet route, direct contact, or possibly by contact with contaminated objects. The virus is shed in the feces and urine of infected individuals and spread by contact. The usual route of infection is through the upper respiratory tract, following inhalation of infective virus. Occasionally infection occurs from ingestion of

infective material. The virus is cold tolerant and outbreaks can occur in the fall and early winter.

Once contracted, there is no treatment or cure for canine distemper. If an outbreak occurs, removal or burying of carcasses which have died from the disease, and vaccination of susceptible domestic species to decrease the number of susceptible hosts will help slow the disease. Due to the similarity of clinical signs between canine distemper and rabies, affected animals should be handled with caution until a diagnosis is confirmed. Canine distemper is not considered a threat to humans.

Article by D. Zimmerman, IDNR

Avian Botulism

Avian botulism is a paralytic disease caused by ingestion of a toxin produced by the bacteria, *Clostridium botulinum*. This bacteria is widespread in soil and requires warm temperatures, a protein source and an anaerobic (no oxygen) environment in order to become active and produce toxin. Decomposing vegetation and invertebrates combined with warm temperatures can provide ideal conditions for the botulism bacteria to

activate and produce toxin. This disease usually becomes prevalent between July and September.

Birds may ingest the toxin directly or through feeding on invertebrate larvae. Ducks that consume toxin-laden maggots can develop botulism after eating as few as 3 or 4 maggots.

The toxin affects the nervous system by preventing impulse transmission to mus-

cles. Birds are unable to use their wings and legs normally, neck or other muscles. Birds with paralyzed neck muscles cannot hold their heads up and often drown. Death can also result from water deprivation, electrolyte imbalance, respiratory failure, or predation. Quick removal and disposal of carcasses is effective in slowing or ending an outbreak.

Article by D. Zimmerman, IDNR



Midwest Wildlife Disease Update

Indiana - On June 20, 2006, Wildlife Disease Biologist Caudell removed 6 juvenile skunks suspected of having rabies from a small farm in Warren County, Indiana. The samples were submitted to the Indiana State Department of Health Rabies Lab for testing (all

were negative). In cooperation with the Indiana Department of Natural Resources, two of the carcasses were submitted to the Purdue Animal Disease Diagnostic Lab for a general necropsy to determine cause of death/illness. Samples were taken for canine distemper (all negative). The two skunks had liver ne-

crolos and suspected pneumonia. Samples were also taken from two of the animals for Wildlife Services' tularemia surveillance.

Wildlife Disease Biologist Caudell conducted an avian mortality investigation in Franklin, Indiana

Continued on Pg. 7

Rabies 101 (Continued from pg. 1)

pain, and/or itching of the site of virus inoculation. This stage is followed by a non-descript flu-like illness. Next, a person may be excitable with hypersensitivity to external stimuli and hydrophobia. The next stage is paralysis and death.

Transmission - Rabies is most commonly transmitted from an infected animal into another susceptible animal (including humans) through a bite, mucous membrane, or a break in the skin.

Incubation and Communicability - The incubation period is varied, although it is usually between 3 to 8 weeks in humans and canine species. The period

of communicability is also varied among species and is not well known. In dogs, virus shedding in saliva occurs at or a few days before the development of early symptoms of the disease and continues until death.

Diagnosis - Rabies cannot be diagnosed through symptoms. It is normally diagnosed through direct fluorescent antibody testing of the brain. Other tests are available to rule out rabies in humans prior to death.



Skunks are a common reservoir for rabies (Photo: USDA).

Control Measures - Indiana law requires the vaccination of all cats and dogs. Contact between humans and stray dogs, cats, and wildlife should be avoided.

Prevention - Pre-exposure immunization is appropriate

for persons who come into close contact with wildlife and stray animals that may carry the virus, including animal control workers, conservation officers, rehabilitators, veterinarians, and veterinary technicians.

Source: Indiana Rabies Control Guidelines

Indiana Rabies Task Force

In 1997, Ohio experienced its first positive case of raccoon strain rabies in animals. During that year, 52 raccoons, 52 bats, 2 cats, 1 skunk, and 1 dog tested positive for rabies. In previous years, only 10 to 20 cases (primarily in bats) were normal. In addition, a child was bitten by a rabid raccoon while riding his tricycle. Ohio began an extensive campaign to manage rabies in that state, including an oral rabies baiting program (see related story on page 2), a public awareness program, and a quarantine/vaccination order for dogs and cats in Mahoning, Columbiana, Trumbull, and Ashtabula Counties and the surrounding counties.

Due to concern about the rabies situation in Ohio and the significant public health risk associated with rabies, Dr. Bret Marsh, Indiana State Veterinarian and Dr. Greg Wilson, the Indiana State Health Commissioner, assembled the Indiana Rabies Task Force in 1997. The

purpose of this task force is to ultimately develop a plan of action for dealing with the progression of raccoon strain rabies into Indiana. Members of this task force include individuals from the Animal Disease Diagnostic Laboratory, Indiana State Department of Health, Indiana State Board of Animal Health, Department of Natural Resources, Department of Veterinary Pathobiology at Purdue University, USDA Wildlife Services, and others.

The primary mission of the task force is to evaluate the needs of Indiana with regard to preventing and combating this disease. Since its creation, the task force has developed a set of guidelines for managing rabies titled Rabies Control in Indiana: Guidelines for Handling People and Animals. A slide card for first responders has been developed and distributed to veterinarians, physicians, animal/shelter workers and other

health care workers who deal with animal bite cases. In general, public and domestic animal vaccination programs along with public education about rabies are important in other states for managing rabies on the east coast and this strategy is reflected in the work of this Task Force. Raccoon strain rabies has been found in the Cuyahoga county area in 2005 in coyotes and rabies positive raccoons were also identified, taking it out of the managed area for the first time since the oral bait management program. Additional baiting is being done in Ohio and other states to try and control the westward movement of raccoon strain rabies. The Task Force does not meet on a regular basis, but does keep the manual updated on an as-needed basis. For more information on the Indiana Rabies Task Force, contact Dr. Sandra Norman at the Board of Animal Health in Indianapolis (317-227-0300/ toll free 877-747-3038 or snorman@boah.in.gov).

Article by Dr. S. Norman, BOAH

Indiana Wildlife Disease News

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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)

on May 5, 2006. Caudell was forwarded a call about 12 dead birds from the Dead Bird Hotline. The call was regarding an unidentifiable species of adult passerine and the caller gave no reasonable explanation for so many dead birds in a small area. Upon investigation, Caudell determined the dead birds were the result of nests that had been disturbed during a large storm event the previous night. The birds consisted of 12 nestlings and no adult birds. All specimens were collected and disposed of. No samples were collected.

Ohio - The Ohio DNR reports that raccoon populations are

up 800% in the last 15 years due to urban growth and reduction in fur harvest. They also report that ducks, small birds and small mammal numbers are inversely proportional to the raccoon numbers.

Ohio Wildlife Services, Ohio Department of Health, and other state cooperators continues to monitor raccoons for rabies within and west of the Ohio Oral Rabies Vaccination (ORV) barrier. In 2006, 3 positives have been found within the extended barrier (see related story on page 2), with the latest case being found in June, 2006. No new cases of raccoon rabies have been found west of the barrier. The next

ORV bait drop in Ohio is scheduled for September, 2006.

Kentucky - Due to the threat of [Chronic Wasting Disease \(CWD\)](#) to Kentucky's deer and elk resources, any member of the family Cervidae (deer and elk including reindeer) originating from outside of Kentucky is prohibited from entering Kentucky by Executive Order 2002-1256. This includes importation and transportation through Kentucky.

Column by D. Zimmerman, IDNR