RABIES

Bob Garrison, DVM, MS
HSR 6/5S Zoonosis Control
April 18, 2017
pbs.org
Conflicts of interest

I declare that I have no conflicts of interest with anyone or any institution
Plan for today

• A little background about rabies--history, rabies in nature, US and TX #s
• Pathogenesis (BRIEF)
• Risk assessment, including animal signs
• Post-exposure prophylaxis (PEP)
Rabies: history, etiology

• Known about for millennia!
• “rahbas”: Sanskrit—to do violence
• Biblical references to mad dogs; also Aristotle, Homer

• Family Rhabdoviridae
• Genus Lyssavirus (Lyssa = frenzy; Greek)
• Enveloped virus; bullet-shaped on EM
Rabies: where is it in nature?

- Found ONLY in infected mammals

- Susceptibility varies somewhat by species, but not reason to relax!
  - E.g., popular myth that opossums are resistant

- Birds: Some can seroconvert, but no dz

- Reptiles, fish, amphibians: no
Rabies in the U.S. and rest of the world

- **U.S.**: ~90% of cases in wildlife
  ~10% in domestic species

- **Rest of world**: the opposite
  
  - DOG strain rabies virus is responsible for > 95% of human rabies deaths
  - Est. ~60,000 deaths a year (at least—likely very under-reported)
  - Almost all in Africa and Asia, including India

- **In the U.S.**: 0-4 deaths / year
Rabies virus is “species adapted”

- There’s an independent transmission cycle within a reservoir species

- E.g., skunk, raccoon, coyote, silver-haired bat—all have their own “strains” or variants

- “Spillover” outside the reservoir species occurs, but usually results in few cases (e.g., bat to skunk, skunk to raccoon, skunk to dog, etc.)

For land mammal strains of virus, one strain, in its reservoir species, predominates in a geographic area
The low-risk animal that skipped class…

Something like this…

Possible, but rare
Distribution of major rabies virus variants among mesocarnivores in the United States and Puerto Rico from 2008 to 2014.
Special situation--bats

• >40 bat species in U.S. (~30 in Texas)

  ➢ Rabies has been found in almost all spp., but est. that <1% of bats infected at any one time

• Rabid bats found in every state except Hawaii

• Several bat rabies virus strains exist (e.g., “big brown bat variant”)

• Bats are not a major contributor to outbreaks in terrestrial mammals (e.g., skunks)
Rabid bats, 2014, CDC data
Rabies in southeast Texas

- Main concerns
  - South-central skunk variant
  - Several bat variants

- Skunks
  - Concern = spillover to other wild and domestic species

- Bats
  - Common in large cities—roost under bridges
  - Hill Country also--caves
  - TX leads the nation in # of confirmed rabid bats (513 in 2014)
Laboratory-confirmed rabies in HSR 6/5S, 2016

- Bat (62)
- Skunk (2)
Positive rabid animals, HSR 6/5S, 2016

• By species
  • Bat    62
  • Skunk  2

• By county
  • Austin  1 (skunk)
  • Brazoria 18 (all bats)
  • Chambers 1 (bat)
  • Fort Bend 12 (1 skunk, 11 bats)
  • Galveston 3 (all bats)
  • Harris  24 (all bats)
  • Jefferson, Montgomery, Walker, Waller, Wharton: 1 bat each
Pathogenesis (briefly)

• Virtually all infections transmitted by the bite of an infected animal (virus in saliva)
  ➢ Contamination of open wounds or scratches with saliva also a concern, but low probability of infection

• Virus inoculated into wound travels via peripheral nerves to spinal cord, up to brain, and back to salivary glands via nerves

• Extremely rare in humans: inhalation, corneal transplants, solid organ transplants
Rate of axonal movement of virus: 50-100 mm / day

*Rabies, eds. Jackson and Wunner, 2002*
Animal behavioral changes with rabies

• Wild terrestrial mammals
  - Lose their fear of people
  - Nocturnal animals (e.g., skunks) seen walking around during the day
  - Go into attack mode: anything (trees, etc.)

• Pets: often noticeable personality changes
  - Injured animals will bite! This doesn’t count as a significant behavior change...

• Bats
  - Lose their “sonar” and fly into objects
  - Often found flopping / squeaking on the ground
  - Extremely rare: attacking animals or people
Rabies in a Beaver --- Florida, 2001

On November 25, 2001, a beaver exhibited aggressive behavior by charging canoes and kayaks on the Ichetucknee River in Alachua County, Florida. The beaver was captured by park personnel and submitted to a Florida Department of Health (FDoH) laboratory for rabies testing. Park rangers contacted the Alachua County Health Department after they identified persons who were in the vicinity of the animal before capture. These five persons were interviewed by county health department personnel, who reported that although the beaver had made aggressive actions, the animal had not bitten anyone. This report summarizes the investigation of this case of animal rabies. Mammals that exhibit aggressive or other unusual behavior should be reported promptly to local health officials and should not be approached or handled by the public.
Risk assessment—in the ED
First things first

--Patient potentially exposed to rabies--

• What was the nature of the exposure? Bite or other?

• What animal was involved? Wild or domestic species? How did the bite happen?

• Is the animal available for_____?
  ➢ Quarantine (domestic animals, most of the time)
  ➢ Prompt rabies testing (certain wild animals)

• Has animal control been notified?
Rabies exposure—how?

• A bite exposure
  - An animal bite which breaks the skin and introduces saliva
  - Covers almost all exposures

• A non-bite exposure
  - Exposure of broken skin* or mucous membranes to saliva or brain matter (or CSF)
  - Includes scratches!
  - Extremely rare: inhalation, transplants

*bled or had serous drainage within the past 24 hours
Rabies NON-exposures

- Petting or handling an animal, even if rabid
- Contact with blood, urine or feces
- Contact of saliva with intact skin

Non-mammalian bites

Getting sprayed by a skunk

www.allupdatenews.com
PEP—needed or not?

• What type of animal was involved?

• For dog and cat bites, starting PEP immediately is almost never recommended
  - Give animal control a few days to find the animal
  - A short delay if PEP is needed is acceptable practice
  - If the animal is available, NO NEED to start PEP!

• Rabies in dogs and cats in Houston: quite rare
  - Last rabid dog: 2015 (before that, 1979)
  - Last rabid cat: 1979

• IMP’T: circumstances of the bite!
  - Provoked: MUCH less worrisome than unprovoked
  - Examples: trying to pet unfamiliar animal, breaking up dog fight, trying to assist injured animal
PEP—needed or not?

• What type of animal was involved?

• For low-risk wild animals, rabies testing and PEP are virtually never recommended

  ➢ Squirrels, rabbits, chipmunks, etc.
PEP—needed or not?

- What type of animal was involved?

- For high-risk wild animals, starting PEP is indicated UNLESS ANIMAL IS AVAILABLE FOR TESTING

  - Bats, skunks, raccoons, foxes, coyotes
Poss. rabies exposure—high-risk species

• Catch animal if possible, euthanize, test

• What about starting rabies PEP?

  ➢ A matter of medical urgency, but not an emergency

  ➢ IT IS OK to wait for test results if a bat is available for testing; usually proceed if other species involved and animal can’t be found

• Questions--consult local health dept / DSHS; involve local animal control too!
The bat in the bedroom scenario

• One of our most frequent calls

• Scenarios:
  – Someone wakes up to a bat flying in the room
  – Someone wakes up to a bat crawling on them
  – Bat found in room of: toddler, impaired person, etc.

• Question: where’s the bat?
  – If available, get it tested! NO NEED for immediate PEP
  – If not available, start PEP for those who can’t verify the absence of a bite
Terms defined

• **PEP:** Post-exposure prophylaxis—two parts

  • **Day 0 only:** rabies immunoglobulin (RIG)
    – Injected around the bite site, if possible
    – Remainder in other locations (split up PRN)
    – Dosed by weight
    – $$$: for a 75 kg (165 lb) person, ~$2,500
    – Limited availability

  • **Days 0, 3, 7, 14:** rabies vaccine (~$400/dose)
    – 1.0 ml IM in deltoid (adults) or thigh (kids)
    – Never in gluteal region
Common misunderstanding #1

• “PEP needs to be started immediately after a bite”
  – Not true in most situations
  – A matter of medical urgency, but not an emergency
  – If animal is available for testing, it’s acceptable to delay PEP; results can be obtained in day or two
  – Considerations: location of bite, type of animal, circumstances of bite
Common misunderstanding #2

- “PEP must be given within x days of a bite or it won’t help”

  – Unless pt shows s/s of rabies, PEP can be started any time after a bite—failure of current regimen has never been documented in the absence of s/s

  – One critical issue: timing of RIG relative to starting series

  – Can delay RIG up to 7 days after starting immunizations
    • After day 7, should not be given
One more misunderstanding

- “DSHS provides PEP at no cost”
- Variation: “Patients can go to DSHS regional office and be given immunizations there for free”

Not true
Clarifications about PEP from DSHS

• Region 6/5S does have PEP on hand, but:

  – Limited quantity
  – It’s not free
  – We don’t administer the injections
  – We are the LAST option as a source of PEP

  – Time-consuming logistics, including reimbursement documentation and patient coming to us to pick up PEP

  – Pt usually gets billed because of MC/MA reimbursement policies
Two last bits

• If patient was bitten by a bat, or found it in a bedroom (esp. children),

• DON’T RELEASE IT OR THROW IT AWAY!

• Test it....test it first...

• A major challenge for us: assisting patients with getting the remaining immunizations after they’ve been to the ED!
After the ED--follow-up for patients

• Several options; see handout
  ➢ Variables include insured status, presence of PCP, residence

• Worst option by far: return to the ED
  ➢ Typically, patients told to contact their PCP
  ➢ At this point, we get the phone call: what to do now?
  ➢ One option: for providers to order remaining doses and administer in office, but not popular

• “Adherence to the complex series of vaccinations can provide a substantial challenge for the general public, from both a time and cost perspective” (Adv Emerg Nurs J, 35: 110-19, 2013)
Finally, the myth that won’t go away...

“15* painful rabies shots in the abdomen”

*number may vary, depending on whose grandmother is the source of the information
SHOW THE RABID BAT CLIP AFTER YOU’RE DONE
QUESTIONS?

713-767-3300

Zoonosis Control Program, Region 6/5 South, DSHS

Bob Garrison, DVM, MS
Regional Zoonosis Veterinarian
281-782-4924 cell