



Animal Bites and Rabies Risk

a guide for health professionals



For consultation on animal bites and rabies risk in humans

MINNESOTA DEPARTMENT OF HEALTH
Acute Disease Investigation and Control Section
625 North Robert Street
St. Paul, MN 55155
Telephone: 651-201-5414 or toll free: 1-877-676-5414
24-hour answering service available to healthcare providers,
public health professionals, veterinarians and law enforcement:

For Consultation on Rabies Exposure of Animals

MINNESOTA BOARD OF ANIMAL HEALTH
625 North Robert Street
St. Paul, MN 55155
Telephone: 651-201-6808

For Specimen Submission for Rabies Testing During Regular Business Hours

VETERINARY DIAGNOSTIC LABORATORY
University of Minnesota
1333 Gortner Avenue
St. Paul, Minnesota 55108
Telephone: 612-625-8787; 1-800-605-8787
Fax: 612-624-8707
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For Specimen Submission for Rabies Testing on Holidays, Weekends and After Business Hours

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ANIMAL BITES AND RABIES RISK: A GUIDE FOR HEALTH PROFESSIONALS

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I. INTRODUCTION

Rabies is a fatal neurologic illness transmitted to people by direct contact with the saliva of a rabid animal, normally through a bite; however, transmission through saliva contact with mucous membranes or a fresh wound is possible. The virus cannot penetrate intact skin. Rabies virus is inactivated rapidly by ultraviolet light and desiccation and does not persist in the environment; therefore, contact with the environment around a rabid animal such as with bedding or water bowls does not present a risk. In Minnesota, rabies is found mainly in skunks and bats. Livestock and pets generally develop the disease following a bite from a rabid skunk. People in turn, are generally exposed to rabies by bats, livestock and unvaccinated pets. Bites from wild carnivores and large rodents such as muskrats, groundhogs, and beaver are also of concern (see Table 1 for species of concern). Species that are not a rabies risk in Minnesota include mice, hamsters, guinea pigs, gerbils, squirrels, chipmunks, rats, voles, and rabbits. For more general information and current statistics on rabies in Minnesota see: www.health.state.mn.us/divs/idepc/diseases/rabies/index.html.

II. MANAGEMENT OF ANIMAL BITES TO HUMANS

Consultations on animal bites and rabies risk

- Available 24/7 at 651-201-5414 for healthcare providers, public health professionals, veterinarians, and law enforcement.
- Available to the public Monday-Friday, 8:00 a.m. to 4:30 p.m. at 651-201-5414.
- Please do not call the MDH Public Health Laboratory.
- For questions regarding animals that have been bitten by a suspect rabid animal in which there is no human exposure, please contact the Board of Animal Health (BAH) at 651-201-6808.

Evaluation of the patient following animal bites

- Wash the wound well with soap and running water.
- Assess the need for tetanus vaccination booster.
- Assess the need for antibiotics.
- Assess the need for rabies post-exposure prophylaxis (PEP).

Assessment of the need for rabies post-exposure prophylaxis

- Is this a species that we are concerned about? (Table 1)
- Was there a bite or saliva exposure to a mucous membrane? (Table 2; Figure 1)
- Is the animal available for 10 days of observation or testing? (Table 2; Figure 1)

Table 1: Human Rabies Risk Evaluation: Species of the Biting Animal

Species of Concern		
Domestic Animals	Cat Dog Ferret Alpaca Cow Donkey	Goat Horse Llama Mule Pig Sheep
Wild Animals, Captive Wild or Hybrid Animals Please consult with MDH about bites from these wild animals. 24/7 consultation is available to health care providers and veterinarians at: 651-201-5414	Badger Bat Bear Beaver Bison Bobcat Cougar/Puma/Mountain lion Coyote Deer Elk Ermine Fisher Fox Lynx Marten	Mink Monkey Moose Muskrat Opossum Otter Porcupine Raccoon Skunk Weasel Wolf Wolf/dog hybrid Wolverine Woodchuck
Bites From These Species are Not a Rabies Concern in Minnesota*		
All amphibians All birds All reptiles Mouse Chipmunk Gerbil	Gopher Guinea pig Hamster Hare Hedgehog Mole	Mouse Rabbit Rat Shrew Squirrel Vole

*MDH strongly discourages testing small rodents or rabbits for rabies, but unique situations do occur in which testing may be justified. Please do not submit these species without first consulting with MDH at 651-201-5414.



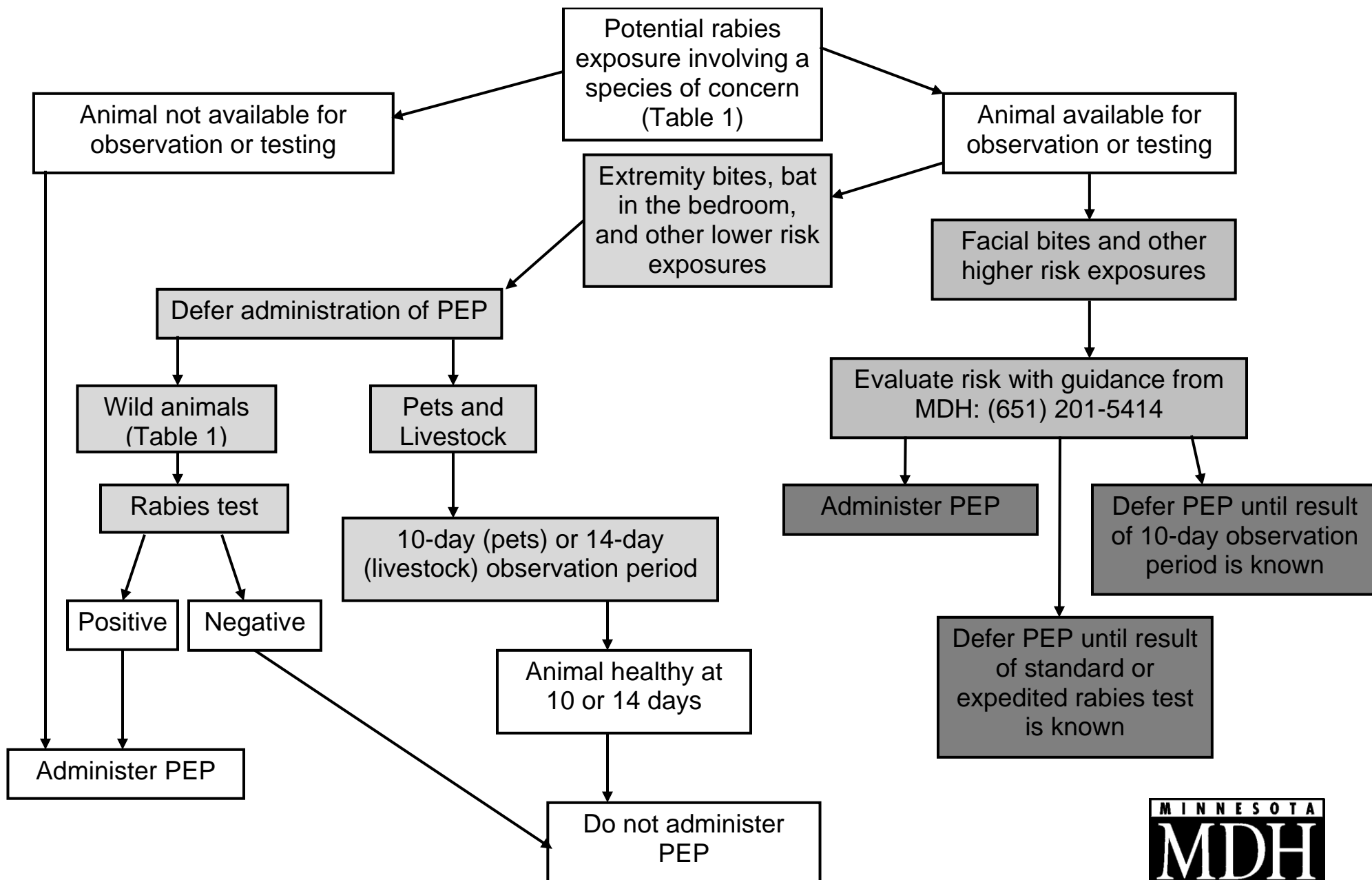
**Table 2: Guidelines for Managing Animal Bites
and Bat Encounters in Humans**

Animal species	Situation	Location of bite (or non-bite) exposure	Rabies post exposure prophylaxis (PEP) recommendations
Dogs, Cats, Ferrets	Animal available to be confined and observed for 10 days or tested for rabies	Extremities	Defer administration of PEP until outcome of 10 day observation period or rabies testing is known
		Face or head	Consult with MDH epidemiologists
	Animal unavailable	Anywhere	Administer PEP regimen
Horses and other Livestock (ex. cow, sheep, goat, pig, llama)	Animal available to be confined and observed for 14 days	Extremities	Defer administration of PEP until outcome of 14 day observation period is known
		Face or head	Consult with MDH epidemiologists
	Animal unavailable	Anywhere	Consult with MDH epidemiologists
Bats, Skunks, Raccoons, Foxes, or other Wild Animals (see Table 1)	Wild animal available for euthanasia and testing	Anywhere	Consult with MDH epidemiologists. In most cases, PEP can be deferred until rabies test results are known
	Wild animal unavailable	Anywhere	Administer PEP regimen

MDH epidemiologists are available 24/7 to healthcare providers at 651-201-5414 to discuss management of possible rabies exposure in humans.



Figure 1: Evaluation of Potential Rabies Exposures Flowchart



Factors to consider when determining need for PEP

Type of exposure

- **Bite exposures:** Consultation with a healthcare provider is recommended anytime a bite wound breaks the skin. Considerations include wound cleaning, tetanus vaccination, the need for antibiotics, and whether or not rabies post-exposure prophylaxis (PEP) is indicated.
- **Non-bite exposures:** Non-bite exposures include saliva contact to mucous membranes, saliva contact to fresh, non-scabbed skin wounds, and scratches. In general the risk of rabies is very low following non-bite exposures; however, there are rare reports of rabies transmission by these routes suggesting that they constitute sufficient risk to consider administration of PEP on a case-by-case basis.

Location and severity of the bite

When a bite is to an extremity, there is adequate time and it is safe for the patient to wait for completion of the 10-day observation and confinement period or for rabies test results to determine whether or not PEP is necessary. Bites to the face and head are more urgent, and consultation with MDH on these cases is recommended (Table 2; Figure 1). Regardless of location, the deeper and more serious the bite wound(s), the greater the urgency for PEP. Normal laboratory turn-around time for rabies testing in Minnesota is 1 to 2 business days. In urgent situations, expedited rabies testing can be arranged by calling MDH at 651-201-5414.

Circumstances of the bite incident

Factors surrounding the circumstances of the bite include the species of the animal, whether the bite occurred in an urban area or a rural area, if there was a history of a skunk on the premises within the past few months, and whether the bite was provoked or unprovoked. A dog or cat living in a rural area is more likely to be exposed to a potentially rabid skunk than one living in an urban setting. A bite occurring during the feeding of wild, feral or stray animals is considered a provoked bite.

Vaccination status of the biting animal

In the United States, rabies vaccine is licensed for dogs, cats, ferrets, sheep, cattle and horses. An animal is currently vaccinated and can be considered immunized if the primary vaccination was given at least 28 days before the biting incident, or if the animal has received a primary vaccine and a booster vaccination within the timeframe recommended by the manufacturer.

Even though rabies occurrence among currently vaccinated animals is rare, out of an abundance of caution, dogs, cats and ferrets are confined and observed for 10 days or euthanized and tested for rabies following a bite to a human. This is the law in Minnesota and is required regardless of the animal's vaccination status.

Species of the animal and requirements of the confinement and observation period

Dogs, cats and ferrets are the only species that may be confined and observed for 10 days following a bite to rule out rabies risk. Livestock such as horses, cattle, goats and sheep may be confined and observed for 14 days following a bite. There is no such option for wild animals that bite humans; these bites are handled on a case-by-case basis following consultation with MDH (Table 2; Figure 1).

Rationale for confinement and observation period

Animals cannot transmit the rabies virus to humans until the virus is present in the animal's salivary glands and saliva. Once the disease has progressed to this stage in domestic animals, they will begin to show obvious clinical signs of rabies. The time period between the onset of viral shedding and onset of clinical signs of rabies is known to be at maximum 3 to 4 days in dogs, cats and ferrets. Thus, if a dog, cat or ferret had rabies virus in its saliva at the time of a bite (and could have transmitted the disease to the victim), it will be sick or dead within 3 to 4 days. The 10-day confinement period includes a large safety factor.

In Minnesota, dogs, cats and ferrets are usually confined and observed at home. However, in some Minnesota communities, unless the animal is currently vaccinated for rabies, it must be confined at an approved quarantine facility at the owner's expense. Any illness in the animal must be reported to MDH, and if the animal dies for any reason during the 10-day confinement and observation period it must be tested for rabies.

III. MANAGEMENT OF HUMAN-BAT ENCOUNTERS

Bat encounters and bat bites

Most people who have been bitten by a bat report a stinging or needle prick sensation. However, bat bites may not be noticed, especially if someone is asleep, and bat bites may leave little or no evidence of a wound or puncture.

When should a bat be submitted for rabies testing?

- A person has been bitten or has had any physical contact with a bat.
- A person wakes up to find a bat in the bedroom.
- A bat is found in a room with an unattended child.

How to capture a bat and submit it for testing

- Use a container with a lid. Do not use pillowcases, blankets or towels, as bats may bite through fabric.
- Wear leather gloves.
- Approach the bat slowly and place the container over the bat. Then slide the lid (or a piece of cardboard) underneath the bat and flip the container over, trapping the bat inside.
- Secure the lid with tape.

- There is no need to kill the bat; the bat may be hand delivered alive to the Minnesota Veterinary Diagnostic Laboratory during normal business hours or it may be euthanized by a veterinarian prior to shipping. The brain must remain intact for the bat to be tested for rabies.
- If the bat is dead, keep it cool, but avoid freezing.
- Submit the bat for rabies testing: (For more information on rabies specimen submission, including after hours submissions, see pages 20-21).
 - Deliver the bat in person or contact a local veterinary clinic to euthanize the bat (if necessary), package it, and arrange for overnight shipment to:

Veterinary Diagnostic Laboratory
 University of Minnesota
 1333 Gortner Ave
 St. Paul, MN 55108
 Phone: 1-800-605-8787; 612- 625-8787
 (See map for directions, page 18)

- In some Minnesota communities, an animal control officer may be called to capture a bat and submit it for rabies testing.

Assessment of the need for rabies PEP following a bat encounter

- Administration of rabies PEP should generally be deferred until the results of a rabies test are known. Test results are available within 1 to 2 business days and only 3% to 4% of bats test positive for rabies.
- PEP should be initiated if there is a human/bat encounter during which physical contact occurred or may have occurred, and the bat is not available for testing.
- Consultation with MDH on handling bat encounters is available 24/7 to healthcare providers and veterinarians at 651-201-5414, and to the public at the same number Monday to Friday, 8:00 a.m. to 4:30 p.m.

IV. RABIES POST-EXPOSURE PROPHYLAXIS (PEP) REGIMEN

Rabies PEP overview

The rabies PEP regimen involves administration of human rabies immune globulin (HRIG), which is given only once, and a series of four 1.0 mL rabies vaccinations (Table 3). HRIG and the first vaccination are given on the first day of treatment (designated day 0) and three additional rabies vaccinations are given on days 3, 7, and 14.

Immunocompromised persons receive a fifth vaccination on day 28, and should be tested for seroconversion 7 to 14 days following completion of the PEP regimen (Table 4).

Patients who have previously received either pre or post-exposure rabies prophylaxis should receive only two rabies vaccine boosters following an exposure, given on days 0 and 3. **Patients who have been previously vaccinated SHOULD NOT receive HRIG**, even if the pre or post-exposure rabies prophylaxis regimen was given many years prior (Table 3; Table 4).

Human rabies immune globulin (HRIG)

Human rabies immune globulin (HRIG) provides rapid passive immune protection with a half life of approximately 21 days. It is given only once, on the first day of the PEP regimen (designated day 0). No more than the recommended dosage of HRIG should be given because excessive HRIG can partially suppress active production of antibody. If the HRIG was not administered on day 0, it may be administered up to and including day 7 of the PEP regimen. Beyond day 7, HRIG is not indicated, as the patient's antibody response to the vaccine occurs in that timeframe.

- The recommended dosage of HRIG is 20 IU/kg body weight for all ages including children.
- Infiltrate as much of the HRIG as possible into and around the bite wound.
- Administer the remaining HRIG intramuscularly (IM) at a site distant from the first vaccination site, generally in the quadriceps or deltoids.
- If there is no wound, such as following a bat-in-the-bedroom exposure, then HRIG may be given in the deltoids, quadriceps, or gluteals.

Rabies vaccine

A 1.0 mL dose of rabies vaccine is given IM in the deltoid area of adults or the anterolateral thigh of young children on days 0, 3, 7, and 14 of the rabies PEP regimen (Table 3). The first vaccination is given concurrently with the HRIG at a site distant from the HRIG. An additional fifth dose of rabies vaccine is given on day 28 to immunocompromised patients (Table 4). Rabies vaccine must **NOT** be given in the gluteals due to the possibility of poor absorption from that site and lower neutralizing antibody titers.

Two inactivated, cell culture rabies vaccines are currently available in the United States: human diploid cell vaccine (HDCV) or purified chick embryo cell vaccine (PCEC). Both are considered equally safe and efficacious. It is recommended that a vaccine series be initiated and completed with the same vaccine product; however, decreased efficacy or increased frequency of adverse reactions have not been documented when the series is initiated with one vaccine product and completed with another. The rabies vaccine series induces an active immune response that requires 7 to 10 days to develop and persists for many years. A rabies vaccine information statement (VIS) is available for distribution from CDC at: www.cdc.gov/vaccines/pubs/vis/downloads/vis-rabies.pdf

Previously vaccinated persons

Previously vaccinated individuals are those who have completed a pre-exposure or post-exposure regimen of human diploid cell vaccine (HDCV) and purified chick embryo cell vaccine (PCEC), or who have received a different vaccine outside of the U.S. and have a documented rabies antibody titer of $\geq 1:5$ by the rapid fluorescent focus inhibition test (RFFIT). These individuals are given two 1.0 mL doses of vaccine intramuscularly in the deltoid area on days 0 and 3 following an exposure. **No HRIG is administered.** Please consult with MDH epidemiologists if the patient's previous pre- or post-exposure vaccination regimen was administered more than 20 years prior to the current exposure.

Deviations from recommended PEP vaccination schedule

Once the decision to initiate rabies PEP has been made, it should be started as soon as possible. Every effort should be made to adhere to the recommended PEP regimen schedule, especially the first two days of treatment, days 0 and 3. After day 3 of the regimen, deviations of a few days are acceptable. For most minor delays or interruptions, the vaccination schedule can be shifted and resumed as though the patient were on schedule. For example, if a patient misses the dose scheduled for day 7 and presents for vaccination on day 10, the day 7 dose should be administered that day, and the final dose given one week later on day 17. Please consult MDH epidemiologists for advice when substantial deviations from the recommended schedule have occurred.

**Table 3: Rabies Post-Exposure Prophylaxis
Healthy, Immunocompetent Persons, Including Pregnant Women**

Vaccination Status	Treatment	Dosage/Administration Guidelines for All Ages	Day of Regimen
Not Previously Vaccinated	<ul style="list-style-type: none"> • Wound cleansing • Tetanus toxoid booster* • Human rabies immune globulin (HRIG) 	<ul style="list-style-type: none"> • 20 IU/kg body weight • Infiltrate HRIG into and around the wound • Remaining HRIG given IM at a site distant from the vaccination site 	Day 0 (can be given up to day 7)
	<ul style="list-style-type: none"> • Rabies vaccine 	<ul style="list-style-type: none"> • Four 1.0 mL doses, given IM <ul style="list-style-type: none"> ▪ Adults/older children: deltoid area ▪ Young children: anterolateral thigh ▪ Never in gluteals 	Days 0, 3, 7, 14
Previously Vaccinated†	<ul style="list-style-type: none"> • Wound cleansing • Tetanus toxoid booster* • Rabies vaccine 	<ul style="list-style-type: none"> • DO NOT give HRIG • Two 1.0 mL doses, given IM <ul style="list-style-type: none"> ▪ Adults/older children: deltoid area ▪ Young children: anterolateral thigh ▪ Never in gluteals 	Days 0, 3

* Indicated if last tetanus vaccine was more than 5 years prior to exposure

† Completed pre- or post-exposure regimen of human diploid cell vaccine (HDCV) or purified chick embryo cell vaccine (PCEC) within the past 20 years, or received another vaccine with documented rabies antibody titer $\geq 1:5$ by rapid fluorescent focus inhibition test (RFFIT)



**Table 4: Rabies Post-Exposure Prophylaxis
Immunocompromised Persons**

Vaccination Status	Treatment/Testing	Dosage/Administration Guidelines for All Ages	Day of Regimen
Immunocompromised, Unvaccinated Persons	<ul style="list-style-type: none"> Wound cleansing Tetanus toxoid booster* Human rabies immune globulin (HRIG) 	<ul style="list-style-type: none"> 20 IU/kg body weight Infiltrate HRIG into and around wound Remaining HRIG given IM at a site distant from the vaccination site 	Day 0 (can be given up to day 7)
	<ul style="list-style-type: none"> Rabies vaccine 	<ul style="list-style-type: none"> Five 1.0 mL doses, given IM <ul style="list-style-type: none"> Adults/older children: deltoid area Young children: anterolateral thigh Never in gluteals 	Days 0, 3, 7, 14, 28
	<ul style="list-style-type: none"> Post vaccination serologic testing 	<ul style="list-style-type: none"> Submit serum (2cc) for a rapid fluorescent focus inhibition test (RFFIT)[†] Adequate antibody titer: $\geq 1:5$ by the RFFIT 	7-14 days following PEP completion
Immunocompromised, Previously Vaccinated Persons[†]	<ul style="list-style-type: none"> Wound cleansing Tetanus toxoid booster* Rabies vaccine 	<ul style="list-style-type: none"> DO NOT give HRIG Two 1.0 mL doses, given IM <ul style="list-style-type: none"> Adults/older children: deltoid area Young children: anterolateral thigh Never in gluteals 	Days 0, 3
	<ul style="list-style-type: none"> Post vaccination serologic testing 	<ul style="list-style-type: none"> Submit serum (2cc) for a rapid fluorescent focus inhibition test (RFFIT)[†] Adequate antibody titer: $\geq 1:5$ by the RFFIT 	7-14 days following PEP completion

* Indicated if last tetanus vaccine was more than 5 years prior to exposure

† Completed pre- or post-exposure regimen of human diploid cell vaccine (HDCV) or purified chick embryo cell vaccine (PCEC) within the past 20 years, or received another vaccine with documented rabies antibody titer $\geq 1:5$ by rapid fluorescent focus inhibition test (RFFIT)

‡ Refer to page 15
that offer the RFFIT

for laboratories



Human rabies biologics

Rabies products are commercially available through pharmaceutical distributors or may be obtained directly from the manufacturers using the toll-free numbers listed below. The Minnesota Department of Health does not provide rabies biologics. Check with your pharmacy to determine availability.

Human rabies immune globulin (HRIG) products

Imogam[®] Rabies-HT
Sanofi Pasteur
www.vaccineshoppe.com
1-800-822-2463

HyperRab[™] S/D
Talecris Biotherapeutics
Bayer Biological Products
www.talecris-pi.info
1-800-243-4153

Human rabies vaccines

Human Diploid Cell Vaccine (HDCV)
Imovax IM[®] (pre- and post-exposure)
Sanofi Pasteur
www.vaccineshoppe.com
1-800-822-2463

Purified Chick Embryo Cell Vaccine (PCEC)
RabAvert[®] (pre- and post-exposure)
Novartis Vaccines and Diagnostics
www.novartisvaccinesdirect.com/index
1-800-244-7668

Patient assistance programs

Both rabies vaccine manufacturers have patient assistance programs that provide biologics to qualifying underinsured or uninsured patients.

An application form and information about Sanofi Pasteur's Patient Assistance Program (providing Imogam[®] Rabies HT and Imovax[®] IM) can be found at: www.needymeds.org/papforms/sanofi0312.pdf or by telephone at 1-866-801-5655.

Information on the Novartis Pharmaceuticals Patient Assistance Program (providing RabAvert[®]) is available at: www.rxassist.org/pap-info/company_detail.cfm?Cmpld=32 or by telephone at 1-800-589-0837.

Adverse reactions

In general, there is a very low frequency of serious adverse reactions to the rabies PEP regimen. Local pain, headache and low-grade fever may follow administration of HRIG. Pain, erythema, swelling, itching, and other mild local reactions are reported among 11-90% of vaccinees. Rabies PEP should not be interrupted or discontinued because of local or mild systemic adverse reactions to rabies vaccine. Non-steroidal anti-inflammatory drugs and antipyretic agents, such as ibuprofen or acetaminophen may be used to control mild adverse reactions.

An immune-complex-like reaction (generalized urticaria, sometimes accompanied by arthralgia, arthritis, angioedema, nausea, vomiting, fever, and malaise) occurs in approximately 6% of pre-exposure vaccinated individuals receiving a booster dose of rabies vaccine after primary vaccination. Although it is rare, this reaction can occur in persons receiving their primary vaccination regimen. No deaths resulting from these reactions have been reported.

When a person with a history of serious hypersensitivity to rabies vaccine must be revaccinated, antihistamines may be administered concomitant with vaccine, and the patient should be observed for development of anaphylaxis immediately following vaccination. The Acute Disease Investigation and Control Section is available for consultation about the management of possible rabies exposure and PEP in patients with a history of serious adverse reactions to rabies vaccine.

For more information regarding the safety of rabies biologics, please consult Manning, SE., et al., *Human rabies prevention--United States, 2008: Recommendations of the Advisory Committee on Immunization Practices*. MMWR Recomm Rep, 2008. 57(RR-3): p.9-10.

V. RABIES PRE-EXPOSURE PROPHYLAXIS (PEP) REGIMEN

Pre-exposure vaccination against rabies simplifies the rabies post-exposure treatment and it may protect in cases of unrecognized rabies exposure or when post-exposure treatment is delayed. It does not eliminate the need for appropriate treatment following a known rabies virus exposure.

Who should receive rabies pre-exposure prophylaxis?

- Veterinarians, veterinary technicians, animal control officers, wildlife rehabilitators, zoo employees, and others who have regular contact with potentially rabid animal species and certain laboratory workers.
- International travelers to areas with endemic canine rabies who are likely to come into contact with dogs or wild animals and where access to medical care and appropriate biologics may be limited.

Pre-exposure rabies vaccination series

- Three 1.0 mL doses of rabies vaccine are given IM, one injection per day, on days 0, 7, and 21 or 28, in the deltoid area of adults or in the anterolateral thigh of young children.
- Human diploid cell vaccine (HDVC) or purified chick embryo cell vaccine (PCEC) may be used, although it is recommended that the vaccine series be initiated and completed with the same vaccine product.
- No HRIG should be given.

Antibody titers and booster vaccination

- Vaccinated persons in high-risk occupations should have their virus neutralizing rabies antibody titers checked periodically (Table 5).
 - Every 6 months in persons in the continuous-risk category.
 - Every 2 years for persons in the frequent-risk category.
- A single booster rabies vaccination is given when the titer drops below 1:5 by the rapid fluorescent focus inhibition test (RFFIT), a virus neutralization test. Other available titer tests (such as the ELISA test) are not recommended for this purpose.

Table 5: Rabies recommendations for pre- exposure vaccinated persons

Pre-exposure rabies prophylaxis	Serologic testing	Rabies booster	Post-exposure rabies prophylaxis for pre-exposure vaccinated persons
Three 1.0 mL IM rabies vaccinations are given. One injection per day on days 0, 7, and either 21 or 28	<u>Continuous Risk</u> [†] Rabies titers performed every 6 months using the RFFIT* method <u>Frequent Risk</u> [‡] Rabies titers performed every 2 years using the RFFIT* method	A single booster rabies vaccination is given when the rabies titer drops below 1:5 by the RFFIT* method	<ul style="list-style-type: none"> • Following a rabies exposure, two 1.0 mL rabies vaccinations are given on days 0 and 3 • No human rabies immune globulin (HRIG) is given • No serum titer test is performed

† Rabies research laboratory workers; rabies biologics production workers

* RFFIT = rapid fluorescent focus inhibition test

‡ Veterinarians and staff; animal control and wildlife workers; rabies diagnostic laboratory worker

Laboratories offering RFFIT rabies antibody titer testing

All require 2.0 mL serum.

Rabies Laboratory
 Kansas State University
 2005 Research Park Circle
 Manhattan, KS 66502
 785-532-4483
www.vet.k-state.edu/depts/dmp/service/rabies/rffit.htm
 (form available online)

Atlanta Health Associates
 309 Pirkle Rd, Suite D-300
 Cummings, GA 30040
 1-800-717-5612
www.atlantahealth.net
 (form available online)

J. Mehsen Joseph-Public Health Laboratory
 Maryland Department of Health and Mental Hygiene
 201 W. Preston St.
 Baltimore, MD 21201
 410-767-6177
 (form not available online)

VI. MANAGEMENT OF ANIMALS EXPOSED TO A RABID ANIMAL

Rabies is a reportable disease in Minnesota. Any person who has reason to believe that an animal is affected with rabies or has been exposed to rabies should call the Minnesota Board of Animal Health (BAH) at 651-201-6808. BAH investigates all cases in which a domestic animal has been exposed to rabies and, when necessary, will quarantine exposed animals. Exposed animals are managed as follows:

- An animal that is currently vaccinated for rabies at the time of the exposure is immediately revaccinated for rabies and kept under quarantine or confinement for 40 days.
- An animal for which there is a licensed rabies vaccine, but which has never been vaccinated for rabies, is usually euthanized. Alternately, the exposed animal may be vaccinated for rabies and quarantined for 180 days.
- All other animals are evaluated on a case by case basis by BAH. The exposed animal may be euthanized, quarantined, or confined for up to 180 days.

A wild animal that has potentially exposed a domestic animal to rabies should be tested whenever possible. Local animal control officers in some communities may assist with capturing a wild animal for rabies testing. Veterinarians can be contacted to assist with rabies specimen submission.

For questions about rabies in animals or to report suspect or exposed animals, contact: **Minnesota Board of Animal Health 651-201-6808**

For more information on rabies or to get a copy of Minnesota rabies rules go to: www.bah.state.mn.us/diseases/rabies/

VII. RABIES TESTING

Background

- In Minnesota, 19,682 suspect animals were tested for rabies from 2003 to 2010 (median, 2,401 samples per year).
- Of these, 490 (2.5%) tested positive for rabies.
- Skunks and bats form the two wildlife rabies reservoirs in Minnesota and were the animals most commonly found to be rabid.
- Skunks had the highest number and the greatest proportion (231/460; 50.2%) of positive samples from 2003 to 2010.
- Among bats, 161 (3.3%) of 4,960 submissions tested positive.
- There were 657 raccoons tested during the eight-year period, and all were negative for rabies.
- Among domestic farm animals (cattle, horses, goats, and sheep), cattle had the highest number and greatest proportion of positive samples (38/474; 8.0%).
- Dogs, cats and ferrets had a lower proportion of positive samples (0.6%, 67/11,886), although they constituted the majority of submissions.

Guidelines for submitting suspect animals for rabies testing

The only test for rabies in animals that may be used to guide human rabies risk analysis is the direct fluorescent antibody (DFA) test. There is no live animal test for rabies. The animal's brain, specifically sections of the medulla, cerebellum, and hippocampus are required to perform the DFA test. The brain must be relatively fresh and in good condition, as the test cannot be done reliably if the different regions of the brain are not discernable. See the Rabies Specimen Submission Form (page 20) for complete instructions on specimen handling and submission.

Laboratory testing, result reporting, and positive result follow-up

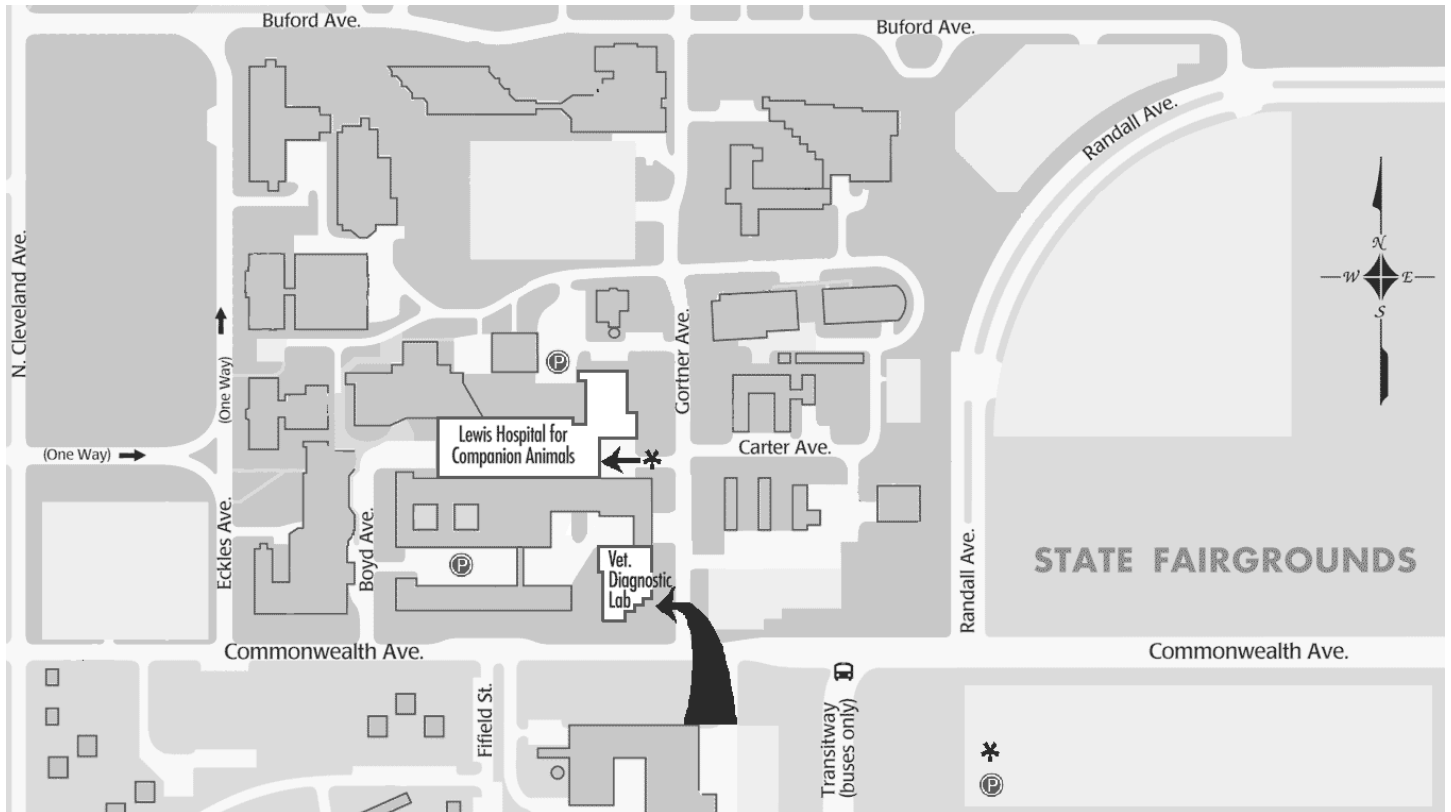
- There is a \$25.00 fee payable to the University of Minnesota Veterinary Diagnostic Laboratory (VDL) for rabies testing by the direct fluorescent antibody (DFA) test. Please add 10% for out-of-state specimens.
- Results for specimens received at the VDL before 11:00 a.m. will be available the next business day by 2 p.m. Results for specimens received after 11:00 a.m. will be available in two business days.
- Expedited testing is available in emergency situations. Healthcare providers, veterinarians or law enforcement may contact MDH epidemiology at 651-201-5414 to discuss the need for an expedited test.
- Positive rabies reports are telephoned immediately to the veterinarian, healthcare provider, or other submitter listed on the Rabies Specimen Submission Form, followed by a written, mailed, confirmation.
- Positive test results are reported to the Minnesota Board of Animal Health (BAH) and the Minnesota Department of Health (MDH).
- Situations involving laboratory-confirmed rabies positive animals are investigated, evaluated, and managed by MDH epidemiologists and BAH veterinarians.
- Negative rabies reports are mailed or faxed to the submitter within 1 business day of completion of the test.

Rabies testing in humans

- Testing for diagnosis of rabies in humans is performed at the Centers for Disease Control and Prevention. Please telephone the MDH Acute Disease Investigation and Control Section at 651-201-5414 for assistance with human rabies specimen submission and testing.

VIII. MAP

Figure 2. University of Minnesota Veterinary Diagnostic Laboratory and Veterinary Medical Center, St. Paul Campus of the University of Minnesota



For directions to St. Paul Campus, visit:
www1.umn.edu/twincities/maps/directions-stpaul.php

IX. REFERENCES

1. Manning, S.E., et al., Human rabies prevention--United States, 2008: recommendations of the Advisory Committee on Immunization Practices. *MMWR Recomm Rep*, 2008. 57(RR-3): p. 1-28.
2. Rupprecht, C.E., et al., *Use of a reduced (4-dose) vaccine schedule for postexposure prophylaxis to prevent human rabies: recommendations of the Advisory Committee on Immunization Practices*. *MMWR Recomm Rep*, 2010. 59(RR-2): p.1-9.
3. *Compendium of animal rabies prevention and control, 2008*. *J Am Vet Med Assoc*, 2008. 232(10): p. 1478-86.
4. Rabies. In: Heymann D, ed. *Control of Communicable Diseases Manual* 19th Edition. Washington DC: American Public Health Association, 2008; 498-508.
5. Rupprecht, C.E. and R.V. Gibbons, *Clinical practice. Prophylaxis against rabies*. *N Engl J Med*, 2004. 351(25): p. 2626-35.
6. Minnesota Board of Animal Health Rules: 1705.1090-1705.1210.

X. FREQUENTLY ASKED QUESTIONS

1. My patient found a bat in her son's bedroom yesterday morning. She opened the window and the bat flew out. She doesn't think the bat bit her son. Do she and her son require rabies post-exposure prophylaxis (PEP)?

Only the son requires rabies PEP because he was asleep in a room with a bat and we can't know for certain whether or not the bat bit him while he was asleep. The mother does not need PEP because she wasn't exposed to the bat while asleep and had no physical contact with the bat.

2. My patient started rabies PEP and is scheduled for her 3rd rabies vaccination (day 7) tomorrow. She is currently out of town – is it OK to give the day 7 vaccination 2 or 3 days late? If so, when should her fourth (day 14) vaccination be given?

After the day 0 and 3 vaccinations, minor deviations from the recommended schedule are unimportant. Give the third vaccination as close to the recommended time as possible, then shift the schedule and resume as though the patient were on schedule, giving the fourth vaccination 7 days later.

3. A neighbor's cat that bit a child on the hand can't be found after one day of searching. How long should I advise the parent to look for the cat before starting the child on rabies PEP?

Because the bite was to an extremity and thus, less urgent, you could allow the mother to continue searching for the cat for 2 to 3 more days. If the cat has not been found at that point, begin PEP.

4. What are the signs of rabies in cats (or dogs)? My patient is confining a cat that bit her for a 10 day period following the bite. What signs should she be looking for?

An animal that had rabies virus in its saliva and was able to transmit the disease at the time of biting someone would develop severe illness or even die within 3 to 4 days of the bite. The 10-day observation period includes a safety factor. Signs to watch for include loss of appetite, depression, lameness, fever, and any neurologic signs such as behavior changes, vocalization, circling, or seizures. If the cat develops any of these signs the patient should contact her veterinarian immediately. If the cat is alive and well 10 days following the bite, then there was no risk of rabies at the time of the bite.

5. I have a patient who was bitten by a dog in Mexico two weeks ago. He had a rabies vaccine there and was told that he was protected. Should I restart the entire PEP series?

In situations like this it is best to get as much information as possible about vaccinations given outside the U.S. and then call MDH for a consultation.

6. A patient who was bitten by a bat a few months ago is wondering if it is too late to receive rabies PEP.

There is no time limit regarding the administration of PEP after an exposure. In this case it is still appropriate to initiate PEP. Administration of both human rabies immune globulin (HRIG) and four doses of rabies vaccine is recommended regardless of the time elapsed since the exposure.

7. A 7 year-old boy was bitten by a squirrel he was chasing around a tree. The squirrel is not available for testing. What should be done?

Rabies PEP is not indicated following a squirrel bite in Minnesota. Wash the wound well with soap and water and check that the boy's tetanus vaccination is up to date. Squirrels, chipmunks, mice, rats and other small rodents do not pose a rabies risk in Minnesota.

8. How long does the rabies virus last in the environment?

Rabies virus does not persist in the environment; it is inactivated almost immediately by UV light and desiccation. Rabies is transmitted only through direct contact with a rabid animal through a bite or saliva contact with a mucous membrane. Rabies is not transmitted through environmental contact or through aerosols.



MDH Use Only

Rabies Specimen Submission Form

Physicians, veterinarians, and law enforcement may consult the Minnesota Department of Health at (651) 201-5414, 24/7 to obtain information on rabies, including human exposure, prophylaxis and bite management. The public may consult the Minnesota Department of Health M-F, 8:00 a.m. to 4:30 p.m. at the same number.

Fee for testing is \$25.00. Out of state add 10%.

Party responsible: _____

VDL Use Only

Submitter

Person submitting sample: _____ Date: ____/____/____
(check all that apply): Owner Veterinarian Exposed person Other _____

If veterinarian, name of clinic: _____

Address: _____

City/Zip: _____ State: _____ County: _____

Phone 1: _____ Phone 2: _____

Email: _____ Fax: _____

Species: _____ Owned Stray Wild

Date of death: ____/____/____ Tested animal was: Euthanized Died naturally Killed Found dead

Test Animal

Owner (if different from submitter): _____ Phone: _____

Address/Location of tested animal: _____

City/Zip: _____ State: _____ County: _____

Explain situation: _____

Cremation request (check one): Mass (no remains returned) Individual (remains returned). Arranged by owner or veterinary clinic. An animal testing positive for rabies cannot be released for individual cremation.

Exposure

No human exposure Human exposure Date of exposure: ____/____/____

Type of exposure: Bite (where on body): _____ Non-bite

Person(s) exposed: _____ Adult Child

Where did exposure occur? _____ County: _____

Contact phone for exposed person (Phone 1): _____ (Phone 2): _____

Laboratory VDL

Live Dead: Whole body Head Brain: Hippocampus Cerebellum Brain stem Sent to MDH: _____ Date _____ Initials _____
Condition Good Fair Autolyzed Traumatized Dried No tissue

MDH

Test date: ____/____/____
 FA rabies positive FA rabies negative
 Unsatisfactory specimen Equivocal

Comments: _____

Instructions and Information

Whenever possible, specimens should be hand delivered. If this is not possible, ship by a direct overnight delivery service (such as Fed Ex). For next business day results, a specimen must be received at the Veterinary Diagnostic Laboratory (VDL) by 11:00 a.m. Specimens should not be sent by mail. There is a \$25.00 fee for testing of all specimens and a 10% additional charge for out of state submissions. Any costs associated with euthanasia, specimen preparation, packing, shipping, and testing are the responsibility of the person requesting the examination.

Specimens should be delivered to:

Business hours (M-F, 8:00-4:30)

Veterinary Diagnostic Laboratory (VDL)
College of Veterinary Medicine
University of Minnesota-St. Paul Campus
1333 Gortner Avenue
St. Paul, MN 55108
Phone: 612- 625-8787
Fax: 612- 624-8707

Non business hours and holidays*

Veterinary Medical Center (VMC)
Emergency Receiving
College of Veterinary Medicine
University of Minnesota-St. Paul Campus
Phone: 612- 625-9711
1365 Gortner Avenue
St. Paul, MN 55108

* Live bats will not be accepted after business hours.
Notify personnel that this is a suspect rabies specimen.

Packing requirements:

- Specimens should be chilled (not frozen) until ready to ship.
- Double bag specimens in heavy, leak-proof plastic bags, securely sealed and ship in a leak-proof container, preferably a Styrofoam box with a cardboard exterior.
- Leak-proof freezer packs should be included in the shipping container to keep specimen cold.

DO NOT PACK IN WET ICE OR DRY ICE

- Newspaper or other absorbent packing material should be used to fill space within the container to ensure temperature stability and to absorb fluids in case of leakage.
- Complete this form, place in a plastic bag and attach securely to the outside of the specimen container. Form is also available at: www.vdl.umn.edu/ourservices/rabies/home.html.
- Label the exterior of the box, "Veterinary Diagnostic Specimen."

Specimen:

Companion animals should be euthanized by a licensed veterinarian. Whole bodies of dogs, cats, ferrets, skunks, bats and other small animals may be sent intact. Bats may be delivered alive during regular VDL business hours as long as they are well contained, the container is labeled "Live Bat for Rabies Testing" and the bat is hand delivered, not shipped. Unless a full necropsy is to be performed, ship only the heads of large animals such as cows, horses, and pigs. If the brain is removed by a veterinary professional, the entire brain should be sent, including the cerebrum with hippocampus, cerebellum and brain stem. Bilateral samples must be tested as unilateral rabies infection of large animals has been reported.

It is imperative that brain samples not be fixed in chemical preservatives. Keep the specimen chilled, not frozen until shipped. However, samples that have been inadvertently frozen can often yield satisfactory results. Grossly deteriorated specimens will not be tested.

The VDL does not provide individual cremation services. Animal remains will be processed using mass chemical cremation unless arrangements for private cremation are made by the client or the client's veterinarian. Once results of all tests are known, animals testing negative for rabies may be released to a private cremation service. Animals testing positive for rabies will not be released for cremation due to the risk of human exposure.

Reptiles, amphibians and birds are not susceptible to rabies, and these animals are not tested for it. Small rodents (hamsters, gerbils, guinea pigs, squirrels, chipmunks, rats, mice, gophers, etc.), insectivores (moles and shrews), and lagomorphs (hares and rabbits) DO NOT pose a risk for rabies in Minnesota. MDH strongly discourages testing them for rabies.

Form revised 05/2011



UNIVERSITY OF MINNESOTA

VETERINARY DIAGNOSTIC LAB



Minnesota Department of Health
Infectious Disease Epidemiology, Prevention and Control Division
651-201-5414 – TDD/TTY 651-201-5797
www.health.state.mn.us

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