OPH Infectious Disease: 800-256-2748 **August 2019**	**Rabies**	**CDC Public 800-232-4636** **CDC Clinicians 877-554-4625** **CDC Day 404-639-1050**

Virology	Rhabdoviridae, Lyssavirus, single stranded RNA virus, bullet shaped, nucleocapsid and lipoprotein envelope
Hosts	Numerous mammals are affected with disease; only **bats are healthy carriers**, about 1-2%
Bats	Rabid bats throughout Louisiana. Bats important wildlife reservoirs. Transmission can occur from minor or unrecognized bites. Limited injury and inaccurate recall of exposure history → evaluation of exposure difficult.
Wild Terrestrial Carnivores	Raccoons, skunks, foxes, and coyotes = animals most often infected
Other Wild Animals	Small rodents (e.g., squirrels, hamsters, guinea pigs, gerbils, chipmunks, rats and mice) and lagomorphs (including rabbits and hares) almost never found to be infected. But in Louisiana 1 squirrel was found to be infected
Meat	Consumption of meat from an infected animal as carnivorous animals eat sick or dead rabid animals. About 150 rabid cattle yearly in US. Best not to consume tissues and milk from rabid animals. US law: animals showing neurological conditions are not to be consumed after 7 days after presumed infection date. Meat (muscle) of an animal dead of rabies contains very little virus. **THOROUGHLY COOKED**, dried or salted meat presents no risk to the consumer. The real risk is to the processors -- cutting up the animal, chiefly brain, spinal cord or salivary glands.
Milk	Transmission by unpasteurized milk possible. Drinking pasteurized milk from a rabid animal not an indication for PEP.
Human to human	Human-to-human transmission: recipients of transplanted corneas and other organs
Source	Infected animals: **SALIVA**, meat, neural tissue, kidney, prostate, pancreas and other tissues and body fluids. If well cooked, meat is deemed to be safe.
Environmental Persistence	Inactivated by desiccation and ultraviolet irradiation, In general, if the material containing the virus is **DRY = NON-INFECTIOUS**.
Transmission	**ANIMAL BITE** most common, also animal licking mucosa, damaged skin (eczema) or open wounds
Type of exposure	Transmitted only when virus introduced into bite wounds, open cuts in skin, onto mucous membranes or conjunctiva
Bite	Any **PENETRATION OF THE SKIN** by teeth = bite exposure. All bites = potential risk. Bites by bats, often undetected.
Non-bite	Open wounds, abrasions, mucous membranes, or scratches, with saliva or other potentially infectious material (such as neural tissue) from rabid animal = exposure.
Other	Large amounts of aerosolized rabies virus and surgical recipients of organs transplanted from rabid humans.
Non-exposure	Petting rabid animal, contact with blood, urine, or feces (e.g., guano) of rabid animal is not an exposure
Susceptibility	Very high for wolves, foxes, coyotes, kangaroo rats, cotton rats, jackals, voles; High for hamsters, skunks, raccoons, domestic cats, rabbits, bats, cattle; Moderate for dogs, and primates; Low for opossums; Only 20% of humans bitten by a rabies animal develop rabies
Louisiana Animals	Wild animals, skunks mostly in southwestern, central and northern LA. Bat rabies throughout. Occasionally positive results from domestic animals, primarily dogs and cats. Rodents (rats, mice, squirrels), and rabbits rarely positive, not found to transmit rabies, not tested under usual circumstances.
Louisiana Humans	The last case of indigenous human rabies in Louisiana occurred in 1953.
Incubation Period	From few days to >19 years, **75% occur within 90 days of exposure**. **Rule: About 1cm/day from bite site to brain**.
Clinical	Prodrome 2-4 days: fever, malaise, headache, nausea
	Disease starts only after CNS invaded, array of neurological signs: Hyperexcitability, Hydrophobia, Aerophobia (spasms of pharyngeal muscle after fanning the face), sensitivity to light, sound and other sensory stimuli, increased muscle tension and tics, then painful muscle contractions (spasms) caused by swal lowing (hydrophobia), seizures, increased sweating, salivation or lacrimation resulting from involvement of the sympathetic system, ascending paralysis, particularly in bat rabies, confusion, delirium, coma
Furious or Encephalitic 80%	Hydrophobia, delirium and agitation may be prominent despite a normal sensorium. As the disease progresses, the patient becomes confused and then declines into coma.
Paralytic or dumb 20%	Little cerebral involvement until late. Spinal cord and brain stem mostly involved. Ascending paralysis, resembling acute inflammatory polyneuropathy (the Guillain-Barre syndrome), or a symmetric quadriparesis. Weakness may be more severe in the extremity. Meningeal signs (headache, neck stiffness)
Differential	Detection of Negri bodies: Negri bodies are cytoplasmic inclusions made of rabies virus ribonucleoprotein which can be stained (Giemsa, Mann staining techniques) and observed under the light microscope.
Lab Dx Humans	Detection of Negri bodies
FTA	Detection of viral particles by fluorescence antibody test (FA): A fluorescein dye conjugated to a rabies antiglobulin is applied on a tissue. Fluorescence on rabies viral particles. Rapid and reliable with experienced technician. Brain smear, skin biopsy (back of the neck at the hairline), corneal impression or buccal mucosal scraping.
Anti-rabies antibody	Detection of rabies antibodies in the CSF: No antibodies in CSF after vaccination. with prior approval, through CDC
Culture	Culture (saliva, cerebrospinal fluid, or central nervous system tissue). with prior approval, through CDC
Multiple specimen	When a case is suspected in a human, CSF, blood, saliva and/or appropriate skin biopsies need to be sent to CDC through the OPH Lab. Contact the Infectious Disease Epidemiology Section and the OPH Laboratory on the proper handling and shipping of specimens prior to submitting the samples.
Lab Dx Animals	Direct fluorescent antibody test (submit specimen: preferably central nervous system tissue).
	Wear plastic or rubber gloves. Make sure not to damage the head when killing the animal. **Do not shoot the animal in the head or smash the head.** Place specimen in plastic bag and seal. Ideally, the head should be shipped in a styrofoam container with freeze packs to keep cool. **Do not use dry ice. Do not freeze, unless shipping will be delayed due to inability to access the laboratory (weekends, holidays)**. The use of wet ice is acceptable only if the package containing the head will remain sealed. Very important to chill immediately. An animal head that is unable to be shipped by Friday may be kept frozen over the weekend, if necessary.
Surveillance	Rabies in humans or animals is a reportable condition by phone within 24 hours of suspecting the diagnosis
Case Definition	Illness characterized by acute encephalomyelitis that almost always progresses to coma or death and is laboratory confirmed. Laboratory confirmation - A case of human rabies can be confirmed by: 1. Detection by direct fluorescent antibody of viral antigens in a clinical specimen, or

	2. Isolation (cell culture or in laboratory animal) of virus from saliva, cerebrospinal fluid (CSF), or central nervous system tissue, or 3. Identification of a rabies-neutralizing antibody titer >5 (complete neutralization) in the serum or CSF of an unvaccinated person.

Investigation of a HUMAN Case	• Assist in confirmatory diagnosis • Identify source of human infection. If the source is identified as an animal, ensure that the biting animal is managed properly. • Identify all individuals and animals exposed to the implicated animal. • Ensure that exposed individuals obtain proper medical care. • Ensure that exposed animals are properly handled. • Identify additional infections in animals in the surrounding area.		
Investigation of an EXPOSURE to a Suspected Rabid Animal	• **Document nature and circumstances of the bite**: 1-Patient: Age, site of bite on the body, depth of the bite, bleeding 2-Bite: Date, time, location (home, outside), what was the animal doing, what was the patient doing, provoked or unprovoked attack, 3-Animal: Species, breed, habitat (domestic, stray, wild), vaccine history, 4-Whereabouts of animal: Confined (Home, shelter, vet), ability to follow up for 10 days (ONLY dogs, cats, ferrets) • **Advise patient**: 1-Seek medical attention for dog and other animal bites (risk is rabies and other bacterial infections) 2-Immediately and thoroughly WASH of all bite wounds and scratches with soap and water and a virucidal agent, such as a povidone-iodine solution irrigation. Important measures for preventing rabies. In studies thorough wound cleansing alone without other post-exposure prophylaxis has been shown to reduce markedly the likelihood of rabies. 3-Recommend tetanus prophylaxis, 4-Answer any questions about rabies PEP; State that PHVet or public health official may call for further PEP recommendation 5-Get contact information (personal and family/friend phones) for follow-up		
When to Administer PEP			
Do Not Wait, Administer PEP Immediately	• If the biting animal tests **positive or inconclusive for rabies** • If the wild animal (such as **fox, bat, skunk, raccoon, wolf, etc. including hybrids**) cannot be located for testing. If captured, wild animals should be humanely killed and tested. Observation of wild animals for 10 days is NOT appropriate. • If the situation surrounding the bite indicates that the animal possibly could be rabid (sick, aggressive or unusual behavior) and the animal was not tested or the test results were equivocal •If the **animal was not located** and the animal was likely not have been vaccinated (stray animal, wild animal)		
Wait for the Results	If the head was sent to a lab, wait for the results unless the bite occurs on the face of a small child		
Wait for 10 Days Quarantine Before Administering PEP	Domestic pets, (**cats, dogs, ferrets**) should be: -**quarantined and observed** for 10 days by an authorized party. Immediate testing is only recommended in specific instances. Consult with the State Public Health Veterinarian in cases where the bite is on the head or neck, or when extremely aggressive animals are involved. If the quarantined animal becomes ill with symptoms of rabies during the observation period, the animal should be euthanized and the head sent to the OPH lab in Shreveport for testing. Assure the person bitten that if the animal is found to be positive for rabies during the observation period, post exposure prophylaxis will be effective in preventing the disease, despite the ten-day delay due to the aforementioned quarantine. - If the animal dies from a rabies-like illness during the observation period, its head should be sent to the OPH lab in Baton Rouge for testing.		
No PEP	Animals such as **squirrels, hamsters, guinea pigs, gerbils, chipmunks, rats, mice, rabbits, hares**, and **opossums** are frequently killed during an encounter with a rabid animal and therefore are not usually a source of infection. Their head will not be accepted for testing unless cleared by consultation with the Infectious Disease Epidemiology Section.		
Post-exposure Prophylaxis PEP	Persons who have been bitten by animals suspected or proven to be rabid should **begin post-exposure prophylaxis immediately. Post-exposure prophylaxis is indicated regardless of the length of the delay**, provided the clinical signs of rabies are not present.		
Rabies Vaccines & Rabies Immune Globulins	Rabies vaccines induce →production of neutralizing antibodies starting at 7-10 days to develop, persists > 2 years. Rabies immune globulin (RIG) provides a rapid, passive immunity with half-life of 21 days. In all PEP regimens, except for persons previously immunized, both products should be used concurrently.		
Information for HCF	**Product**	**Product name**	**Manufacturer and ordering**
Vaccine and Immuneglobulin are Available in some Large Pharmacies and in former LSU Medical Center Pharmacies.	Human diploid cell vaccine HDCV	Imovax Rabies (IM or ID)	Aventis/Sanofi /Pasteur (800) VACCINE or 822-2463
	Purified chick embryo cell	RabAvert	Novartis (800) 244-7668 McKesson MedSurg (800) 950-9229 ASD Healthcare (800)746-6273 FFF Enterprises (800) 843-7477 Cardinal (800) 964-5227
	Rabies immune globulin (RIG)	Imogam Rabies-HT	Pasteur-Merieux (800) VACCINE or 822-2463
	Rabies immune globulin (RIG)	BayRab	Bayer Corp (800) 288-8370
	Rabies immune globulin (RIG)	KEDRAB	Kedrion Biopharma
	Rabies immune globulin (RIG)	HyperRab	Grifols
Vaccine administration	**Vaccine dose: one injection per day on days 0, 3, 7, 14, (and 28 if immune-compromised) 1ml intramuscularly (deltoid area), NOT in gluteal area**		
RIG administration	**RIG** concentration of 150 IU per mL, is supplied in 2-mL (300 IU) vials for pediatric use and 10-mL (1,500 IU) vials for adult use; Dose is **20 IU/kg body weight**. **HyperRab® immunoglobulin product has a different concentration compared to all other rabies immunoglobulins** (including the very similarly named HyperRab™ S/D) and requires lower volumes to administer the recommended dose of 20 IU/kg. Care should be taken to ensure the correct dose of immunoglobulin is administered to ensure adequate immune response. Administered **only once** (beginning of PEP). If RIG not administered immediately, OK to administer up to 7th day, after that antibod-		

	ies to vaccine are produced. Full dose of RIG should be thoroughly infiltrated in the wound area. Remainder IM at distant site (Gluteal area)
Vaccine Pre-Exposure	**Vaccine Pre Exp**: one injection per day on days 0, 3, 7, and 21 or 28. 1ml intramuscularly (deltoid area), NOT in gluteal area
Pre-Exposure Prophylaxis	Lab workers in production labs; tests q 6 mos; boost if low Lab workers in Dx labs, spelunkers, vets & staff, animal-control, wildlife officers in endemic areas; tests q 2 years; boost if low Veterinarians who do not handle wildlife or large animals - Primary course, no testing.
Protective titer	•There is **no** "protective" titer against rabies virus. •In animal studies, survival against rabies more likely to occur the higher an animal's titer at time of infection, • Anamnestic response = better indicator of surviving exposure •After being vaccinated, antibody levels subside over time. •Complete neutralization of rabies virus at **a serum dilution of 1:5 (~0.11 IU/mL)** is recommended by ACIP as evidence that an individual still has a detectable level of rabies virus neutralizing antibodies. At this level, an immune competent individual would be expected to mount a rapid response to a booster dose of rabies vaccine in the event of an exposure, precluding the need of rabies immune globulin during postexposure prophylaxis." •LDH recommends that a single booster rabies vaccination be given when the titer drops below 0.5 IU/mL by the RFFIT •Other available titer tests (including the ELISA test) are not recommended for evaluating protective titer
Boosters for PreEP	•Following their initial rabies vaccination series, persons in high-risk occupations should have their virus neutralizing rabies antibody titers checked periodically - Every 6 months in persons in the continuous-risk category. - Every 2 years for persons in the frequent-risk category.
Rabies serology lab location	For the Rapid Fluorescent Focus Inhibition Test (RFFIT): Two commercial laboratories testing. **Kansas State University**, 1800 Denison Avenue, Manhattan, KS 66506-5600, Phone: 785-532-4483 www.vet.ksu.edu/depts/dmp/service/rabies/index.htm Testing at KSU may also be requested through Quest Labs as Rabies Vaccine Response End Point Titer (order # 5789). **Atlanta Health Associates**, 309 Pirckle Ferry Road, Suite D300, Cumming, GA 30040 Phone: 770-205-9091 or 800-717-5612, Fax: 770-204-9021, www.atlantahealth.net
Hospital Precaution and Isolation:	Standard precautions; special attention to prevent exposure to saliva.

ANIMAL	
10 day Quarantine	• Quarantine only applies to dogs, cats and ferrets (**DCF**) • For provoked bites in a well vaccinated animal, quarantine may be done in the owner's care • If the animal develops any signs or symptoms suspect of rabies or if the animal dies during the quarantine, the head should be submitted to the lab • Vaccine should not be administered during the quarantine period
Unvaccinated DCF Exposed to a Rabid Animal	• If a dog was exposed to a known rabid animal (usually a bat), the dog should be euthanized • or quarantined for four months for dogs and cats and six months for ferrets before being released. A rabies vaccine shall be administered at the time of entry into quarantine (confinement) to bring the animal up to current rabies vaccination status. Administration of the vaccine shall be done as soon as possible. It is recommended that the period from exposure to vaccination not exceed 96 hours. • There is no reason to submit the head to the lab. The DC or F may be incubating and no test will be positive during the incubation period
Vaccinated DC (even if overdue) Exposed to a Known Rabid Animal	• Revaccinate immediately and confine for 45 days • Confinement at home possible but restrict animal contact to few individuals
Overdue F Exposed to a Known Rabid Animal	• Considered unvaccinated and shall be immediately vaccinated for rabies and strictly quarantined for 6 months.
Unvaccinated DCF Exposed to Potentially Rabid Animal	• If a dog was exposed to an animal whose rabies status is unknown, the dog should be immediately vaccinated against rabies, confined for 90 days and given booster vaccinations at day 21 (third week), and at day 56 (eight week). • Confinement can be done at owner's home • If the dog becomes ill during confinement, consult a veterinarian
Bat Contact	Human and domestic animal contact with bats should be minimized and bats should never be handled by untrained and unvaccinated persons or be kept as pets. In potential human exposures involving bats, collect the bat and send the head for lab examination.