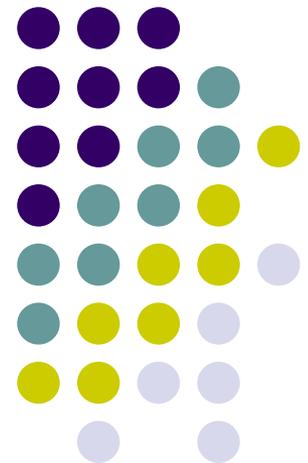
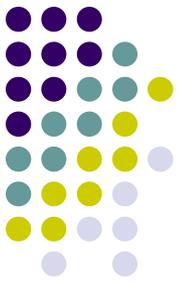


Rabies- Public Health Surveillance and Disease Investigation

Marilyn Goss Haskell, DVM, MPH
NC DHHS Public Health Veterinarian
Veterinary Epidemiologist
North Carolina Division of Public Health

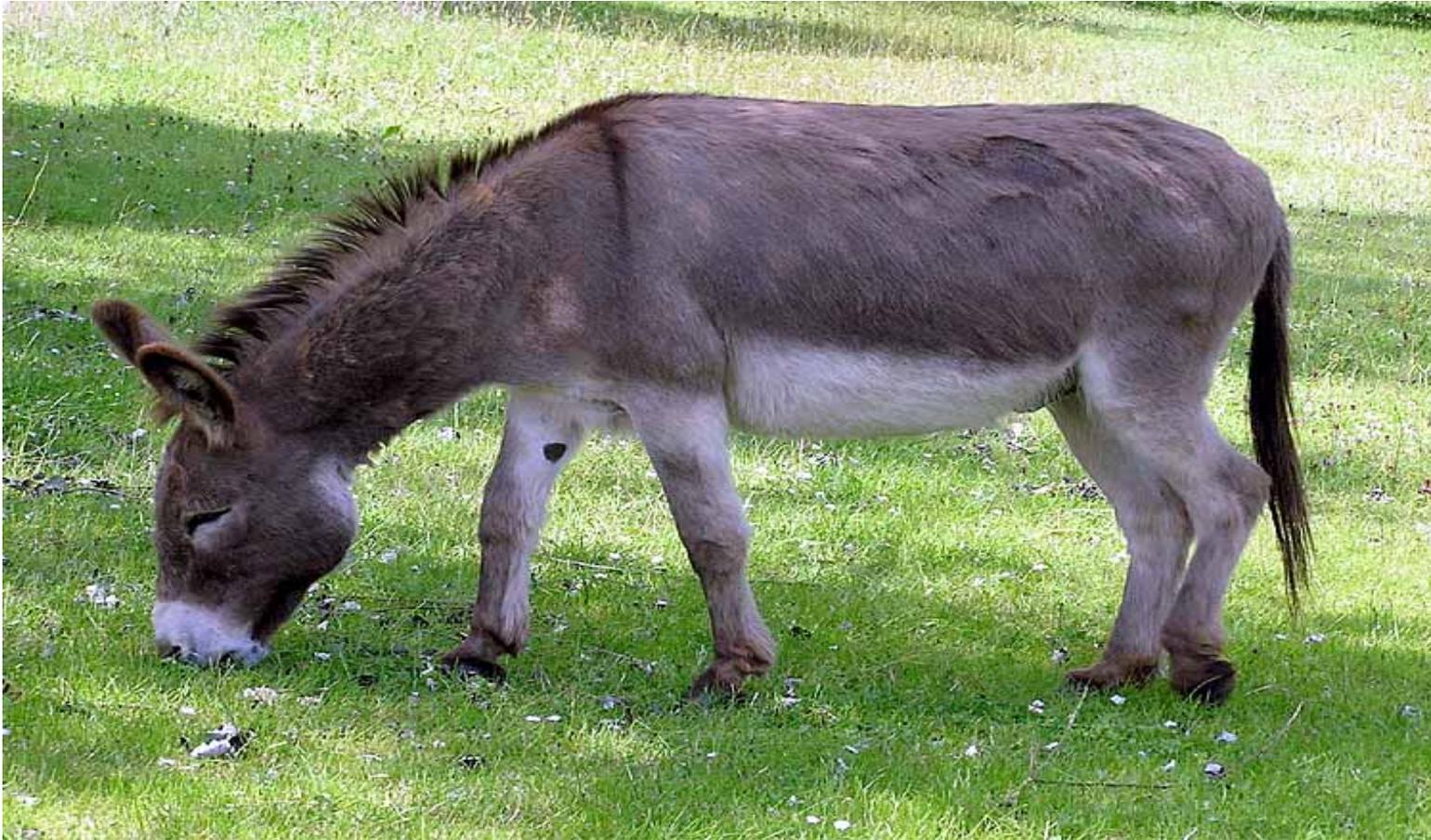
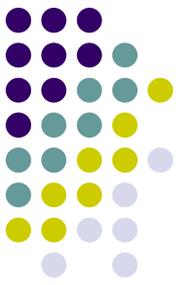




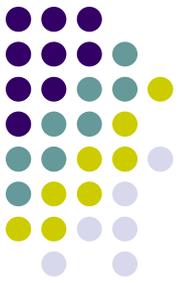
Learning Objectives

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

Do donkeys get rabies?



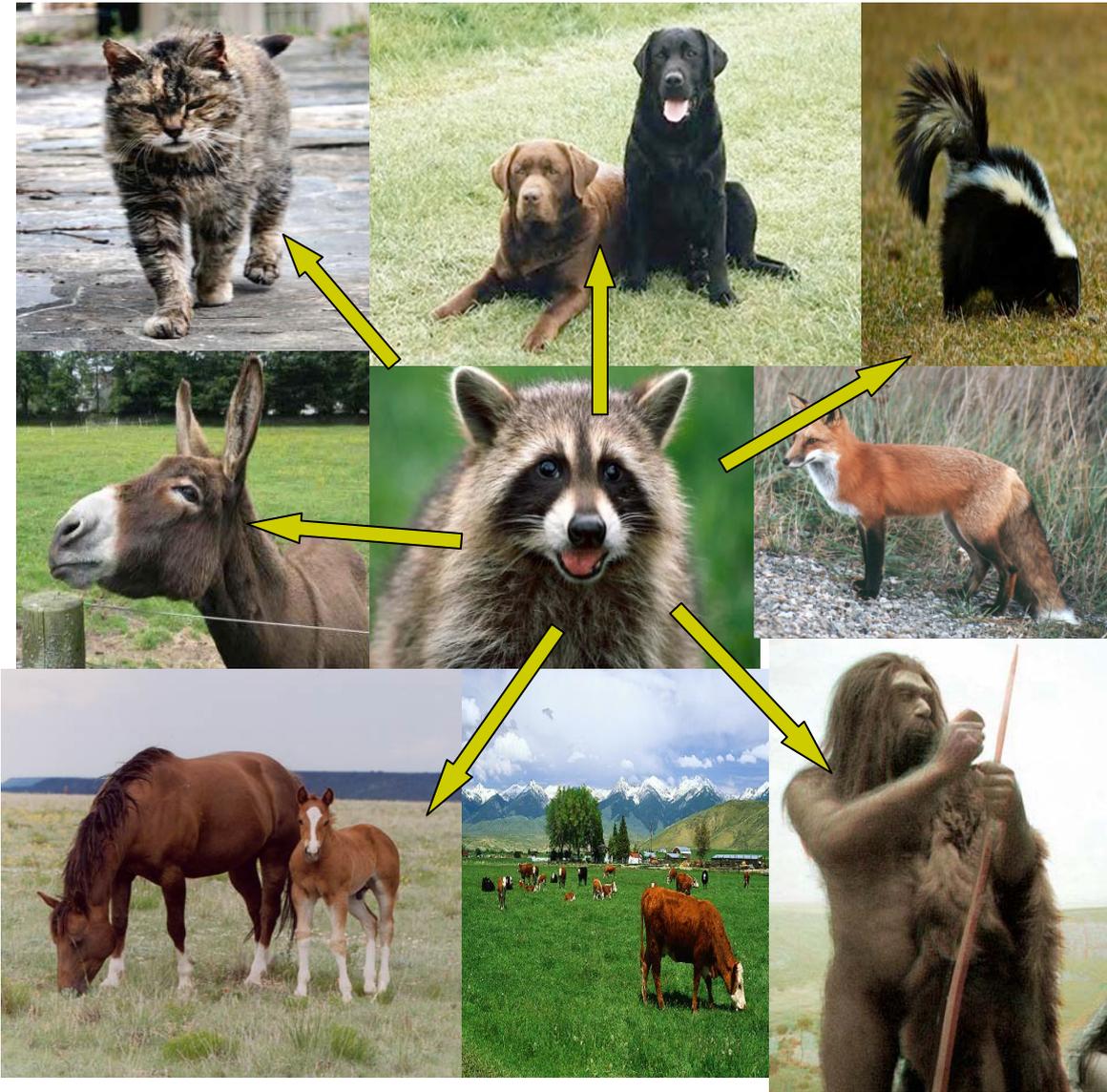
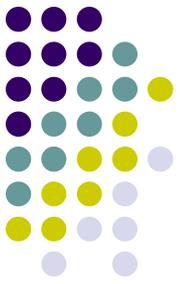
Raccoons - the Terrestrial Reservoir



- All mammals susceptible
- Can transmit rabies to
 - wild mammals
 - feral mammals
 - domestic mammals
 - humans



<http://phil.cdc.gov/phil/>

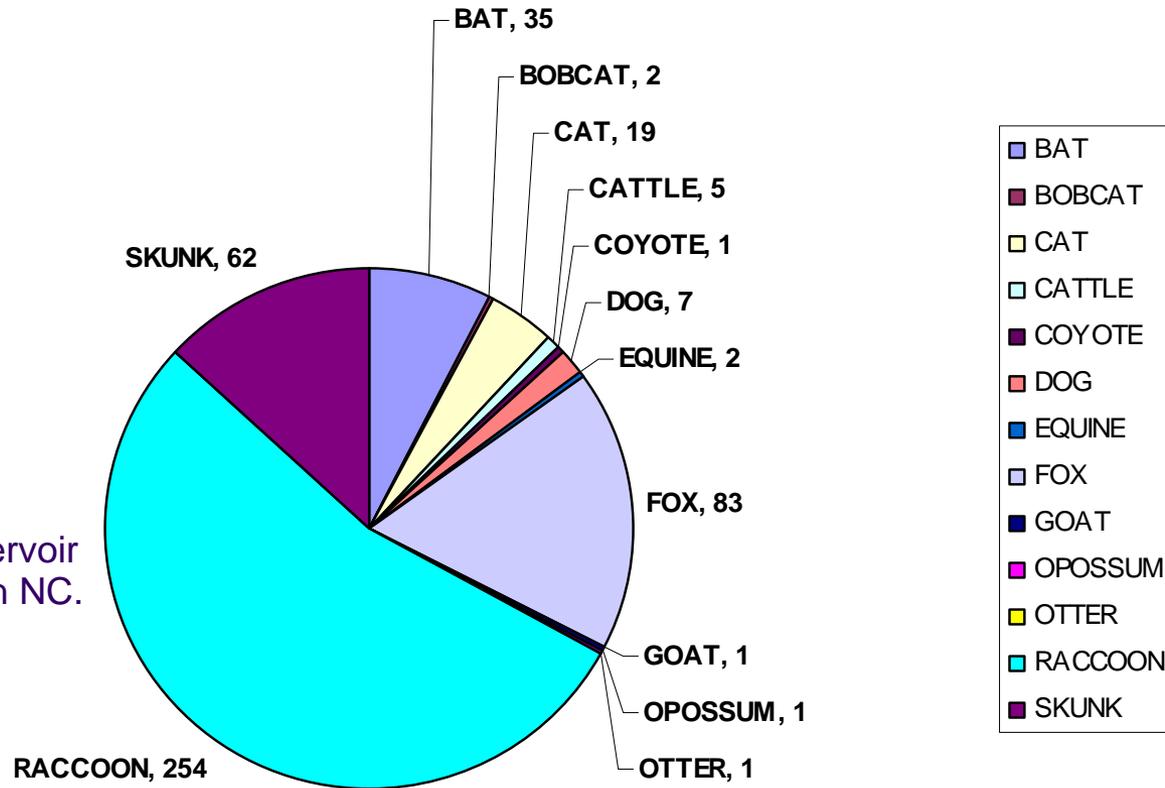




High Risk Species

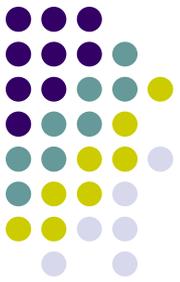
- **Raccoons**
- **Bats**
- **Red and Gray Foxes**
- **Striped and Spotted Skunks**
- **Bobcats**
- **Coyotes**
- **Beavers**
- **Groundhogs (Woodchucks)**

Rabies: Positives by Species, North Carolina 2009, (N = 473)



Raccoons are the reservoir and carrier for rabies in NC.

Human Rabies



- Human mortality
 - 55,000 deaths per year *worldwide*
 - 95% in Africa and Asia
 - Uncontrolled *canine variant* rabies
- US - past 25 years, a few cases per year
 - Overwhelming majority - Bat Variant



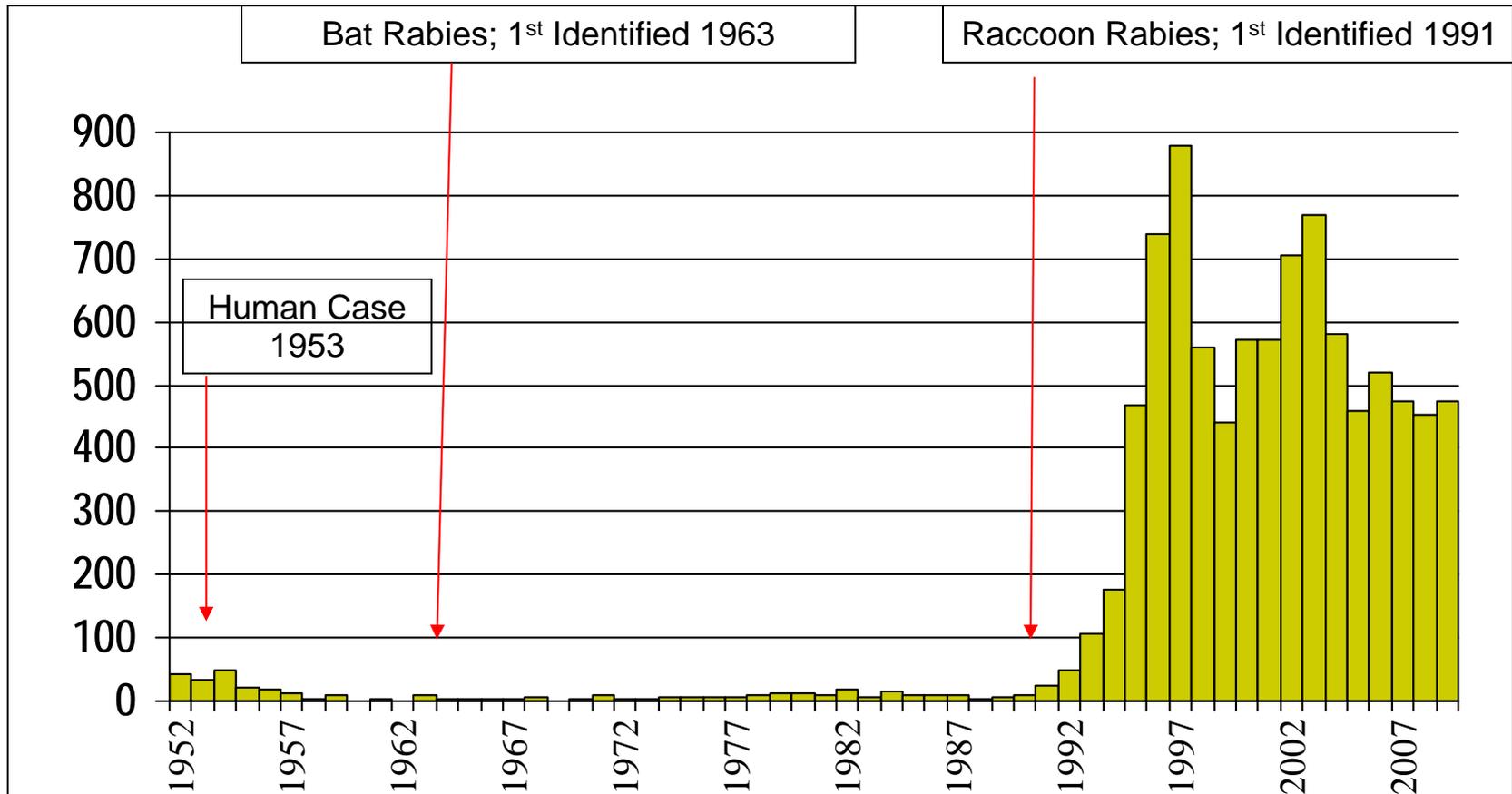
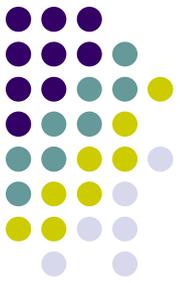
US Human Rabies

2000-2010, N=31

- **25.8% (8) infected outside US**
- **74.2% (23) infected in US (indigenous)**
 - **78.3% (18) bat variant**
 - **15 (83.3%) bite or direct contact**
 - **3 (16.7%) no known exposure**
 - **4 bat variant organ transplants**
 - **1 raccoon variant, 2003 VA**

Confirmed Rabid Mammals

NC 1952-2009 N= 9,412



The Expanding Epizootic of Raccoon Rabies, Eastern United States, 1977-1996

- 1977-1979
- 1980-1984
- 1985-1989
- 1990-1993
- 1994-1996
- No raccoon rabies detected

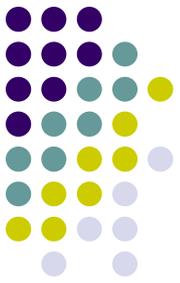


Epizootic convergence between Southeastern and mid-Atlantic rabies foci.

SOURCE: MMWR 1996;45:1117.

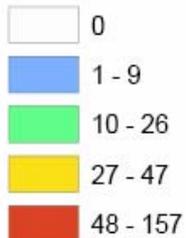


Major rabies virus variants

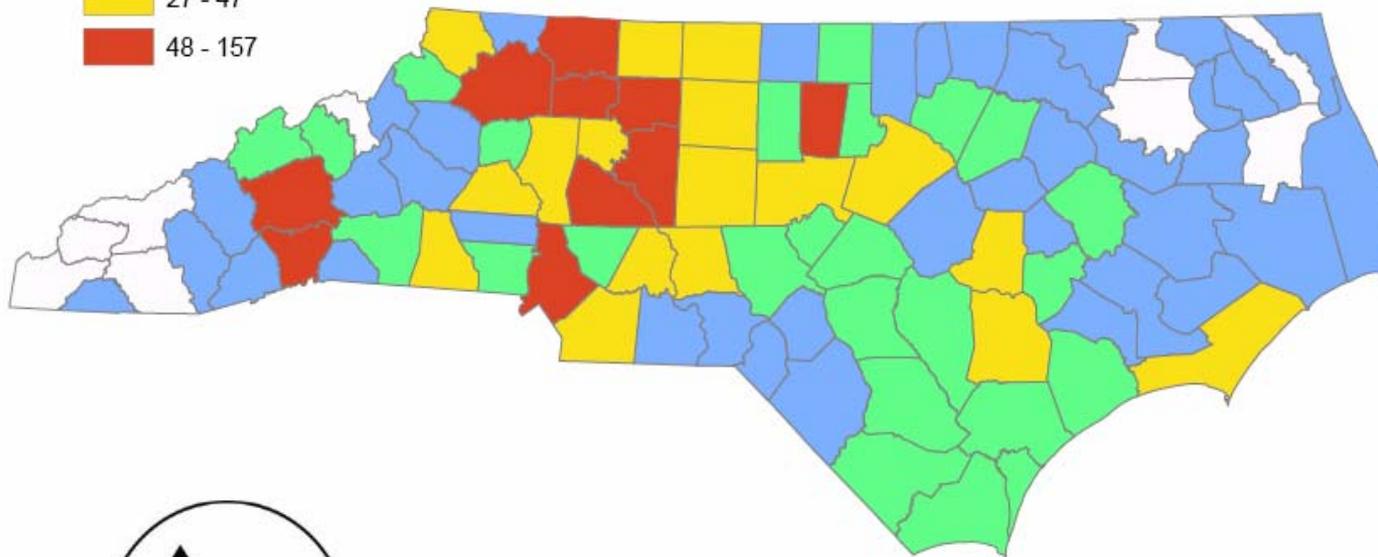


Cases by County

Number

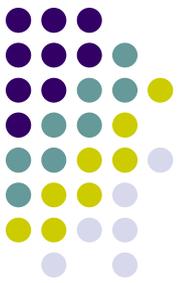


Rabies Cases, Common Raccoon North Carolina, 2001 - 2005 n = 1973



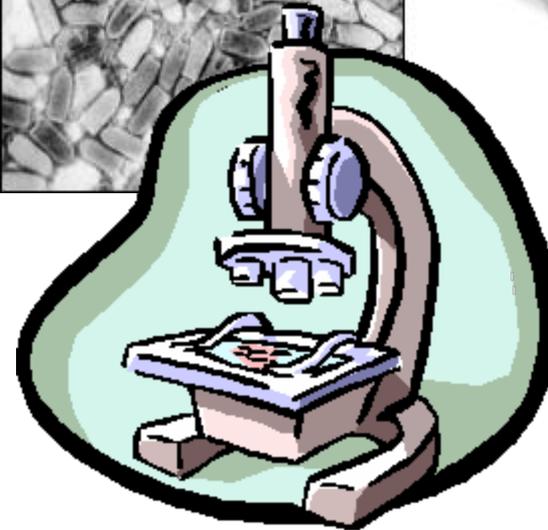
Data Source: NC State Laboratory of Public Health





What causes rabies?

- A RNA virus
- Microscopic
- Other RNA viral diseases
 - Common cold, Measles, Flu, AIDS



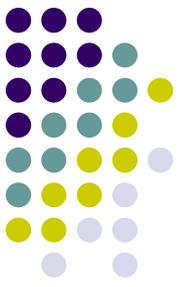


How does rabies make you sick?

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



**NEVER HANDLE BATS
WITH BARE HANDS!**

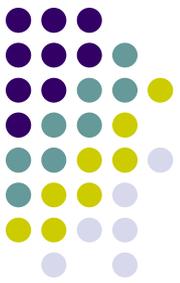


How does rabies make you sick?

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

Rabies is 100% fatal without treatment!

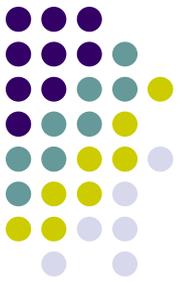




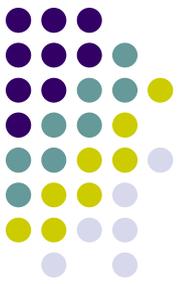
How is rabies transmitted?

- **Bites – Highest risk, most common**
- **Non-bites – a risk – consultations to LHD**
 - Saliva to open wound, scratch, abrasion
 - Saliva to mucous membrane
 - Nervous tissue to open wound, scratch, abrasion
 - Nervous tissue to mucous membrane
- **Bats – any direct contact or suspect contact**

What is an exposure to rabies ?



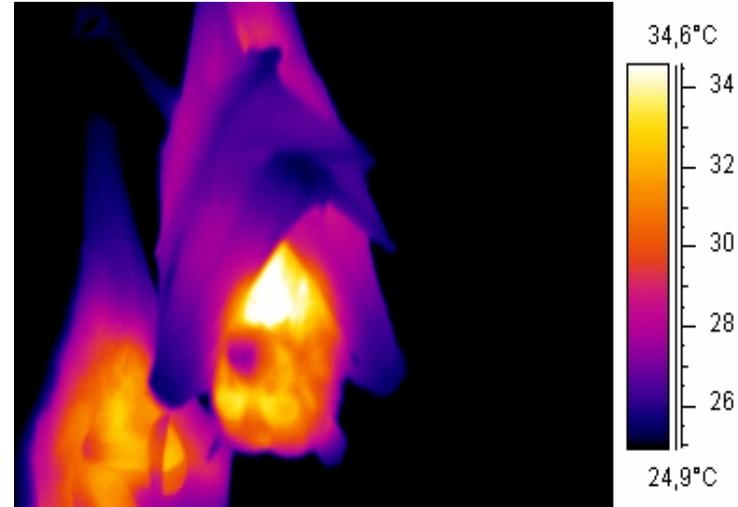
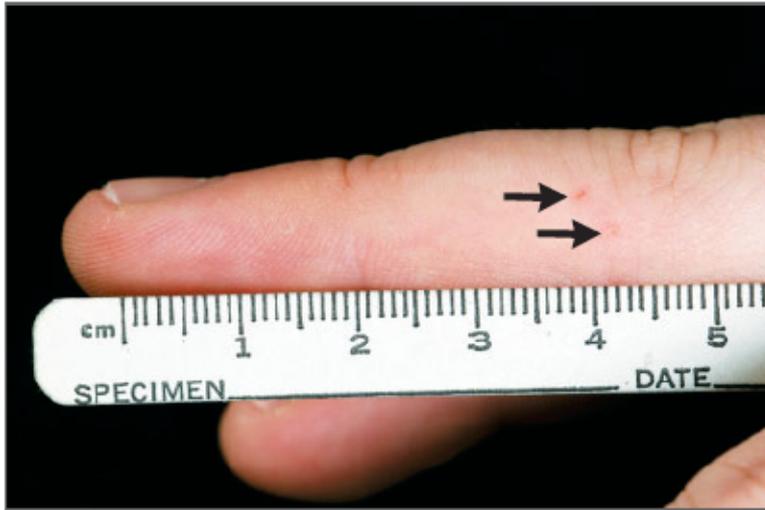
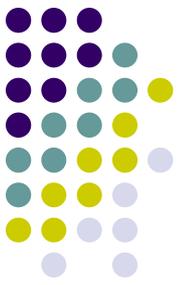
Any bite, scratch or other situation in which saliva or Central Nervous System (CNS) tissue from a potentially rabid or confirmed rabid animal enters an open wound, or comes in contact with a mucous membrane by entering the eye, mouth or nose.

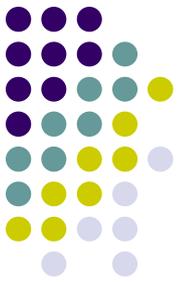


What is a bat exposure?

- Thorough evaluation of all exposures
- Has bat been captured and tested?
- Direct contact with bat?
- Was bat found in the same room with:
 - a previously sleeping person,
 - a previously unattended child, mentally disabled person, or intoxicated person
- Request help from Veterinary Public Health

Why do Bats Pose Such a Risk?

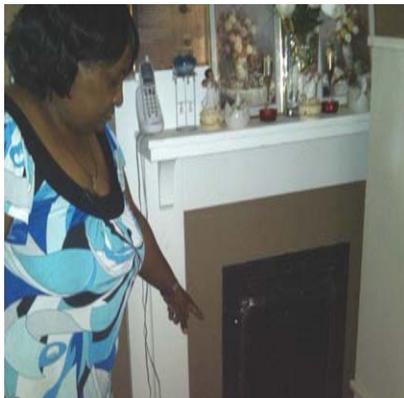




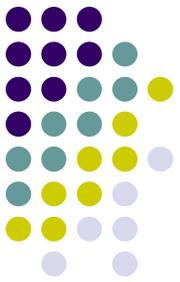
**Sixty Participants In Camp D.A.R.E.
Get Rabies Shots After Bat Infestation
7/15 Hendersonville NC**



**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**



Exposure Risk Assessment

- Does the exposure meet CDC definition ?
- When ?
- Animal species? Wild or domestic?
- Low or high risk ?
- Can animal be positively identified?
- Provoked or unprovoked bite? If low risk – sick or prior injury?
- Animal captured? Tested negative?
 - Wild rabies vector – within 24 hours?
 - Domestic dog or cat – within 48 hours?

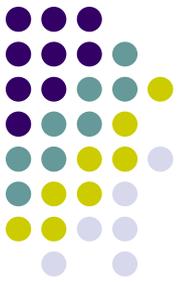


Notice and confinement of biting animals

Dog, Cat, Ferret: Reports

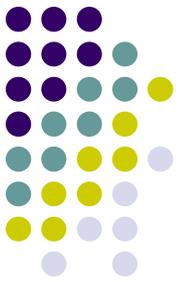
- **Attending physician**
- **Person bitten**
- **Owner of animal**
- **Reportable to local health director**





Vaccination

- **NCGS 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.**



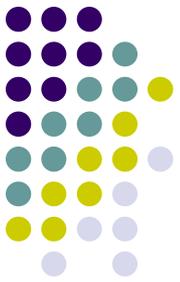
NC Rabies Laws

Shedding

- §130A-196
- Dog, cat, ferret bites human
- 10-day Confinement
- “shedding” period

Incubation

- §130A-197
- Potentially rabid or rabid animal bites
- 6 month quarantine or euthanasia (LHD decides)
- Incubation period (up to 6 months)



Incubation and Shedding Periods



Animal exposed to rabies virus

Incubation period up to 6 months

Onset of signs of disease



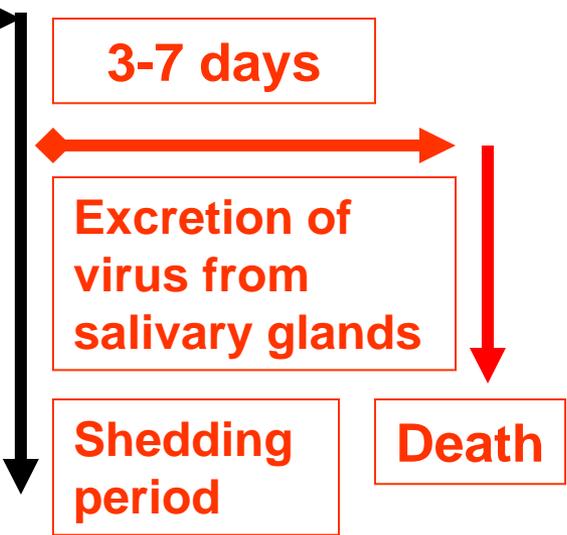
Appears healthy – non infectious

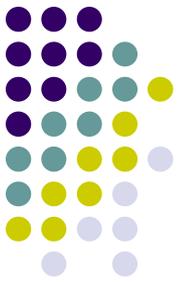
3-7 days

Excretion of virus from salivary glands

Shedding period

Death

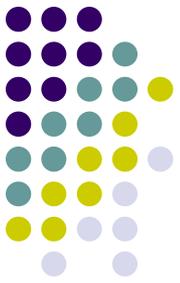


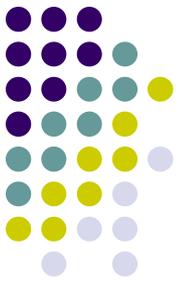


NC Rabies Laws

- **Rabid animal bites (vaccinated, domestic)**
- **Booster within 5 days**
- **Call Animal Control**

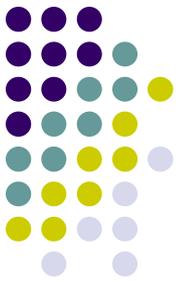






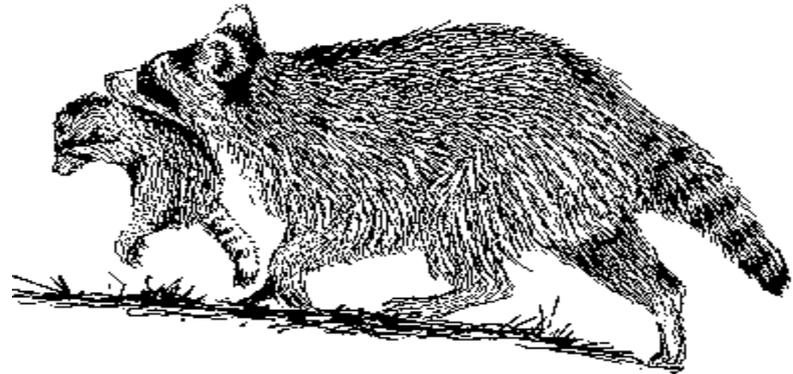
NC Rabies Laws

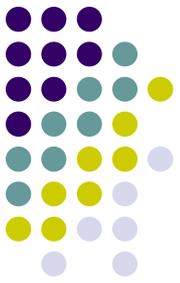
- Dog, cat, ferret bites person
- Report to LHD
- Call ACS to capture animal
- Regardless of vaccination status
- 10-day confinement
- If not captured within 48 hours - begin PEP



Prevention of Rabies

- **EDUCATION!!!**
- **Change behavior**
- **Common sense**
- **Pre-exposure vaccination**
- **Post-exposure management**

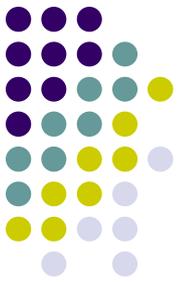




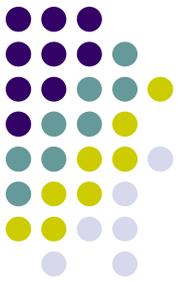
Rabies Biologics

- **Human rabies vaccines**
 - **Sanofi Pasteur**
 - **Novartis**
- **Rabies Immune Globulin**
 - **Sanofi Pasteur**
 - **Talecris Biotherapeutics**

Pre-exposure Immunization

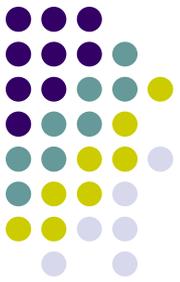


- **Veterinarians and staff**
- **Laboratory workers**
- **Animal Control officers**
- **Animal shelter workers**
- **Wildlife workers**
- **Travelers to endemic countries**



Pre-exposure Immunization Regimen

- 3 vaccines
- Days 0, 7, and 21 or 28
- IM deltoid
- Local Health Department or physician
- Titers – q 6m or 2 yrs



Post-Exposure Vaccination Regimen*:

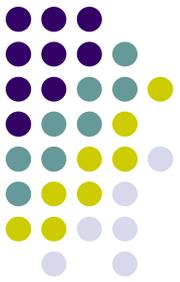
- **Wound cleansing**
- **2 vaccines**
- **1.0 ML IM deltoid**
- **Days 0 and 3**
- **No HRIG required**

***Previously vaccinated people**

2010 ACIP Recommendations

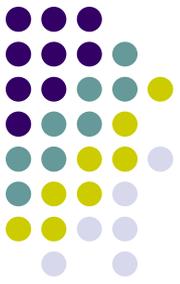
Human Rabies

Post-Exposure Prophylaxis



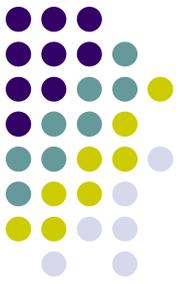
Day →	0	3	7	14	28
2010 ACIP	1.0 ml vaccine IM (deltoid) & 20 IU/kg HRIG	1.0 ml vaccine IM (deltoid)	1.0 ml vaccine IM (deltoid)	1.0 ml vaccine IM (deltoid)	No vaccine given
2010 Immune Compro-mised	1.0 ml vaccine* IM (deltoid) & 20 IU/kg HRIG	1.0 ml vaccine IM (deltoid)			

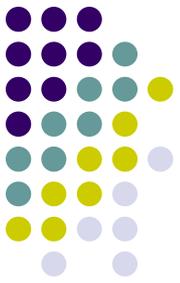
Post-Exposure Vaccination Regimen*



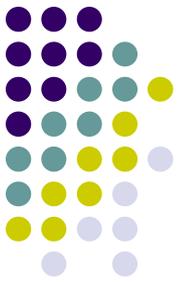
- Wound cleansing
 - 4 or 5 vaccines
 - 1.0 mL IM (HDCV or PCEC)
 - Days 0, 3, 7, 14
- AND**
- Human rabies Immune Globulin (HRIG)
 - Day 0
 - 20 IU/kg body weight

* Previously unvaccinated people





Veterinary Public Health Contact Information



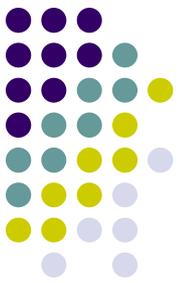
**1902 Mail Service Center
Raleigh NC 27699-1900**

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

<http://www.rabies.ncdhhs.gov>

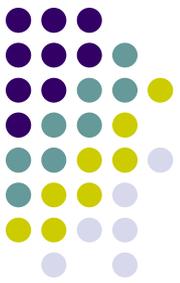


North Carolina Public Health
Working for a healthier and safer North Carolina
Everywhere. Everyday. Everybody.



References & Handouts

- **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**



References

- **NC DPH Veterinary Public Health**
<http://www.rabies.ncdhhs.gov/epi/rabies/medical.html>
- **NC State Laboratory Public Health – Virology – Rabies**
<http://slph.ncpublichealth.com/virology-serology/default.asp#rabies>
- **CDC Rabies** <http://www.cdc.gov/RABIES/>
- **NC Rabies Laws Chapter 130A**
<http://www.rabies.ncdhhs.gov/epi/rabies/pdf/NCRabiesLaws.pdf>
- **NC Rabies Statistics**
<http://slphreporting.ncpublichealth.com/VirologySerology/Rabies/PositiveCountBySourceCounty.asp>