Compendium of Animal Rabies Prevention and Control
Upcoming Changes to Guidance Regarding Domestic Animals Exposed to Rabies Virus

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...And then came Ebola Virus
“The Compendium”

• Publication of the National Association of State Public Health Veterinarians (NASPHV)
  • Last updated in 2011
  • Revisions expected in 2014

• Recommendations in the compendium serve as a basis for animal rabies prevention and control programs throughout the U.S.
  • Facilitate standardization of procedures among jurisdictions

• Compendium committee
  • Public health veterinarians
  • Consultants including rabies experts from CDC, rabies vaccine experts
Rabies Prevention and Control in Domestic Animals

• Pre-exposure vaccination and management
• Post-exposure management
  • Booster vaccination
  • Quarantine for unvaccinated animals or animals with lapsed vaccination
    • Minimize contact with humans and domestic animals
    • Prevent escape
  • Euthanasia
• Management of animals that bite humans
June 2014

- Changes to the Compendium to be published in 2014 were announced at the NASPHV business meeting
  - Changes based on unpublished data (submitted for publication as of 10/2014)
- Pending changes to the NYS Sanitary Code, planned for 2014, put on hold pending updated guidance
- NYS Public Health Veterinarian plans to give key stakeholders advance notice of proposed changes
October 2014

- Ebola
  - Two of six members of the Compendium Committee in areas with Ebola cases (NYC, TX)
  - Others heavily involved in response
- Changes at CDC
  - 10/16/14 – Announcement that Dr. Cathy Hanlon has transitioned to a new role outside the Rabies Program
- Current timetable is uncertain, but this is what I can share
Quarantine for Unvaccinated Animals

• **Unvaccinated** = No prior proof of vaccination

• **Current Compendium recommendation** for unvaccinated animal exposed to rabies is euthanasia or strict 6 month quarantine
  • Can vaccinate at the beginning or end of quarantine

• **Upcoming Compendium guidance** to reduce quarantine period if the animal is immediately vaccinated for rabies
  • Incubation period for animals exposed to rabies is generally 1–3 months after exposure
  • Will reduce burden on LHD staff
Quarantine for Animals with Lapsed Vaccination

• Current Compendium recommendation for unvaccinated animal exposed to rabies (and status of source animal cannot be determined) is euthanasia or 6 month quarantine
  • Can vaccinate at the beginning or end of quarantine

• New York State has allowed “modified’ quarantines to be considered on a case-by-case basis after considering:
  • Source animal (vector species vs. healthy acting dog or cat)
  • Nature of the exposure (bite vs non-bite/bite cannot be ruled out)
  • Vaccination history of exposed animal

• Upcoming Compendium guidance will be more in line with our modified quarantines
What Will Remain the Same

• Compendium guidance for actively immunized animals exposed to rabies
  • Immediate booster

• Management of animals that expose humans to rabies virus
  • 10-day confinement and observation for healthy acting domestic animals
  • Euthanasia and testing if not healthy or not domestic

• Serologic titer will not substitute for current vaccination
What Will Happen When the Compendium is Updated

• I will advocate that NYS adopt the updated guidance
  • Update our Public Health Law
  • Update our Sanitary Code
  • Time frame after publication?

• Update NYS guidance regarding quarantines

• Webinars, other outreach to county health departments
Rabies Post-Exposure Prophylaxis: Tracking Who is Exposed to Rabies and the Cost of Rabies Prevention in New York State
Rabies Post-exposure Prophylaxis Reporting in New York State

• Under NYS Sanitary Code, animal exposures for which rabies post-exposure prophylaxis (RPEP) is given are reportable to the local health department (LHD)

• LHD must be notified prior to initiating RPEP

• Allows LHD opportunity to identify exposing animal and confirm rabies status
  • 10-day confinement/observation for apparently healthy domestic animals
  • Laboratory testing

*Dogs, cats, domesticated ferrets, cattle, goats, horses, donkeys, mules, sheep, and swine
County Responsibilities for Rabies Suppression Under Public Health Law Include

- Staff available 24/7 to respond to reports of possible exposures to rabies of people, pets, or domestic livestock occurring within the county, and to render authorization for RPEP
  - Testing or confinement and observation
  - Quarantine or booster vaccination of animals exposed to rabies
- Collection, preparation and submission of animals specimens to the Rabies Laboratory
- Operating free rabies vaccination clinics at least 3 times a year
Authorization of RPEP under Public Health Law

• LHD uses New York State Department of Health (DOH) guidance to “authorize” RPEP if
  • Exposure is consistent with DOH definitions of exposure
  • Animal positive for rabies or rabies status is unable to be determined

• Authorization insures that exposed individuals will not incur any financial cost for RPEP
  • Third party insurance is billed first, county assumes remainder of cost
  • Persons not authorized to receive RPEP may seek treatment at their own expense
Authorization of RPEP
Public Health Law (Article 21, Title 4, §2145),

• The county health authority is responsible for authorized RPEP for all persons exposed within the county, regardless of the location of the person's residence

• For persons with local residence who are exposed to rabies in New York city or out of state, the county health authority is responsible for that portion of RPEP that occurs after such persons return to their local residences

• New York City (NYC) is exempt from the PH Law pertaining to rabies
Definitions of Exposure

NEW YORK STATE DEPARTMENT OF HEALTH
Rabies Policies and Procedures
(518) 473-4439
(866) 881-2809 (after hours)

SUBJECT: Guidance Regarding Human Exposure to Rabies and Postexposure Prophylaxis Decisions

I. Human exposure to rabies
Human exposures to rabies can generally be categorized as bite, open wound, mucus membrane, or other types of exposure:

Bite exposure: Any penetration of the skin of a person by the teeth of a rabid or potentially rabid animal.

Open wound exposure: Introduction of saliva or other potentially infectious material (cerebrospinal fluid, spinal cord, or brain tissue) from a rabid or potentially rabid animal into an open wound (e.g., broken skin that bled within the past 24 hours).

Mucous membrane exposure: Introduction of saliva or other potentially infectious material (cerebrospinal fluid, spinal cord, or brain tissue) from a rabid or potentially rabid animal onto any mucous membrane (eyes, nose, mouth).

Other exposure: Any interaction with a rabid or potentially rabid animal where a bite, open wound, or mucous membrane exposure cannot be definitively ruled out. This includes situations where a bat is found in a room with a sleeping person, unattended child, intoxicated or mentally compromised person.

NYS Rabies Contracts

• Contractual agreement with all 57 LHDs outside of NYC

• State Reimburses LHDs
  • Cost of RPEP
  • Expenses associated with specimen preparation and shipping to Rabies Lab
  • Cost of rabies vaccination clinics for dogs, cats, and ferrets
    • Staff
    • Advertising
    • Supplies

• $1,400,000/year allotted to rabies control in NYS budget

• Vouchers submitted quarterly to DOH
Rabies Reporting System (RRS)

• Separate module within the Communicable Disease Electronic Surveillance System (CDESS)

• RRS first launched in 2010

• Record (incident) is tied to the animal
  • May have more than one person exposed to an animal
  • All results from Rabies Lab are mapped to the RRS
  • LHD may manually enter animal information for exposing animals unavailable for testing

• RRS contains information about reported RPEPs (authorized or not)
  • Searchable by incident and by name of exposed individual
Laboratory Confirmed Rabid Animals by Species — New York State, 2009–2013

<table>
<thead>
<tr>
<th>Species</th>
<th>Positive animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raccoons</td>
<td>969</td>
</tr>
<tr>
<td>Bats</td>
<td>407</td>
</tr>
<tr>
<td>Skunk</td>
<td>322</td>
</tr>
<tr>
<td>Foxes</td>
<td>147</td>
</tr>
<tr>
<td>Other wild</td>
<td>44</td>
</tr>
<tr>
<td>Domestic</td>
<td>172</td>
</tr>
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</table>

Wadsworth Center, NYSDOH
Laboratory Confirmed Rabies, Other Wildlife — New York State, 2000–2011

<table>
<thead>
<tr>
<th>Species</th>
<th>Positive animals</th>
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</thead>
<tbody>
<tr>
<td>Woodchucks</td>
<td>25</td>
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<tr>
<td>Deer</td>
<td>10</td>
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<tr>
<td>Otters</td>
<td>3</td>
</tr>
<tr>
<td>Bobcats</td>
<td>2</td>
</tr>
<tr>
<td>Coyotes</td>
<td>2</td>
</tr>
<tr>
<td>Fisher</td>
<td>1</td>
</tr>
<tr>
<td>Mink</td>
<td>1</td>
</tr>
</tbody>
</table>

Wadsworth Center, NYSDOH
Laboratory Confirmed Rabies in Domestic Animals — New York State, 2009–2013

Wadsworth Center, NYSDOH
Reported RPEP and Demographic Characteristics — New York State, 2009–2013*

- **RPEP Reported**
  - Authorized 12,375 (94.1%)
  - Not authorized 281 (2.0%)
  - Unknown 532 (3.9%)

- **Sex (authorized RPEP)**
  - Male 5467 (46.2%)
  - Female 6297 (53.3%)
  - Unknown 60 (0.5%)

- **Age (authorized RPEP)**
  - Mean 35 years
  - Median 34 years
  - Mode 21 years
  - Range 8 days–98 years

- **Previously vaccinated**
  - No 10,857 (85.3%)
  - Yes 939 (7.4%)
  - Unknown 939 (7.4%)

*All data are for NYS outside of NYC
Total Authorized RPEP by Month of Exposure — New York State, 2009–2013
Total Authorized RPEP by Year — New York State, 2009–2013

The chart shows the total RPEP reported by year from 2009 to 2013, categorized by different animal species. The species categories include Other, Skunk, Fox, Raccoon, Dog, Cat, and Bat. The bars represent the total number of RPEP authorized by year, with the segments indicating the distribution across different animal species.
Total Authorized RPEP by Species — New York State, 2009–2013

- Bat: 54%
- Cat: 15%
- Dog: 15%
- Raccoon: 8%
- Fox: 2%
- Skunk: 2%
- Other: 4%
What “Other” Species are Associated with Authorized RPEP?

- Cattle (98)
- Goats
- Horse (29)
- Guinea pig (1)
- Coyotes (37)
- Deer
- Non-human primates
- Ferrets
- Fishers
- Beavers
- Otters

- Mink
- Mole (1)
- Opossum (27)
- Muskrat
- Human (2011 human case)
- Woodchuck (84)
- Porcupine (2)
- Sheep
- Pig
- Bobcat
- Unknown (95)
### Exposure Type by Species — Authorized RPEP, New York State, 2009–2013

<table>
<thead>
<tr>
<th>Species</th>
<th>Bite</th>
<th>Wound contamination</th>
<th>Mucous membrane exposure</th>
<th>“Bat in Bedroom*”</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bat</td>
<td>694 (11%)</td>
<td>92</td>
<td>264</td>
<td>4979 (79.1%)</td>
<td>269</td>
</tr>
<tr>
<td>Dog</td>
<td>1821 (97.1%)</td>
<td>13</td>
<td>36</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Cat</td>
<td>1540 (82.1%)</td>
<td>134</td>
<td>142</td>
<td>0</td>
<td>57</td>
</tr>
<tr>
<td>Raccoon</td>
<td>376 (39.2%)</td>
<td>134</td>
<td>391 (40.7%)</td>
<td>0</td>
<td>57</td>
</tr>
<tr>
<td>Skunk</td>
<td>79 (46.8%)</td>
<td>14</td>
<td>68 (40.2%)</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Fox</td>
<td>152 (48.7%)</td>
<td>22</td>
<td>79 (30.4%)</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>263</td>
<td>87</td>
<td>164</td>
<td>0</td>
<td>26</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4925</td>
<td>496</td>
<td>1144</td>
<td>4979</td>
<td>431</td>
</tr>
</tbody>
</table>

*Bat in sleeping person’s room = 4685; bat with unattended child = 265; bat with impaired, medicated or intoxicated person = 29
<table>
<thead>
<tr>
<th>Reason Not Tested</th>
<th>Bat N (%)</th>
<th>Dog N (%)</th>
<th>Cat N (%)</th>
<th>Raccoon N (%)</th>
<th>Fox N (%)</th>
<th>Skunk N (%)</th>
<th>Other N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escaped</td>
<td>1689 (52.1)</td>
<td>732 (68.5)</td>
<td>591 (74.3)</td>
<td>227 (77.5)</td>
<td>44 (74.5)</td>
<td>41 (80.4)</td>
<td>133 (71.9)</td>
</tr>
<tr>
<td>Let go</td>
<td>1337 (41.2)</td>
<td>107 (10.0)</td>
<td>91 (11.5)</td>
<td>45 (15.4)</td>
<td>10 (17.0)</td>
<td>6 (11.8)</td>
<td>20 (10.8)</td>
</tr>
<tr>
<td>Unknown</td>
<td>219 (6.8)</td>
<td>113 (14.2)</td>
<td>229 (21.4)</td>
<td>21 (7.2)</td>
<td>5 (8.5)</td>
<td>4 (7.8)</td>
<td>32 (17.3)</td>
</tr>
</tbody>
</table>
Test Status of Animal by Species – Authorized RPEP, New York State, 2009–2013

Percent RPEPs

Species

Positive

Untestable

Negative

Not tested

Bats

Cats

Dogs

Raccoons

Species

Fox

Skunk

Other

0%

20%

40%

60%

80%

100%
CDESS Rabies Financial Module

Required for all reimbursements sought beginning with the first quarter of the 2014-15 fiscal year
Conclusions

• RRS has simplified quantifying the administration of RPEP
  • Easy to link patient records with animal testing records
  • Can look at trends in RPEP administration over time

• Creates central, searchable data base regarding human rabies vaccination status for persons vaccinated in NYS

• Will allow us to quantify the cost of RPEP in a state where terrestrial rabies is enzootic
...And then came Ebola Virus
Filoviruses

• Family = Filoviridae
  • Marburg virus – first recognized in 1967
  • Ebola virus – first recognized in 1976

• Zoonotic enveloped RNA viruses

• Natural host: Fruit bats

• Cause severe hemorrhagic fever in humans and non-human primates

www.batworlds.com
Ebola virus

• Five species with different case fatality rates
  • Zaire, Sudan, Taï Forest (formerly Ivory Coast), Bundibugyo, Reston
• All cause severe disease in humans except for Ebola-Reston
  • Ebola-Reston does cause fatal disease in monkeys
• 1976 – two outbreaks of Ebola hemorrhagic fever
  • Zaire (Democratic Republic of Congo) and Sudan
• Since 1976, sporadic appearances in Africa with several larger outbreaks
  • Guinea, Liberia, Sierra Leone (2014)
Signs and Symptoms of Ebola

• Incubation period of 2–21 days (usually 8-10 days)
• Early signs of illness are non-specific
• Fever Severe headache
• Muscle pain
• Diarrhea
• Vomiting
• Abdominal (stomach) pain
• Unexplained bleeding or bruising
Differential Diagnosis

- Malaria
- Typhoid fever
- Bacterial sepsis
- Leptospirosis
- Cholera
- Other viral hemorrhagic fevers (Lassa, Dengue...)
Treatment

• Supportive care
  • IV fluids, electrolyte balance
  • Maintaining blood pressure and oxygen status
  • +/- Treating secondary infections

• Zmapp – experimental treatment; limited supply

• Vaccine undergoing phase 1 clinical trial
  • Safety
  • Immune response

• Transfusions using blood from survivors
Transmission

• Humans are infected through animal contact
  • Hunting/bush meat consumption
  • Fruit bats, non-human primates

• Outbreaks perpetuated by person-to-person spread

• OCCURS ONLY FROM ILL INDIVIDUALS

• Direct contact through broken skin or mucous membranes with
  • Blood or body fluids (urine, saliva, feces, breast milk, vomit, semen) of infected person
  • Contaminated objects
  • Handling infected animals and their tissues
West Africa Outbreak – 2014

- Index case in Guinea in December 2013
- Outbreak recognized in March 2014
- Propagation enabled by
  - Poverty
  - Poor (non-existent) medical and public health infrastructure
  - Distrust of government and outsiders
  - Cultural practices and beliefs
  - Occurrence of cases in non-remote (urban) settings
Overall case fatality rate = 48.5%
Countries with widespread intense transmission (Guinea, Liberia, Sierra Leone)
Countries with initial cases or localized transmission (Mali, Nigeria, Senegal, Spain, USA)
244/450 (54%) of confirmed healthcare workers have died
Distribution of Cases in Countries with Active Intense Transmission – WHO 10/17/14
Geographical Distribution of New Cases
– WHO 10/17/14
“There remains compelling evidence obtained from responders and laboratory staff in the country that there is widespread under-reporting of new cases, and that the situation in Liberia, and in Monrovia in particular, continues to deteriorate.”

WHO. Situational Road Map, October 1, 2014
Outbreak Control

- Isolation of patients
- Use of personal protective equipment (PPE) and rigid adherence to infection control protocols
- Cleaning and disinfection of equipment
- Appropriate handling/disposal of medical waste
- Handling of corpses
- Contact tracing and quarantine of exposed persons
- Social mobilization
  - Door-to-door education
  - Radio
  - Religious groups
New York State DOH Response – Not A Complete List

- DOH
  - Division of Epidemiology
  - Lab
  - Legal affairs
  - Public affairs
  - Environmental Health
  - EMS
  - OPCHSM
  - OHEP
  - Many others

- DEC
- Hospitals
- NYCDOHMH
- CDC

- Infection control
  - Healthcare settings
  - Non-health care setting

- Patient evaluation
- Isolation and quarantine
- Contact tracing
- Laboratory guidance
- ED drills
- “Referral centers”
- Critical specimen transport
- Specimen packaging and shipping
- Medical waste, sewage
Ebola and Domestic Animals
Can Dogs get Sick with Ebola?

• Limited studies in the natural setting

• Madrid, Spain – 2014
  • Dog, Excalibur’ owned by Ebola patient was euthanized under orders of the Spanish authorities
  • Not enough science to say with complete certainty that dogs can’t be infected with Ebola virus

• Dallas, TX – 2014
  • Bentley, owned by an Dallas nurse infected with Ebola virus undergoes 21 day quarantine
  • Bentley has remained healthy and has not tested positive for Ebola virus
Animals and Ebola Virus

• Evidence suggests that both bats and non-human primates can serve as the source of infection to humans
  • It is thought that fruit bats may maintain the virus; shedding it without developing illness
  • Several species of non-human primates upon infection develop severe illness and can shed the virus
  • One virus positive grey duiker has been reported in the literature, and though while duikers are not thought to contribute to the maintenance of the virus, it is a common source of bush meat. Whether there is a potential role of duikers in transmission to humans is not known.

• Limited information about whether dogs and other animals are susceptible to infection with Ebola viruses.
  • Observations from previous outbreaks have not implicated dogs as contributing the transmission of Ebola.
  • Reports of dogs feeding on human carcasses infected with Ebola have brought theories of the possibility of a transient contamination of a dog’s mouth.

• The diet of dogs in remote villages where Ebola outbreaks have occurred places them at risk for infection

• The dogs are not fed and have to scavenge for their food
  • Small dead animals found near the villages
  • Internal organs of wild animals hunted and slaughtered by villagers
  • Remains of Ebola virus-infected animals, vomitus, and human corpses
Objective, Results and Conclusions

• Large-scale serologic survey to determine the prevalence of Ebola virus infection in pet dogs in an Ebola virus–epidemic area of Gabon
  • Ebola Zaire strain
  • 2001-2002.
• Signs of illness did were not noted in any dogs
• Prevalence of Ebola virus–reactive IgG among dogs
  • From the villages where humans cases occurred was 27.2%, vs. 22.4% from villages where no human cases were noted
  • From villages with both an animal source and human cases was as high as 31.8%, compared to 15.4% among dogs from villages with human cases but no identified animal source
• No circulating Ebola virus antigens or viral DNA sequences were found in either positive or negative serum samples
• Findings suggest transient, asymptomatic infection or antigenic stimulation
Planning for Pets in the Home of an Ebola Patient

• CDC recommends that public health officials in collaboration with a veterinarian evaluate the pet’s risk of exposure to the virus (close contact or exposure to blood or body fluids of an Ebola patient).

• Based on this evaluation as well as the specific situation, local and state human and animal health officials will determine how the pet should be handled.

• Workgroup convened including AVMA, CDC, USDA, and academicians.
Planning in New York State

- Collaboration between NYSDOH, NYCDOHMH, Cornell University, NYSDAM, NYSDEC, USDA
- Will consider CDC and AVMA work group guidance
- To discuss
  - Authority? PUBLIC HEALTH (NYSDAM, too)
  - Where will quarantine take place?
  - Who pays?
  - How to clear animal?
  - PPE and waste disposal