

# **RABIES!**

## **Or the Fear of Water** What a Sanitarian Should Know

**Connecticut Environmental Health Assoc.  
Annual Meeting, April, 2019**

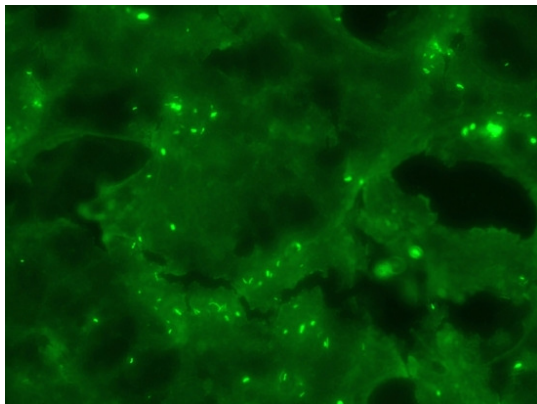
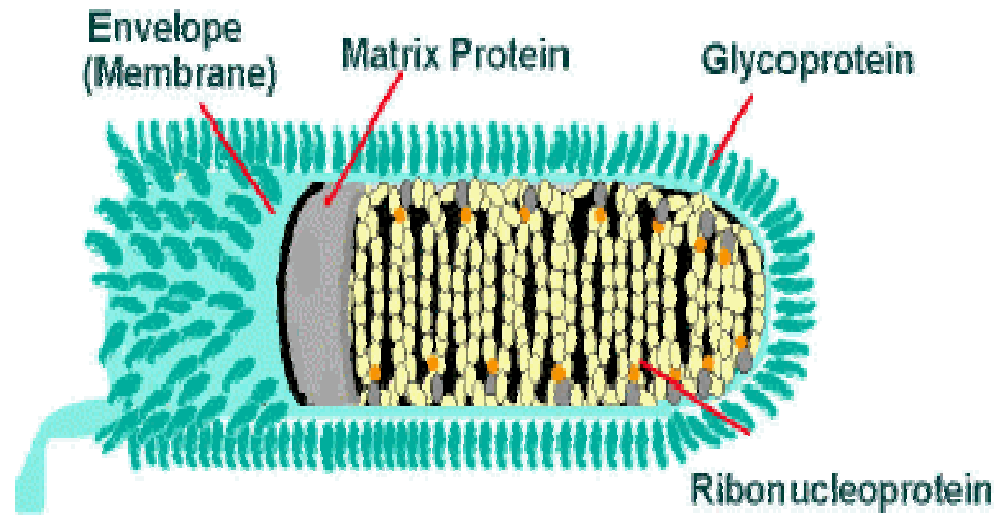
**Jocelyn Mullins, DVM, MPH, PhD**  
Connecticut Department of Public Health  
Epidemiology and Emerging Infections Program

**860-509-7994**

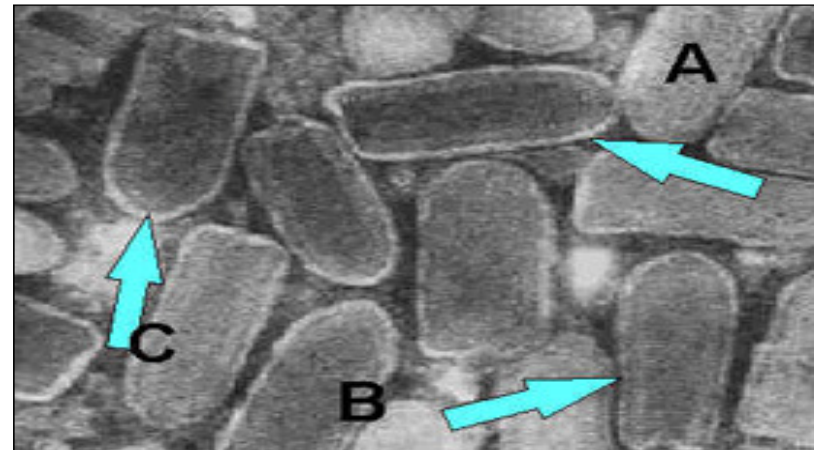
**[jocelyn.mullins@ct.gov](mailto:jocelyn.mullins@ct.gov)**



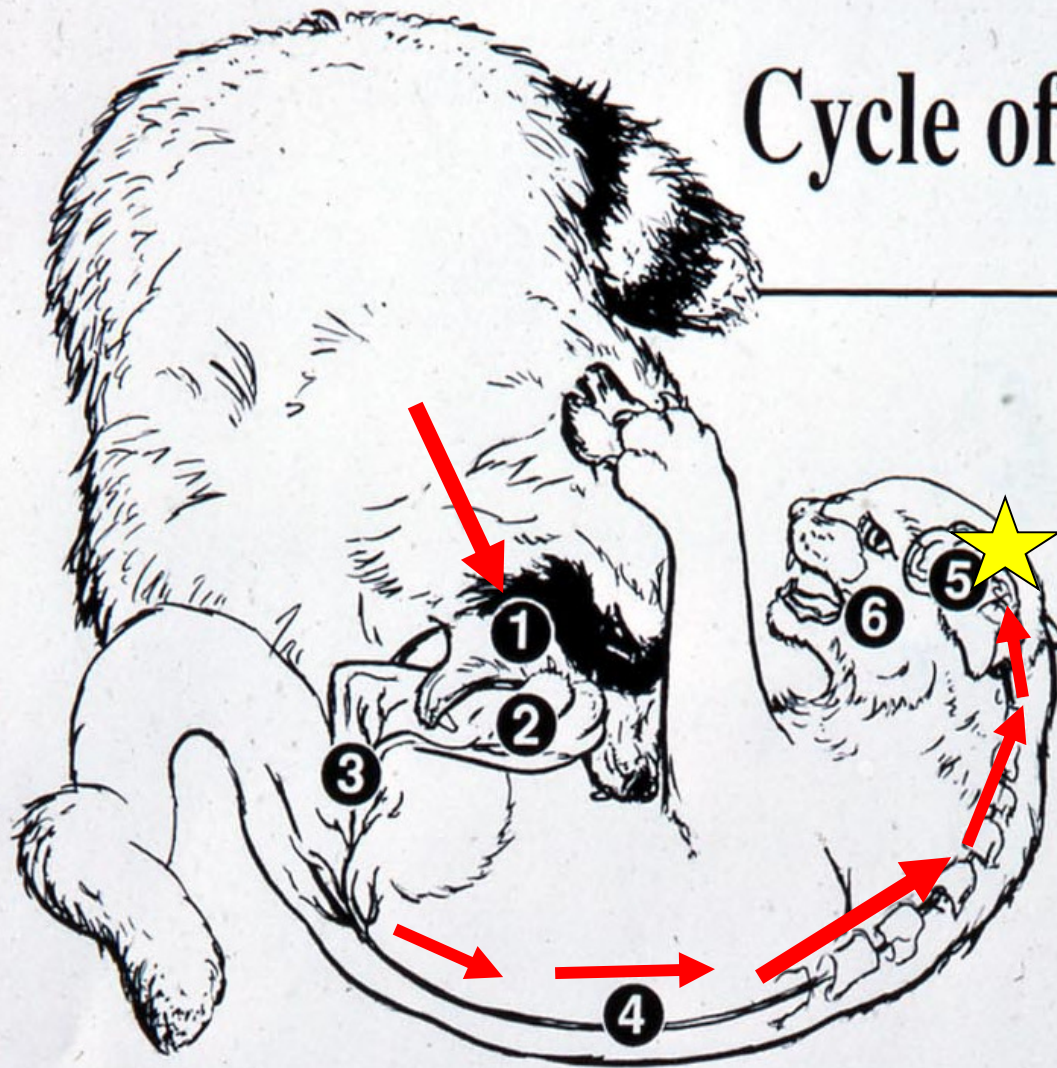
# Rabies Virus



Positive sample

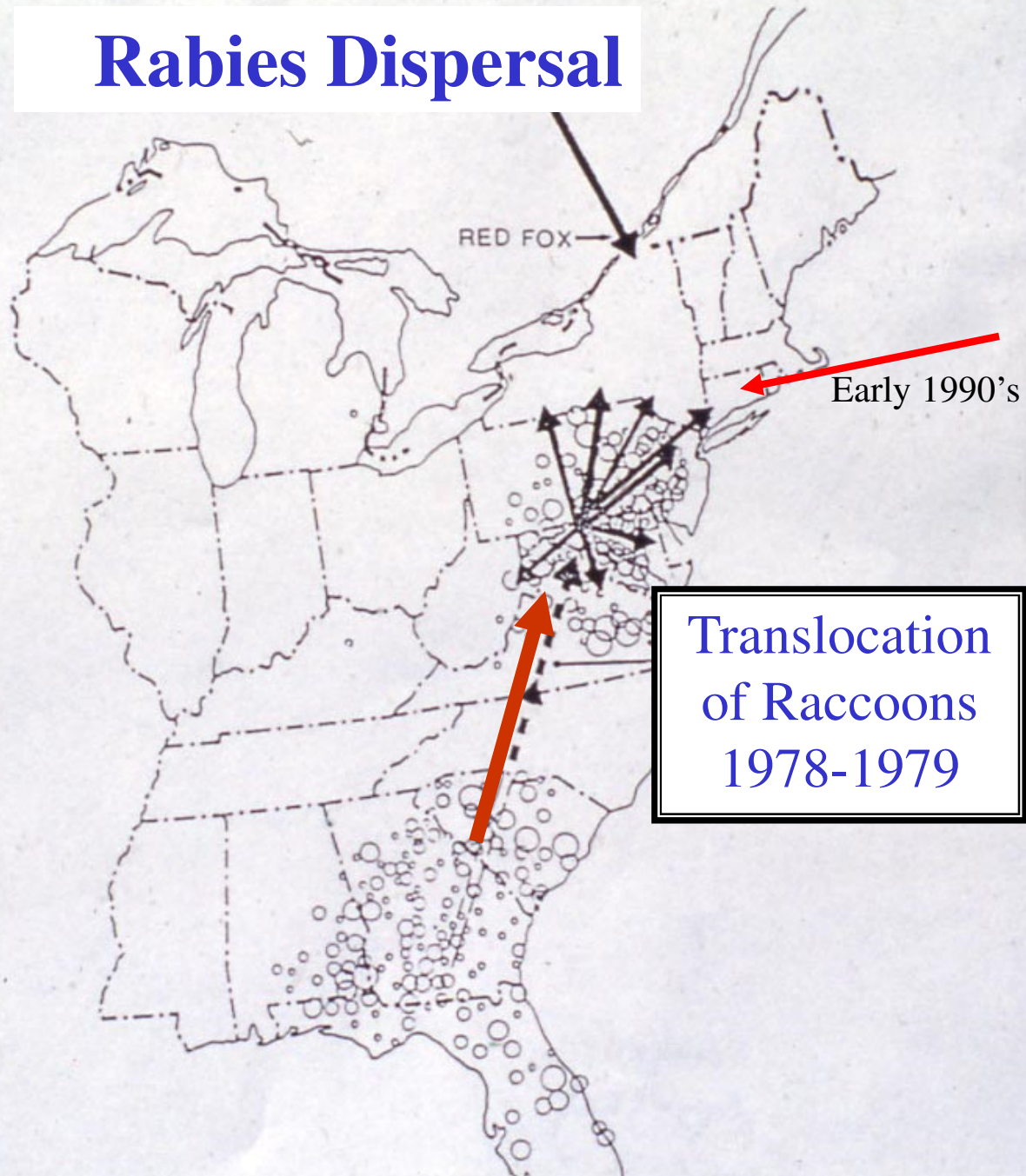


# Cycle of the Rabies Virus

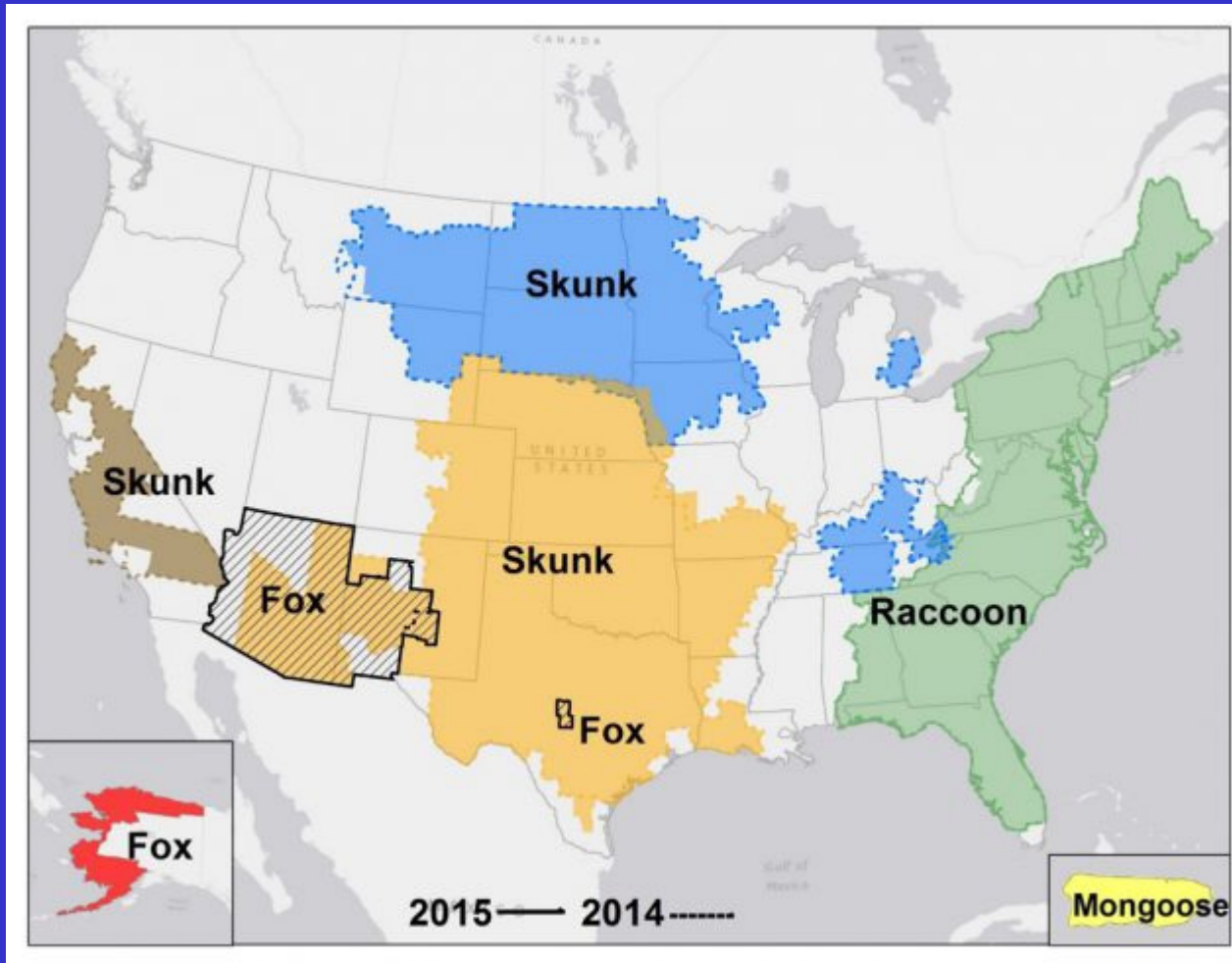


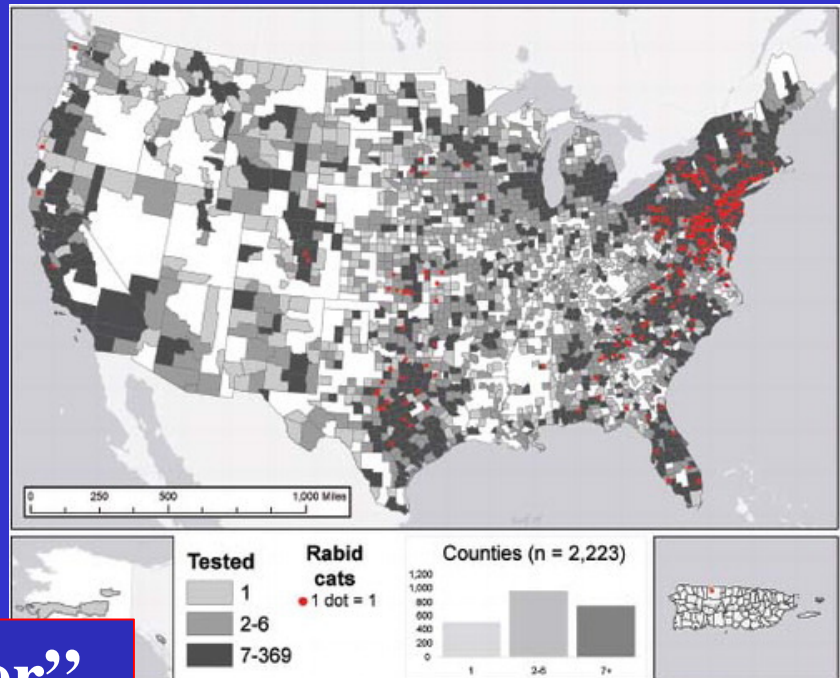
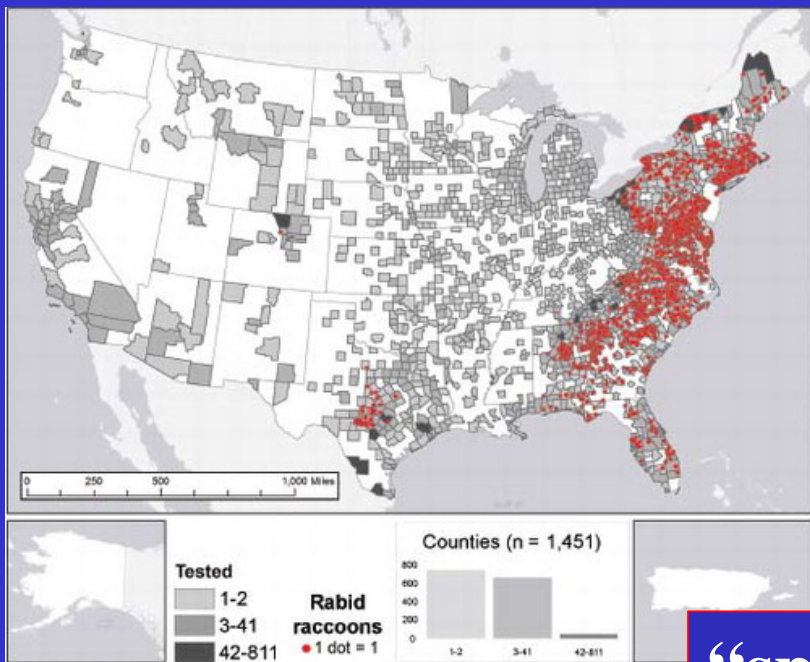
- 1 Exposure
- 2 Incubation
- 3 Virus Replication
- 4 C.N.S. Spread
- 5 Clinical Rabies
- 6 Virus Shedding

# Rabies Dispersal

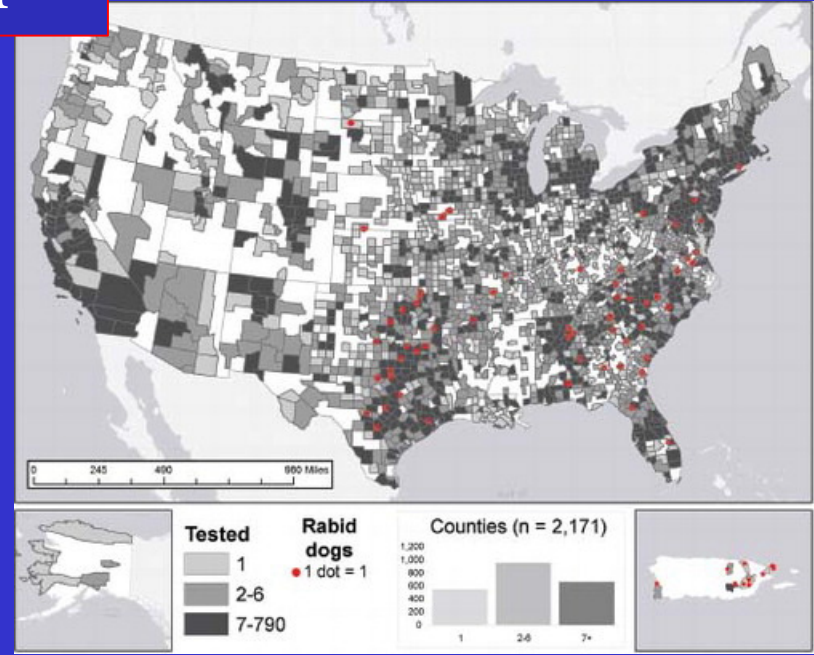
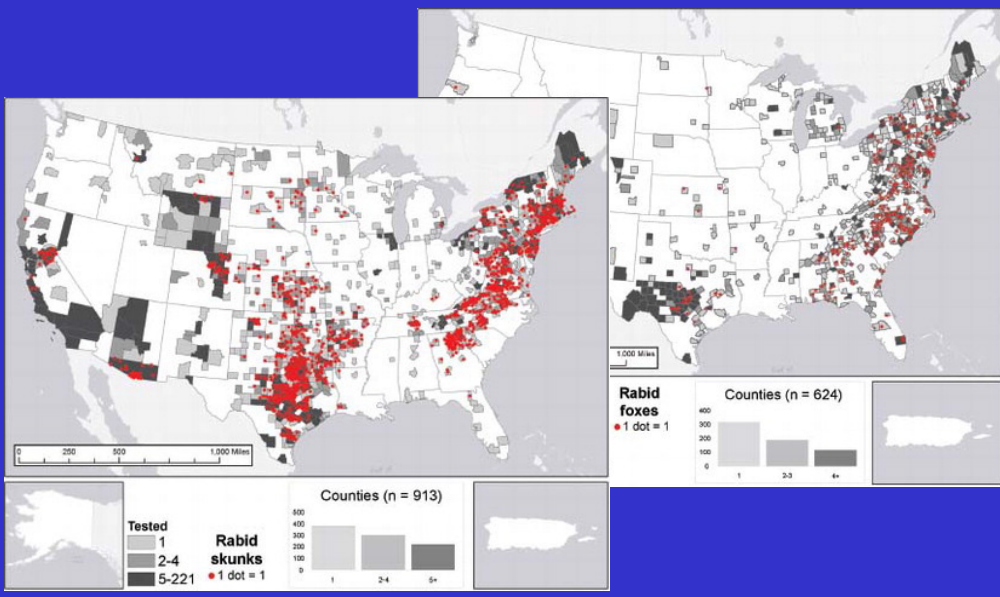


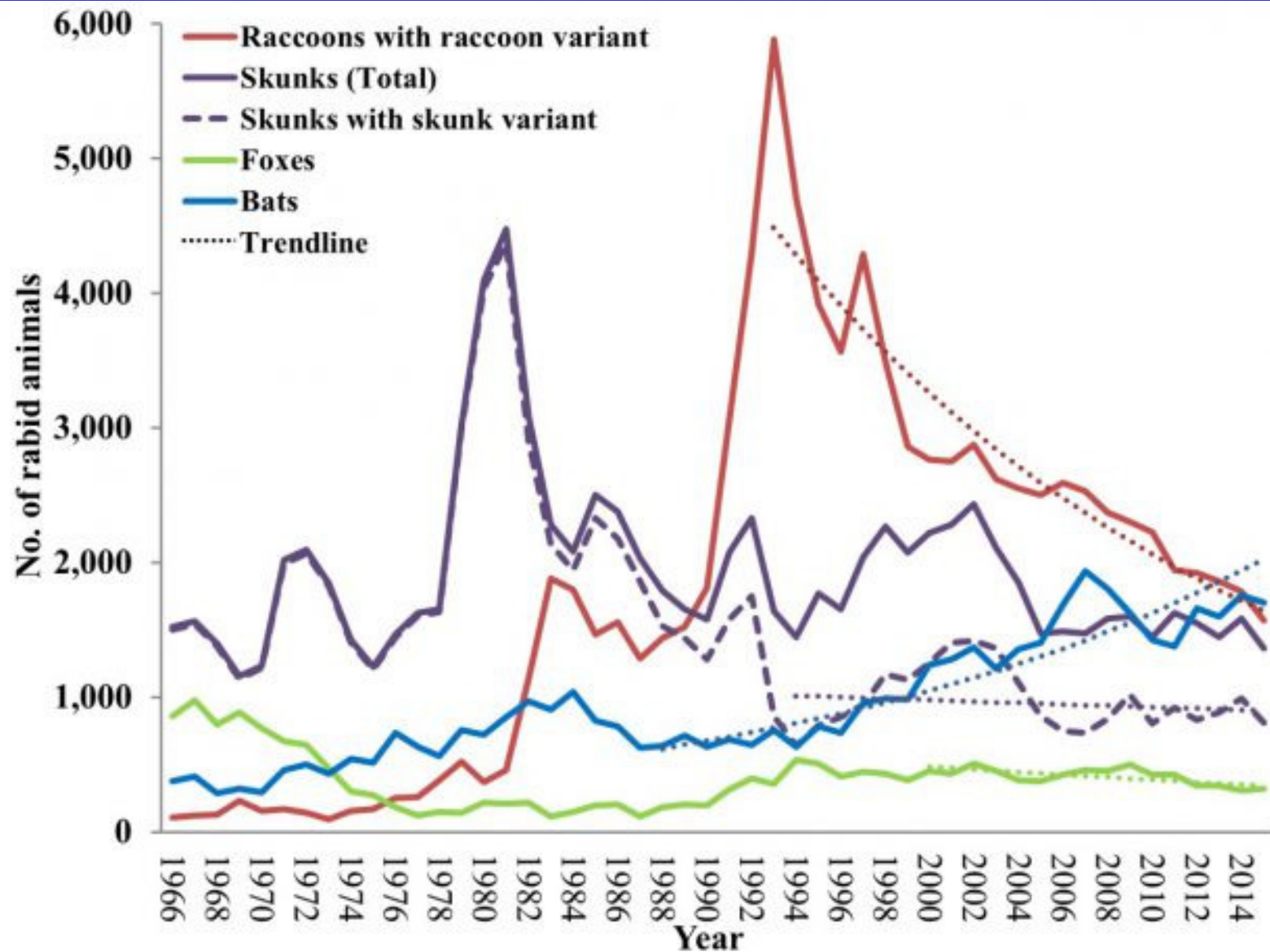
# Terrestrial Animal Reservoirs United States





“spill-over”



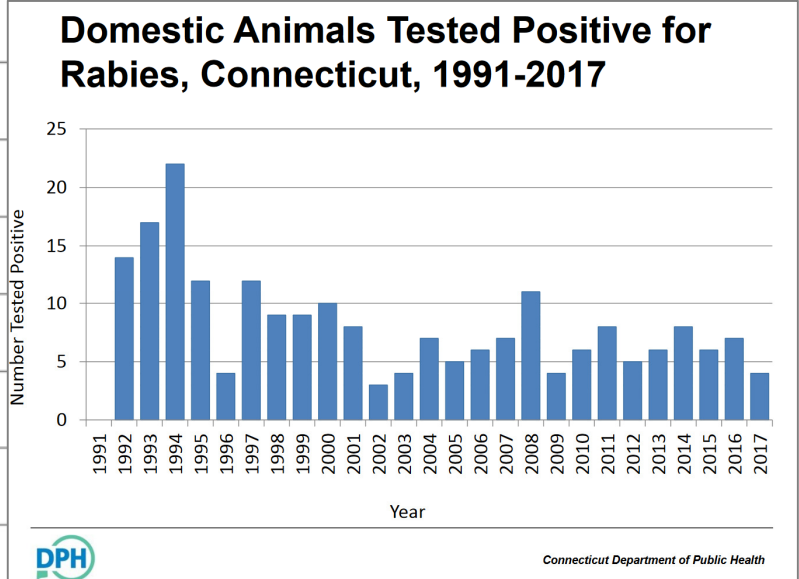
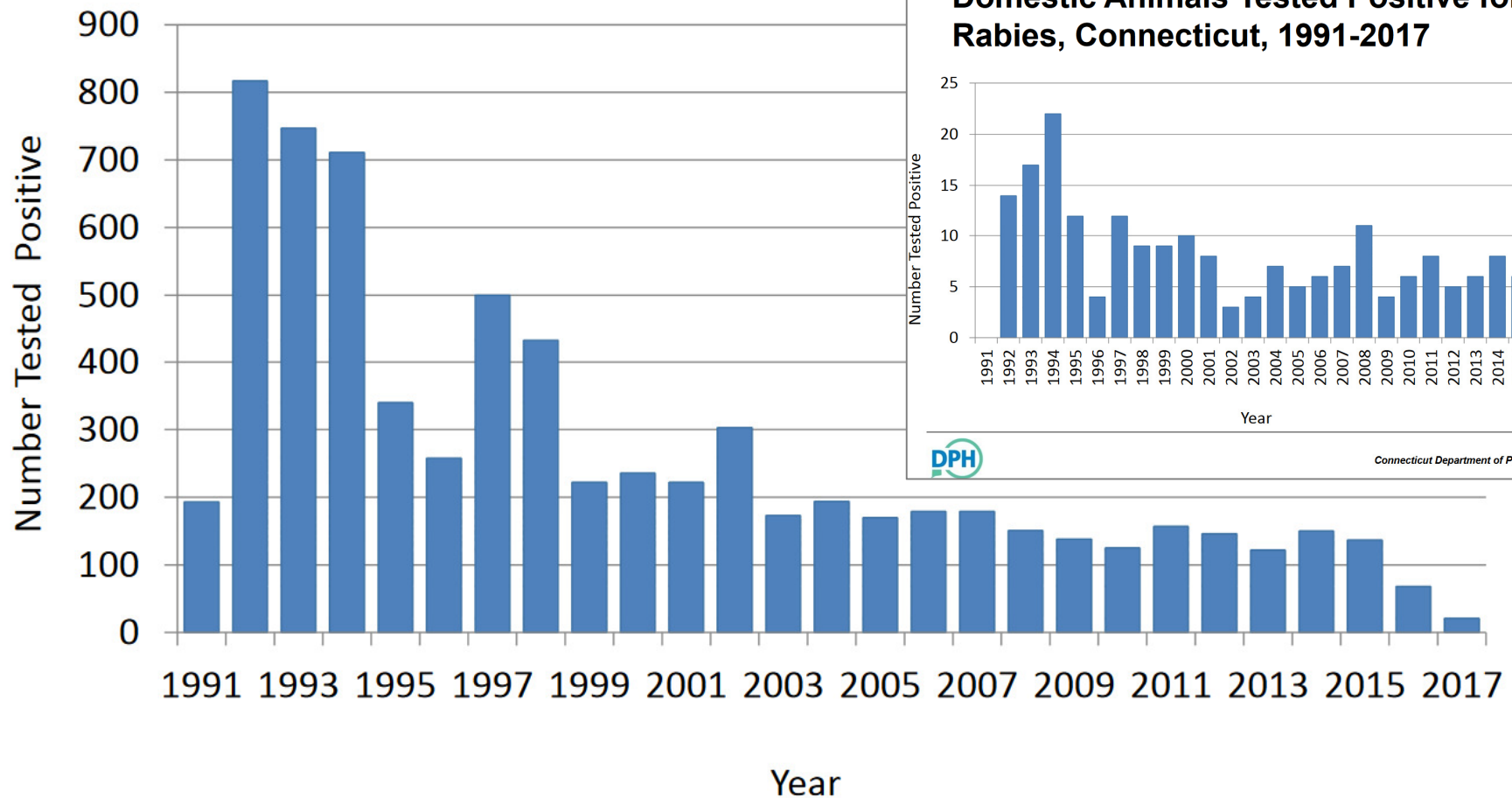


# Rabid Terrestrial Animals Connecticut, 1991-2018

Wild Animals			Domestic Animals		
<b>Raccoon</b>	5349	(75%)	<b>Cat</b>	157	(73%)
<b>Skunk</b>	1519	(21%)	<b>Cattle</b>	24	(11%)
<b>Fox</b>	121	(2%)	Dog	11	(5%)
Woodchuck	81		Horse	9	
Deer	6		Sheep	5	
Coyote	6		Goat	4	
Bobcat	5		Rabbit	2	
Otter	1		Donkey	1	
Opossum	1		Ferret	<u>1</u>	
<u>Beaver</u>	<u>1</u>			194	
	7092				



# Terrestrial Animals Tested Positive for Rabies, Connecticut, 1991-2017



# How about squirrels?

- Small mammals not considered a rabies threat

(Exception – rabbits/others kept outdoors in enclosures an animal can reach through)



# Rabies in Animals

- Incubation: 3 - 12 weeks
- Early: look sick, abnormal behavior, staggering (can be non-specific)
- Within 3-5 days: clear signs of rabies  
(biting/aggression, very abnormal behavior, salivation, seizure, unable to eat/drink/swallow)
- Death within 7 days



# Rabies in People

- Incubation: 3 - 8 weeks
- Prodrome: 2 - 10 days
- Acute neurologic phase: 2-7 days
- Coma
- Death – 100% fatal



# Bats

First bats recorded in 1953 (CT 1959)

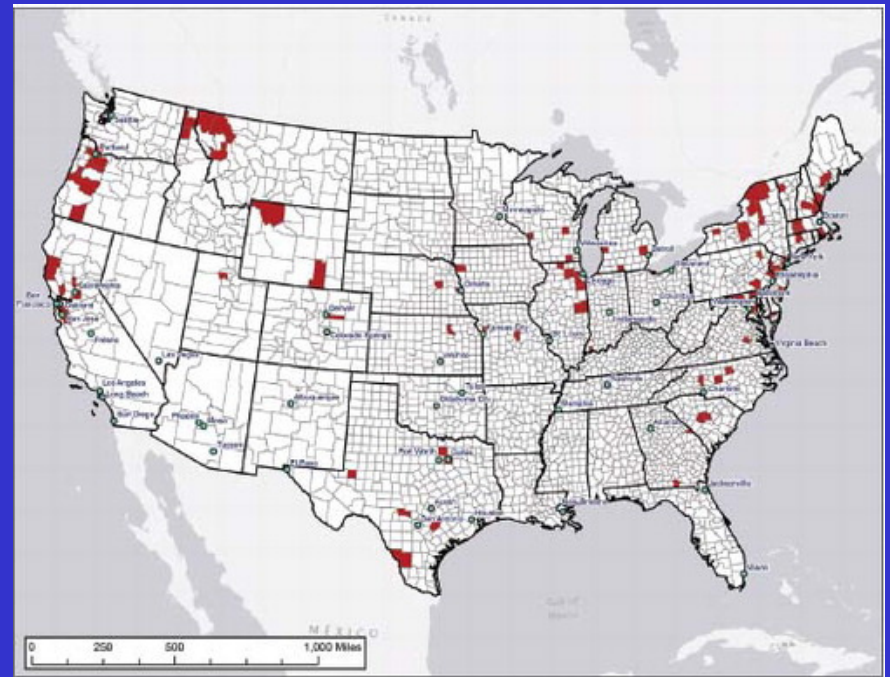
Bats = 3% of human case exposures

Bat variants = 42/45 (93%) human infections

Submitted bats in CT:

4 - 6% rabid

2015 – 2018: 71



Reported cases of rabies involving bats, by county, during 2015.

# National Guidance

## Public Veterinary Medicine: Public Health

### Compendium of Animal Rabies Prevention and Control, 2016

National Association  
of State Public Health Veterinarians  
Compendium of Animal Rabies Prevention  
and Control Committee

Catherine M. Brown DVM, MSc, MPH (Co-Chair)

Sally Slavinski DVM, MPH (Co-Chair)

Paul Ettestad DVM, MS

Tom J. Sidwa DVM, MPH

Faye E. Sorhage VMD, MPH

From the Massachusetts Department of Public Health, MA 02130 (Brown); the New York City Department of Health, 2 Gotham Center, CN# 22A, 42-09 28th St, Queens, NY 11355 (Ettestad); the Texas Department of State Health Services, 1190 St Francis Dr, Room 1190, Austin, TX 78714 (Sidwa).

Consultants to the Committee: Jesse Blanton, PhD (Georgia State University, Atlanta, GA 30333); Richard B. Chipman, MSc (New Hampshire Department of Health and Human Services, 59 Chenell Dr, Ste 2, Concord, NH 03301); University of Kansas, Room 1016 Research Park, Manhattan, KS 66506 (Blanton); Jamie McAloon Lampman (McKamey Rd, Chattanooga, TN 37415 [representing the National Association]); Joanne L. Maki, DVM, PhD (Merial, 2800 Peachtree Road, Atlanta, GA 30601 [representing the Animal Health Institute]); Kansas State University, Room 1016 Research Park, Manhattan, KS 66506 (Lampman); Wisconsin State Laboratory of Hygiene, 465 Walnut St, Madison, WI 53706 (Maki); Association of Public Health Laboratories, 19104 W. 19th Ave, Golden, CO 80231 (Lampman); VMD, PhD (Wistar Institute of Anatomy and Biology, 3601 Locust Walk, Philadelphia, PA 19104); Geetha B. Srinivas, DVM, PhD (USDA Center for Animal Health, 3000 N. Dayton Ave, Ames, IA 50010); Nick Striegel, DVM, MS (Colorado State University, 1475 Agriculture, 305 Interlocken Pkwy, Broomfield, CO 80020); PhD (University of Vermont, 302 Rowell Building, Burlington, VT 05405 [representing the American Public Health Association]).

Endorsed by the AVMA, American Public Health Association, American Veterinary Health Laboratories, Council of State and Territorial Health Officials, and the American Animal Care and Control Association.

This article has not undergone peer review.

Address correspondence to Dr. Brown (catherine.brown@state.ma.us).

**R**abies is a fatal viral zoonosis and serious public health problem.<sup>1</sup> All mammals are believed to be susceptible to the disease, and for the purposes of this document, use of the term animal refers to mammals. The disease is an acute, progressive encephalomyelitis.

petance, dysphagia, cranial nerve deficits, abnormal behavior, ataxia, paralysis, altered vocalization, and seizures. Progression to death is rapid. There are currently no known effective rabies antiviral drugs.

The recommendations in this compendium come



# MMWR

Morbidity and Mortality Weekly Report

[www.cdc.gov/mmwr](http://www.cdc.gov/mmwr)

Recommendations and Reports

March 19, 2010 / Vol. 59 / No. RR-2

## Use of a Reduced (4-Dose) Vaccine Schedule for Postexposure Prophylaxis to Prevent Human Rabies

### Recommendations of the Advisory Committee on Immunization Practices

# Pre-exposure Immunization

For people at increased risk of exposure

= animal control / conservation officers,  
veterinarians, vet staff, lab workers, travelers

Vaccine

3 doses on days 0, 7, 21 *or* 28

Serologic testing

frequency depends on risk of exposure  
vaccine booster

# What is an Exposure?

Contact that can introduce the virus into the bloodstream of a person or animal

*Infectious material + "portal of entry"*

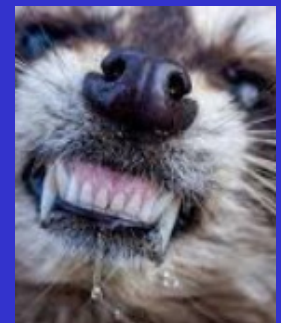
Infectious material = CNS tissue, saliva

NOT infectious = blood, feces, urine, dried saliva

Portal of Entry = bite, saliva onto mucus membranes, saliva into broken skin



Bite vs. Non-bite exposure  
In saliva a few days before sick





# Bat Exposures

Risk assessment difficult

limited injury, inaccurate recall

ACIP Guidelines

reasonable probability of contact

(or reasonable certainty of no contact)

-Bat in room with sleeping person

-Bat in room with unattended child, mentally disabled, intoxicated



# What if it's an exposure?

- **Exposure to Wild animals**
  - test if available
- **Exposure to Domestic animals** (animal control)
  - Owned animal consider quarantine
  - Test if euthanized (stray, elective)
- **Recommend PEP?**
  - Discuss with health director or DPH if 'gray area'
  - Recommend discuss PEP with their physician or ED

# Who is Involved?

- **Local Animal Control**
  - Investigation of bites/incidents, quarantine, seizure, euthanasia
- **Department of Agriculture**
  - Assessment of animals – final authority for quarantine, euthanasia
- **Local health**
  - Human risk assessment, coordination, communication
- **State Department of Public Health**
  - Testing, human risk assessment, assistance
- **DEEP**
  - Wildlife issues

# Where to test?

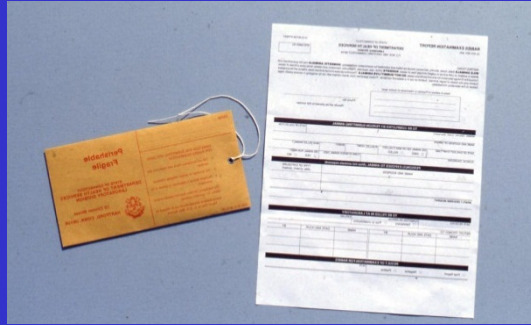
## At State Lab:

When there is a possible human exposure (infectious material + portal of entry)

- Must be submitted by ACO, local health, veterinarian, NWCO
- Domestic animals – consider quarantine

At UConn: No human exposure

# Rabies Testing



**DPH Lab, 10 Clinton St., Hartford**



**After Hours**

# What if the test is positive?

- Lab notifies submitter, local health, DPH
  - Animal control, vet, local health, DPH
  - One (or more) of above notifies owner or exposed person
- Humans assessed for risk, need for PEP
  - ACO, vet staff, owners, community members
  - PEP recommended to those potentially exposed
- Domestic animals assessed
  - Quarantine, booster vaccination, euthanasia

# Post-exposure Prophylaxis (NO previous vaccination)

1. Really good wound cleansing

2. Immune globulin (HRIG)

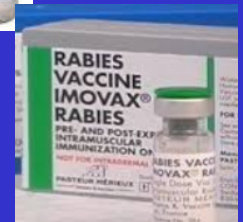
Infiltrate wound

IM in gluteal or distant area

3. Post-exposure vaccine (revised 2010)

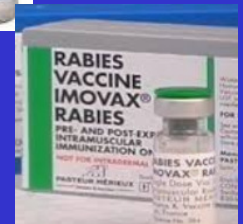
4 doses IM in deltoid (shoulder muscle)

Days 0, 3, 7, 14



# Post-exposure Prophylaxis (WITH previous vaccination)

1. Really good wound cleansing
2. NO Immune globulin (HRIG)
3. Post-Exposure Vaccine
  - 2 doses, days 0 and 3





# Post-exposure Prophylaxis

Urgency vs Emergency?

Factors to consider:

- Species

- Nature of exposure or incident

- Severity or location of wound

- Animal available for quarantine or testing

  - quarantine in CT 14 days for dog or cat

Highly successful



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## Rabies

Rabies is a viral disease primarily of animals caused by infection of the brain and spinal cord. People get rabies from the bite of an infected animal. In many areas of the developing world including Asia, Africa, and South America, it is attributable most often to dog bites. In the United States, where rabies in dogs has been largely eliminated, rabies is still widespread in wildlife. Bats, raccoons, skunk, and fox are the major reservoirs and serve as a source of potential infection for other animals and people.

In 1991, a resurgence of rabies in Connecticut followed the spread of rabies in raccoons from southern states and resulted in the first rabid domestic animals in the state since the 1940's. The raccoon rabies outbreak reached Connecticut in March of that year, entering Fairfield County through New York state. Over the following 4 years, it spread to all eight counties and remains present throughout the state.

Rabies testing done at the Connecticut Department of Public Health (DPH) Laboratory allows the DPH to monitor the occurrence of rabies among wild and domestic animals. Results are also important to guide the medical management of patients exposed to potentially rabid animals.

After an incubation period that is usually 3-8 weeks, symptoms in people progress over the course of several days from a flu-like illness to encephalitis that may be characterized by confusion, agitation, hallucinations, and muscle paralysis. Once clinical signs of rabies appear, the disease is fatal. However, disease can be prevented by thorough wound cleaning and timely medical treatment that includes administration of one dose of immune globulin (antibodies) and 4 doses of vaccine over 2 weeks.

Vaccination of domestic animals is an important component of rabies prevention programs. Connecticut state law requires vaccination of cats and dogs. In addition, dogs must also be licensed.

When making decisions related to rabies post exposure prophylaxis, health care providers are encouraged to refer to "Use of a Reduced (4-Dose) Vaccine Schedule for Postexposure Prophylaxis to Prevent Human Rabies: Recommendations of the Advisory Committee on Immunization Practices (ACIP) - 2010".

### Important Contact Information:

- The Department of Public Health, Epidemiology and Emerging Infections Program for questions regarding human exposures at 860-509-7994.
- The Department of Agriculture, Animal Control Division for questions regarding domestic animals at 860-713-2506.
- The Department of Energy and Environmental Protection, Wildlife Division for questions regarding wildlife at 860-424-3011.
- The local police department when prompt assistance is needed.

[Rabies & Risky Behavior](#) (YouTube)

[Rabies Brochure](#)

[Rabies Fact Sheet](#)

[Request for Rabies Examination Form](#)

This form was revised on May 19, 2016 to incorporate changes to animal testing at the State Public Health Laboratory. The new requirements, as outlined in the April issue of the Connecticut Epidemiologist newsletter, will begin July 1, 2016.

This form should only be completed by an appropriate submitter. The submitter must be the authorized person who will be notified of the results and will provide consultation regarding the need for testing the animal (i.e., Animal Control Officer, Environmental Conservation Police Officer, health care provider, local Health Director, Nuisance Wildlife Control Operator, police officer, or veterinarian). This form should not be used by the general public. In the event of a potential rabies exposure, please contact your local health department or local animal control officer.

[Modifications to rabies testing requirements and testing hours](#) - 4/25/2016 (The new requirements began July 1, 2016.)

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[Modifications to rabies testing requirements and testing hours](#) - 4/25/2016 (The new requirements began July 1, 2016.)

[Changes to the weekend and holiday animal rabies testing schedule](#) - 8/3/2015

[Compendium of Animal Rabies Prevention and Control, 2016](#)

### Statistics

[Rabies Statistics, Connecticut Annual Cases of Reportable Diseases](#)

### Other helpful sites:

[Connecticut Department of Agriculture](#)

- [Manual for Rabies Management and Protocols](#)

[Connecticut Department of Energy and Environmental Protection](#)

- [Nuisance Wildlife Control and Rabies](#)

[Centers for Disease Control and Prevention \(CDC\) Rabies](#)



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by Keyword

## Rabies Statistics

In the United States (US), rabies was controlled after World War II mainly by initiation of vaccine and stray dog control programs.

Although rabies in dogs has been controlled in the US, it is still the animal species most responsible for rabies transmission to people in much of the world. Rabies is also widespread in wild mammals. In the US, bats, raccoons, skunk, and fox are the major reservoirs and serve as the primary source of infection to other animals and people.

In 1991, a resurgence of rabies in wild animals followed the spread of rabies in raccoons from southern states to Connecticut. By the end of 1995, each county in the state was affected. Rabid raccoons were the cause of the first rabid domestic animals in the state since the 1940's.

In 1992, the highest number of rabid animals in Connecticut was identified (838). Since then the number of reported rabid animals has declined but infected animals continue to be found in all areas of the state. The decline reflects an actual reduction of the raccoon population due to rabies and a change in animal testing criteria.

In Connecticut, testing of wild animals for the rabies virus is limited to animals involved in exposure incidents with people or domestic animals. Therefore, the statistics presented on this page do not represent the total number of rabid animals in the wild. Rabies testing of animals is primarily performed to aid healthcare providers in the medical evaluation and treatment of people who may have been exposed. Testing is also done to guide animal control officers in the management of domestic animals that bite people or may have been exposed to the rabies virus through the bite of a wild animal. These statistics are useful to identify the species that most frequently test positive for rabies and the statewide distribution of rabid animals; they should not be used to evaluate risk of exposure. Connecticut residents may consult with their local health department or the DPH to evaluate their risk of exposure to the rabies virus.

Animals suspected of having rabies infection that have been involved in incidents with humans or domestic animals are tested at the Department of Public Health Virology Laboratory. Animals not involved in incidents with humans or domestic animals can be tested at the Connecticut Veterinary Medical Diagnostic Laboratory at the University of Connecticut.

Human and animal rabies statistics are compiled by the Epidemiology and Emerging Infections Program of the Department of Public Health.

All documents are PDF unless otherwise stated.

[Current Connecticut statistics](#)

### Line Listings

- [Rabies Positive Animals by Town and County, 2017](#)
- [Rabies Positive Animals by Town and County, 2016](#)
- [Rabies Positive Animals by Town and County, 2015](#)
- [Rabies Positive Animals by Town and County, 2014](#)
- [Rabies Positive Animals by Town and County, 2013](#)
- [Rabies Positive Animals by Town and County, 2012](#)
- [Rabies Positive Animals by Town and County, 2011](#)
- [Rabies Positive Animals by Town and County, 2010](#)



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## Manual for Rabies Management and Protocols

In December 1991 with assistance from state and private agencies, the Connecticut Veterinary Medical Association published the "State of Connecticut Manual for Rabies Management and Protocols". It served as an essential reference for veterinarians and other professionals who were expected to provide assistance and advice regarding rabies. In large part this web site is based on the manual and includes updated information with links that will provide further information about rabies and who to contact in the event of a rabies incident.

*All documents below are in .pdf format unless noted otherwise.*

- [Introduction](#)
- [Rabies Contact Information](#)
- [Rabies Information Brochure](#)
- [\(NEW\) Rabies Management of Domestic Animals Exposed to Wildlife](#)
- [Rabies Advisory Notice](#)
- [Rabies Management of Domestic Animals Bitten by other Domestic Animals](#)
- [Rabies Management of Livestock](#)
- [Regulations for the Control of Rabies in Public Settings](#)
- [Quarantine and Euthanasia of Biting Animals \(C.G.S. 22-358\)](#)
- [Rabies Wildlife Situations and Information](#)
- [Instructions for Submitting Specimens to CT Department of Public Health \(DPH\) Lab](#)
- [DPH Lab Rabies Testing Submission Form](#)
- [UCONN - CT Veterinary Medical Diagnostic Lab \(CVMDL\) Rabies Testing Submission Form](#)
- [Acknowledgement of Receipt of Rabies Testing Information](#)
- [Human Rabies Prevention](#)
- [Rabies Statistics](#) (link to CT Dept of Public Health page)



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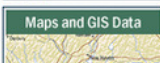
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Nuisance Wildlife Control and Rabies

Information for Connecticut's Home & Business Owners



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Connecticut's Nuisance Wildlife Control Operator Program

Each year, the Wildlife Division receives several thousand calls concerning conflicts with wildlife. A majority of these problems involve small mammals, such as squirrels, raccoons, skunks, woodchucks, opossums, and bats, as well as some birds, such as house sparrows, starlings, pigeons, and woodpeckers.

Compounding these conflicts are the loss of wildlife habitats caused by residential and commercial development and an increasing human population that often lacks a basic understanding of common wildlife and the prevention and control of damages.

The Wildlife Division provides wildlife damage control information over the telephone or through information provided on our website to assist Connecticut residents in resolving wildlife conflicts, but some residents require more assistance.

In 1985, the Connecticut State Legislature established a license for Nuisance Wildlife Control Operators (NWCOS). Licensed NWCOS must complete a comprehensive training course and pass a state exam which assesses their knowledge of NWCO regulations, policies and procedures; animal identification, habits, and life histories; recommended wildlife control practices; and humane handling and euthanasia.

If you are experiencing wildlife-caused problems and are unable or unwilling to resolve the situation yourself, you will most likely be referred to a NWCO. The DEEP, through regulation and policy, determines which animals the NWCOs can handle and which methods they can employ.

- Determine the nature of the problem.
Determine which methods will be used to resolve the problem.

## RABIES CONTACT INFORMATION

### Who to Call for Assistance

#### Department of Agriculture

*For questions concerning domestic animals (e.g. biting incidents, quarantine, vaccination)*

- \* Animal Control Division 860-713-2506 (M-F, 8:00-4:30)
- \* State Veterinarian 860-713-2505 (M-F, 8:00-4:30)
- \* <http://www.ct.gov/doag/cwp/view.asp?a=1367&q=259098>

#### Department of Environmental Protection

*For questions concerning wildlife (e.g. biting incidents, wildlife management, rehabilitation)*

- \* Wildlife Division 860-424-3011 (M-F, 8:00-4:30)
- \* Environmental Conservation Police 860-424-3333 (after-hours)
- \* [http://www.ct.gov/dep/cwp/view.asp?a=2723&q=325720&depNav\\_GID=1655&depNav=](http://www.ct.gov/dep/cwp/view.asp?a=2723&q=325720&depNav_GID=1655&depNav=)

#### Department of Public Health

*For questions concerning rabies in people (e.g. risk assessment, treatment)*

- \* Epidemiology Program 860-509-7994 (M-F, 8:30-4:30)
- For questions concerning submission of animals for testing (e.g. packaging, forms)*
- \* Virology Section, State Laboratory 860-509-8553 (M-F, 8:00-4:00)
- \* <http://www.ct.gov/dph/cwp/view.asp?a=3136&q=396178>

Connecticut Veterinary Medical Association 860-635-7770

*For questions regarding rabies clinics*

- \* <http://www.ctvet.org/>

#### University of Connecticut

*For questions regarding submission of livestock for testing (e.g. cost, requirements)*

- \* Veterinary Medical Diagnostic Laboratory 860-486-3738 (M-F, 8:30-4:30)
- \* <http://cvmdl.uconn.edu/>

Local Animal Control Officer – found in the blue pages of the telephone directory

*For reporting incidents of animals biting people or domestic animals*

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Local Health Department – listing available at

[https://www.han.ct.gov/local\\_health/localmap.asp?bar=1](https://www.han.ct.gov/local_health/localmap.asp?bar=1)

*For questions concerning rabies in people (e.g. risk assessment, treatment)*

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Centers for Disease Control and Prevention

*For information about rabies in the United States*

- \* <http://www.cdc.gov/rabies/>

⇒ When prompt assistance is needed call your local police department!

Jocelyn Mullins, DVM, MPH, PhD  
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Epidemiology and Emerging Infections Program

860-509-7994

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**QUESTIONS?**