Rabies: Review and Guidelines
Updates

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Why rabies?

- 20,000 – 40,000 people exposed to rabies each year in U.S.
- Infection is almost always fatal
- Public health costs (detection, prevention, control) > $300,000,000 annually in U.S.
- Rabies is endemic in Virginia

Rabies in the News

Richmond Times Dispatch
Thursday, February 9, 2006
FOR IMMEDIATE RELEASE: April 13, 2006

Rabid Raccoon Found in the Pungo/Blackwater Area of Virginia Beach

On April 10, 2006, a Virginia Beach resident collected a raccoon on the 1500 block of Morris Neck Road. When the animal was found, it was apparently injured. As a result, the raccoon was turned over to a licensed animal rehabilitator. Within 24 hours, the raccoon started to display symptoms of rabies and died shortly after. Specimens of the raccoon were submitted to the Norfolk Department of Public Health – Bureau of Laboratories on April 11, 2006.

Three rabid animals, all raccoons, have been identified in Virginia Beach this calendar year.

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Richmond Times Dispatch
Wednesday, August 2, 2006

85-year-old wards off attack by rabid cat

BY JEFF STURGEON Feb 7, 2007

ROANOKE -- Bleeding from three bites and wearing only the housecoat she had on to retrieve her newspaper, an 85-year-old woman upended an attacking, rabies-crazed cat. With her hand tight around its tail, she beat the feline into submission against a nearby utility pole in front of her house.

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THE ROANOKE TIMES
roanoke.com
Rabies - Outline
- Virus
- Disease and diagnosis
- Animal epidemiology – U.S. and VA
- Human epidemiology – U.S. and VA
- Domestic animal control
- Human prevention
- Commonly asked questions

Rabies Virus
- Rhabdovirus – bullet shape
- Inactivated by drying, high temperatures, sunlight, most disinfectants
- Survives freezing

Rabies Virus - Transmission
- Most commonly through the bite and virus-containing saliva of an infected animal
- Virus can not enter intact skin
- Other possible routes
  - Contamination of mucous membranes
  - Scratches - only if contaminated with wet saliva or CNS material
  - Aerosol
  - Transplantation
Rabies virus-Pathogenesis

- Virus enters the body
- Virus enters NM junctions
- Travels via peripheral nerves to spinal cord
- Then to brain stem and forebrain

Rabies virus

<table>
<thead>
<tr>
<th>Incubation</th>
<th>Exposure</th>
<th>Shedding</th>
<th>Signs</th>
<th>Death</th>
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<td>10 d-6 m</td>
<td>0-5d</td>
<td>0-8d</td>
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<tr>
<td>Cats</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Hu</td>
<td>5d-6y</td>
<td>2-14d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>?</td>
<td>?</td>
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</table>

Rabies Virus - Variants

- Associated with certain animal species
- Associated with certain geographic areas (except bats)
- Spillover to other species
- Vaccines protect against all variants
Rabies Virus - Variants

Reservoirs of virus variants, U.S.
- Raccoon
- Skunk
- Fox
- Coyotes
- Bats – several species

Distribution of Major Terrestrial Reservoirs of Rabies in the United States and Puerto Rico

Rabies Animal Epidemiology, VA
- Two terrestrial wildlife rabies variants – raccoon and skunk
  - Spillover to other wild and domestic animals
  - Raccoon – endemic in most areas with cycling
  - Skunk – confined to southwest VA
- Multiple bat variants
  - Occasional spillover
Rabies – risk of transmission by animal type

- **High risk**
  - Carnivores (raccoons, skunks, foxes)
  - Large rodents (groundhogs in raccoon areas)
  - Opossums (in raccoon endemic areas)
  - Bats

- **Low risk**
  - Small rodents (squirrels, chipmunks)
  - Rabbits, hares

- **Evaluate circumstances**
  - Exotic animals/hybrids
  - Livestock

Rabies - Animal Epidemiology

Rabies - Animal Epidemiology

Cases of Animal Rabies, 1955-2006
Rabies - Domestic Animal Epidemiology, U.S.

Domestic Animal Epidemiology

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Cats</th>
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<td>1955</td>
<td>6200</td>
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<td>400</td>
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<td>500</td>
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<td>5</td>
</tr>
<tr>
<td>2006</td>
<td>12.5</td>
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Animal Rabies Statistics-Virginia

<table>
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<th>Species</th>
<th>2004</th>
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<tbody>
<tr>
<td>Raccoons</td>
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<td>247</td>
<td>311</td>
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<tr>
<td>Skunks</td>
<td>89</td>
<td>122</td>
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<tr>
<td>Foxes</td>
<td>56</td>
<td>57</td>
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<td>Bats</td>
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<td>1</td>
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</tr>
<tr>
<td>Sheep</td>
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</tr>
</tbody>
</table>

≤ 5yr = beaver, coyote, deer, donkey, goat, groundhog, horse, opossum, otter, rabbit, rat
Human Rabies Epidemiology, U.S.

- 51 cases, 1990 – 2006
- 10 (21.3%) infected outside US
  - Often regions with canine variant
- Majority of cases bat associated
  - History of a bite established in only a few cases
Rabies-Symptoms in Humans

- Initial clinical symptoms include anxiety, headache, mild fever, irritation at bite site
- Progresses to muscle spasms, difficulty swallowing, hydrophobia
- Clinical course is typically short

Human Rabies Epidemiology
Virginia Cases

- 1953 – veterinary hospital worker
  - Unknown exposure
- 1998 – prisoner in work program
  - Unknown exposure
  - Pipistrel/silver-haired bat variant
- 2003 – office worker
  - Unknown exposure
  - Raccoon variant

Rabies – signs and symptoms in animals

- Clinical presentation is variable
- Early – vague, nonspecific
- Behavioral – more or less aggressive, vocalization
- Physical – appetite loss, paralysis, seizures, coma, death
- Behavior or physical signs or symptoms that are clearly abnormal
Rabies Control – Domestic Animals and Humans

- Animal and human vaccination
- Animal control
- Pre- and postexposure management

RabiesControl_HumanExposure

What constitutes an exposure?

- Any bite, scratch, or other situation where saliva or central nervous system tissue from a potentially rabid animal enters an open fresh wound or contacts a mucous membrane by entering the eye, mouth, or nose.
Rabies Control - Human Exposure

**Scratches:**
- A scratch should be evaluated like any other open wound, i.e. did saliva or some other virus containing material (cerebral spinal fluid, brain) contaminate the wound while it was fresh. A scratch in and of itself is not an exposure unless the paws were soaked with saliva, e.g., cat is salivating/drooling profusely or paws are visibly wet.

Rabies Control – Domestic Animal Exposure

**What constitutes an exposure?**
- Any circumstance where saliva or central nervous system tissue from a potentially rabid animal did have or could have had direct contact with mucous membranes or a break in the skin of a domestic animal
- Note: The actual witnessing of a bite or attack by a potentially rabid animal is not required for an exposure to have occurred

Rabies Control Guidelines for Humans

**Human exposed to a dog, cat, or ferret**
- Any dog, cat, or ferret (vaccinated or unvaccinated) that bites a person must be confined for 10 days observation
- Veterinary evaluation at first sign of illness
- If thought to be rabies, euthanize and test
- Do not vaccinate during confinement
- Discuss all human exposures with District Health Director
Rabies Control Guidelines for Domestic Animal Exposure

- Human bitten by livestock
  - 10 – 14 day observation (if normal health and behavior, no exposure history, area not rabies endemic)
  - Consider euthanasia, testing, human PEP

Rabies Control Guidelines for Humans

- Pre exposure series
  - High risk occupations: DVMs, ACOs, LVTs
  - Titers every 2 years
  - Boosters if exposed or low titer
  - Should never receive RIG

- Post exposure series (for those with no prior vaccination)
  - RIG plus five vaccinations

Rabies Control – Domestic Animal Vaccination

- Virginia code requires dogs and cats to be vaccinated by 4 months of age
- Booster dose given 1 year after initial vaccination
- Thereafter, should vaccinate every year or every 3 years, depending on vaccine type
- Encourage use of 3 year vaccine
Rabies Control – Domestic Animal Vaccination

- Virginia code requires vaccine administration by currently licensed veterinarian or veterinary technician under direct supervision
- Veterinarians must practice in a licensed facility
- Exception – rabies clinics outside licensed facility
  - Governing body finds number of resident veterinarians inadequate
  - Clinic approved by LHD and local government

Rabies Control Guidelines for Domestic Animal Exposure

- Confinement
  - House animal in a building, pen, or other escape-proof method or enclosure
  - Do not remove animal unless on leash and under control of responsible adult
  - Owner should notify Health Department at first sign of illness and take to veterinarian

- Strict isolation
  - House animal in a kennel at a veterinary hospital, animal control facility, commercial boarding establishment, or pen at home
  - Pen design should prevent direct contact between animal and human or other animal
  - Pen design should allow for feeding, watering, cleaning (see example in Guidelines)
  - District Health Director or designee should approve pen
Rabies Control Guidelines for Domestic Animal Exposure

**Vaccinated dog, cat, or ferret exposed to proven or suspected rabid animal**
- Should receive immediate booster of vaccine
- Confine for 45 days observation
- Veterinary evaluation at first sign of illness
- If thought to be rabies, euthanize and test

**Unvaccinated dog, cat, or ferret exposed to proven or suspected rabid animal**
- If available, test exposing animal
- If exposing animal unavailable, euthanize exposed animal or 6 months strict isolation
- Veterinary evaluation at first sign of illness
- If thought to be rabies, euthanize and test
- Vaccinate exposed animal before release from 6 months isolation

**Dog, cat, or ferret with expired vaccination exposed to proven or suspected rabid animal**
- Immediate booster to exposed animal (unless euthanized)
- If available, test exposing animal
- If exposing animal unavailable, 6 months strict isolation for exposed animal
- Contact Office of Epidemiology to discuss situations where vaccination is recently expired
Rabies Control Guidelines for Domestic Animal Exposure

- Vaccinated livestock exposed to proven or suspected rabid animal
  - Immediate booster
  - If available, test exposing animal
  - Confine in manner routine for species
  - 45 day observation

- Unvaccinated livestock exposed to proven or suspected rabid animal
  - Euthanize immediately, or
  - 6 months physically separated from unexposed animals if possible
  - If available, test exposing animal

Rabies Resources

- www.vdh.virginia.gov
- www.cdc.gov
Contacts for Rabies Advice

- State health department
  - Julia Murphy
    - Public Health Veterinarian
    - julia.murphy@vdh.virginia.gov
  - Catherine McManus
    - Veterinary Epidemiologist
    - catherine.mcmanus@vdh.virginia.gov
  - 804-864-8141

Rabies Control

Messages for the Public

- Keep rabies vaccinations up-to-date on dogs, cats, and ferrets
- Supervise pets so they do not come into contact with wild animals
- Call animal control to remove strays
- Enjoy wild animals from afar
- Never adopt wild animals
- Teach children never to handle unfamiliar animals
- Prevent bats from entering living quarters