

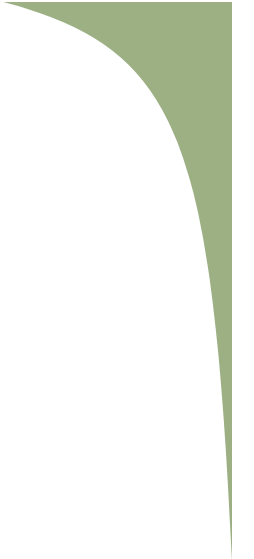


Rabies Surveillance and Prevention

Recommendations for Veterinarians
and Veterinarian Technicians



NORTH
Dakota | Health
Be Legendary.™



HUMAN RABIES PREVENTION





Rabies - Background

- Lyssavirus belonging to the Rhabdoviridae family
 - “bullet-shaped virus”
 - RNA virus
- Rabies is a virus that affects the central nervous system in mammals
 - Virus travels within the nerves
 - Within the brain, virus multiplies rapidly
 - Signs of disease begin to develop

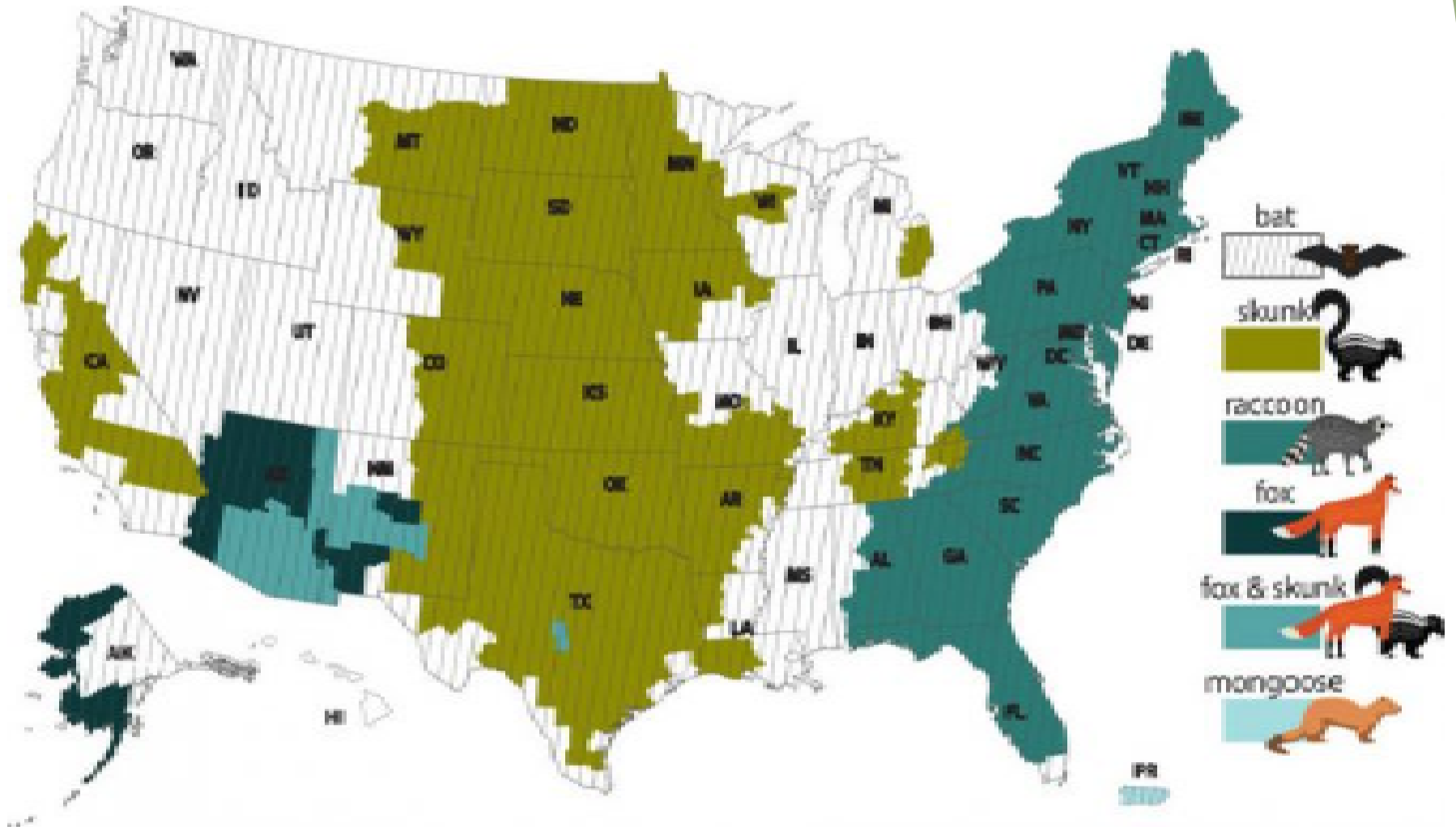




Rabies - Background

- In the most recent report (2018) more than 90 percent of rabies cases reported each year in the United States occurred in wildlife
 - 33% bats
 - 30.3% raccoons
 - 20.3% skunks
 - 7.2% foxes
- Skunks are responsible for most reported animal cases in North Dakota
- Different variants (bat, skunk, raccoon, etc.)

Terrestrial Rabies Reservoirs(2019)



Rabid Cats and Dogs Reported in the U.S. (2018)

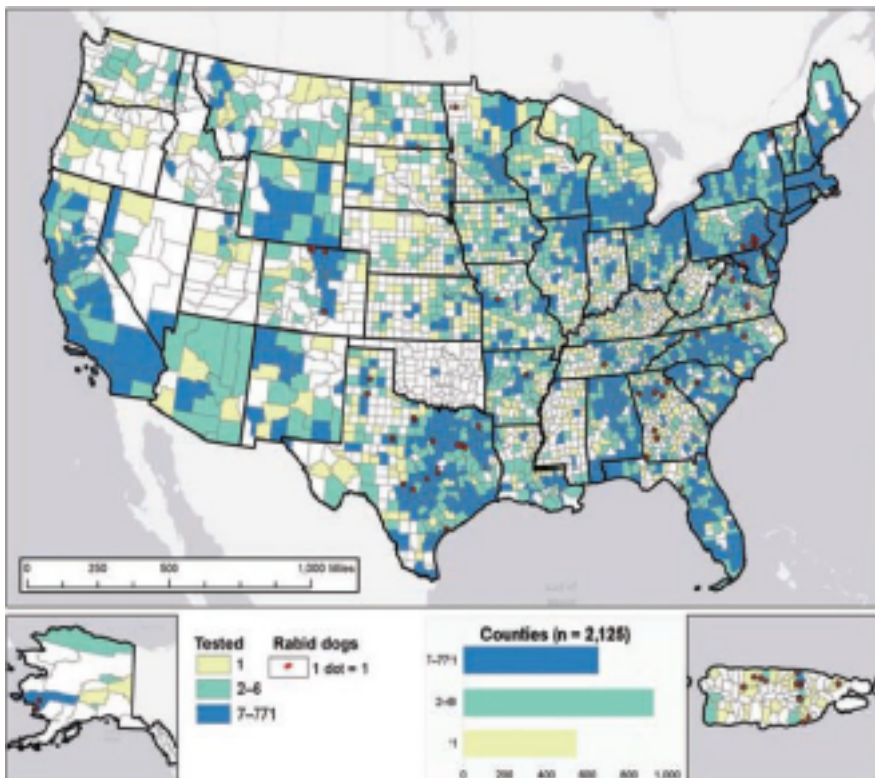


Figure 7—Reported cases of rabies involving dogs, by county, during 2018. Histogram represents number of counties in each category for total number of dogs submitted for rabies testing. Point locations for rabid dogs were randomly selected within each reporting jurisdiction.

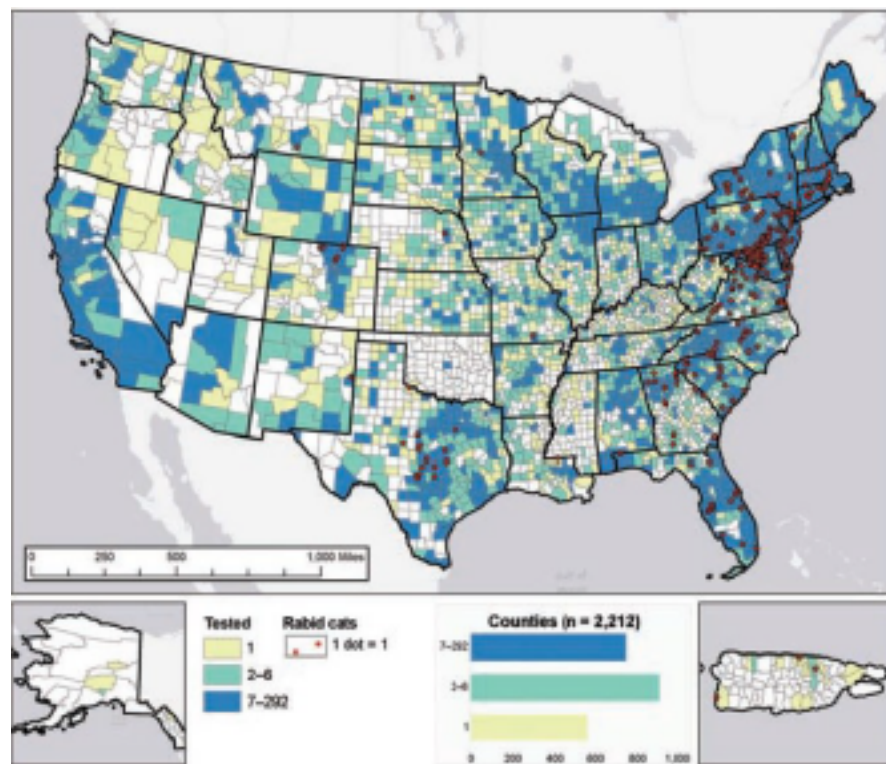
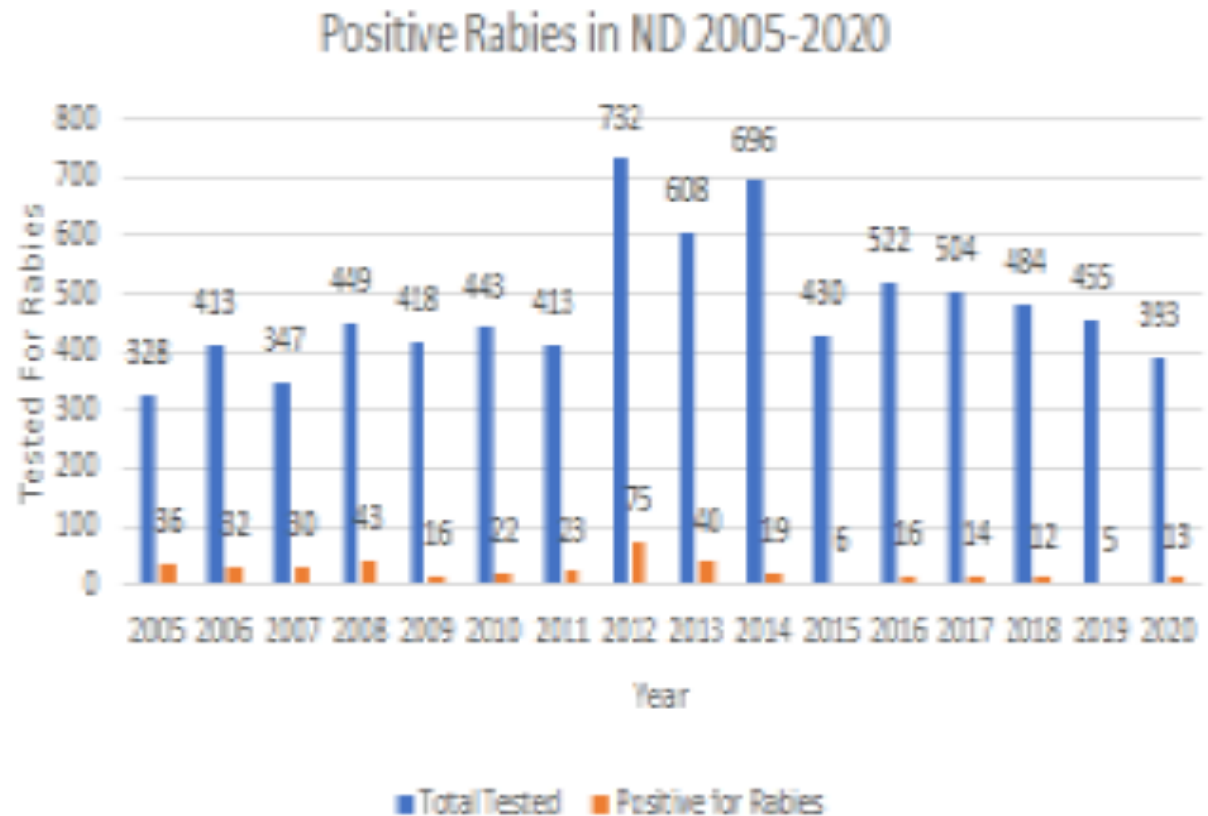


Figure 8—Reported cases of rabies involving cats, by county, during 2018. Histogram represents number of counties in each category for total number of cats submitted for rabies testing. Point locations for rabid cats were randomly selected within each reporting jurisdiction.



Rabies in North Dakota

- Average of 477 animals tested per year
 - 732 animals tested in 2012
- Average of 25 positive rabies animals per year
 - 5% positive

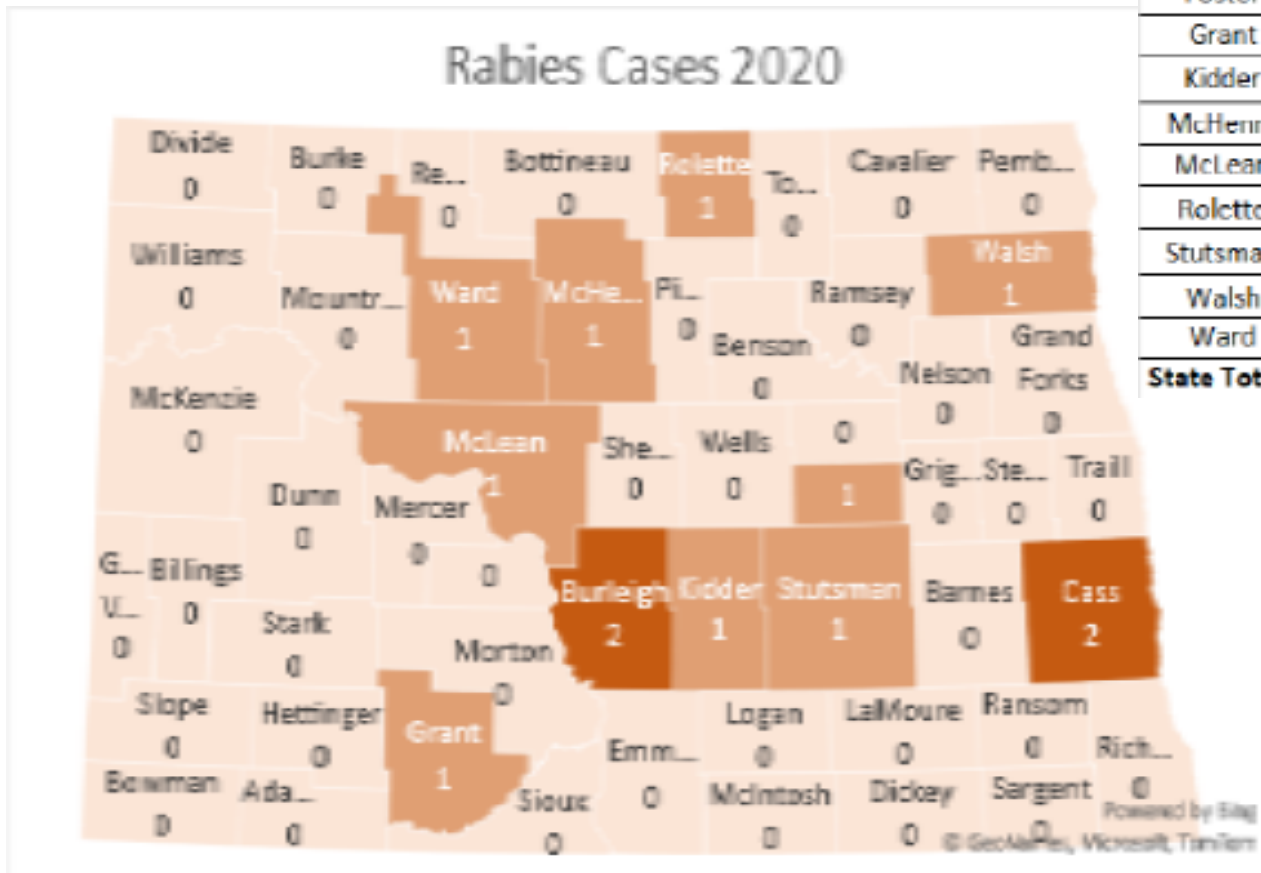




Rabies in North Dakota

- Positive Animals Rabies Cases by County, North Dakota, 2020

Rabies Positive Animals in ND			
County	Bat	Cow	Skunk
Burleigh			2
Cass	1		1
Foster			1
Grant	1		
Kidder			1
McHenry			1
McLean	1		
Rolette			1
Stutsman			1
Walsh		1	
Ward		1	
State Totals	3	2	8





Human Rabies Around the World

- Rabies is a global health issue
- Human cases are underreported
 - Most rabies cases occur in countries with inadequate diagnostic facilities and surveillance systems for rabies
- Exposure to rabid dogs is the cause of over 90% of human exposures and over 99% of human rabies deaths¹
- Limited access to healthcare and resources



1- <http://www.cdc.gov/rabies/location/world/index.html>

US soldier dies of rabies after dog bite in Afghanistan

Published May 03, 2012 NewsCore

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Comments (1)

WASHINGTON – A 24-year-old American soldier died of rabies after being bitten by a dog last year in Afghanistan, US health officials said Thursday following an investigation into the rare case.

The otherwise healthy soldier started experiencing symptoms of shoulder and neck pain and tingling sensations in his hands soon after arriving at Fort Drum, in mid-August 2011.

An Idaho man died of rabies. It was the first death of its kind since 1978.

BY: AUDREY DUTTON - NOVEMBER 17, 2021 7:30 AM



condition escalated to include nausea, vomiting, anxiety and trouble swallowing. By the time he was admitted to an emergency room, he was irate and hydrophobic, meaning he developed an intense fear of drinking liquids because of the painful muscle spasms he experienced while swallowing.



In the U.S., rabies is mostly found in wild animals including bats, foxes, raccoons and skunks. (Courtesy of the Centers for Disease Control and Prevention)

A man from Boise County died last week from a rabies infection, according to state and local health officials. It is the first such death in Idaho since 1978.



Rabies in the U.S.

- Human cases – 1 to 3 each year
 - 25 human cases 2009-2018¹
 - Variant Type
 - Bat(13), Dog(8), Raccoon(3), unknown (1)
 - Exposure Type
 - Bite (8), Contact (8), Transplant (1), unknown (8)
- Estimated 30,000 to 60,000 human exposures¹
 - Most from domestic animal exposure
- Cases of human and animal rabies are mandatory reportable conditions to the NDDoH
 - Website - www.ndhealth.gov/disease/Rabies/

1- http://www.cdc.gov/rabies/location/usa/surveillance/human_rabies.html



Cost of PEP

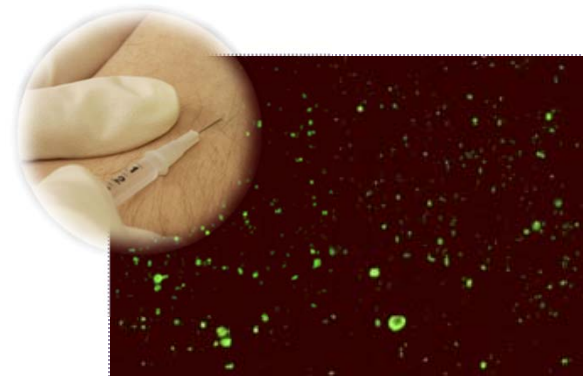
- Cost to fully vaccinate is variable, average of \$2,500¹ to \$5,000
 - Approx. \$506,250 in vaccination costs
 - Est. \$364,000 potentially avoided costs by vaccinating pets, quarantine, etc.



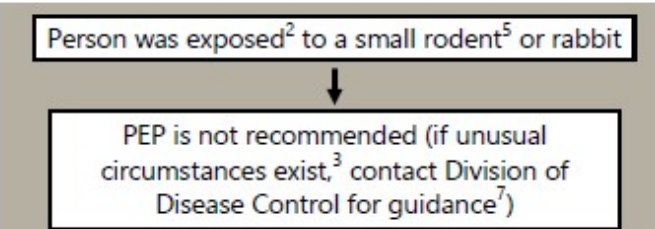
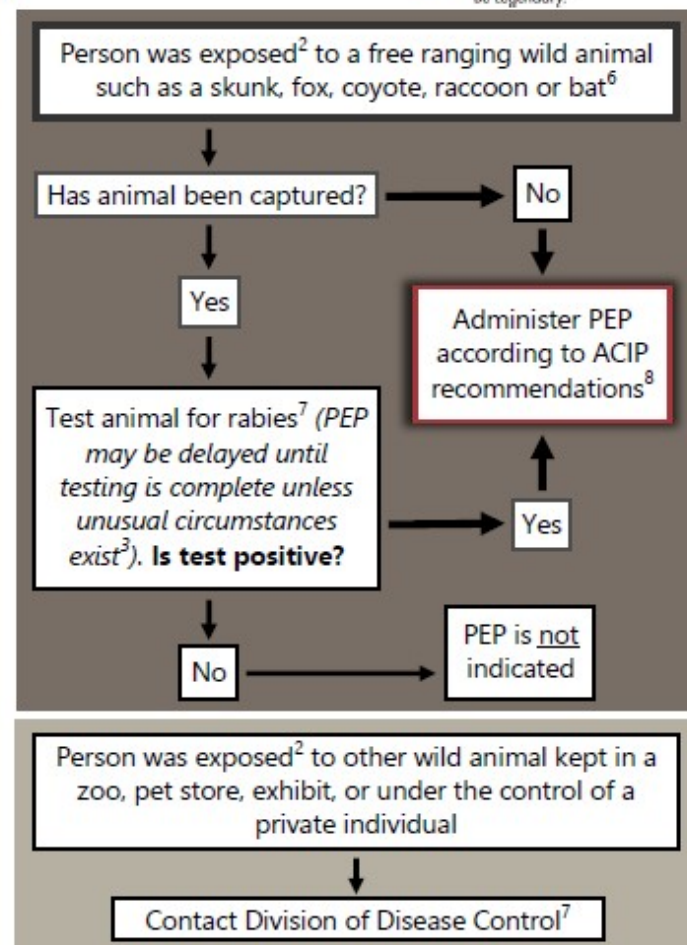
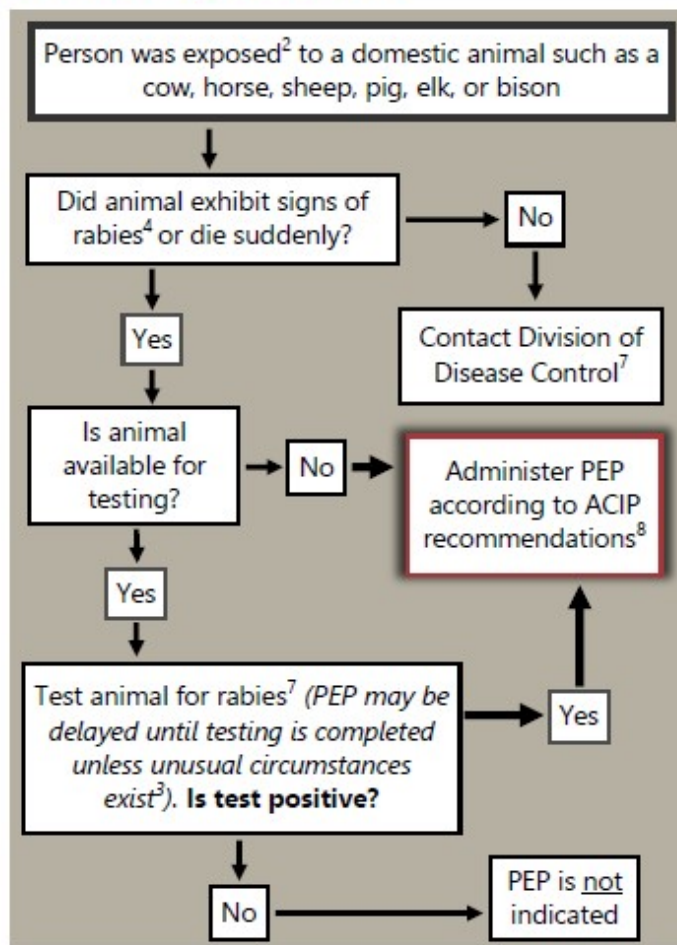
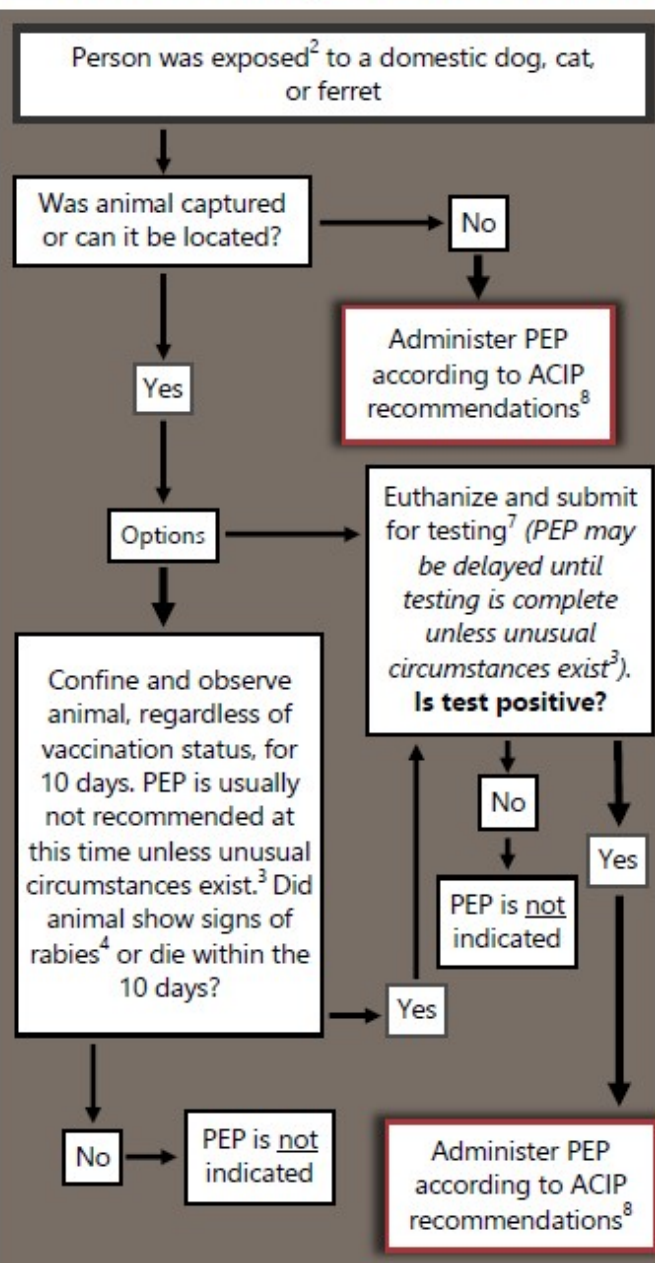


Rabies Exposure

- Definition of rabies exposure
 - Introduction of virus-laden saliva into the body through a bite or contact of the virus-laden saliva or neural tissue with an open wound or the mucous membranes.
 - *Blood, urine, feces is not infectious*
- All animal bites or other possible exposures should be assessed by a healthcare provider!



Rabies Exposure Assessment¹ Algorithm



1. Risk assessment should include the type of exposure, the species of animal involved, and circumstances of the exposure incident (e.g., appearance and behavior of animal, provoked or unprovoked attack, etc.).
2. Two types of exposures exist. A bite exposure is any penetration of the skin by teeth. A nonbite exposure is contamination of open wounds, abrasions (including scratches) or mucous membranes (e.g., mouth, nose, eyes) with saliva or other potentially infectious material (e.g., cerebrospinal fluid, spinal cord, brain tissue). Direct contact with a bat is also an exposure (see 6). If no exposure occurred, PEP is not necessary.
3. If the animal exhibited any sign(s) of rabies (see 4), the attack was vicious or unprovoked, or the bite(s) occurred in the head or neck region, consider starting PEP immediately.
4. Signs of rabies may include any of the following: excitability, vicious attacks, biting, agitation, restlessness, aggression, lack of fear, excessive salivation, aversion to water, inability to swallow or drink, muscular dysfunction, coordination or gait irregularities, paralysis, convulsions, avoidance of contact with humans or other animals, lethargy, and loss of appetite.
5. Small rodents include squirrels, hamsters, mice, rats, gerbils, chipmunks, gophers, moles, and voles.
6. Any potential exposure to a bat requires a thorough evaluation. See reverse for additional information.
7. See reverse for contact information for rabies exposure consultation and rabies testing laboratories in ND.
8. See reverse for ACIP recommendations for rabies PEP.

Bat Exposures

Any direct contact between a human and a bat should be evaluated for an exposure. If the person is reasonably certain a bite, scratch, or mucous membrane exposure did not occur, PEP is not necessary. If the bat is available for testing and the test is negative, PEP is not necessary. The following situations may qualify as exposures requiring consideration of PEP:

- Finding a bat with a person who may be unaware that direct contact had occurred (ex. An adult witnesses a bat in the room with a previously unattended child, mentally disabled person, or intoxicated person)
- A deeply sleeping person awakens to find a bat in the room

Please contact the Division of Disease Control for consultation regarding potential exposure to bats.

ND Contact Information

Rabies Exposure Consultation in ND

NDDoH Division of Disease Control

800-472-2180 or 701-328-2378

After hours contact 701-220-0819

Rabies Testing Laboratories in ND

NDDoH Division of Microbiology

701-328-6272

After hours contact 701-400-2772 or State Radio at 800-472-2121

NDSU Veterinary Diagnostic Laboratory

701-231-7527 or 701-231-8307

Animal Health and Wildlife Contacts in ND

North Dakota Department of Agriculture, State Veterinarian's Office

701-328-2655

North Dakota Game and Fish Department

701-328-6300

Post-exposure Prophylaxis (PEP) for Rabies

The Advisory Committee on Immunization Practices (ACIP) recommends that unless a person has previously completed the rabies vaccination regimen (either pre- or post-exposure) or is immunosuppressed, PEP should always consist of human rabies immune globulin (HRIG or RIG) and four vaccine doses. RIG and the first dose of the 4-dose vaccine should be administered as soon as possible after exposure (day 0). Additional doses of vaccine should be administered on days 3, 7, and 14. Previously vaccinated persons should receive 2 vaccine doses, the first dose as soon as possible after the exposure (day 0) and the second dose 3 days later (day 3). Persons with immunosuppression should receive RIG and five vaccine doses. RIG and the first dose of the 5-dose vaccine should be administered as soon as possible after exposure (day 0). Additional doses of vaccine should be administered on days 3, 7, 14, and 28.

Every attempt should be made to adhere to the ACIP's recommended vaccination schedules. For most minor deviations from the schedule (i.e., delays of a few days for individual doses), vaccination can be resumed as though the patient was on schedule. If substantial deviations from the schedule occur, reinitiation of the entire series may be required. Contact the Division of Disease Control for guidance on deviations from the vaccine schedule.

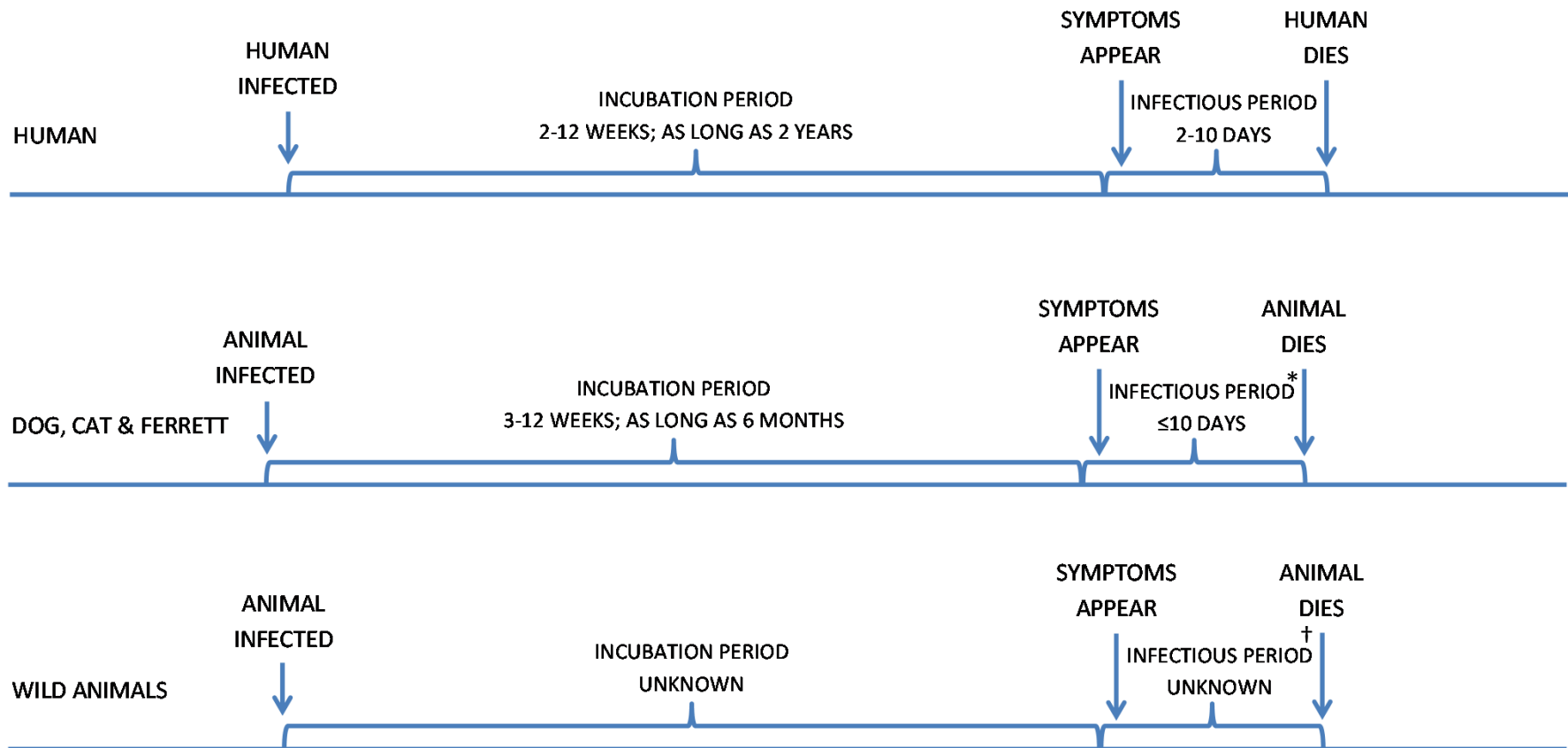
For additional information on rabies PEP and vaccine availability in North Dakota, please visit www.ndhealth.gov/disease/Rabies/Vaccine.

References

1. Human Rabies Prevention – United States, 2008: Recommendations of the Advisory Committee on Immunization Practices (ACIP). CDC MMWR 2008; 57 (No. RR-3).
2. Use of a Reduced (4-Dose) Vaccine Schedule for Postexposure Prophylaxis to Prevent Human Rabies: Recommendations of the Advisory Committee on Immunization Practices (ACIP). CDC MMWR 2010; 59 (No. RR-2).
3. Compendium of Animal Rabies Prevention and Control, 2016: National Association of State Public Health Veterinarians, Inc. Journal of the American Veterinary Association. Vol.248, No.5, March 1, 2016.



Rabies Exposure Timeline

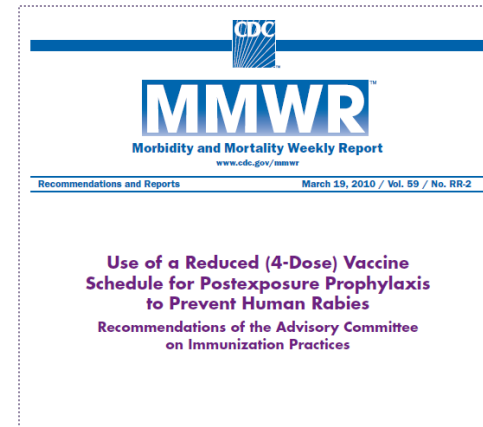


* May be infectious for a number of days before clinical signs appear. When investigating human exposures, it is recommended to consider the 10 days prior to onset of clinical signs (or date of death if no signs of illness) as part of the animal's infectious period.

† It is unknown as to how long a wild animal can shed rabies virus in its saliva before clinical signs of illness appear. Any exposure to a wild animal that cannot be tested, even if apparently healthy, should be treated as if the animal is rabid.

Treatment of Wounds & Vaccination

- Not-previously vaccinated
 - Wound cleansing
 - Soap & Water, wound irrigation.
 - Rabies immune globulin (RIG)
 - 20 IU/kg body weight
 - If possible, full dose should be infiltrated around the wound site.
 - Remainder in anatomical site distant from vaccination site.
 - Vaccine *
 - 1 mL, IM (deltoid area, or outer thigh for small children).
 - 4-doses: Days 0, 3, 7 & 14.
 - Immunosuppression: 5 doses on days 0, 3, 7, 14 and 28





Treatment of Wounds & Vaccination

- Previously vaccinated
 - Wound cleansing
 - Soap & Water, wound irrigation.
 - Rabies immune globulin (RIG)
 - Should NOT be administered!
 - Vaccine
 - 1 mL, IM (deltoid area, or outer thigh for small children).
 - 2-doses: Days 0 & 3.



Rabies Vaccination

- Pre-exposure vaccination
 - 2-doses of 1 mL, IM (deltoid area, or outer thigh for small children).
 - Days 0,7
 - NO RIG
- Booster doses
 - 1-1mL, IM booster dose if does not have evidence of virus neutralizing antibodies in serum at 1:5 serum dilution by the RFFIT (rapid fluorescent focus inhibition test).



Rabies Serologic Testing

- Rapid Fluorescent Focus Inhibition Test (RFFIT)
 - Recommended for persons with continuous exposure every 6 months.
 - Rabies research laboratory workers, rabies biologics workers.
 - Recommended for persons with frequent exposure every 2 years.
 - Rabies diagnostic lab workers, cavers, veterinarians & staff, animal control & wildlife workers in areas where rabies is enzootic. All persons who frequently handle bats.
 - Vet students, people who work with animals in places where rabies is rare and travelers who receive pre-exposure vaccination do NOT need routine serology



One-Health Concept

- Coordinated and integrated approach to public and animal health with relationships across multiple sectors and disciplines
 - Partnerships between human and veterinary medicine





Beth W. Carlson, DVM
Deputy State Veterinarian

RABIES IN DOMESTIC ANIMALS



Rabies in Domestic Animals

- Before 1960, 90% of animal rabies cases were in domestic animals
- Since 1975, <20% of animal rabies cases have been in domestic animals
- Worldwide, dogs cause 90% of human exposures and 99% of human rabies deaths
- Canine rabies variant eliminated from US ~2004
- Any variant can cause disease in any mammal



Rabies in North Dakota

- Cattle, horses, cats and dogs most frequently affected domestic animals
- Sheep, goats, ferrets, swine, bison, elk have been reported
- Ownership of skunks and raccoons is expressly prohibited by law except for by licensed zoos.
- Skunks and raccoons held in violation are confiscated, euthanized, and tested for rabies.

Rabies in North Dakota: Historical Case Perspective

- 1950s 481 cases
- 1960s 826 cases
- 1970s 1471 cases
- 1980s 1386 cases
- 1990s 958 cases
- 2000s 425 cases
- 2010s 245 cases

--- DURING DEPLOYMENT ---

**Cute,
aren't they?**

**BUT THEY COULD BE
DEADLY!**

ABOUT RABIES

HOW CAN YOU TELL? You cannot always tell if an animal has RABIES. Not all animals with rabies look sick or act strange.	BE SAFE! Do not approach, feed or handle wild or stray animals. Do not keep pets or mascots when deployed.
--	---

If you are **BITEN** or if an **ANIMAL'S SALIVA** contacts your broken skin, eyes or mouth, immediately wash the area with soap and water and seek medical attention.

Scan for more information on rabies
<http://phc.amedd.army.mil/rabies>

CP-101-0911

AUSAPHC
U.S. ARMY PUBLIC HEALTH COMMAND



Compendium of Animal Rabies Prevention and Control, 2011

- Issued by the National Association of State Public Health Veterinarians (NASPHV)
- Reviewed and revised as necessary
- Includes recommendations for vaccination and management

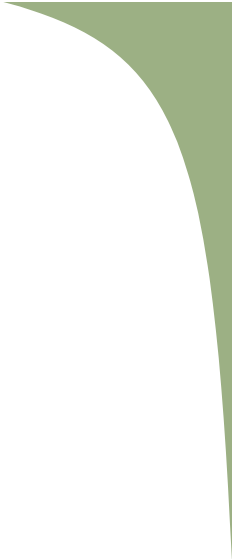
- Can be found at:

<http://www.nasphv.org/Documents/RabiesCompendium.pdf>



Prevention

- Multiple vaccines available
- Duration of immunity ranges from 1-4 years
- Varying vaccine types, administration routes, minimum ages, etc.





Vaccination

- Vaccination is inexpensive and highly effective
- Rabies is very rare in vaccinated animals
- Vaccines available for dogs, cats, ferrets, cattle, horses, and sheep
- Generally given after 3 months of age, 1 year later, and then triennially for dogs, cats, and sheep
- Annual vaccination required for cattle, horses, and ferrets
- Vaccine only available from a licensed veterinarian



Vaccination

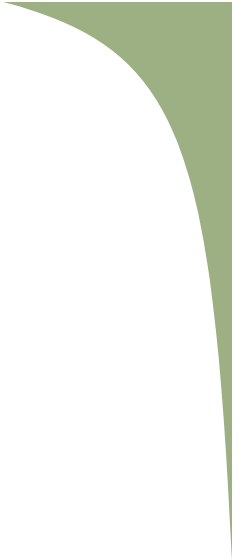
- Veterinary records critical
- **Just because an animal had a vaccination doesn't mean it is currently vaccinated!**





Pre-Exposure Vaccination

- Parenteral animal rabies should be administered by or under the direct supervision of a licensed veterinarian
- The veterinarian signing the certificate must ensure that the person administering vaccine is identified on the vaccination certificate and is appropriately trained.





Pre-Exposure Vaccination

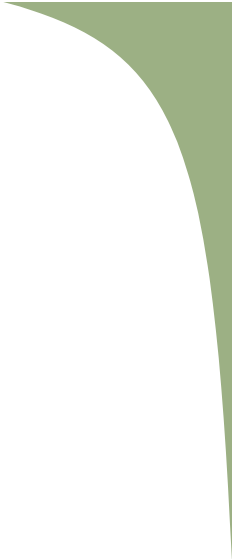
- Peak titers are reached within 28 days
- Animals not considered immunized until 28 days AFTER initial vaccination
- All animals should be boosted one year after initial vaccination
- According to NASPHV, no lab or epi data exist to support annual or biennial administration of 3- or 4-year vaccines after the initial series
- Booster schedule should be based on the vaccine label *





Factors to Consider in Establishing a Vaccination Schedule

- Exposure Risk
 - Indoor vs. Outdoor pets
 - Likelihood of unknown exposure
 - Farm Animals (including dogs and cats)
 - Hunting Dogs
 - Lake/River Dogs





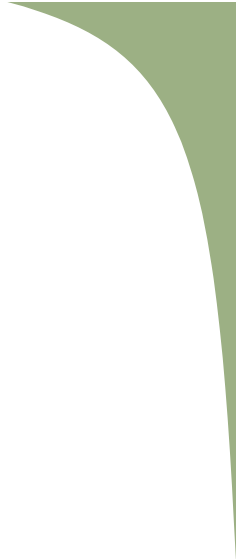
Pre-Exposure Vaccination

- Previously vaccinated animals overdue for booster should be revaccinated.
- Animals are considered currently vaccinated immediately after booster, regardless of whether or not the booster was overdue.



Pre-Exposure Vaccination: Livestock

- All horses should be vaccinated against rabies
- Other livestock that have frequent contact with humans should also be vaccinated
 - Petting zoos
 - Show animals
- Consider vaccinating especially valuable livestock
 - Breeding bulls, etc.





Pre-Exposure Vaccination: Captive Wild Animals and Hybrids

- NASPHV recommends that wild animals and hybrids should not be kept as pets
- No parenteral rabies vaccines are licensed for use in wild animals or hybrids
- Exotic pets may benefit from vaccination, but will not be considered vaccinated.





Interstate Animal Movements

- Animals in transit should be accompanied by a current rabies vaccination certificate, or a health certificate that includes all the information from the vaccination certificate.
- Additional requirements may exist for states of destination



RABIES VACCINATION CERTIFICATE

NASPHV FORM 51 (revised 2007)

Owner's Name & Address Print Clearly			RABIES TAG #	
			MICROCHIP #	
LAST	FIRST	M.I.	TELEPHONE #	
NO.	STREET	CITY	STATE	ZIP
SPECIES Dog <input type="checkbox"/> Cat <input type="checkbox"/> Ferret <input type="checkbox"/> Other: <input type="checkbox"/> _____ (specify)	AGE _____ Months <input type="checkbox"/> _____ Years <input type="checkbox"/> SEX <input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Neutered	SIZE Under 20 lbs. <input type="checkbox"/> 20 - 50 lbs. <input type="checkbox"/> Over 50 lbs. <input type="checkbox"/>	PREDOMINANT BREED _____ ANIMAL NAME _____ _____	PREDOMINANT COLORS/MARKINGS _____ _____ _____
Animal Control License		<input type="checkbox"/> 1 Yr <input type="checkbox"/> 3 Yr <input type="checkbox"/> Other _____		
DATE VACCINATED _____ Month / Day / Year	Product Name: _____ Manufacturer: <input type="text"/> <input type="text"/> <input type="text"/> (First 3 letters)		Veterinarian's Name: _____ License Number: _____	
NEXT VACCINATION DUE BY: _____ Month / Day / Year	<input type="checkbox"/> 1 Yr USDA Licensed Vaccine <input type="checkbox"/> 3 Yr USDA Licensed Vaccine <input type="checkbox"/> 4 Yr USDA Licensed Vaccine <input type="checkbox"/> Initial dose <input type="checkbox"/> Booster dose Vaccine Serial (lot) Number _____		Veterinarian's Signature Address: _____ _____ _____	



Post-Exposure Management

Animals exposed to confirmed or suspected rabid animal

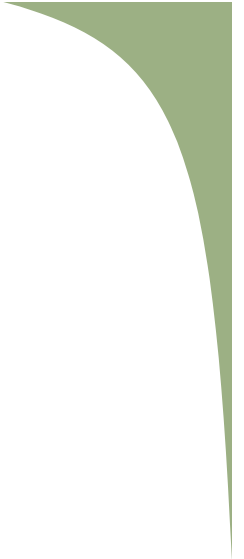
- Unvaccinated dogs, cats and ferrets should be euthanized immediately
- If owner is unwilling, animal should be placed in strict isolation for 6 months
- Animals overdue for a booster should be evaluated on a case-by-case basis
- Currently vaccinated dogs, cats and ferrets should be revaccinated immediately and observed by the owner for 45 days.



Post-Exposure Management

Animals exposed to confirmed or suspected rabid animal

- Unvaccinated livestock should be euthanized immediately.
- If not euthanized, animal must be confined and observed for 6 months.
- Currently vaccinated livestock should be revaccinated immediately and observed for 45 days.
- Herbivore-herbivore transmission is rare; not necessary to restrict the rest of the herd

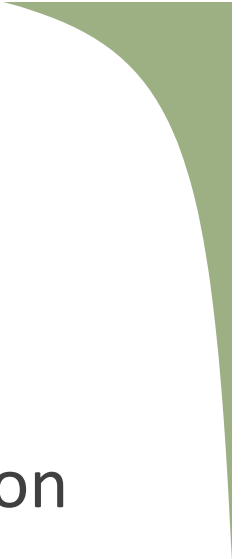




Post-Exposure Management

Animals exposed to confirmed or suspected rabid animal

- Handling and/or consumption of tissues from exposed animals may be risk for rabies transmission
- Custom slaughter may be done immediately after exposure, with all tissues being thoroughly cooked.
- Federal meat inspection guidelines indicate animals exposed within 8 months should be rejected.





Post-Exposure Management

Animals exposed to confirmed or suspected rabid animal

- Rabies virus is widely distributed in tissues of rabid animals.
- Tissues and products from rabid animals should not be used for human or animal consumption.
- Pasteurization and complete cooking will inactivate virus.





Management of Animals that Bite Humans

- Rabies virus is excreted in the saliva of infected dogs, cats and ferrets during illness and/or for only a few days before illness or death.
- Healthy dogs, cats or ferrets which bite humans should be confined and observed daily for 10 days from the time of the exposure.
- Any illness/abnormality should be investigated by a veterinarian immediately.
- If signs suggestive of rabies develop, animal should be euthanized and tested



Management of Animals that Bite Humans

- Stray or unwanted dogs, cats, and ferrets which expose a person may be euthanized immediately and tested.
- Other animals that may have exposed a person will be evaluated on a case-by-case basis.



Titers

- “Rabies virus antibody titers are indicative of a response to vaccine or infection. Titers do not directly correlate with protection because other immunologic factors also play a role in preventing rabies, and our abilities to measure and interpret those other factors are not well developed. Therefore, evidence of circulating rabies virus antibodies should not be used as a substitute for current vaccination in managing rabies exposures or determining the need for booster vaccinations in animals”



Samples Wanted!

- When rabies is suspected in a lactating animal, milk and mammary tissue should be collected and stored.
- If rabies is diagnosed, the milk and mammary tissues should be shipped on dry ice to:

Dr. Charles Rupprecht

DASH, Bldg. 18, Room SSB218

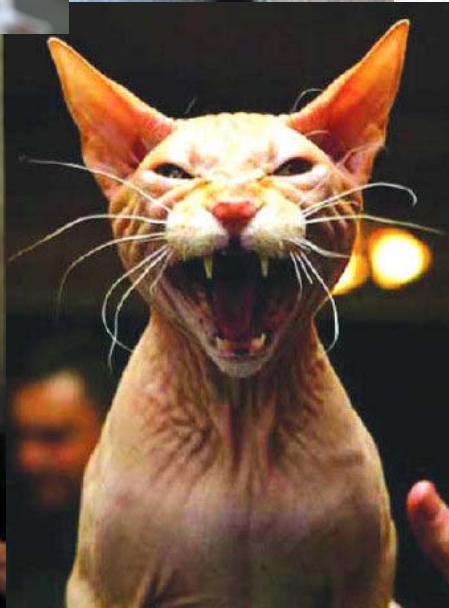
Centers for Disease Control and Prevention

1600 Clifton Road, NE

Atlanta, GA 30333

406-639-1050

Clinical Signs





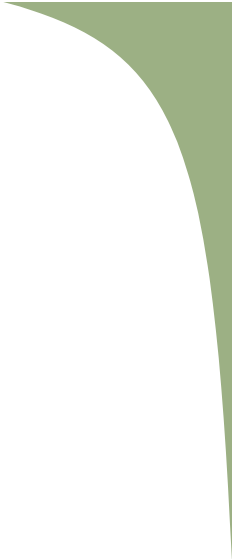
Rabies in an Animal Shelter

- 3/31/10 – North Dakota Department of Health notified by local public health department of a dog testing positive for rabies at the state vet diagnostic lab
- Dog resided in a ND animal shelter prior to being placed with a foster family
- Investigation launched with State Veterinarian's office to identify contacts and prevent transmission to both animals and humans



Public Health Investigation

- Establish timeline of events
- Identify human contacts through the use of employee records, volunteer logs, and a news release to the general public
- Identify animal contacts by obtaining a description of animal handling practices at the shelter and utilizing adoption and claimed pet records





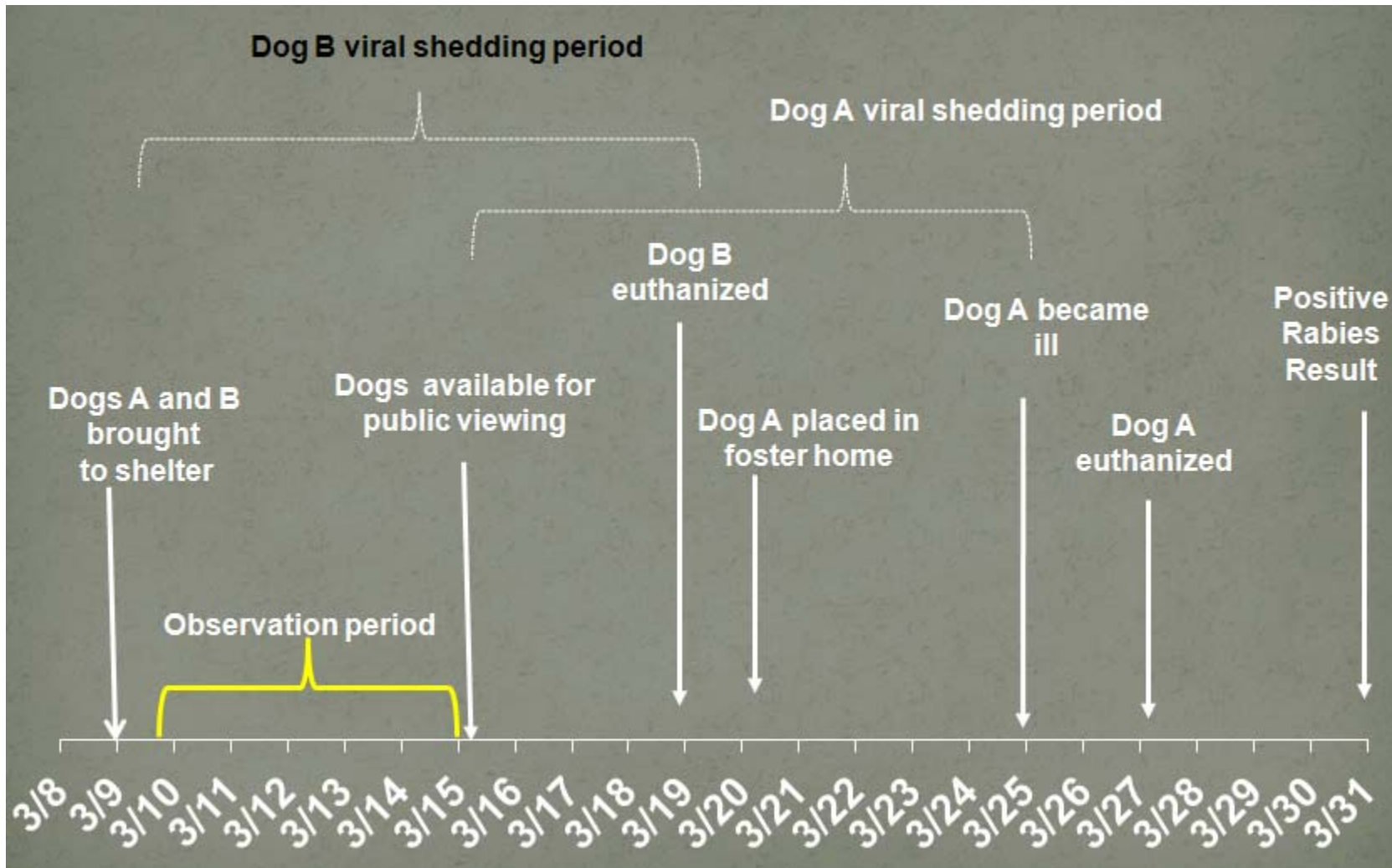
Description of Dogs A and B

- Brought in together from neighboring Minnesota county
- Both blue heeler mix
- Dog A – 8-12 months old, 32 pounds, seemed fearful and dependent on Dog B
- Dog B – 72 pounds, dominant and aggressive
- Likely had shared exposure





Timeline of Events





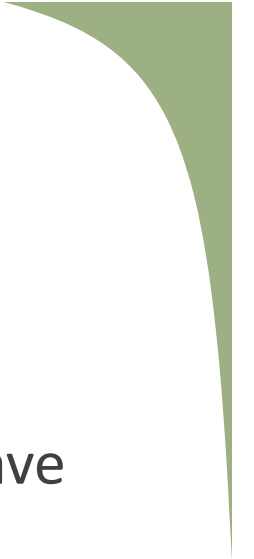
Human Contact Investigation

- 32 employees and volunteers with potential exposure from 3/9-3/20
 - 10 (9 employees, 1 volunteer) received post-exposure prophylaxis (PEP)
- 11 others received PEP
 - 5 members of Dog A foster family
 - 1 neighbor child to Dog A foster family
 - 3 members of family who found Dogs A and B in MN
 - 2 members of the general public



Types of Exposures

- No bites
- Majority of employees/volunteers were licked and may have had open cuts or sores on their hands
- Young children, autistic child





Animal Handling Practices





Animal Handling Practices

- Always taken out on leashes
- Could not guarantee that dogs did not interact even while on leashes





Animal Contact Investigation

- 25 dogs remaining in the shelter euthanized
 - All tested negative for rabies
- 39 adopted or claimed dogs assessed in ND and MN (33 ND, 5 MN, 1 MI)
 - 12 up to date on rabies vaccination (inc. 1 MN and 1 MI dog)
 - 11 euthanized*
 - 13 placed in 6 month isolation period (inc. 4 MN dogs)
 - 2 not exposed
 - 1 undecided (dog HBC prior to owner's decision)



Recommendations

- Consider pre-exposure rabies vaccination of animal shelter employees
- Enforce animal handling practices within the shelter
- Continue to encourage responsible pet ownership, including rabies vaccination
- Warn adoptees about unknown history of animals and the potential for rabies exposure
- Waivers
- Require foster family pet vaccination





Officials 'err on the side of caution'

More than 20 dogs likely will be euthanized this week, and about 15 people have been referred to their physician after a rabid dog was brought to Grand Forks' Circle of Friends Humane Society, officials said Monday.

By: [Ryan Johnson](#), Grand Forks Herald

- Grand Forks Herald Editorial:
 - “Agencies act decisively in response to rabid dog”
 - “The authorities did the right thing”





IF YOU WATCH OLD YELLER
BACKWARDS, ITS A FAMILY CLASSIC
ABOUT A ZOMBIE DOG WHO BECOMES
FRIENDS WITH A YOUNG BOY.





Resources

- Disease Control – 800.472.2180 or 701.328.2378
- CDC MMWR Human Rabies Prevention -- <http://www.cdc.gov/mmwr/PDF/rr/rr5703.pdf>
- CDC MMWR Reduced 4-Dose Schedule -- <http://www.cdc.gov/mmwr/pdf/rr/rr5902.pdf>
- CDC Rabies website -- <http://www.cdc.gov/rabies/>
- NDDoH Rabies website -- <http://www.ndhealth.gov/disease/Rabies/>
- NASPHV Compendium on Animal Rabies Prevention and Control-- <http://www.nasphv.org/Documents/RabiesCompendium.pdf>