Understanding Rabies in NC; Prevention, Control and Epidemiology

Carl Williams, DVM, DACVPM

Public Health Veterinarian, NC Division of Public Health

919-733-3419

WRNC Symposium

January 26, 2019

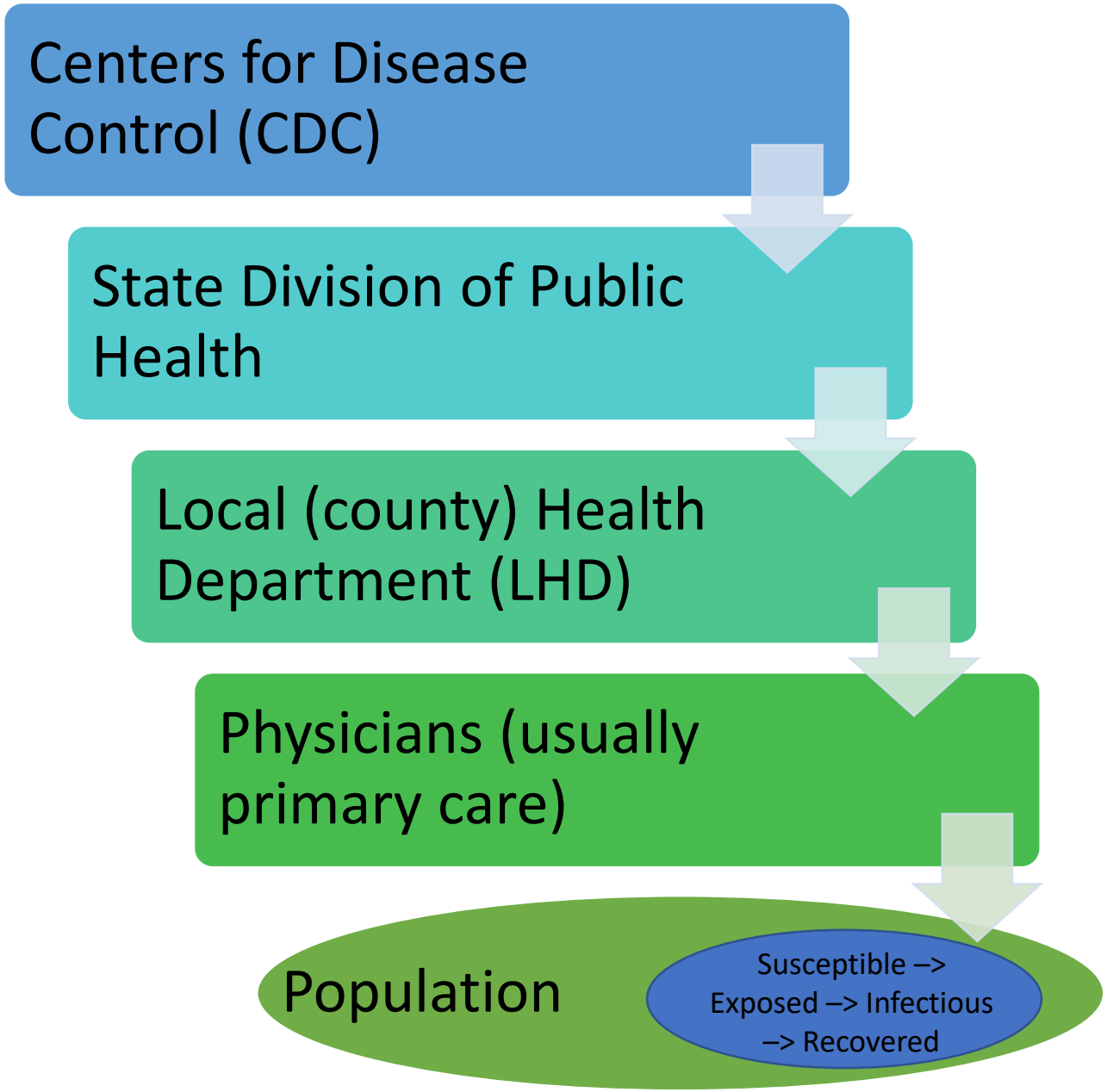
Overview

- Structure of Public Health in North Carolina
- Public Health Law
- Introduction to Rabies
- Wildlife rehabilitation and public health
- How do we jointly proceed?

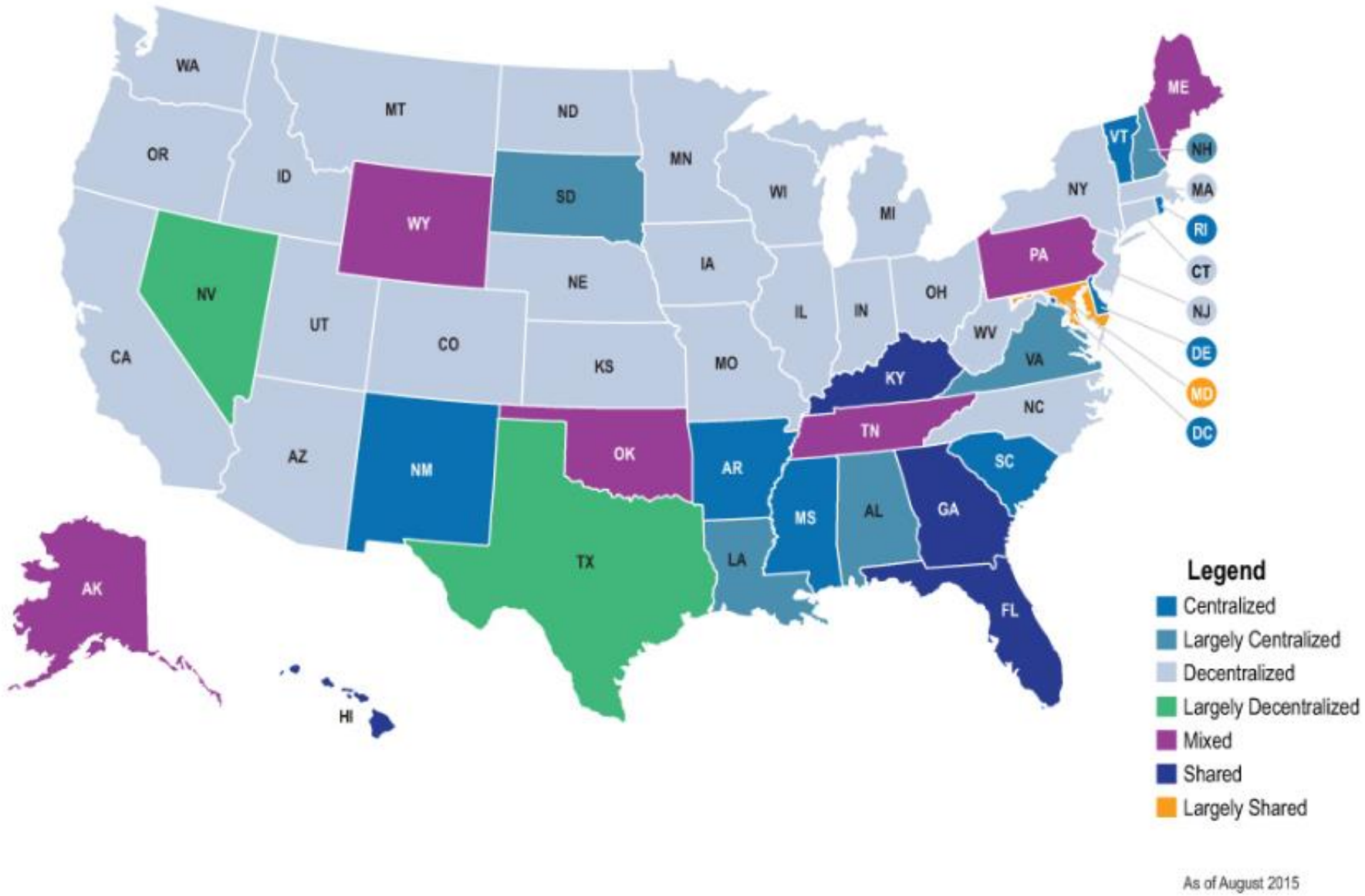
Public Health Infrastructure

CDC and State DOHs must cooperate and have limited powers (although rarely tested)

Tremendous responsibility falls on MDs/Primary Health Care Providers



State and Local Health Department Governance Classification Map



NC is a decentralized state

Each local health department is autonomous

https://www.cdc.gov/stltpublichealth/sitesgovernance/index.html

Structure of Public Health in North Carolina

86 Local Health Departments (LHD)

State Division of Public Health – Communicable Disease Branch

Centers for Disease Control (CDC)

Public Health Mission in NC

- 130A-1.1. Mission and essential services.
  - The General Assembly recognizes that unified purpose and direction of the public health system is necessary to ensure that all citizens in the State have equal access to essential public health services.
  - The General Assembly declares that the mission of the public health system is to promote and contribute to the highest level of health possible for the people of North Carolina by:

- Preventing health risks and disease;
- Identifying and reducing health risks in the community;
- Detecting, investigating, and preventing the spread of disease;
- Promoting healthy lifestyles;
- Promoting a safe and healthful environment;
- Promoting the availability and accessibility of quality health care services through the private sector; and
- Providing quality health care services when not otherwise available

Delegation of Public Health Authority

- 130A-6. Delegation of authority
  - Whenever authority is granted by this Chapter upon a public official, the authority may be delegated to another person authorized by the public official.

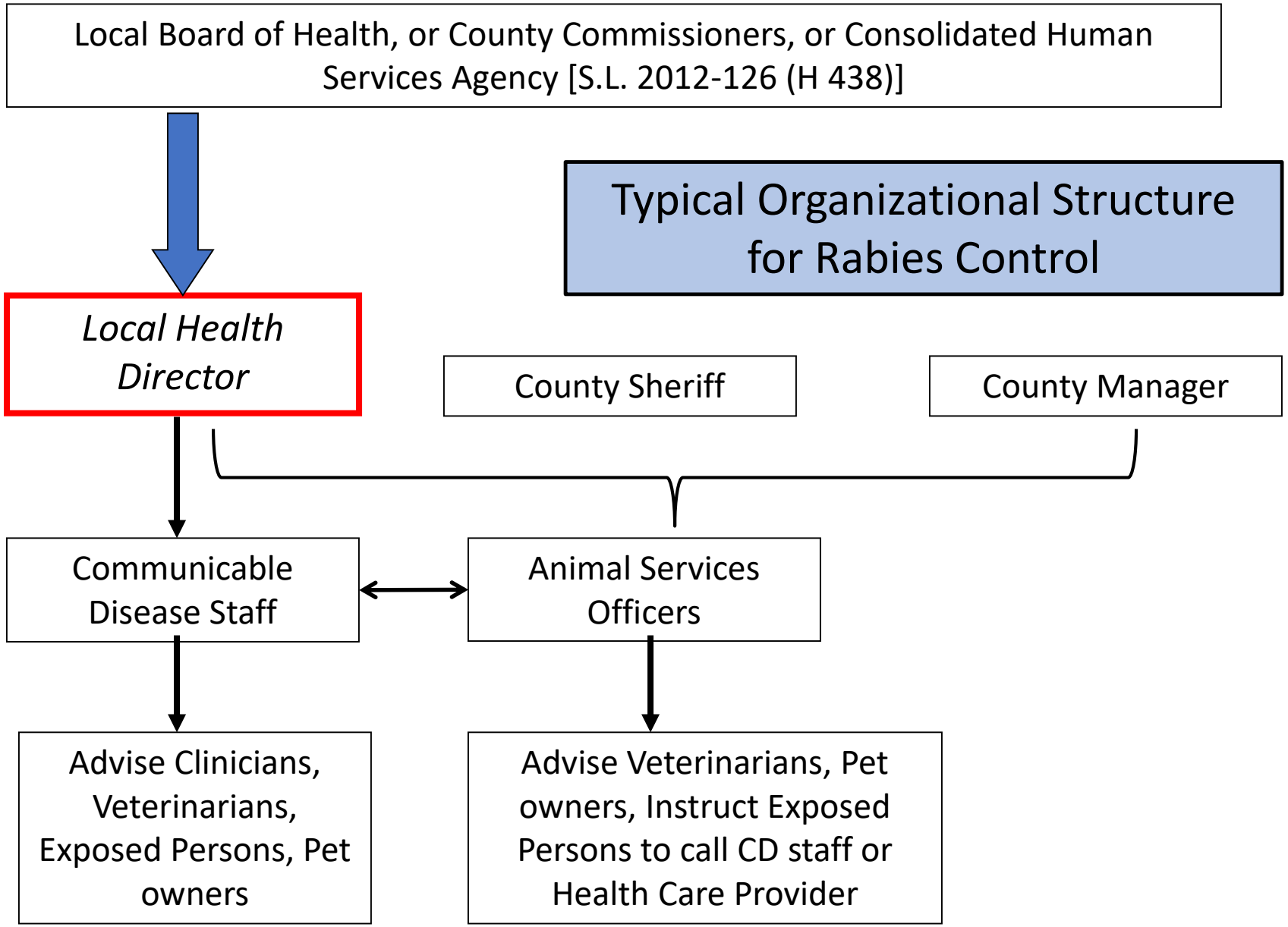
Violation of Public Health Law

- 130A-25. Misdemeanor
  - Except as otherwise provided, a person who violates a provision of this Chapter or the rules adopted by the Commission or a local board of health shall be guilty of a misdemeanor.

Public Health Authority in NC

- NCGS 130A-41 Powers and duties of local health director:
  - To investigate the causes of infectious, communicable and other diseases;
  - To exercise quarantine authority and isolation authority pursuant to G.S. 130A-145;
  - To examine, investigate and control rabies pursuant to Part 6 of Article 6 of this Chapter;
- The LHD may delegate (some) responsibility to Animal Control (AC) agencies
  - There must be written agreements (MOA) between agencies specifically delineating responsibility
  - AC officers **must** defer human rabies risk assessments to local CD nurses

Typical Organizational Structure for Rabies Control

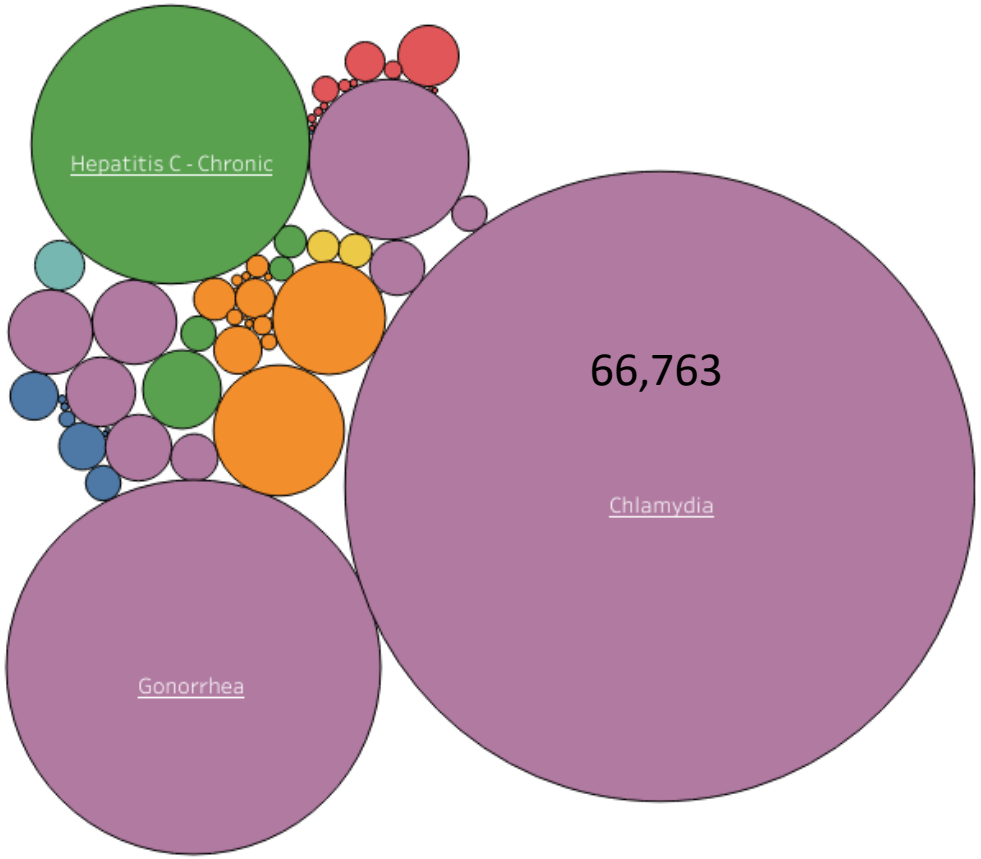


Reportable Diseases

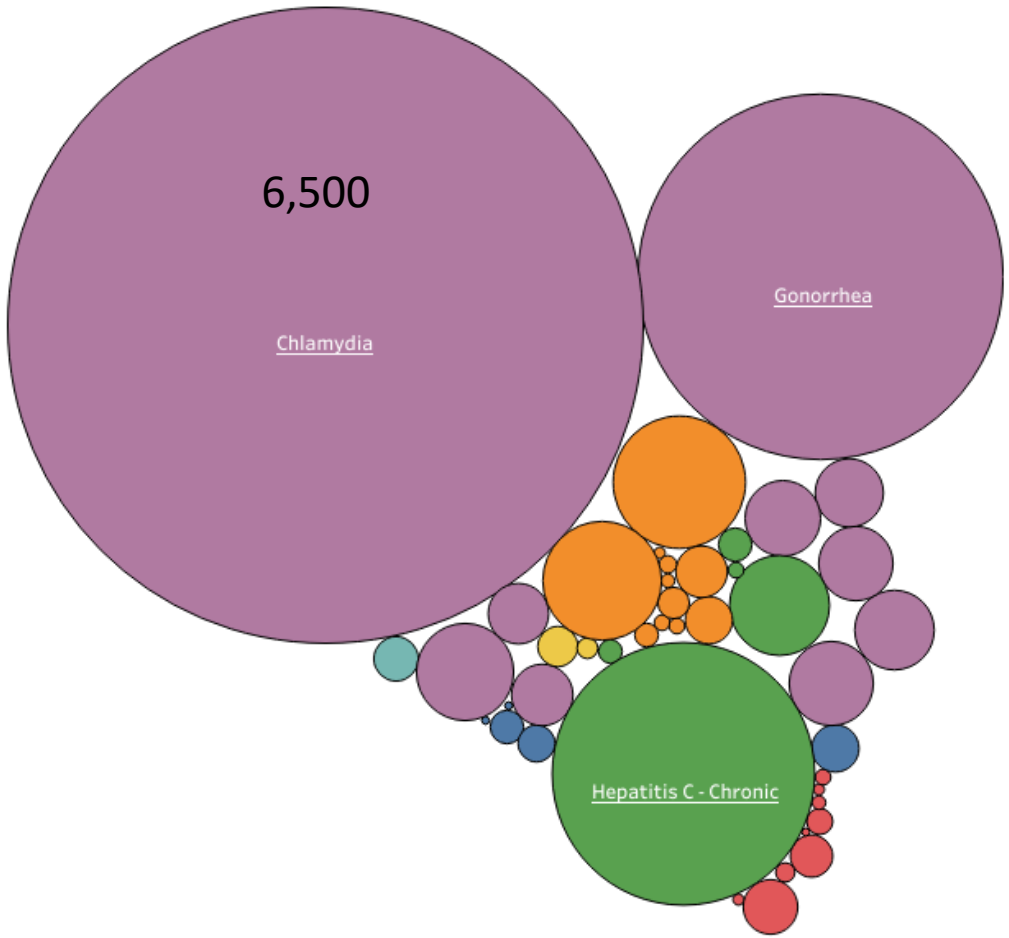
- ~ 80 Reportable Conditions in NC:
  - High consequence or fatal:
    - Rabies, Anthrax, Elevated blood lead levels
  - Spread quickly:
    - Measles, Pertussis
  - May become established without intervention
    - Malaria, Zika
  - May be spread through common food supply
    - E. coli O157:H7, Salmonellosis
- Health Care Providers and Laboratories responsible

NCD3: North Carolina Disease Data Dashboard

Proportional Disease Burden for North Carolina in 2018



Proportional Disease Burden for Wake County in 2018



Instructions

Year
2018

Disease Group
All

County
Wake County

Disease Statistic
Reported Cases

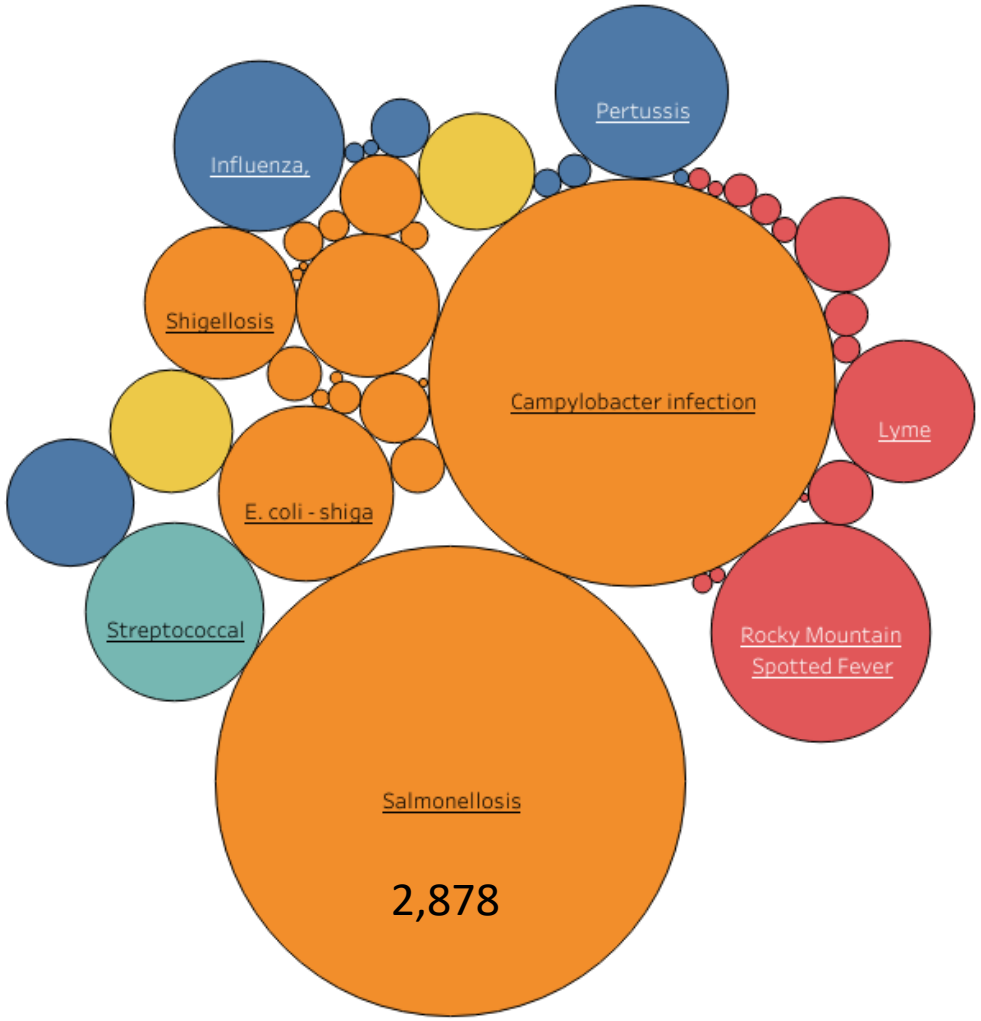
Disease Group Color Legend
- Enteric
- Hepatitis
- Respiratory
- Sexually transmitted
- Systemic Conditions
- Vaccine Preventable
- Zoonotic & Vector Borne

Data Notes

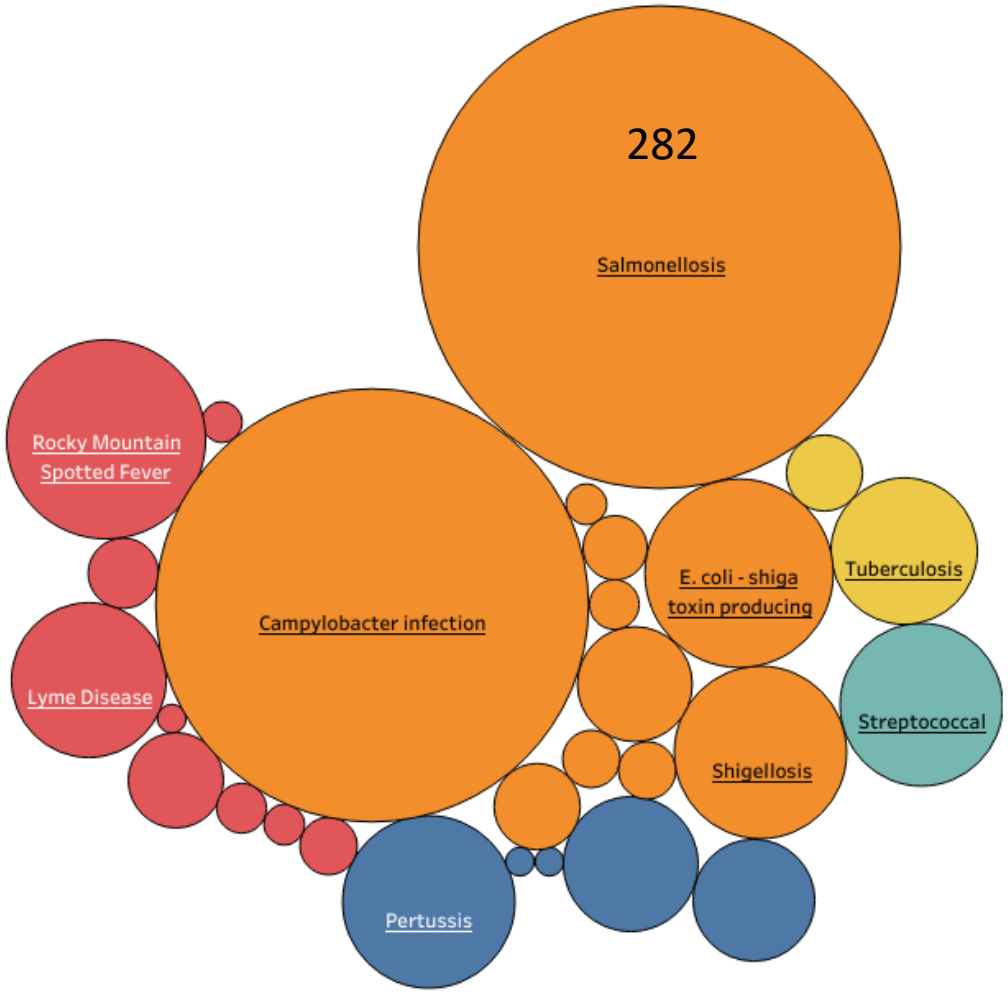
How To Download Data

NCD3: North Carolina Disease Data Dashboard

Proportional Disease Burden for North Carolina in 2018



Proportional Disease Burden for Wake County in 2018



Instructions

Year
2018

Disease Group
Multiple values

County
Wake County

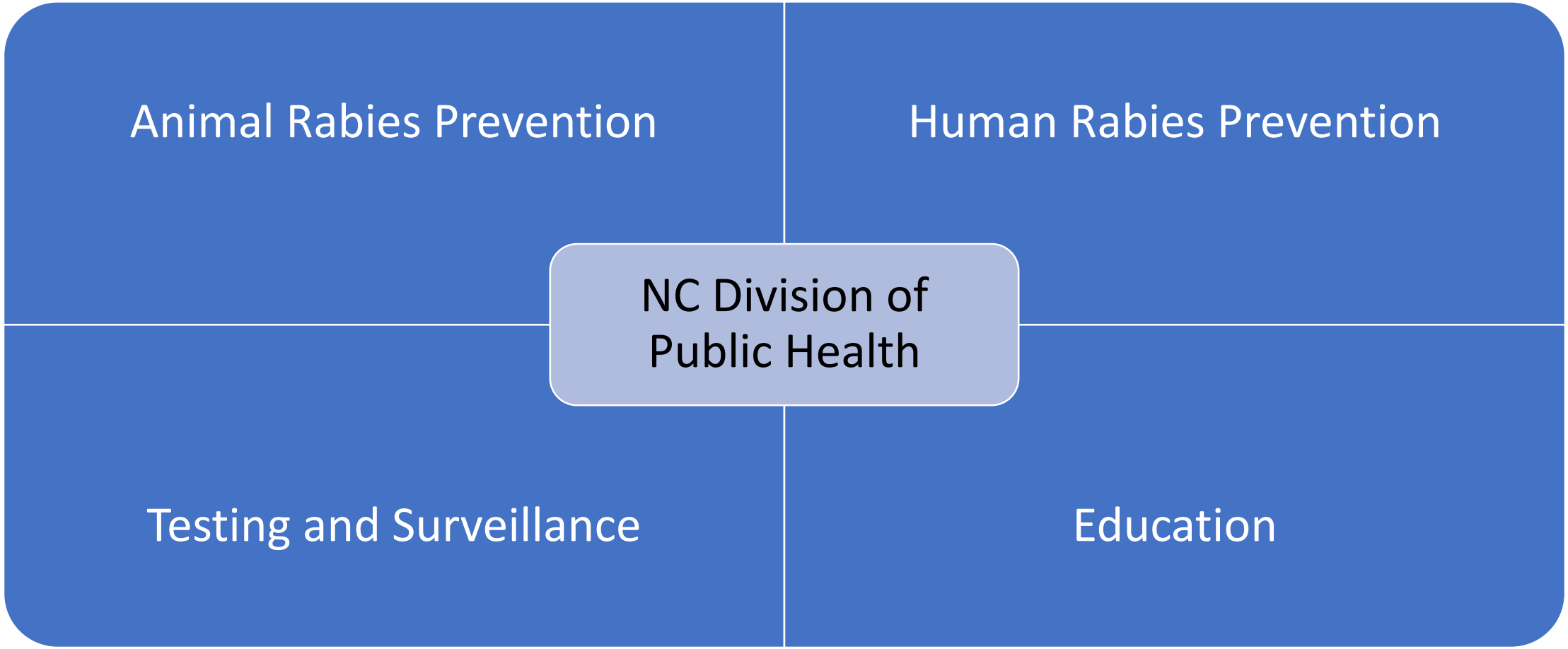
Disease Statistic
Reported Cases

Disease Group Color Legend
- Enteric
- Respiratory
- Systemic Conditions
- Vaccine Preventable
- Zoonotic & Vector Borne

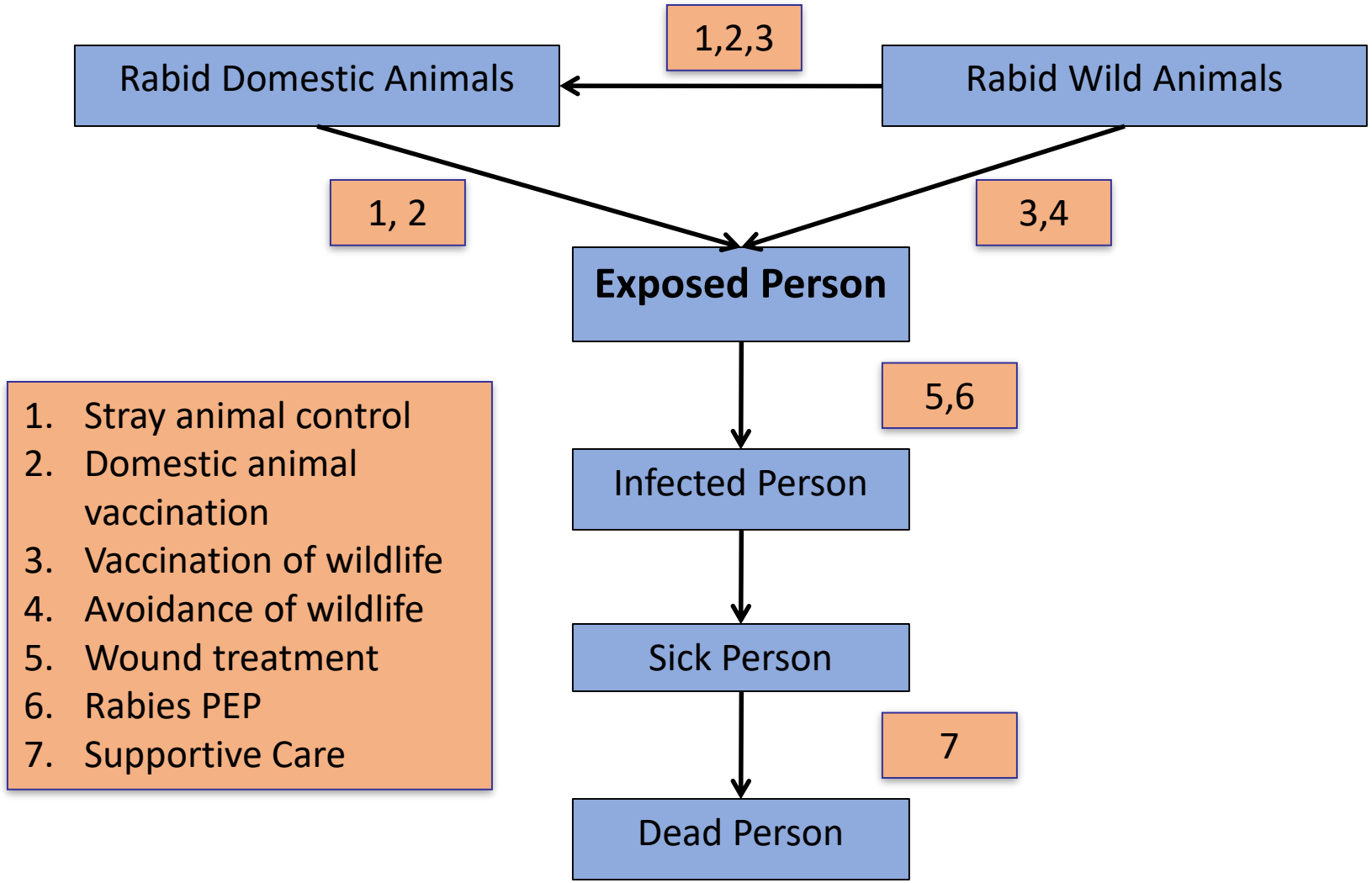
Data Notes

How To Download Data

Texas DSHS 2018 Rabies Awareness and Prevention Poster Contest Winners.
Brooklyn Farmer, 4th Grade, Lampasas TX.

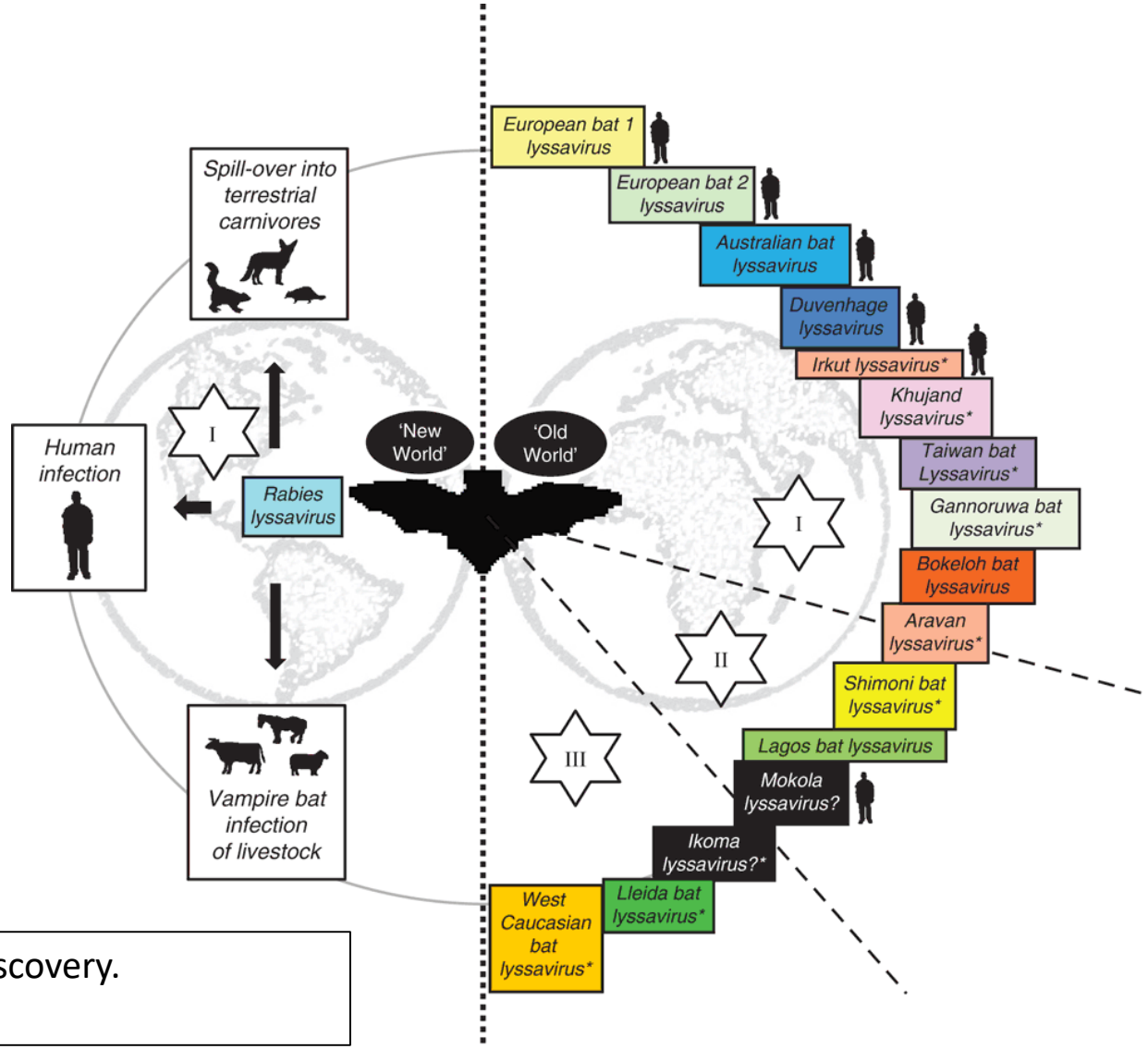

Animal Rabies Prevention
Human Rabies Prevention
NC Division of Public Health
Testing and Surveillance
Education

Multiple Points for Rabies Control



Rabies: What's in a Name?

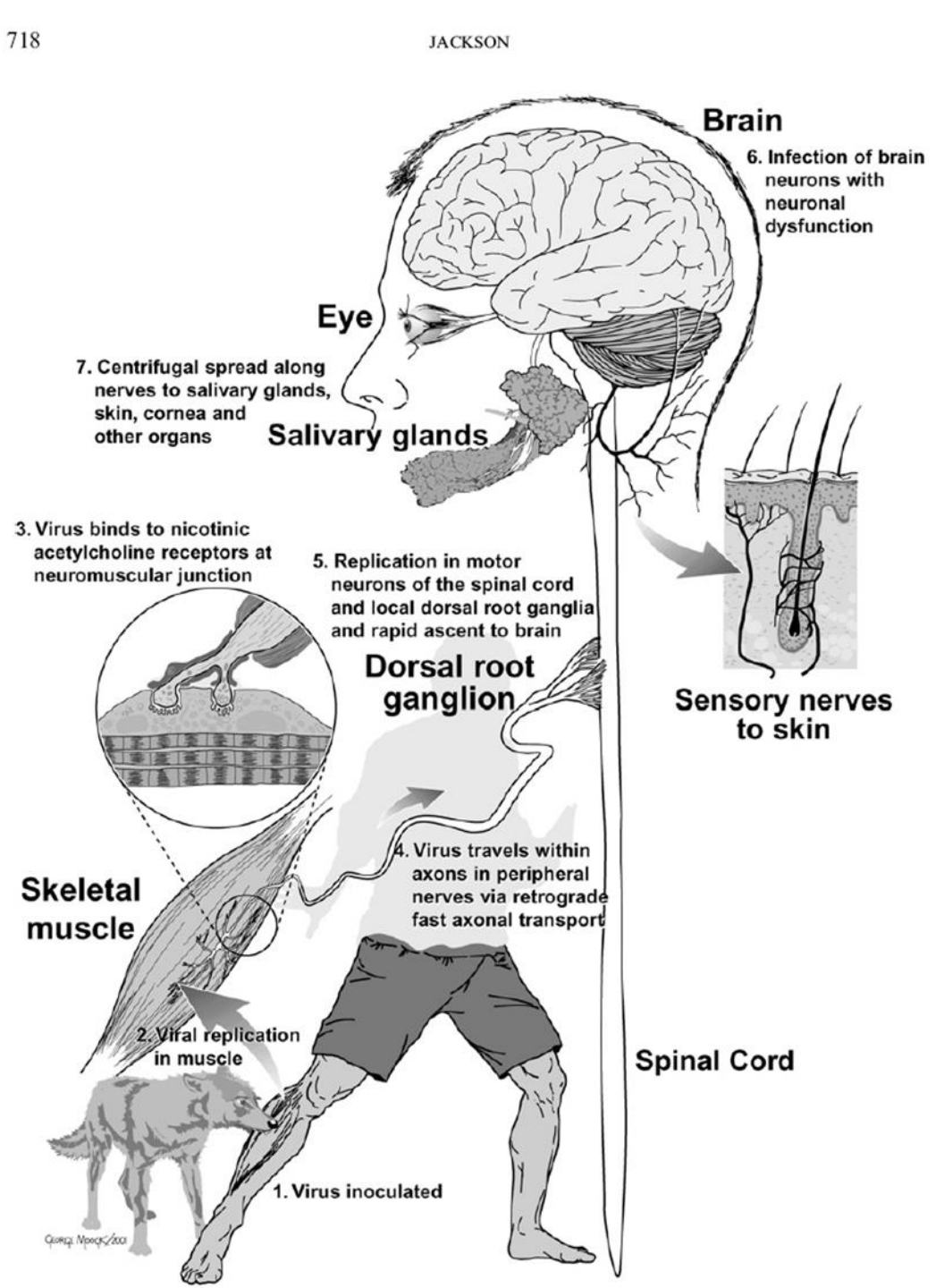
- Rabies is an acute encephalitis or meningoencephalitis due to a lyssavirus infection.
- The etiological agents of rabies encephalitis belong to the
  - Mononegavirales order,
  - Rhabdoviridae family
  - Lyssavirus genus
  - Multiple species (17 on image)
- Only one species, classic rabies virus, is present in North America



Banyard, Fooks. The impact of novel lyssavirus discovery. Microbiology Australia. Feb 2017. pp. 17-21.

Rabies Pathogenesis

- Bite
  - Any penetration of the skin by teeth constitutes exposure
  - It is assumed that all bite exposures result in contamination of the wound with saliva

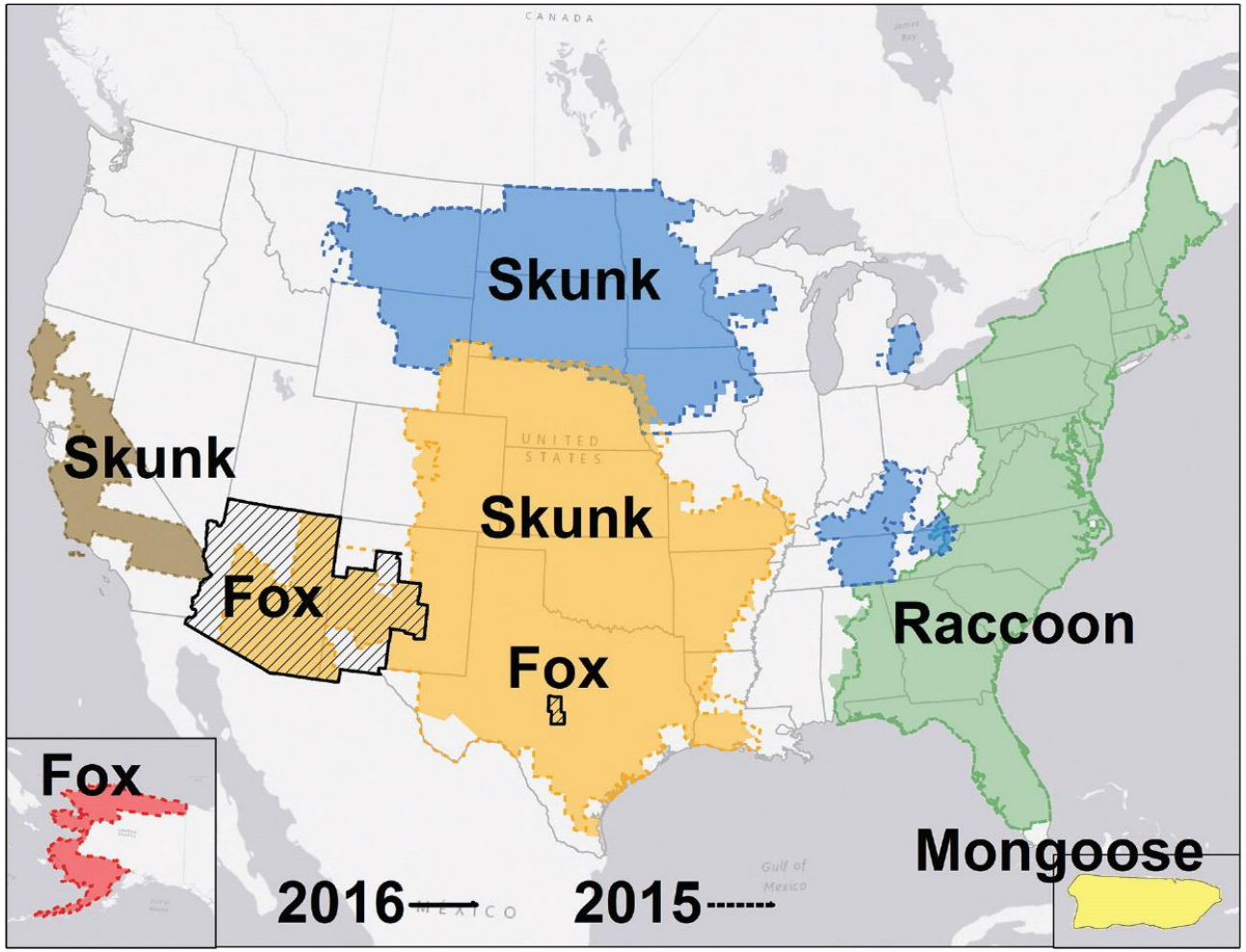


Jackson. Rabies.

Neurol Clinic 26 (2008) 717-726

Rabies in Animals in the United States

- In North America many unique, host adapted, strains of Rabies Lyssavirus exist
  - Eastern raccoon,
  - Texas grey fox,
  - North central skunk,
  - Arctic fox,
  - *etc*.

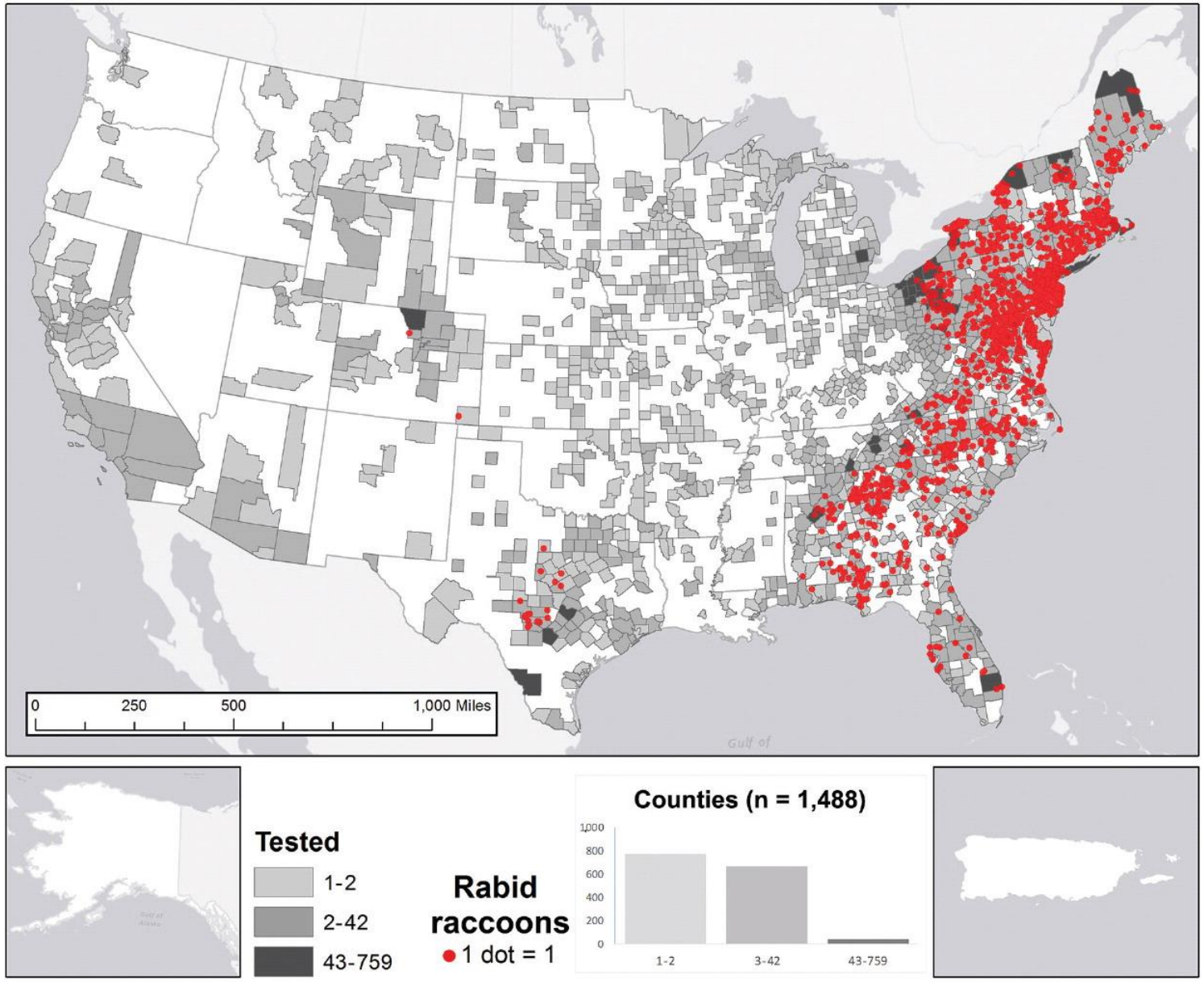


Ma, et. al. Rabies surveillance in the United States during 2016. JAVMA. April 15, 2018, Vol. 252, No. 8, Pages 945-957

Rabies data, US vs NC, 2016

Species	US			NC		
	Submitted	Positive	% Pos	Submitted	Positive	% Pos
Raccoon	11,998	1403	11.7	410	117	28.5
Fox	1,818	313	17.2	115	51	44.3
Skunk	4,339	1031	23.8	59	38	64.4
Bat	23,979	1646	6.9	947	26	2.7
Dog	21,658	58	0.3	796	2	0.3
Cat	21,807	257	1.2	928	10	1.1

Raccoon Rabies 2016

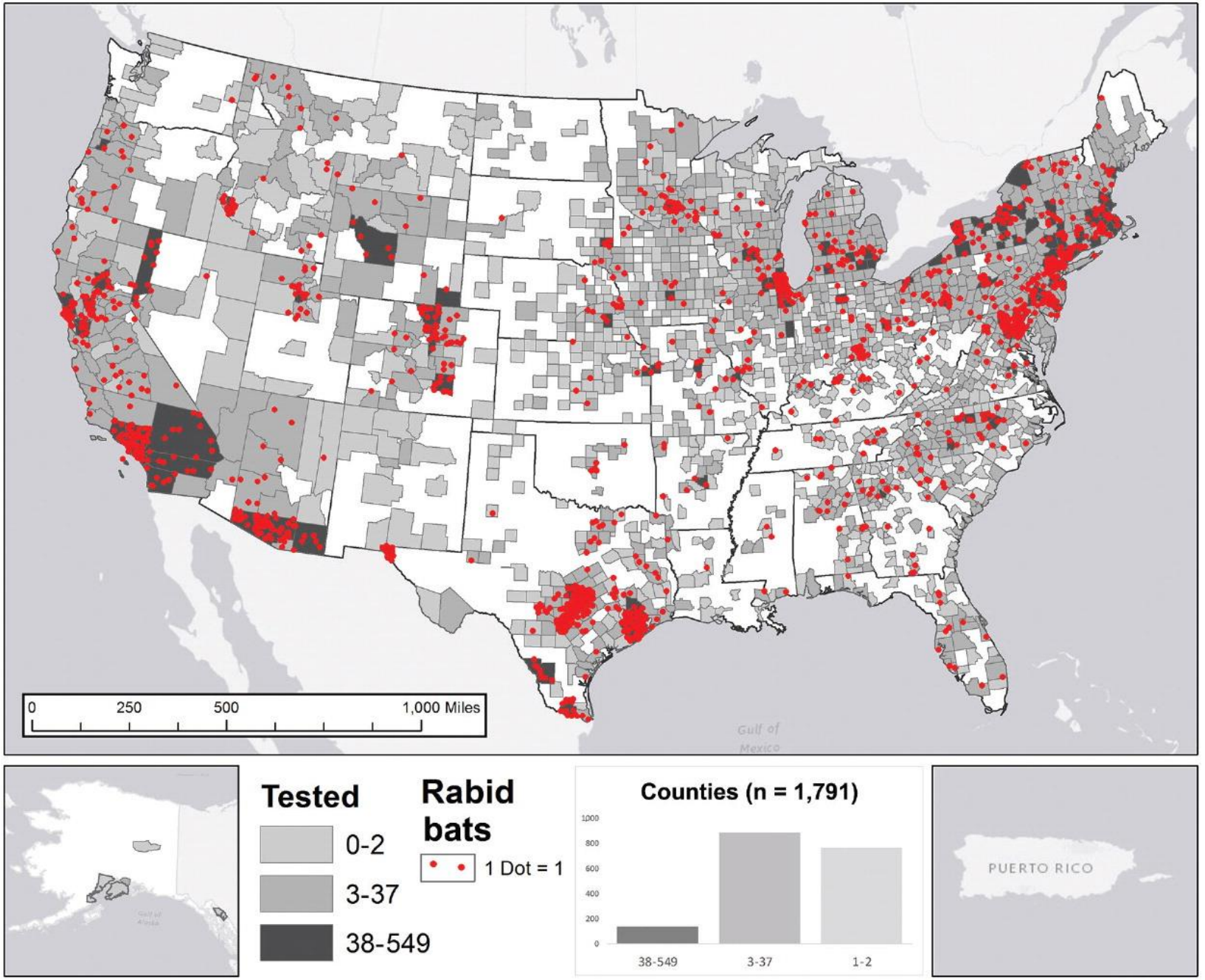


Ma, et. al. Rabies surveillance in the United States during 2016. JAVMA. April 15, 2018, Vol. 252, No. 8, Pages 945-957

Bat Rabies data, US vs NC, 2016

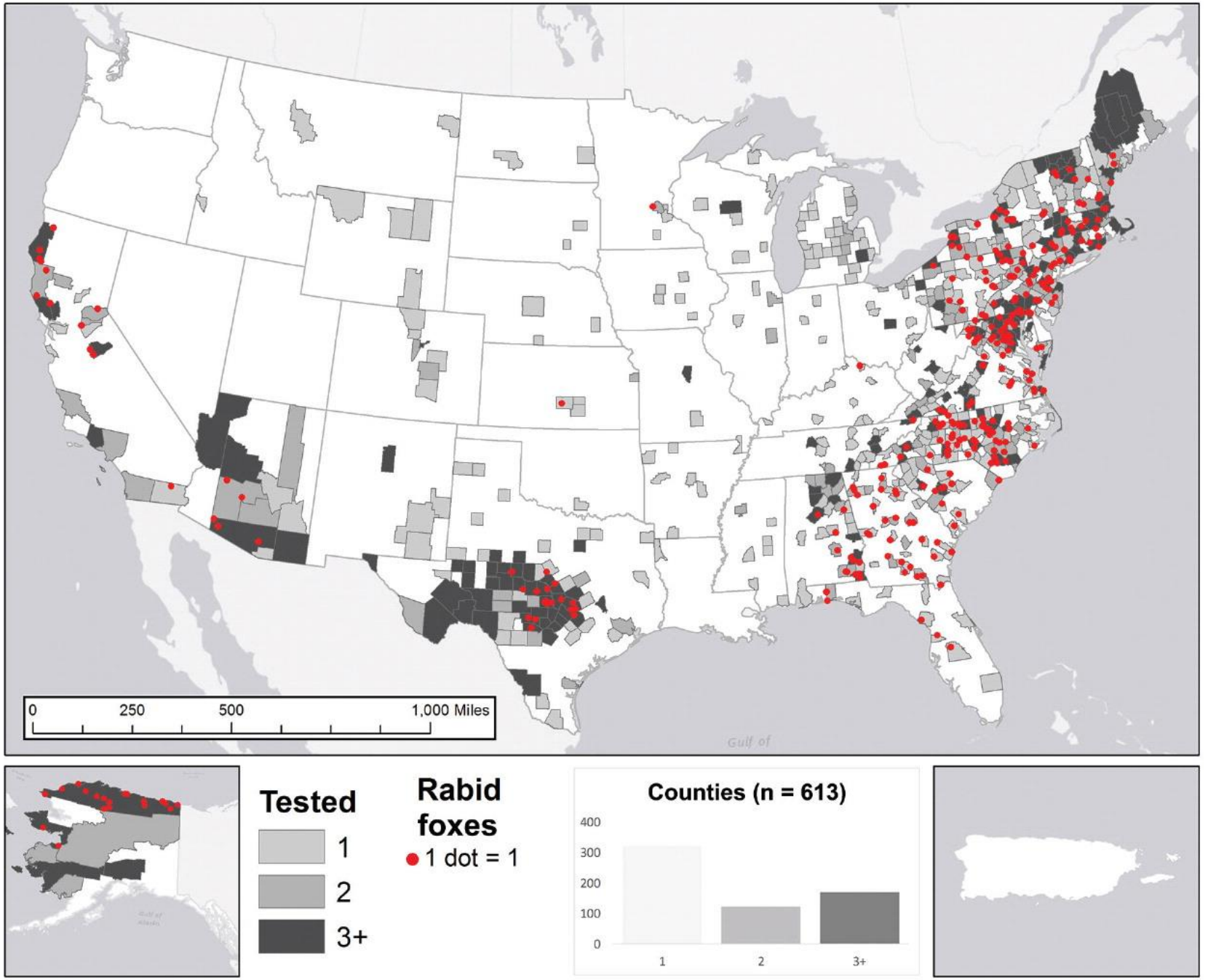
Species	US			NC		
	Tested	Positive	% Pos	Tested	Positive	% Pos
Eptesicus fuscs	8,469	394	4.7	746	16	2.1
Lasiurus borealis	277	29	10.5	43	7	16.3
Lasiurus cinereus	43	21	48.8	2	1	50
Lasiurus seminolus	43	6	14	3	0	0
Myotis spp.				2	0	0
Nysticeius humeralis	319	11	3.4	61	0	0
Tadarida brasiliensis	1,666	350	21	46	2	4.3

Bat Rabies 2016



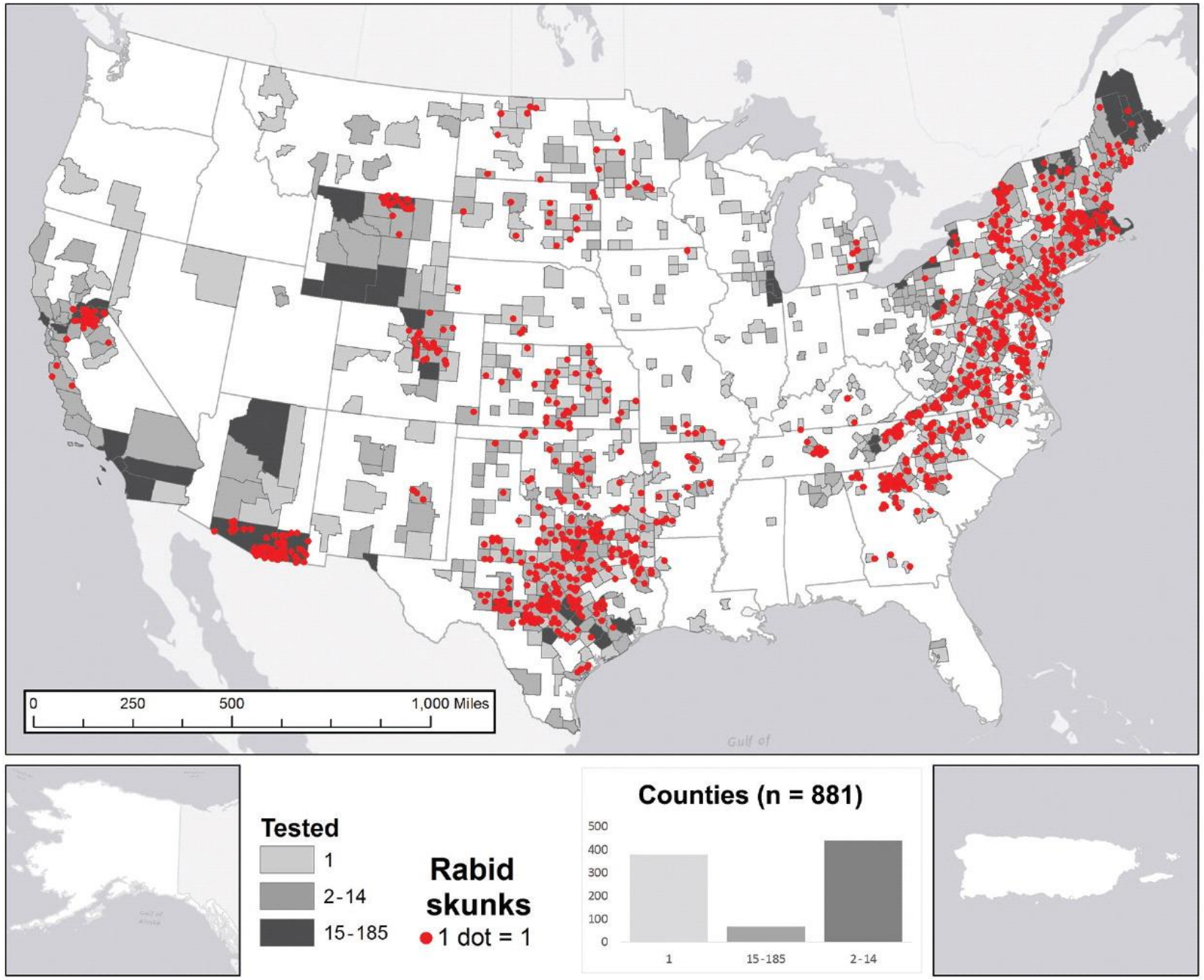
Ma, et. al. Rabies surveillance in the United States during 2016. JAVMA. April 15, 2018, Vol. 252, No. 8, Pages 945-957

Fox Rabies 2016



Ma, et. al. Rabies surveillance in the United States during 2016. JAVMA. April 15, 2018, Vol. 252, No. 8, Pages 945-957

Skunk Rabies 2016



Ma, et. al. Rabies surveillance in the United States during 2016. JAVMA. April 15, 2018, Vol. 252, No. 8, Pages 945-957

Rehabilitation of Rabies Vector Species in NC has Evolved

change.org Start a petition My petitions Browse Membership Log in

Please help permitted wildlife rehabilitators in North Carolina be able to care for raccoon babies just the same as squirrels and not have to turn them down due to North Carolina laws.

Petition Closed

This petition had 1,170 supporters

North Carolina wildlife resources commission: Please help...

Share on Facebook

Send a Facebook message

Send an email to friends

Tweet to your followers

Copy link

Wildthing Wildlife Rehab started this petition to Governor Pat McCrory and 2 others

Professional permitted rehabbers want to be able to rehab orphaned and injured baby raccoons to release. The current North Carolina wildlife law states that no one can rehab raccoons because they are a RVS (rabies vector species.) Most professional permitted rehabbers have taken protective measures, including getting rabies vaccines for themselves, to

Rabies Species Category - Only individuals with the rabies species category may possess, rehabilitate or release rabies species. To become a license to rehabilitate rabies species, an individual shall meet all requirements of the basic captivity license for rehabilitation. Applicants shall have held an active rehabilitation license within or outside of the state of at least the previous three years and rehabilitated during the time. Applicants must have completed 12 hours of rabies or rabies species-specific training or a combination thereof. Applicants must certify up-to-date rabies immunization in accordance with the CDC. Proof immunization to demonstrate that the vaccine was administered shall be provided upon the request of the Commission or authorized representative and shall be kept at the license holder's facility.

Except for bats, rehabilitation and release of rabies species is not authorized in counties where the United States Department of Agriculture-Animal and Plant Health Inspection Service Oral Rabies Vaccination (ORV) program is conducted, as specified by the United States Department of Agriculture-Animal and Plant Health Inspection Service at www.aphis.usda.gov.

Volunteers or individuals under the age of 18 may provide assistance to a licensed rehabilitator at their licensed facility without needing a license.

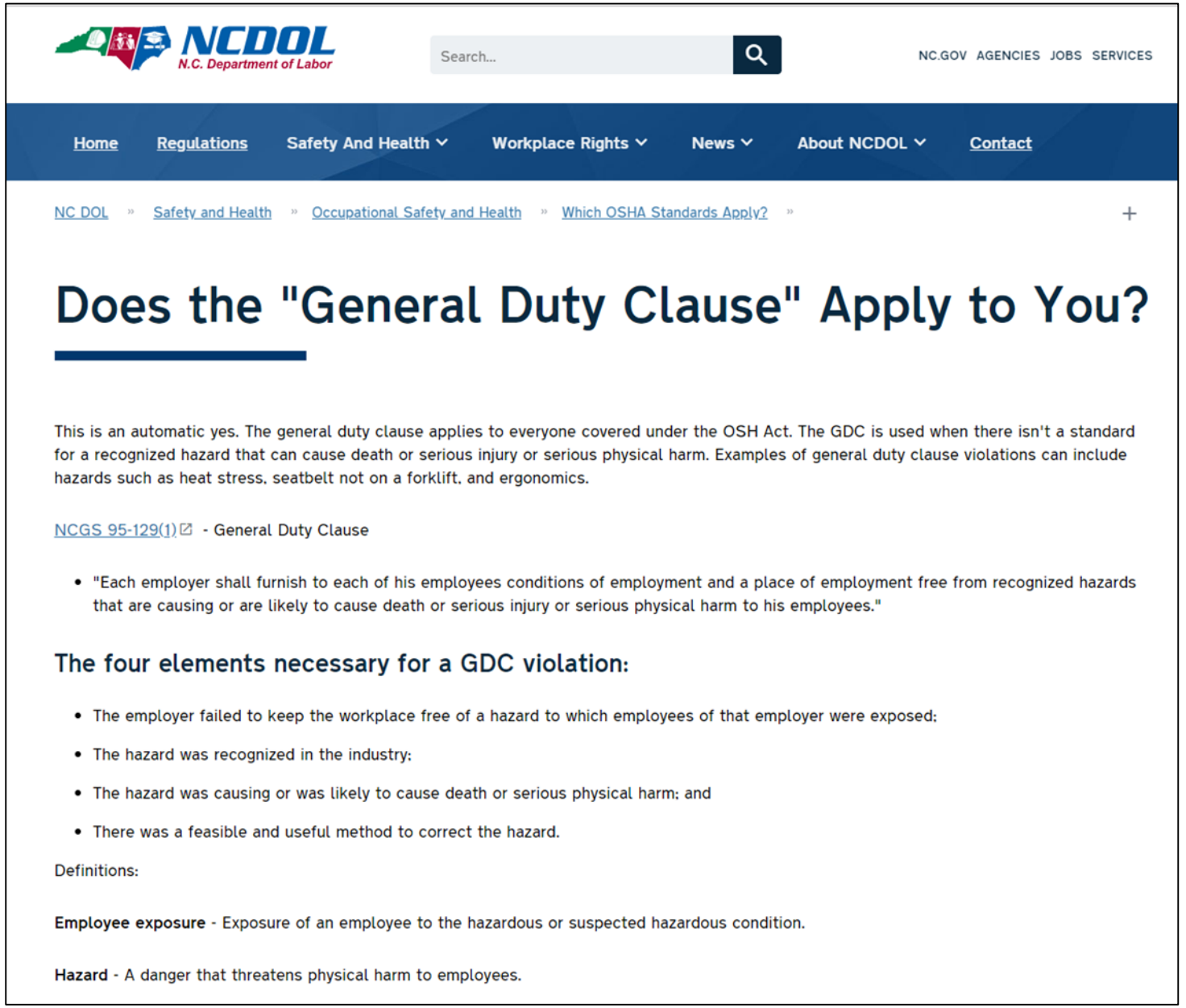
This is an annual license that expires on December 31st of each year.

Download the current Wildlife Rehabilitation License Rules:

- **15A NCAC 10H .1401-.1406**

Rehabilitators now have Rabies Responsibility and Accountability

- Safety and Health of the
  - Employee
  - Volunteer
  - Public



NCDOL
N.C. Department of Labor

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NC DOL » Safety and Health » Occupational Safety and Health » Which OSHA Standards Apply? »

Does the "General Duty Clause" Apply to You?

This is an automatic yes. The general duty clause applies to everyone covered under the OSH Act. The GDC is used when there isn't a standard for a recognized hazard that can cause death or serious injury or serious physical harm. Examples of general duty clause violations can include hazards such as heat stress, seatbelt not on a forklift, and ergonomics.

NCGS 95-129(1) - General Duty Clause

- "Each employer shall furnish to each of his employees conditions of employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious injury or serious physical harm to his employees."

The four elements necessary for a GDC violation:

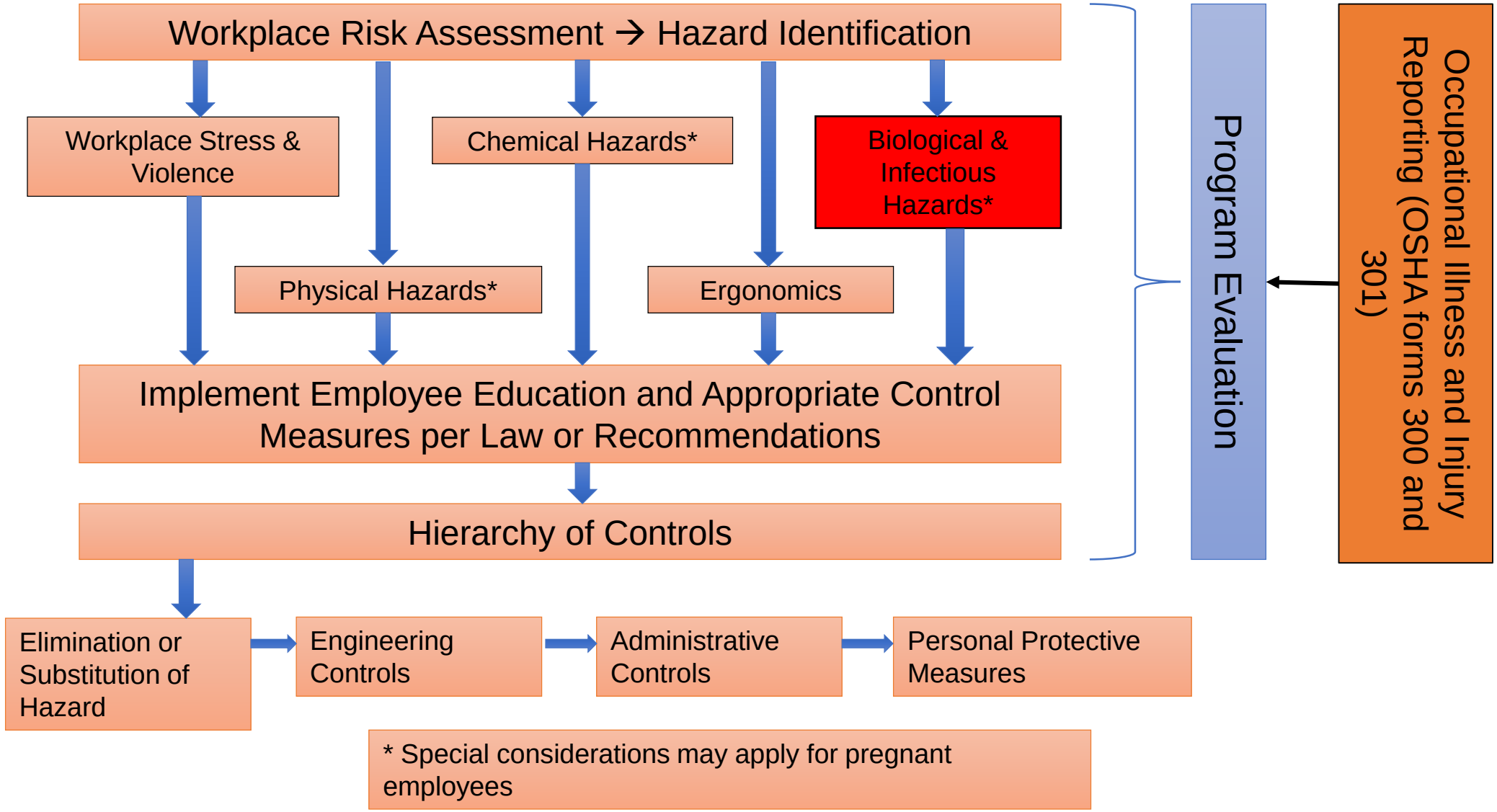
- The employer failed to keep the workplace free of a hazard to which employees of that employer were exposed;
- The hazard was recognized in the industry;
- The hazard was causing or was likely to cause death or serious physical harm; and
- There was a feasible and useful method to correct the hazard.

Definitions:

Employee exposure - Exposure of an employee to the hazardous or suspected hazardous condition.

Hazard - A danger that threatens physical harm to employees.

Comprehensive Employee Safety and Health MUST be Considered



What do we need to work on Together?

- Ensure rabies pre-exposure prophylaxis of rehabilitators
- Document all possible exposures to RVS that you intake
- Ensure proper medical follow up of all staff injuries, especially bites
- Education
- Opportunities of wildlife disease surveillance?
  - Distemper
  - Baylisascaris
- What else?

Who should receive *Pre-exposure* Vaccination?

- Veterinarians and staff
- Laboratory workers
- Animal control officers
- Wildlife workers
- Travelers to rabies endemic countries; at risk

Pre-exposure Vaccines for People at risk for Rabies Exposure

- 3 Vaccines
- Days 0, 7, and 21 or 28
- Local Health Department or Private Physician

Rabies Titers

- Used to assess response to vaccination only!
- Presence of an adequate titer does not obviate the need for PEP if indicated!
- Requesting titer testing for persons exposed to rabies is inappropriate!

Rabies Titers

Use to assess vaccine response in select occupational groups

- RFFIT – gold standard
  - Rapid focus fluorescent inhibition test
  - A virus neutralization assay
- Performed by
  - Kansas State University (785-532-4483)
    - http://www.vet.ksu.edu/depts/dmp/service/rabies/index.htm
  - Atlanta Health Associates (800-717-5612)
    - http://www.atlantahealth.net/

Rationale for Rabies Pre Exposure Immunization for People

- It may provide protection to persons with inapparent exposure to rabies
- It may protect persons whose post exposure therapy is expected to be delayed
- In the event of an exposure to rabies it simplifies therapy by
  - Eliminating need for HRIG
  - Decreasing number of vaccine doses required

Intake Documentation

Intake Form for High-Risk Rabies Vector Species
(raccoons, skunks, foxes, bobcats and bats)

ANIMAL INFORMATION

Species:	Number of animals:	Date of intake:
Condition of animals: Injured___ Orphaned___ Displaced___ Ill___ Other:_____		
Address/Area animal found:		Date animal found:

RESCUER'S INFORMATION

Name of rescuer:	Phone: Email:
Street address:	City/town: State: Zip code:

Did animal bite, scratch or lick anyone?

Yes_____ No_____

If yes, name of person bitten, scratched or licked:_____

Same as rescuer:____

Address:_____

Phone:_____

If yes, please describe what happened:_____

_____

Did anyone handle the animal without gloves or other barrier? Yes_____ No_____

If yes, please provide their name, address and phone number on the back of this form.

Did the animal have any contact with a dog, cat or other pet? Yes____ No____

If yes, please describe the interaction:

Note: If the rescuer reports any bites, scratches or licks to people or contact with pets, contact your Local Health Department.

Additional People Bitten, Scratched, Licked, or Contacted the Animal Without Gloves

Name:_____

Address:_____

Phone:_____ Bitten or licked?_____ Handled without gloves?_____

Name:_____

Address:_____

Phone:_____ Bitten or licked?_____ Handled without gloves?_____

Name:_____

Address:_____

Phone:_____ Bitten or licked?_____ Handled without gloves?_____

Name:_____

Address:_____

Phone:_____ Bitten or licked?_____ Handled without gloves?_____

Name:_____

Address:_____

Phone:_____ Bitten or licked?_____ Handled without gloves?_____

Name:_____

Address:_____

Phone:_____ Bitten or licked?_____ Handled without gloves?_____

Name:_____

Address:_____

Phone:_____ Bitten or licked?_____ Handled without gloves?_____

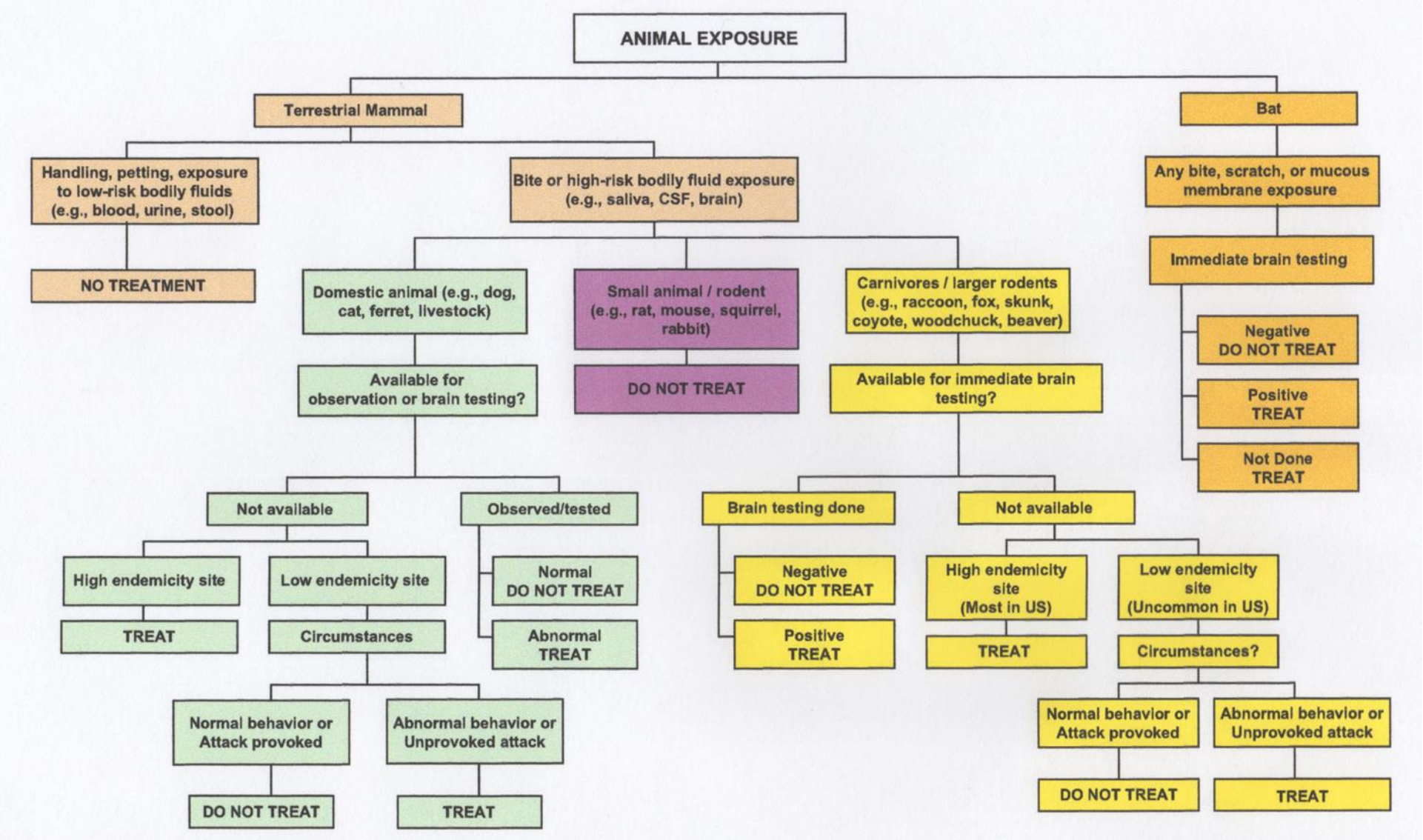
When to Call Public Health

- A bite is reported
- An exposure is suspected
- You have any questions!

What is Needed to Assess Animal Bites?

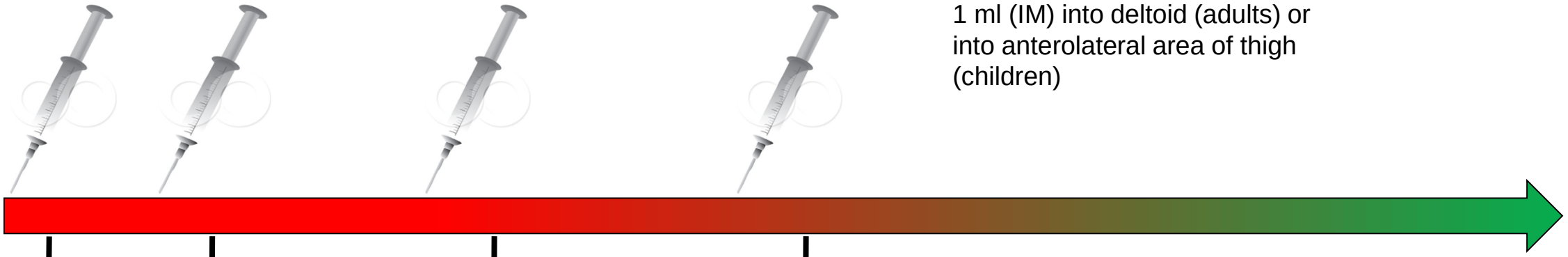
- Wound care
- Antibiotic therapy
- Tetanus Booster or TIG administration[1]
  - Many immigrants not adequately vaccinated against tetanus, thorough history needed
- Rabies specific risk assessment
  - Most dog/cat bites do not require rabies PEP
  - Bites from RVS will likely require PEP initiation

[1] Talan DA, Abrahamian FM, Moran GJ, et al. Tetanus immunity and physician compliance with tetanus prophylaxis practices among emergency department patients presenting with wounds. *Ann Emerg Med*. 2004;43:305-314.



Moran, et. al. Antimicrobial Prophylaxis for Wounds and Procedures in the Emergency Department. Infect Dis Clin N Am 22 (2008) 117–143

ACIP Modified Essen Schedule; 4 doses, 4 visits*



1 ml (IM) into deltoid (adults) or into anterolateral area of thigh (children)

D 0
x 1

D 3
x 1

D 7
x 1

D 14
x 1

D 0
HRIG 20 IU/kg

D 0
Wound Cleansing

* Use of a Reduced (4-Dose) Vaccine Schedule for Postexposure Prophylaxis to Prevent Human Rabies. **March 19, 2010 / 59(RR02);1-9**

Human Rabies PEP IF previously vaccinated; 2 doses, 2 visits*

1 ml (IM) into deltoid (adults) or into anterolateral area of thigh (children)

D 0
x 1

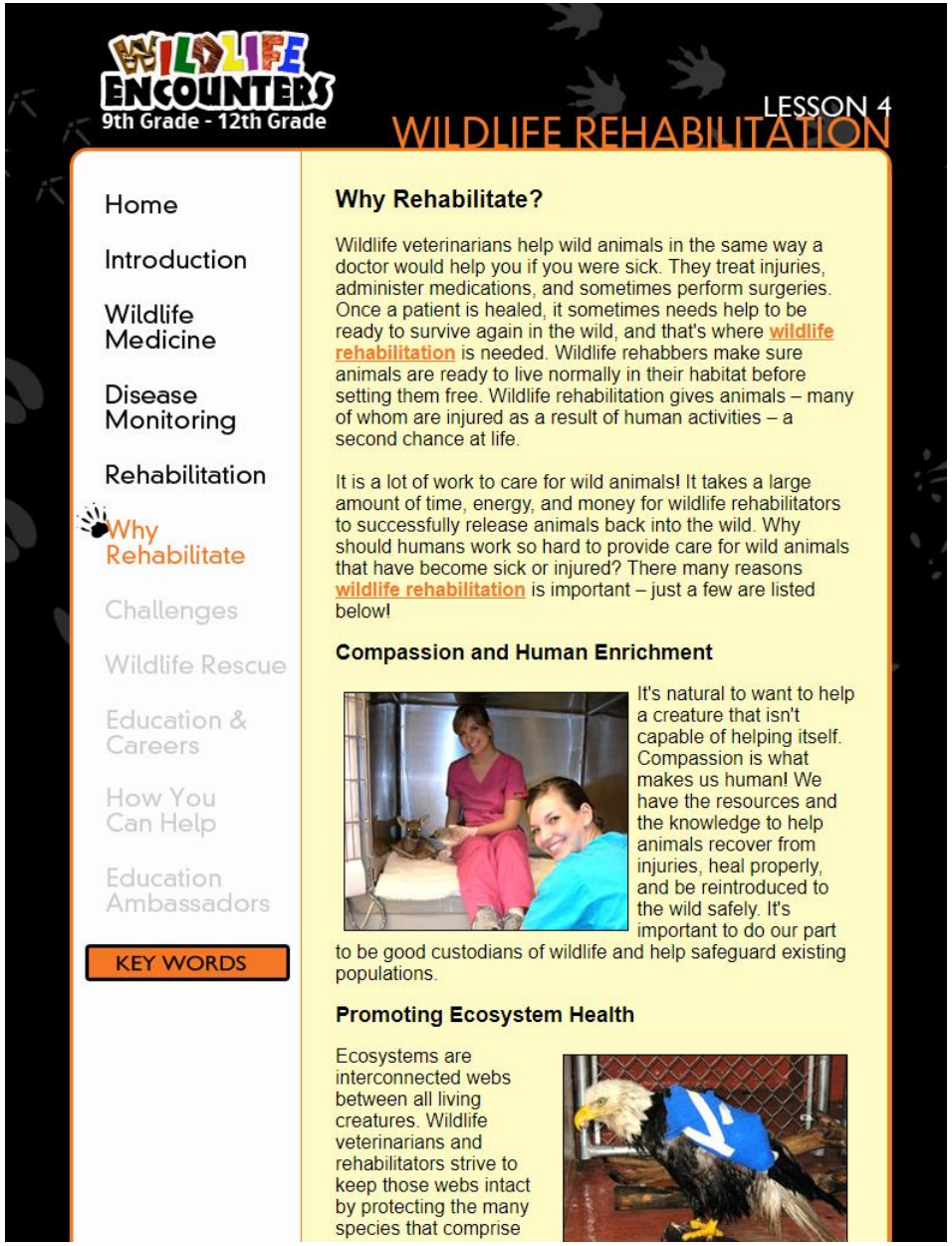
D 3
x 1

D 0
Wound Cleansing

*RabAvert® Novartis Vaccines Rev. 10/06
*IMOVAX® Sanofi Pasteur SA (December 2005)

Univ of Illinois Education

- Why Rehabilitate
  - Compassion and human enrichment
  - Promoting ecosystem health
  - Doctrine of state ownership
  - Responsible stewardship
  - Disease Monitoring



A Few Final Words about Species that Generate Many Questions…

Human Rabies, Bat Variant, US, 1990-2007
n = 34

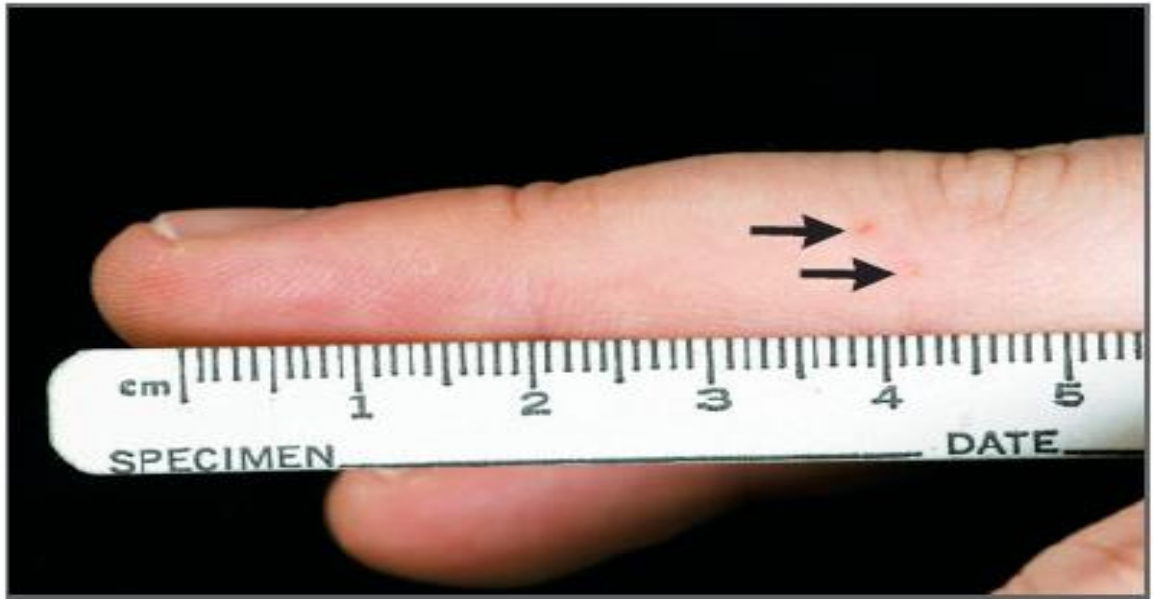
- 6 cases – bite reported
- 2 cases – physical contact reported
- 15 cases – bat documented in living space, no contact, no bite
- 11 cases – no bat encounter at all

MMWR Recommendations & Reports May 23, 2008 / 57(RR03);1-26,28

Why do Bats Pose Such a risk?

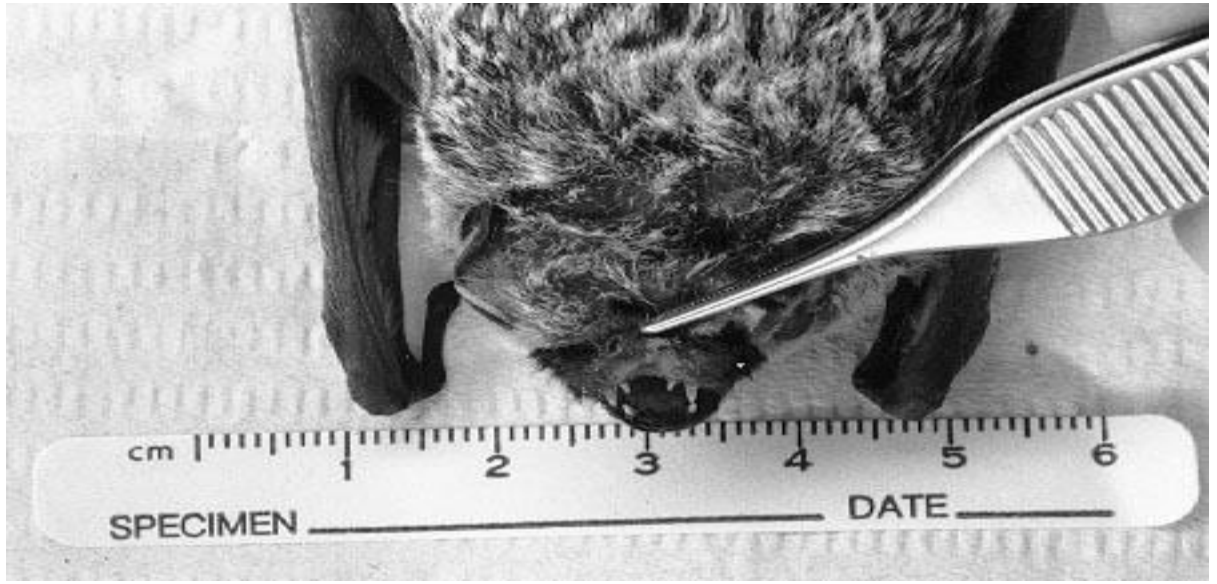
- **The virus from bats can replicate at a lower temperature, thus small superficial wounds from bat bites can lead to infection**
  - Characterization of a Unique Variant of Bat Rabies Virus Responsible for Newly Emerging Human Cases in North America. *Proc Natl Acad Sci USA* 1996;93:5653-5658
- **And / Or**
  - **Bat bites are not dramatic and may not be appreciated when they occur or when the patient is examined**
  - **Some may recognize the bite but not comprehend its implications**
  - **Others, such as young persons or those with disabilities may be unable to provide and accurate history of a bite**
    - Prophylaxis Against Rabies. *NEJM* 2004; 351:2626-2635

Why do Bats Pose Such a Risk?



The image to the left demonstrates minor puncture wounds from a bat bite (arrows point to wounds).

N Engl J Med 2004;351:2626-35.



Small Rodents Present a Low Risk of Transmission

What About Opossums?

- Opossums are relatively resistant to infection with rabies and are considered a low risk for infection
- The viral dose required to infect opossums is 80,000 times that required to infect a fox
    - Beamer, et. al. Resistance of the Opossum to Rabies Virus. AJVR. 1960 May;21:507-10.
- Rabies virus binds to nAChR in skeletal muscle
- A high content of receptors in muscle of red fox makes them susceptible
- Low content of receptors in muscle of opossums makes them resistant
    - Rabies susceptibility and acetylcholine receptor [Letter]. Lancet 1990;335:664–5.