Introduction to Communicable Disease Surveillance and Investigation in North Carolina

January 2014

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Rabies:
Human Risk Assessment

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Learning Objectives

- Recognize the public health significance of rabies
- Explain what constitutes a rabies exposure
- Explain pre-exposure prophylaxis and post exposure prophylaxis

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Rabies Resources

- **2013 NC Rabies Public Health Program Manual**
  http://epi.publichealth.nc.gov/cd/lhds/manuals/rabies/toc.html
- **Rabies Algorithms for Human Risk Assessment**
  http://epi.publichealth.nc.gov/cd/lhds/manuals/rabies/docs/forms_algorithms.pdf
- **Compendium of Rabies Prevention and Control**
  http://www.nasphv.org/Documents/RabiesCompendium.pdf
- **Centers for Disease Control – Rabies**
  http://www.cdc.gov/rabies/
- **Communicable Disease Branch Rabies On Call (24/7), 919-733-3419**

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Rabies Key Points

- Rabies is the most important zoonotic disease threat for humans and mammals in North Carolina.

- In North Carolina the rabies reservoirs are raccoons and bats; each species may be infected with their own species-specific variant of the rabies virus.

- Rabies is nearly 100% fatal. Prompt and appropriate wound care and post exposure prophylaxis will prevent the disease.

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Human Rabies Mortality Worldwide

Canine Variant overwhelmingly

- ~60,000 deaths per year *worldwide*
- >99% of human cases
- Asia and Africa mostly
- >50% children < 15 years

In the United States, we have had a few cases a year over the past 25 years.

- Bat Variant

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27 Cases of Human Rabies
United States
2002 – 2013

22 Bat variant : 18 natural, 4 organ transplant

- 28% Unknown exposures
- 72% Direct Contact or Bite exposure

3 Eastern Raccoon Variant

- 1 unknown, 1 hunter, 1 organ transplant

1 Dog/Mongoose

1 Unknown

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Raccoons - the Terrestrial Reservoir

All mammals are susceptible

Rabies can be transmitted to:

- wild mammals
- feral (wild) cats and dogs
- domestic mammals
- humans

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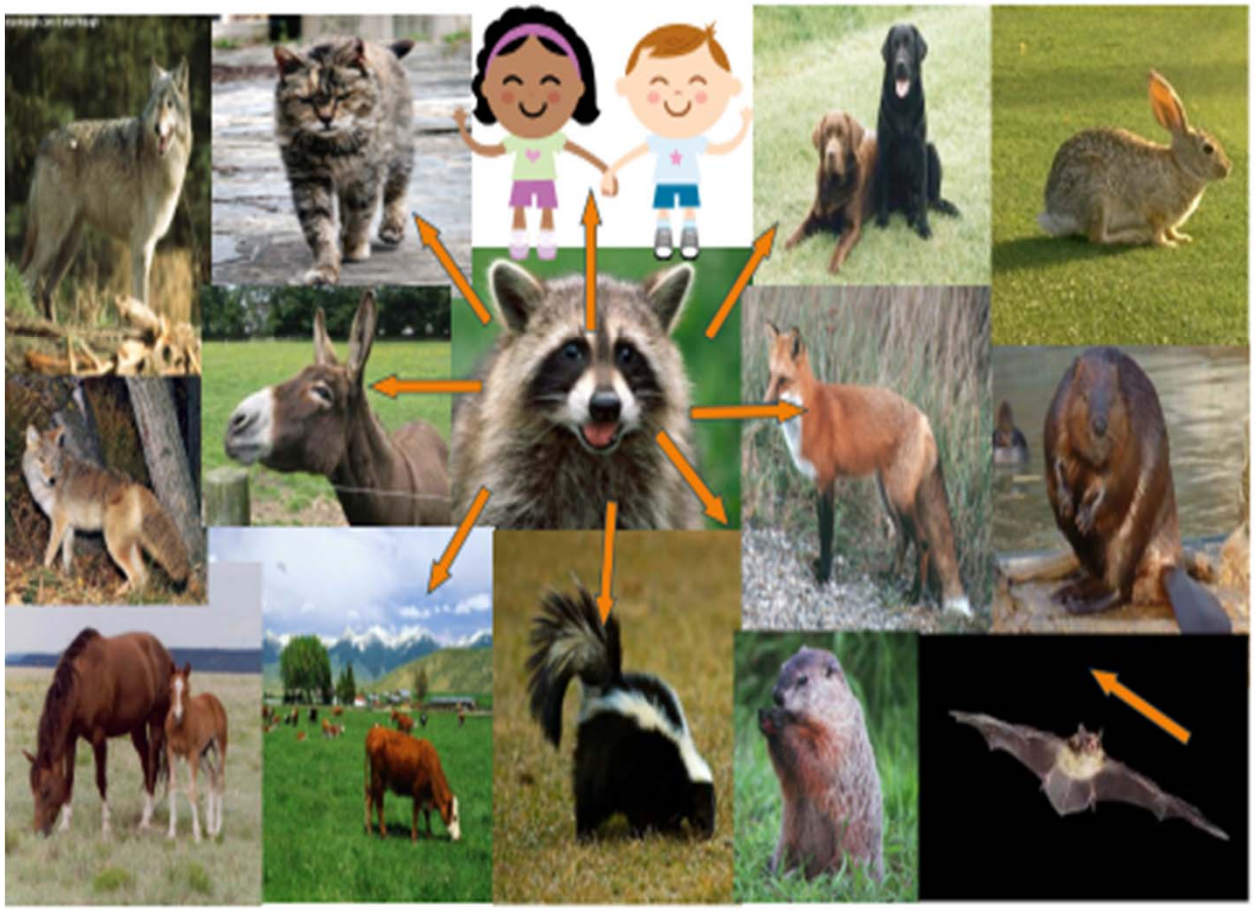
Any Mammal can Acquire Rabies
Any Mammal may Transmit Rabies



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N.C. Wildlife Reasonably Suspected of Having Rabies = High Risk Species

- Raccoons
- Bats
- Red and Gray Foxes
- Striped and Spotted Skunks
- Bobcats
- Coyotes
- Wild Carnivores
- Beavers
- Groundhogs (Woodchucks)

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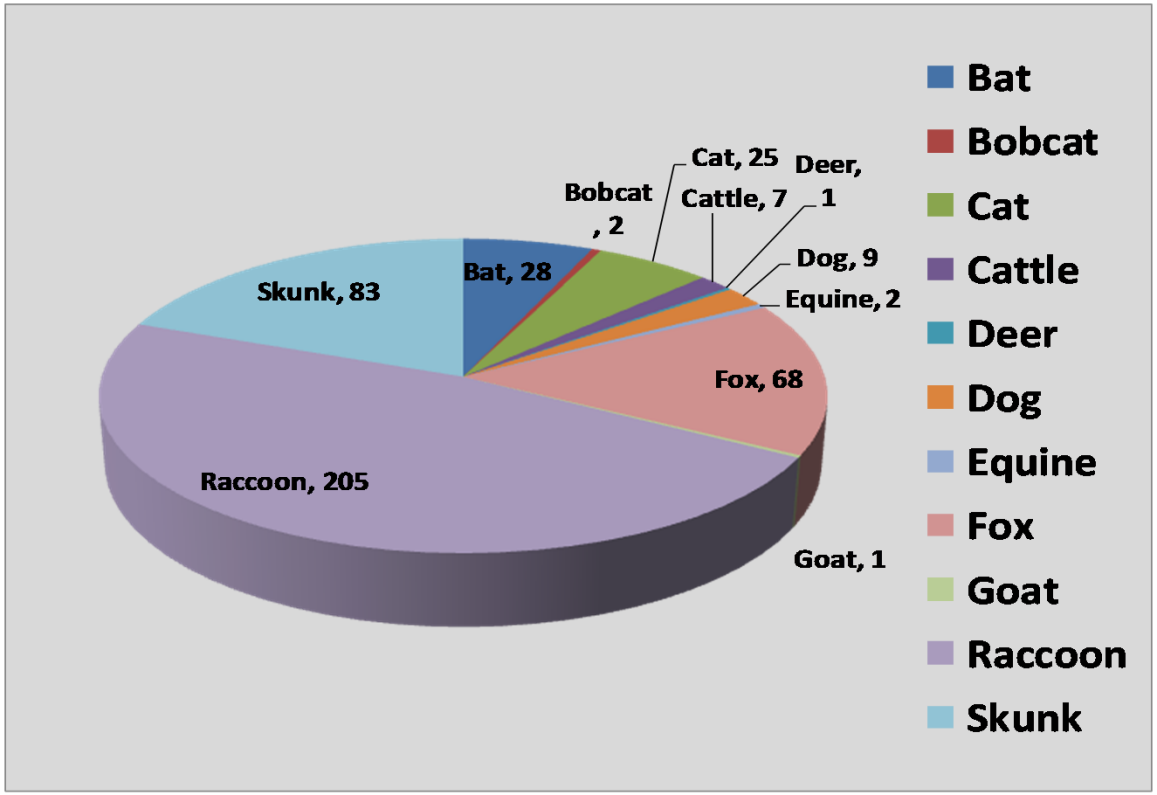
N.C. Rabies: Positive Mammals by Species, 2012 (n = 431)

Species	% Positive by Species Tested
Bat	2.41
Bobcat	50.00 (1/2)
Cat	2.31
Cattle	9.59
Deer	100.00 (1/1)
Dog	1.05
Equine	2.86
Fox	53.13
Goat	2.50
Raccoon	43.43
Skunk	72.17
Total % Positive	10.40



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Source: NC State Laboratory of Public Health

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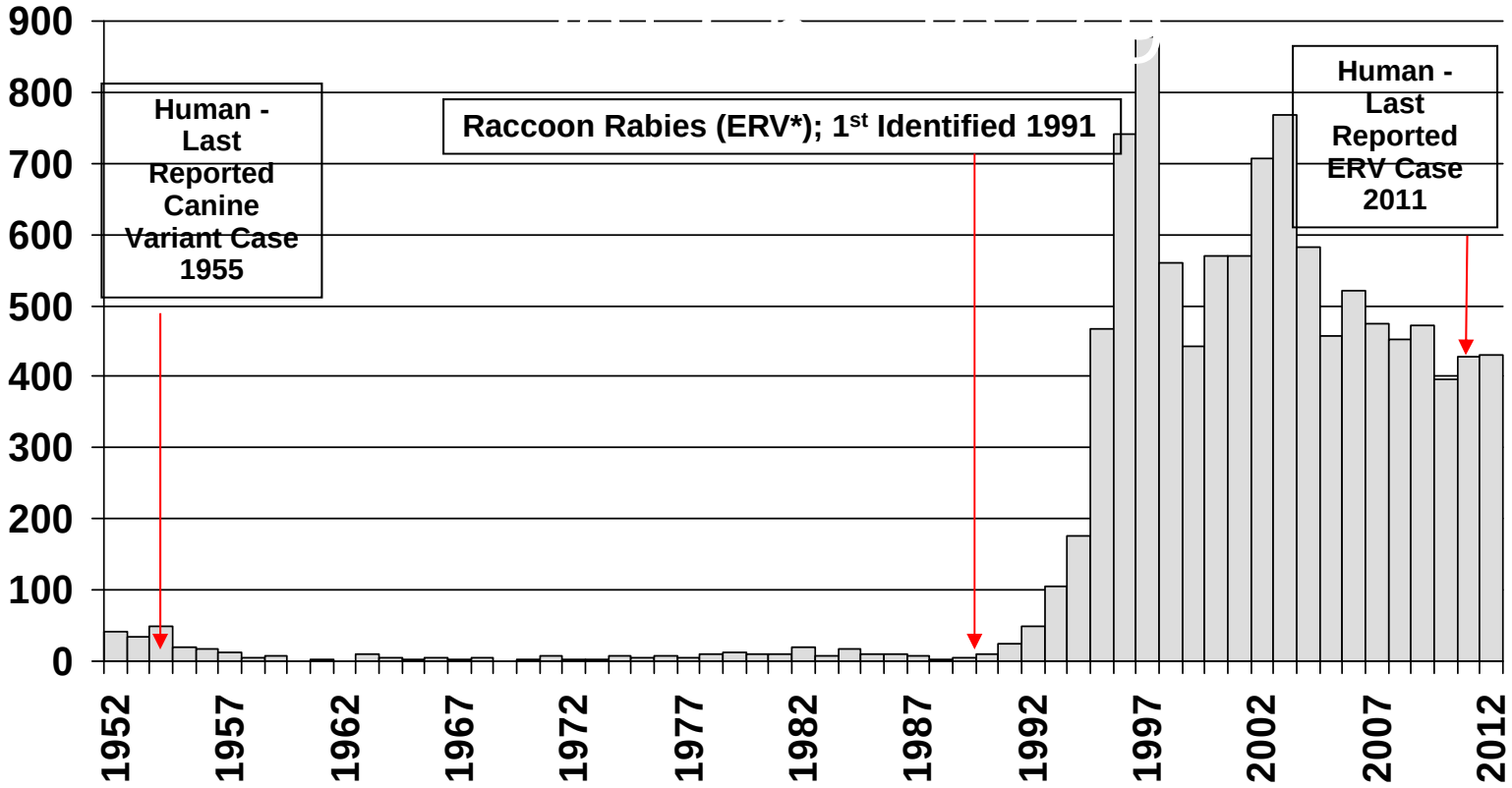
Confirmed Rabid Mammals North Carolina, 1952-2012, n =10,669



Source: NC State Laboratory of Public Health
Updated August 2013

*ERV – Eastern Raccoon Variant

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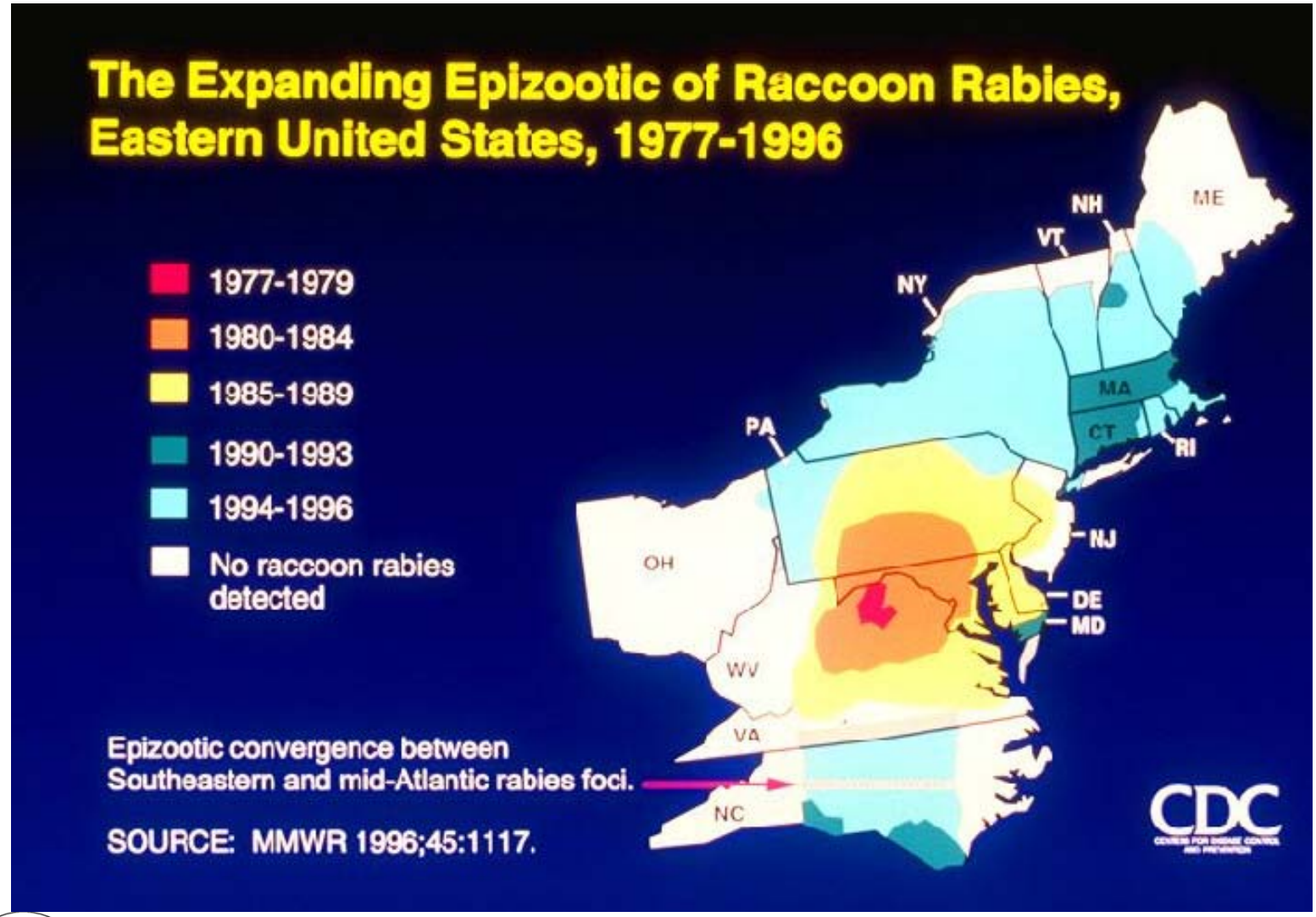

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How does Rabies Virus make you Sick?

- Rabid animal bites
- Virus attaches to healthy nerve cell
- Virus replicates
- Virus travels through nervous system

Never handle bats with bare hands!

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How does Rabies make you Sick?

- Virus moves to the spinal cord, brain and salivary glands
- Brain swelling
- Coma and death

Rabies is 100% fatal without treatment!

How is Rabies Transmitted?

Bites – Highest risk, most common

Non-bites – Consult local health dept.

saliva or tears to open wound (scratch)

saliva or tears to mucous membrane

nervous tissue to open wound (scratch)

nervous tissue to mucous membrane

Bats – any potential direct contact requires a risk assessment

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What is an Exposure to Rabies ?

Any bite, scratch or other situation in which saliva or central nervous system (CNS) tissue or tears* from a potentially rabid or confirmed rabid animal enters an open wound, or comes in contact with a mucous membrane by entering the eye, mouth or nose.

**World Health Organization Expert Consultation on Rabies. Second Report; 2013.*

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What is a Bat Exposure?

Thoroughly evaluation all potential exposures

- If more than 1 bat, is there an infestation ?
- If a single bat was it captured and tested ?
- Direct contact with bat ?

Was the bat found in the same room with:

- a previously sleeping person?
- a previously unattended child, mentally disabled person, or intoxicated person?

Request help from N.C. Veterinary Public Health

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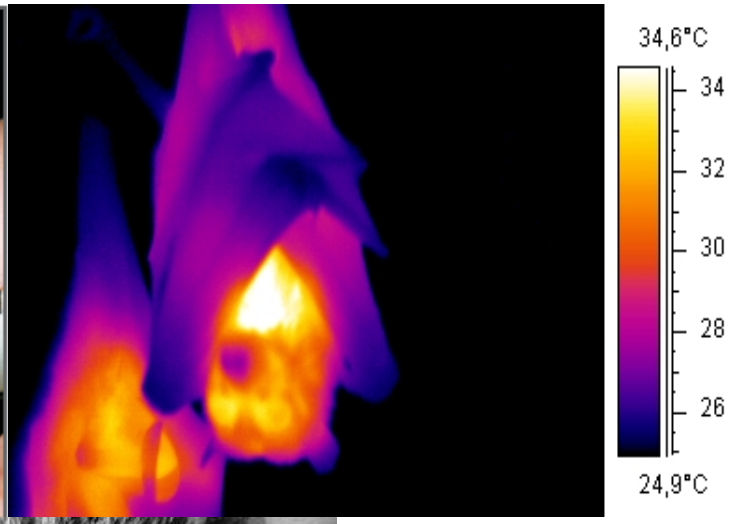
Why do Bats Pose Such a Risk?



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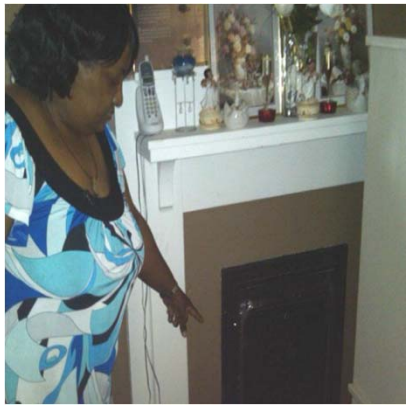
Sixty Participants In Camp D.A.R.E. Get Rabies Shots After Bat Infestation
7/15 Hendersonville NC

Group to get rabies shots after being exposed to bats on mission trip,
7/10 Thomasville NC



Woman Plagued By Bats In Chimney
Tenant: Landlord Closed Live Bats Inside Chimney
7/16 Greenville SC

Human Rabies – South Carolina, 2011

In situations in which bats are physically present and the person(s) cannot exclude the possibility of a bite, post exposure treatment should be considered. Unless it was a solitary bat, and prompt testing of the bat has ruled out rabies infection.

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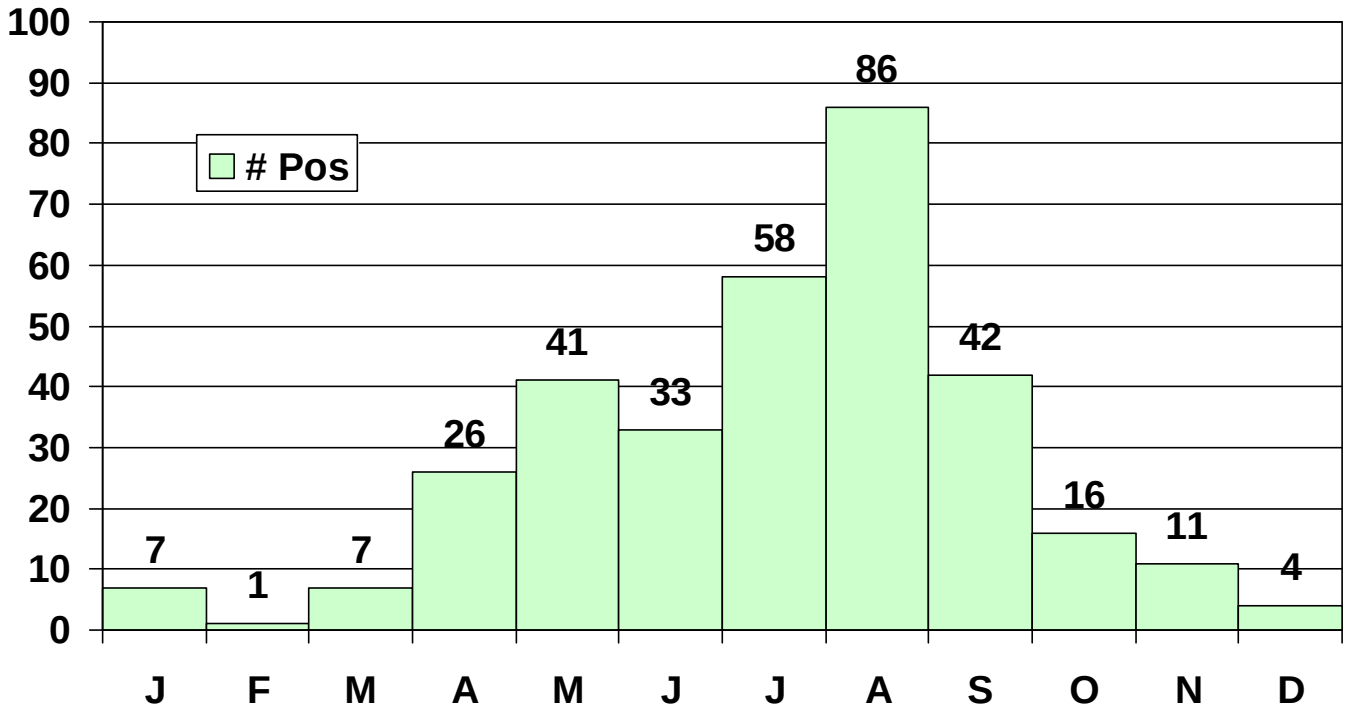
Seasonality of Positive Bats in NC, 2002-2012 (n = 333), SLPH



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Exposure Risk Assessment

Refer to N.C. Rabies Control Manual Appendix: Algorithms

Does the exposure meet the CDC definition?

When did the exposure occur?

Animal species? Wild or domestic?

Low or high risk?

Can the animal be positively identified?

Provoked or unprovoked bite?

If low risk – sick or prior injury ?

Animal captured? Tested negative?

- Wild rabies vector – within 24-48 hours?
- Domestic dog or cat – within 72 hours?

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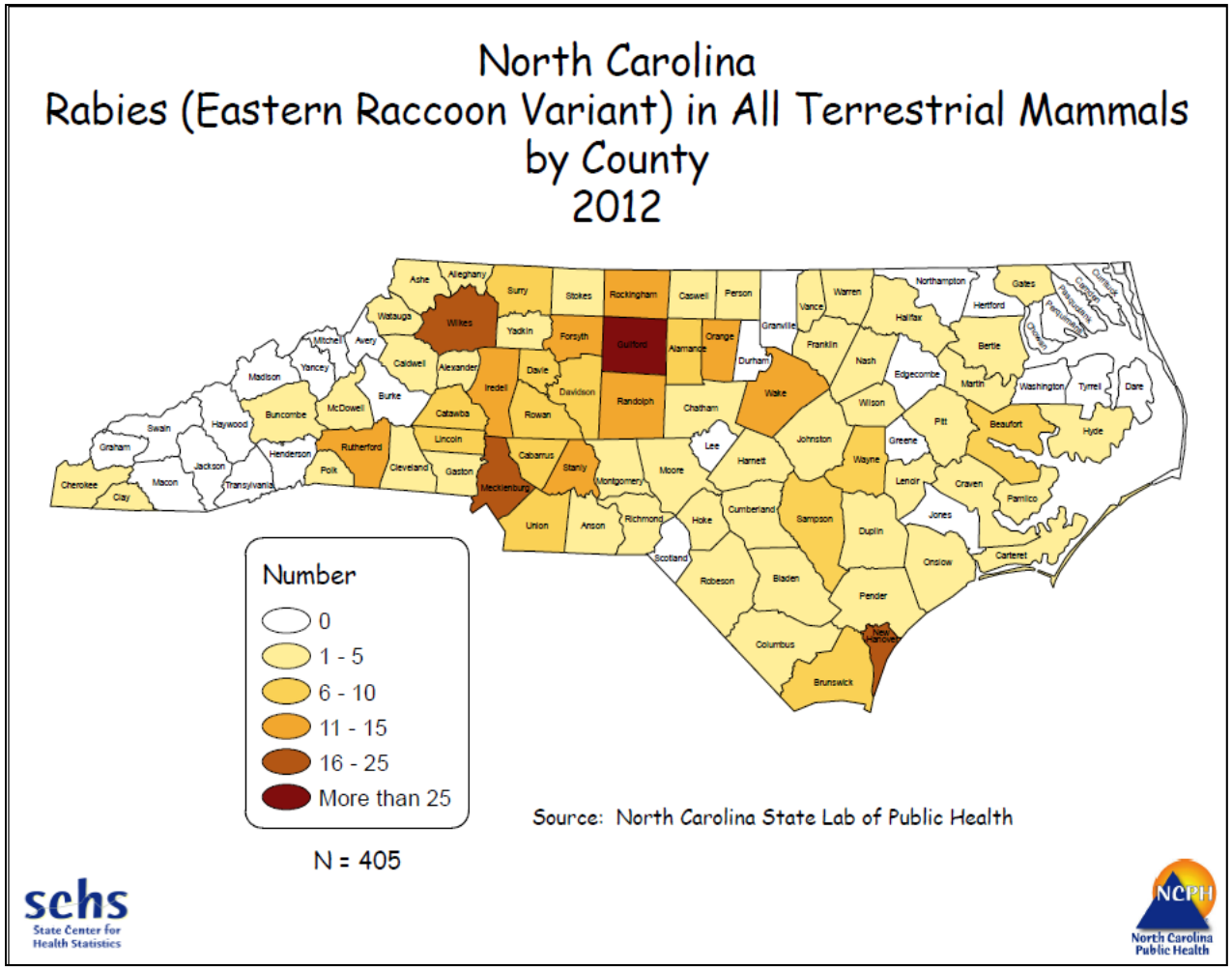
LHDs enforce the N.C. Rabies Law
Rabies is Endemic in Every County



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130A-185. Vaccination required

a) Vaccination required. - The *owner* of an animal listed in this subsection over four months of age shall have the animal vaccinated against rabies.

(1) Cat.

(2) Dog.

(3) Ferret.

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130A-196. Notice and confinement of biting animals

Reported to Local Health Director:
Dog, Cat, Ferret

- Attending physician – 24 hours
- Person bitten
- Owner of animal
- Person in control of animal

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Incubation and Shedding Periods

Animal exposed to rabies virus

Incubation period up to 6 months

Onset of signs of disease

Appears healthy – non infectious

3-7 days

Excretion of virus from salivary glands

Shedding period

Death

NC Rabies Law

SHEDDING

§ 130A-196

- Dog, cat, ferret bites a human
- 10-day confinement
- Shedding period (up to 10 days)

INCUBATION

§ 130A-197

- Potentially rabid or rabid animal bites unvaccinated dog, cat or ferret
- 6 month quarantine or euthanasia (LHD decides)
- Incubation period (up to 6 months)

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NC Rabies Law
130A-197

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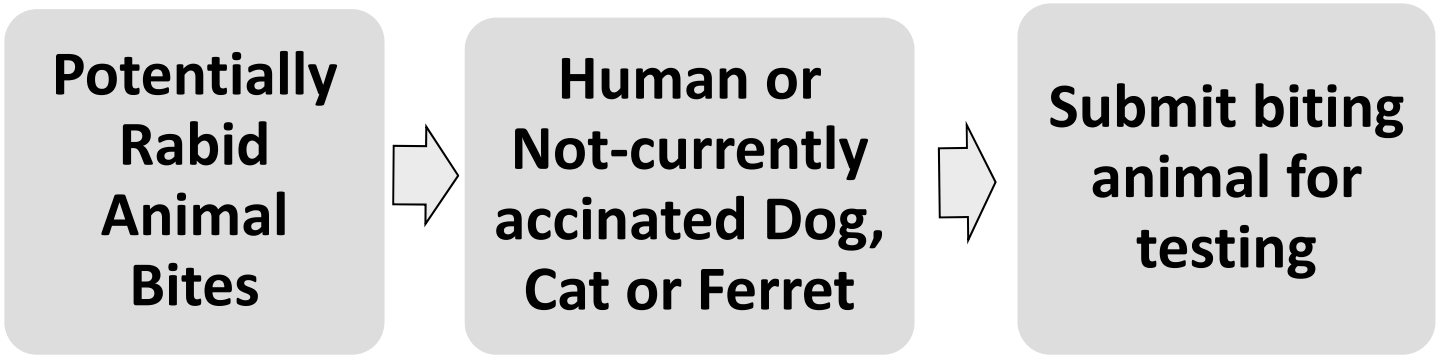
NC Rabies Laws
130A-197



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Dog, Cat or Ferret Bite

If animal is not captured and placed in a 10 day confinement within 72 hours,

Begin PEP.

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Rabies Biologics

- Human rabies vaccines
  - Sanofi Pasteur
  - Novartis
- Human Rabies Immune Globulin (HRIG)
  - Sanofi Pasteur
  - Grifols Therapeutics, INC (formerly Talecris)

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Who should receive the Rabies *Pre-exposure* Vaccination Regimen?

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

http://www.cdc.gov/rabies/news/RabVaxupdate.html

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Pre-exposure Immunization Regimen for People

- **3 doses of Rabies Vaccine**
- **Days 0, 7, and 21 or 28**
- **Where? Local Health Department, Physician or Travel Clinic**
- **RFFIT Titers - q 2 years or 6 mos. (laboratorians)**

RabAvert RABIES VACCINE

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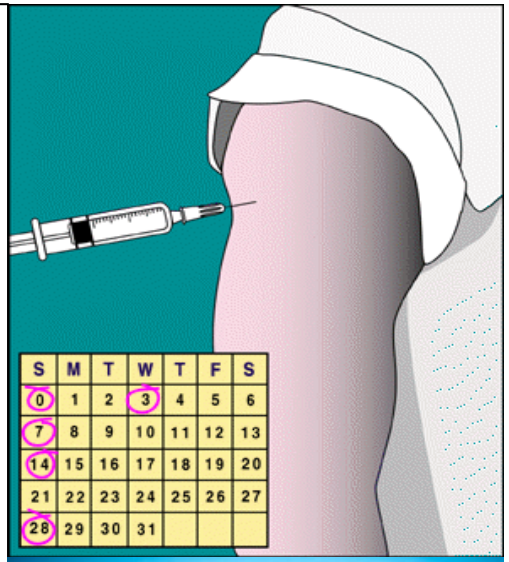
Postexposure Rabies Vaccination for People - *Not Previously Vaccinated*

I. Wound Cleansing; Tetanus;
+/- Antibiotics (HCP)

II. 4 Doses of Vaccine
(5 if immune compromised)
Days 0, 3, 7, 14
AND

III. Human Rabies Immune Globulin (HRIG)
20 IU/kg body weight, Day 0



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2010 ACIP Recommendations
Human Rabies Postexposure Prophylaxis

Day →	0	3	7	14	28
2010 ACIP	1.0 ml vaccine IM (deltoid) & 20 IU/kg HRIG	1.0 ml vaccine IM (deltoid)	1.0 ml vaccine IM (deltoid)	1.0 ml vaccine IM (deltoid)	No vaccine given
2010 Immune Compro-mised	1.0 ml vaccine* IM (deltoid) & 20 IU/kg HRIG	1.0 ml vaccine IM (deltoid)	1.0 ml vaccine IM (deltoid)	1.0 ml vaccine IM (deltoid)	1.0 ml vaccine IM (deltoid)

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Post-Exposure Rabies Vaccinations for *Previously vaccinated Humans*

I. Wound Cleansing; Tetanus; +/- Antibiotics (HCP)

II. 2 Doses of Rabies Vaccine

Days 0, 3

NO HRIG!

Remember: If a person has had a complete regimen before, they still need 2 boosters if they have an exposure.

*

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Risk of Rabies Without PEP* After Exposure to a Rabid Animal

multiple severe bites around the face	80%-100%
single bite	15%-40%
superficial bite(s) on an extremity	5%-10%
contamination of open wound by saliva	0.1%
transmission via fomites (e.g., tree branch)	no cases reported
indirect transmission (e.g., raccoon saliva on a dog)	no cases reported

*PEP = post-exposure prophylaxis

Weber DJ, et al: Rabies (see Suggested Reading)

Bruner, Counselman. Revisiting Rabies. *Emerg Med* 39(8):30, 2007

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Veterinary Public Health Contact Information

1902 Mail Service Center
Raleigh NC 27699-1902

Phone: (919) 733-3410/733-3419
FAX: (919) 733-9555

http://epi.publichealth.nc.gov/cd/diseases/rabies.html

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Working for a healthier and safer North Carolina
Everywhere. Everyday. Everybody.

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References

- NC Rabies Public Health Program Manual
  http://epi.publichealth.nc.gov/cd/lhds/manuals/rabies/toc.html
- CDC - ACIP Recommendations, 2008 & 2010
- NC Rabies Laws - Chapter 130A, Part 6. Rabies
- Rabies Pathogenesis Diagram
- Rabies Algorithms
  - Evaluation of Animal Bites for Rabies Risk
  - Protocol for Dogs and Cats Exposed to Rabies
- Pre-exposure Prophylaxis
- Post-exposure Prophylaxis Treatment
- Affidavit for Indigent Status - Request for
  Free State-Supplied Rabies Vaccine

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References

- **NC Rabies Public Health Program Manual**
  http://epi.publichealth.nc.gov/cd/lhds/manuals/rabies/toc.html
- **NC State Laboratory Public Health – Virology – Rabies**
  http://slph.state.nc.us/virology-serology/rabies.asp
- **Centers for Disease Control : Rabies**
  http://www.cdc.gov/RABIES/
- **NC Division of Public Health: Rabies Control and Prevention**
  http://epi.publichealth.nc.gov/cd/rabies/control.html
- **NC Rabies Facts and Figures**
  http://epi.publichealth.nc.gov/cd/rabies/figures.html

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