

Rabies & Animal Bite Management

The Public Health Perspective

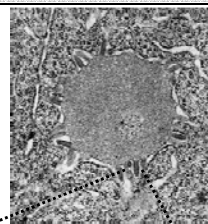


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Rabies Basics

- Genus *Lyssavirus* (*Rhabdoviridae*)
 - Rabies virus = type species
 - Other lyssavirus species or genotypes cause rabies-like disease (e.g., Duvenhage virus, Mokola virus, Lagos bat virus, European & Australian lyssaviruses)
- Viral disease of the CNS - fatal
- Virus primarily shed in saliva, inoculation via bite, to CNS, then back out to salivary glands



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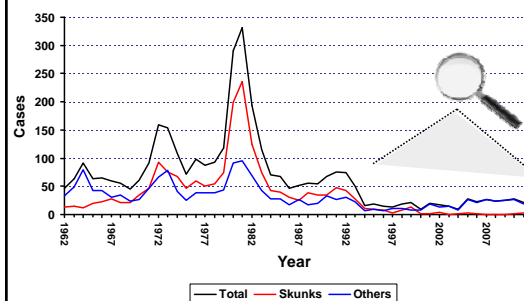
RABIES PATHOGENESIS

- Virus typically transmitted via bite
- Incubation period typically 30 – 90 days (extremes = 5 days to > 6 yrs)
- Virus initially binds to / multiplies in myocytes
- Virus highly neurotropic & enters peripheral nerves
- Centripetal travel by retrograde flow in axoplasm of nerves to CNS
- Replicates in brain
- Centrifugal flow to innervated organs, including the salivary glands → viral excretion in saliva



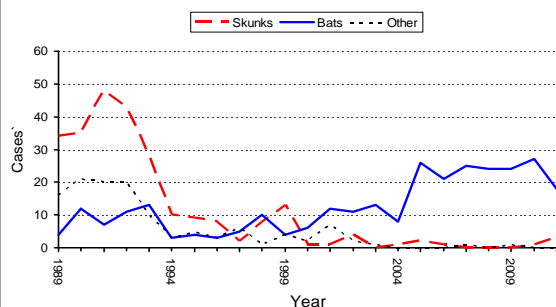
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Animal Rabies in Wisconsin, 1962 – 2011



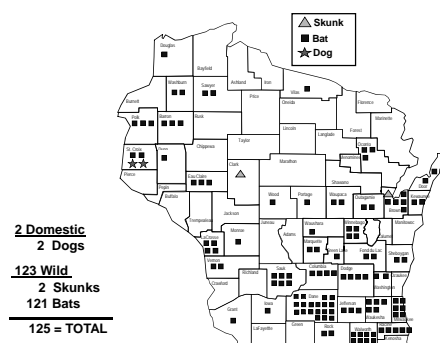
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Animal Rabies in Wisconsin, 1989 – 2011



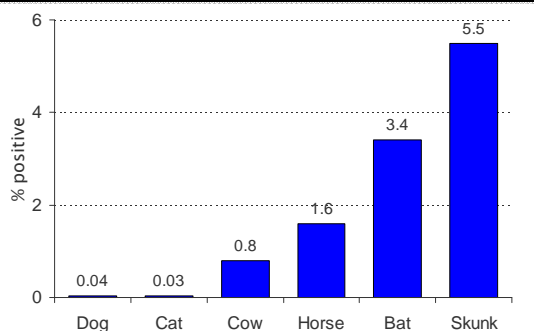
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Animal Rabies Diagnosed in Wisconsin 2006 – 2010



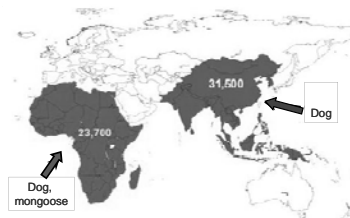
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Percentage of submissions that are rabies positive by species, Wisconsin 2001–2010



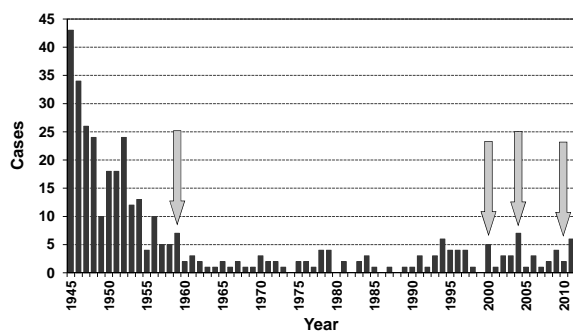
Estimated Annual Human Rabies Cases during ~1985–2005

North America 4 – 8 (*fox, skunks, raccoons, insectivorous bats*)
 Europe 10 – 20 (*fox, bats*)
 Latin America 200 – 400 (*dog, vampire bats*)



Reported Human Rabies Cases, USA, 1945 – 2011

(Arrows represent occurrences of WI cases)



Animal Bites in the USA



- Animal bites account for ~ 1% of all E.D. visits
- Estimated 4,700,000 sustain dog bite annually
- Approximately 800,000 seek medical care for dog bite

Human Rabies – Prodrome

- Fever, chills, malaise
- Generally vague respiratory, gastrointestinal, or neurologic symptoms
- Paresthesia at or near bite site

Essentially incurable, even at prodrome stage

Human Rabies – Neurologic Stage

- Furious Form (~ 80%):
 - hallucinations, agitation
 - thrashing, biting, running
 - hydrophobia / aerophobia
 - fluctuating mental status
- Paralytic Form:
 - weakness, flaccid paralysis sometimes starting in bitten extremity
 - paraplegia, quadriplegia
 - ascending paralysis
- Either Form:
 - fever, nuchal rigidity, muscle fasciculation, seizures
 - typically complete paralysis by day 10
- Coma ⇒ Death (typically flat EEG by day 14)



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Is Rabies in the Rule-out?



**Notify Infection Control if rabies is suspected
(Contact precautions & face shield)**



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Is Rabies in the Rule-out?

- Suggestive hx?
- Signs or symptoms of encephalitis or myelitis, including autonomic instability, dysphagia, hydrophobia, paresis, & paresthesia – Neurologic signs are progressive
- Were neuro s/sx preceded by three to four days by a nonspecific prodrome?
- Negative tests for other etiologies of encephalitis

Rabies is very unlikely if:

- Improvement or no change in neuro status over time
- Illness longer than 2-3 week duration
- Lack of fever

http://www.cdc.gov/rabies/specific_groups/doctors/index.html

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Ante-mortem Diagnosis Human Rabies

- **Contact DPH prior to submission of specimens**
- **Submit:**
 - ✓ Saliva (PCR) – NOT sputum or trach aspirate
 - ✓ Serum (antibody)
 - ✓ CSF (antibody)
 - ✓ nuchal skin biopsy (DFA – include at least 10 hair follicles)
- **Testing performed at CDC**
 - http://www.cdc.gov/rabies/specific_groups/doctors/index.html
 - ✓ Brief patient hx required
 - ✓ Reluctant to test unless clinically suggestive & all 4 specimens are submitted

<http://www.mcw.edu/Pediatrics/InfectiousDiseases/PatientCare/Rabies.htm>

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Prevention and Management of Potential Exposures



Rabies Pre-Exposure Vaccination

- Recommended for travelers to endemic areas, veterinary staff, wildlife rehabilitators, spelunkers, rabies laboratorians, etc.
- Primary series: Vaccine x3
 - IM injection into deltoid (day 0, 7, and 21 or 28)
- Periodic serology recommended to determine when booster is required if risk of exposure is ongoing
 - Frequency of testing is determined by level of risk
 - Assays should measure **neutralizing antibody**
- Does not eliminate the need for post-exposure prophylaxis after a recognized exposure (abbreviated regimen)



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Rabies Post-Exposure Prophylaxis (RPEP)

- Immediate cleansing of wound with soap & water: 10-15 minutes
- For persons not previously vaccinated*
 - 1) Human rabies immune globulin (HRIG) on day 0
 - 20 IU per kg, infiltrated at wound site to extent possible
 - give any remaining HRIG IM at site distal from vx
 - 2) Vaccine (HDCV or PCEC) - 1 ml into deltoid, days 0, 3, 7, & 14
(if immune compromised, add 5th vx on d. 28 and check titer post-vx)



- For persons previously vaccinated*
 - 1) Vaccine x2: 1 ml into deltoid, days 0 and 3
 - 2) Do not use HRIG

* Consult public health officials or ACIP statement for definition of "previously vaccinated"

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What constitutes an exposure ?

An exposure requires:

- 1) Presence of infective virus
 - typically in saliva, but also neural tissue, CSF
 - contact with blood, urine, feces does not constitute an exposure per CDC
 - rabies virus considered noninfectious in dried material
- 2) The potentially infectious material must come in contact with an open wound, scratch, abrasion, or mucosal surface

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Types of Exposures

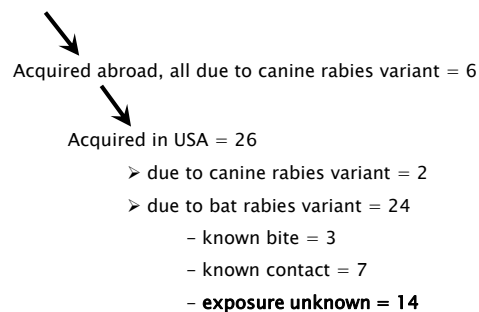
- **BITE**
- **NON-BITE (rare)**
 - potentially infective material in contact with mucous membrane or break in the skin
 - consider fomites, scratches
 - tissue transplants
 - ingestion
 - inhalation
 - bat "exposures" warrant special consideration

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Epidemiology of Human Rabies in USA



32 human deaths 1990 – 2000

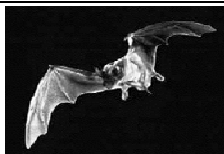


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Bat Exposures

Rationale:

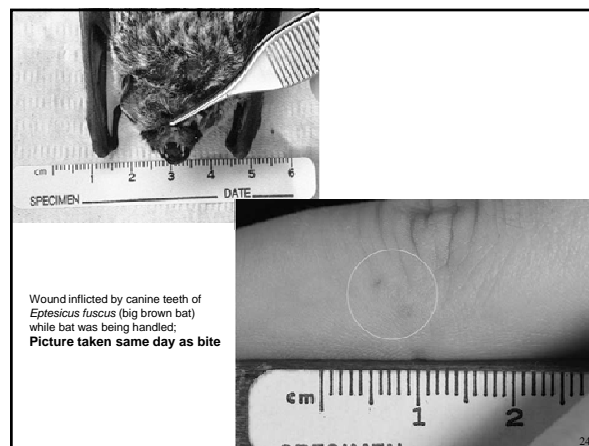
- Majority of bat variant associated human cases had no definite history of a bite (bite/scratch likely went unnoticed)



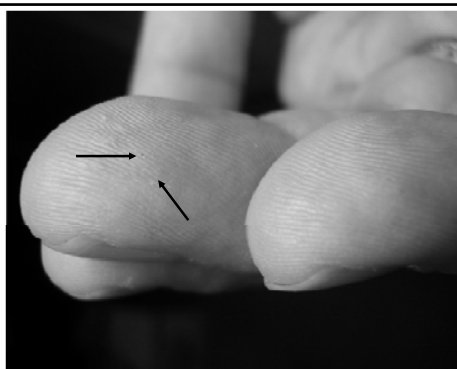
Recommendation:

- Consider RPEP if physical contact occurred and unable to exclude possibility of bite or scratch unless bat is negative upon lab testing
- Consider RPEP when person has been in close physical proximity to a bat and physical contact cannot be excluded, unless bat is negative upon lab testing
 - Being in the same room as a bat does NOT constitute exposure in a competent awake adult
 - RPEP is not routinely advised for entire household

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"The photo was taken within 5 – 10 minutes of the bite. The brown dots are blood spots that disappeared after a cleansing with soap and water."

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Guidelines for potential rabies exposures in Wisconsin

Animal species	Condition of Animal	Disposition of animal Tx of victim
Dog, Cat, Ferret (regardless of vx status) Why? Period of asx-ic viral shedding is known for these species	Healthy and available	<ul style="list-style-type: none"> – Confine & observe animal for 10 days – No RPEP unless animal develops signs of rabies
	Rabid or suspect as rabid	<ul style="list-style-type: none"> – Sacrifice & test animal ASAP – Begin RPEP, discontinue if negative
	Unknown (escaped)	<ul style="list-style-type: none"> – Notify authorities; consider search for animal – RPEP often indicated

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Guidelines for potential rabies exposures in Wisconsin

Animal species	Condition of Animal	Disposition of animal Tx of victim
Skunk, bat, fox, raccoon, coyote, wolf, opossum, bobcat, or other carnivores, whether wild or kept as pets	Regard as rabid unless proven otherwise by lab	<ul style="list-style-type: none"> – Kill and test animal ASAP – Do NOT hold for observation – RPEP indicated unless specimen is negative on lab test

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Guidelines for potential rabies exposures in Wisconsin

Animal species	Disposition of animal Tx of victim
Rodents, rabbits/hares, whether wild or kept as pets	Bites from <u>large rodents</u> (woodchucks, beavers, muskrats) handled as those from wild carnivores, i.e.– presume rabid unless proven negative by lab
	Bites from <u>small</u> herbivorous rodents (squirrels, hamsters, guinea pigs, gerbils, chipmunks, rats, mice) virtually never call for RPEP or testing of animal if it was behaving normally at the time of the bite.

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Overarching Principles for Clinicians

- 1) Do not begin RPEP if the offending animal is available for either observation or testing.
 - There are rare exceptions – consult PH
- 2) Bats aside, non-bite exposures resulting in human rabies are extremely rare.
 - Consult with PH before initiating RPEP for non-bites

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Why report animal bites?


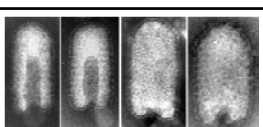
- Animal bites are not reportable conditions under WI law
- BUT**
- For most animal bites, no way to make a rational decision re. RPEP without follow up on the animal
 - Providers unable to provide this follow up

SO ...

Public health or law enforcement must be notified to provide follow up quarantine or testing

No prohibition against doing so (Privacy rules expressly permit disclosures of public health interest, without prior consent of patients, to public health agencies so that public health activities such as disease control and prevention can continue.)


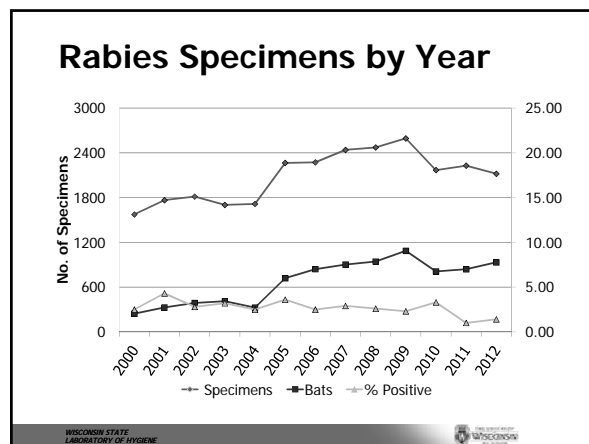
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Rabies Diagnosis and Specimen Submission

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Wisconsin State Laboratory of Hygiene
December 11, 2012

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Importance of Rabies Diagnosis

- Patient management: positive, negative indeterminate or not done results
- Surveillance

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The success of rabies diagnosis depends on ...

- The quality of the specimen submitted. Specimen submission involves multiple steps and test quality depends on optimizing each step

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Division of Public Health Guidelines for specimen submission

- 1989 Guidelines for fee exempt testing
- Requirements
 - Human or domestic animal **exposure**
 - The exposing animal must pose a **risk** for transmitting rabies.
- Most tests are fee exempt

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Does the specimen need to be submitted?



- Was there human exposure?
- Was there domestic animal exposure?
- Does the exposing animal have a risk of transmitting rabies?
 - Low Risk animals; small rodents, rabbits
 - High Risk animals; all other wild animals, domestic animals with CNS signs
 - Quarantine

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Specimen Preparation

- Humane euthanasia-avoid damage to the skull www.avma.org/issues/animal_welfare/euthanasia.pdf
- Animal is decapitated
- Brain submitted (the alternative)
- Unsuitable specimens
 - Decomposed, crushed, shot, chemically treated, cooked
 - If the suitability of the specimen cannot be determined, please call the laboratory.

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Humane euthanasia

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Packaging Goals

- Prevent Leakage and maintain specimen integrity
 - Multiple layers of containment; specimen bag, foam container (seamless), outer plastic bag, cardboard
 - Reusable cool packs (not ice cubes)
 - Packing Materials
 - Frozen specimens
 - Clinical Orders (608-265-2966)

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WSLH Shippers

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Documentation

- 8 ½ by 11 Requisition Form
- Human exposures
- Animal exposures
- Animal submitted, by whom and the owner
 - Number of animals
- Additional victims
- Additional testing at WVDL-specific form

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Documentation Problems

- Multiple specimens (same victim) in the same box, not documented
- Multiple specimens (different victims) in the same box, no clear description
- Physician name not provided in human exposures

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Shipping

- Maximum 24 hour transit time
- Hand delivery-distance versus need
- Commercial vendors
 - Priority Mail, Ground UPS
 - Guaranteed Overnight; UPS, Federal Express
 - DHL, Dunham (at your expense)



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After Hours Delivery

- Normal business hours; 7:45-4:30 M-F
- Saturday hours (specimen receiving only); 6:30-2:30
- All other times, contact UW Police and Security (608-262-2957)



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Outline

- Does the animal need to be submitted?
- Specimen Preparation
- Specimen Packaging
- Documentation
- Diagnosis
- Reporting

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Rabies Diagnosis

- Specimen receipt and identification
- Necropsy
- Brain dissection
- Impression smears
- Fixation
- Staining with rabies specific and labeled antibodies
- Reading slides

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Necropsy



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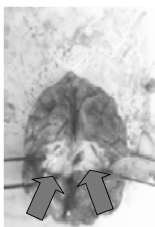
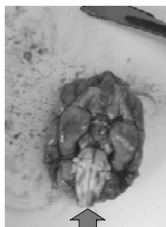
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Brain Sections for Rabies Diagnosis

Cerebellum

Brainstem

Hippocampi

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Brain Tissue Impressions

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Slide Fixation

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Staining

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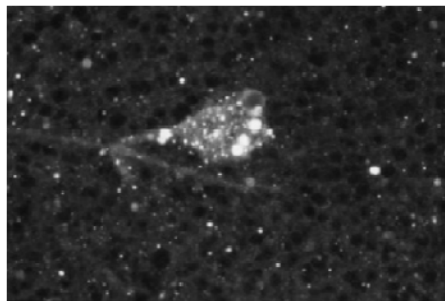
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Microscopy

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Fluorescence

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Outline

- Does the animal need to be submitted?
- Specimen Preparation
- Specimen Packaging
- Documentation
- Diagnosis
- Reporting

Result Reporting: Positive



- **Phoned results**
 - Physician
 - Veterinarian/submitter
 - LHD
- **Hardcopy**
 - Physician
 - Submitter
 - LHD

Result Reporting: Indeterminate/Not Done Specimens

- **Phoned**
 - Physician (human)
 - Veterinarian (Animal)
 - LHD
- **Hardcopy**
 - Physician (human)
 - Veterinarian
 - LHD

Result Reporting: Negative

- **Phoned**
 - By request
- **Hardcopy**
 - Physician (human)
 - Veterinarian/submitter
 - LHD

WSLH Webpage

www.slh.wisc.edu

- Left hand column; click on "Communicable Disease Division"
- Click on "r" in the a to z list
- Click on "rabies"
- Pick the topic of interest from the menu

