Prevention and Control of Disease Transmission from Wildlife:

Challenges and Implications

Suzanne Jenkins, VMD, MPH, ACVPM

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Emerging Interest: Wildlife Related to Public Health

• 1992 - Institute of Medicine Report on emerging infections
  – Recently increased incidence
  – Recently increased geographic range
  – Recently discovered
  – Caused by newly evolved pathogens
  – (Moved into new species)

• 1990’s - Escalation of bioterrorism fears
Emerging Interest in Wildlife Related to Public Health

• 1,415 known human pathogens
  – 61% zoonotic

• Pathogens causing emerging infectious diseases
  – 75% zoonotic
  – Wildlife increasingly important source

• Most bioterrorism agents are zoonoses with wildlife component
Selected Emerging Infectious Diseases Associated with Wildlife

- Bats - SARS, Hendra, and Nipah virusus
- Birds - West Nile virus, avian flu
- Non-human primates – Ebola, HIV/AIDS
- Rodents – hantavirus, monkeypox, lymphocytic choriomeningitis
- Raccoons, bats and skunks - rabies
Definitions of Challenge

• A summons that is often threatening, provocative, stimulating, or inciting (summons to a duel).
• An invitation to compete in a sport.
• A calling to account or into question.
• A stimulating or interesting task or problem.
Definitions of Implicate

• Archaic = to fold or twist together: interweave
• To involve as a consequence, corollary or natural inference.
• To bring into intimate or incriminating connection.
Definition of Implication

• Close connection, relationship or involvement as from:
  – Long association,
  – Logical inevitability
  – Intimate accompaniment
Qualifiers/Limitations

- Incomplete
- Much overlap/interdependency
- Implications can also be challenges
- Smorgasbord of select examples
Public Health Challenge: Identify & Employ Methods to Protect Humans

- Prevent/control wildlife disease
- Intervene at human/animal/environmental interface
  - Direct contact – wild, captive
  - Infected domestic animals
  - Infected vectors
  - Contaminated food, water, animal products
One Science

• Rabies – wildlife biologists, animal control officers
• Ebola – US Army Medical Research Institute for Infectious Diseases
• Pfiesteria (harmful algal blooms) – phycologists, psychologists
• West Nile virus - entomologists
Disease Surveillance Challenges
Human and Animal

• Recognition of disease
  – Reliable observers (first detectors)
  – Laboratories
    • Accessible, reliable
    • Accurate tests available

• Reporting/Collecting data
  – Timely
  – User-friendly/efficient systems
  – Integration of comparable animal & human data
Disease Surveillance Challenges

• Analyses
  – Timely
  – Appropriate

• Sharing data/results/conclusions
  – Timely
  – Secure (pre-publication)
  – Include all stakeholders
Ecological Challenges

• Wildlife adaptation
  – Urban/suburban raccoons and rabies

• Suburban encroachment
  – Deer, ticks and Lyme disease

• Concentrated feeding
  – Deer and TB, CWD

• Captive wildlife
  – Zoos and TB
  – Hunting preserves, coyotes and rabies
Wildlife Movement Challenges

• Translocation
  – Raccoons & rabies: hunters, pest control operators
  – Foxes & *Echinococcus multilocularis*

• Importation – legal and illegal
  – Birds and chlamydiosis (psittacosis)
  – Rodents and monkeypox

• Commercialization
  – Non-human primates and Ebola virus
  – Pet trade, swap meets
Special Human Health Challenges

• Increase in compromised immunity population
  – More susceptible persons, severe disease
  – Sentinels (e.g., cryptosporidiosis)
• Seniors – increasing population (with pets?)
• Children – less exposure, experience = less immunity, understanding?
• Mental health issues – hoarders, emotional response to control efforts, e.g. depopulation
• Health care access
  – Availability of knowledgeable health care providers
Psycho-Social Challenges

- Personalities
- Turf protection or "turfing"
- Perception
- Beliefs
- Will
Communication Challenges

- Multiple target audiences
- Opposing viewpoints
  - Hunters vs. animal rights groups
- Media – help or hinder efforts
- Cultural differences
- Many languages other than English
# Targets/Stakeholders

<table>
<thead>
<tr>
<th>Category</th>
<th>Stakeholders</th>
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<tr>
<td>Agriculture Agencies</td>
<td>Farmers, Other Producers</td>
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<td>Public Health Agencies</td>
<td>Wildlife rehabilitators</td>
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<td>Wildlife Agencies</td>
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<td>Environmental Agencies</td>
<td>Politicians</td>
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<td>Human Medical Care</td>
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<td>Nuisance Wildlife Operators</td>
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<td>Academia</td>
<td>Public</td>
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<td>Military</td>
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Applied and Basic Research Needs

- Financial resources
- Trained/experienced personnel – field/bench
- Training venues – academic, practical
- Qualified, equipped laboratories
Resource Challenges

- Funding
  - Too little
  - Misdirected (disease du jour)
  - Time limits

- Bureaucracy
  - Slow response time
  - Different priorities

- Political Reality
  - Often works against comprehensive, integrated systems

- Systems
Some Examples of Meeting the Challenges
A Small Test

• Wildlife Center veterinarian calls health department about pox lesions on squirrels (probably squirrel pox, but a little odd)
• Public Health laboratory willing to test (want to try out new pox testing capability)
• PHL instructs veterinarian on sample collection
• Wildlife Center delivers specimens to local health department
• LHD ships over night to PHL via lab courier
A Small Test, continued

- It was squirrel pox, but system was tested and worked
- First detector – high level of suspicion, acted
- Health Department – coordinated, communicated
- Laboratory – ability, will & courier system
- Should not be remarkable
Laboratory Collaboration

- Availability of regional laboratories
- Rabies negative brains of cattle sent to NVSL for BSE testing
- Equine rabies suspects tested for arboviruses and vice versa
Rabies

• Effective, long-term, public health program
• Emerging disease
  – Raccoon rabies – new species/geographic area
  – Recent human cases from bat virus variants
  – Skunk outbreak in Arizona from bat variant
• Innovations
  – Oral vaccine for wildlife
  – RabID – CDC’s GIS-based surveillance mapping
  – Field test used by USDA WS
  – Human treatment possibility
Bat Rabies in Skunks, Flagstaff, Arizona

- Coordinated laboratory-based disease surveillance program
  - Test sick/dead wildlife for potential zoonoses (human/pet exposures not necessary)
- Citizen reported dead skunk to animal control
- AZ State Health Lab test positive
- Tissues sent to Texas Health Lab for variant test
  - First time bat variant maintained in terrestrial population (19/145 skunks infected)
Bat Rabies in Skunks, Arizona, cont.

- Task Force established
- Relocation of nuisance skunks prohibited
- Comprehensive public education
- Rabies vaccination clinics for pets
- Emergency quarantine for pets
- USDA Wildlife Services & CDC: trap, vaccinate, release skunks (n = 217)
Bat Rabies in Skunks, Arizona, cont.

- Students: neighborhood leaflets
- Veterinarians: free pet vaccinations
- Animal control (city & county): public calls
- Public Health Lab: surge capacity
- Police: equipment storage space
- Game and Fish: public calls and euthanasia
- Humane Society: euthanasia
- Media – good public education
- Local health department: coordinated feral cat quarantine
Bat Rabies in Skunks, Arizona, cont.

• First detectors: citizens
• Responsive government agencies
• Appropriate lab testing available
• Cooperation: federal/state/local governments/other organizations
• Parenteral vaccination of skunks – spinoff from oral vac program
• Excellent media relations
USDA Wildlife Services

• Oral vaccination of wildlife (> 10 years, 15 states)
  + Political will = $$ (TX, NY)
  + Involve other federal agencies, states, locals
  + Annual planning meeting

• Research – scientific basis for activities
Silos, Gaps and Overlaps
Animal Importation

- Fragmentation at every level
  - Jurisdictions
  - Authorities
  - Statutes
- 200 different government offices and programs respond to 5 zoonotic diseases
- Big business
  - Reston, VA Ebola outbreak
  - Global trade – pets, food, etc.
Surveillance

+ Veterinarians hired with CDC, USDA BT funds to improve animal disease surveillance (integrate with public health)
- More oriented to agriculture than wildlife
+/- Health departments requiring reporting of animals with zoonotic diseases
  ? Duplicative
  ? Integrated
  ? Follow up
+/- Integrated National Zoonoses Surveillance System
Surveillance

• BT funds to public health laboratories
  + /-Some funneled to agriculture agencies
    Any to wildlife agencies?
    – Focused on BT agents
• Avian Flu
  + Bringing wildlife, agriculture and health agencies to same table
Who's Job Is It, Anyway?

• Sick dog at airport question
  – Who examines, quarantines, pays?

• Virginia prairie dogs during monkeypox outbreak
  – Game & Fish ban on ownership
  – VA animals were in transit - technically legal
  – Not an Agriculture issue
VA Partial Answer to Animals that Drop Through the Gaps

- Quarantine and Isolation Law and Regulations
- Gives power to health commissioner if communicable disease of public health threat
- Defines “individual” as including companion animals
- Defines “companion animals” as those not regulated by other agencies
- Does not address who actually investigates, enforces
Authority vs. Ability and Will

- Need memos of understanding if laws and regulations do not apply
- Cannot have written plans for every eventuality
- Depends on willingness of agencies and individuals to act
- Requires established relationships, regular meetings (interagency task force, work group)
Communication/Data Sharing

Pluses and Minuses
ArboNET: Arbovirus National Surveillance System

+ All indicators – human (cases/blood donors), horses, other mammals, mosquitoes, dead birds, sentinel chickens,
+ Timely
+ Accessible
+ All states contribute
+ Zoo Surveillance

- Separate effort (silto)
- Sustainability/Funding
- State silos – Agriculture, laboratories, mosquito surveillance, academia
ProMED

+ Global
+ Includes animal diseases
+ Early warnings
+ Control of disease

- Depends on contributors
- Not comprehensive
- Not surveillance
Other Communication Venues

• EpiX – CDC, limited PH audience
• MMWR – web available to public
• Emerging Infectious Diseases Journal – same
• CDC monthly zoonoses conference calls
• NASPHV listserv
• CNN
Zoonoses Clearing House?

• ArboNET and NASPHV as examples
• Web based with email alerts for selected topics
  – E.g. wildlife, parasites, current research projects
• Exchange ideas, what works and doesn’t
• Fulltime, professional staff
• Open to all stakeholders – not just medical professionals
National Weaknesses
EPJ Gibbs in British Medical Journal

- Lack national program to prevent/control diseases that impact humans/animals/food.
- No coordinated effort or single agency with a ‘command and control’ responsibility.
- Lack of effective public communication.
- Disease surveillance systems not linked.
National Weaknesses, cont.

• BT funding has not adequately supported programs against zoonotic disease threats.
• Fragmentation of jurisdictions, authorities, statutes and research.
• Animal and public health separated by culture and organization
Major Happenings Start Small

- One person engaging and energizing others
- Organizations (local/national) picking up the call and working together
- An educated media, educating the public
- Politicians being convinced it is to their benefit to act
Act Locally, Nationally, Globally

• Engage the individuals and organizations that can help improve surveillance, training communication, funding, etc.
• Provide reasonable, reliable, scientific information to your elected officials
• Become a trusted resource for the media
• Educate and advocate
• Communicate, collaborate, coordinate
Be A “Consilient Thinker”

• An old word recently revived by E.O. Wilson and used to describe John Snow

• Combined insights from different disciplines and different scales of investigation
  – Microscopic exam of water samples
  – Weekly statistics of cholera deaths
  – Geographic patterns
  – Walking distance to Broad Street pump
Today
Problems more complex
Technical advances huge

Greater Need for Consilient Thinkers
References