

GEORGIA

Rabies Control Manual

January 2007 | Fifth Edition



Table of Contents

	Page Number
Foreword	1
Important phone numbers	2
I. RABIES OVERVIEW	4
II. RABIES PREVENTION AND CONTROL	
Legal Authority	6
Principles of Rabies Control	6
A. CONTROL METHODS IN ANIMALS	
• Animal Vaccination Protocols	7
• Management of Animals Exposed to Rabies	8
• Management of Animals that Bite Humans	10
• Protocols--Quick Reference	12
B. CONTROL METHODS IN HUMANS	
• Rabies Biologics	16
• Preexposure Vaccination	17
• Postexposure Vaccination	19
-Regimen and Schedule	20
-Assessing the Need for PEP	20
• Decision Trees	23
• Sources for Rabies Prophylactic Biologics	28
III. LABORATORY DIAGNOSIS OF RABIES	
• General Principles	32
• Reporting & Interpreting Results	35
• Submission Form	36
• Serologic Testing	37
IV. RABIES CONTROL DURING DISASTER RESPONSE	39
IV. BATS AND RABIES	40
V. FREQUENTLY-ASKED QUESTIONS (FAQ) ABOUT RABIES	42
VI. REFERENCES	
• Definitions	45
• Rabies Control Law-O.C.G.A-31-19	47
• <i>Compendium of Animal Rabies Prevention and Control, 2007</i>	50

Foreword

The purpose of this manual is to provide current information on the control of rabies in Georgia. It is designed to be used by county health departments, hospital emergency departments, private physicians and health care practitioners, veterinarians and animal control programs. This manual should serve as an educational tool for use in all facets of community rabies control. Additionally, it is hoped that this manual will assist communities in standardizing rabies control practices within the state.

This document was prepared by Cherie L. Drenzek, DVM, MS, and Meghan M. Weems, MPH. Credit is also given to authors of the following: 1) *Georgia Rabies Control Manual*, Third and Fourth Editions (1996, 2001); 2) National Association of State Public Health Veterinarians (NASPHV) *Compendium of Animal Rabies Prevention and Control 2007*, and 3) *Human Rabies Prevention—United States, 1999, Recommendations of the Advisory Committee on Immunization Practices (ACIP)*.

If you have any questions regarding this manual, please contact the Notifiable Diseases Epidemiology Section, Epidemiology Branch, Division of Public Health, Georgia Department of Human Resources at (404) 657-2588.

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Director
Division of Public Health

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State Epidemiologist
Epidemiology Branch

Important Phone Numbers

RABIES CONSULTATIONS

Georgia Poison Center- (Atlanta)	404-616-9000
*Toll Free Number	800-222-1222
County Health Departments	See local phone directory
County Animal Control	See local phone directory
Epidemiology Branch, DPH, DHR	404-657-2588
CDC Clinician Information Line	800-CDC-INFO (800-232-4636)

STATE PUBLIC HEALTH LABORATORIES

Atlanta (Decatur)	404-327-7900
Albany	229-430-4122
Waycross	912-285-6000

HOSPITALS THAT STOCK RABIES BIOLOGICS

List by County	See pages 28-31
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SOURCES FOR RABIES VACCINE

Sanofi Pasteur (HDCV)	800-VACCINE (800-822-2463)
Chiron Corporation (PCEC)	800-CHIRON8 (800-244-7668)

SOURCES FOR RABIES IMMUNE GLOBULIN

Sanofi Pasteur	800-VACCINE (800-822-2463)
Bayer Corp. Pharmaceutical Division	800-288-8370

INDIGENT PATIENT RABIES VACCINE SUPPORT PROGRAMS

Sanofi Pasteur	800-VACCINE (800-822-2463)
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RxHope Box 4008 Clinton, NJ 08809 Fax: 908-713-7700 customerservice@RXHope.com	908-713-7600
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SEROLOGIC TESTING FOR HUMANS AND ANIMALS (see pages 37-38)

Atlanta Health Associates, Inc. 309 Pirkle Ferry Road, Suite D300 Cumming, GA 30040 Fax: 770 205-9021 *Toll Free Number	770-205-9091 800-717-5612
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Auburn University College of Veterinary Medicine Dept. of Pathobiology, Virology Lab 261 Greene Hall Auburn University, AL 36849-5519	334-844-2659
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Kansas State University Rabies Lab
Veterinary Medical Center
Manhattan, Kansas 66506
rabies@vet.ksu.edu

785-532-4483

Rabies Tags*

Dogs, cats, and ferrets should be identified (e.g., metal or plastic tags or microchips) to allow for verification of rabies vaccination status.

*Licenses/rabies tag requirements are County based; please call your County for specifics.

RABIES OVERVIEW

Rabies is a viral infection transmitted in the saliva of infected mammals. The virus enters the central nervous system of the host, causing an encephalomyelitis that is almost always fatal. Although all species of mammals are susceptible to rabies virus infection, only a few species are important as reservoirs for the disease in nature. In the United States, several distinct rabies virus variants have been identified in terrestrial mammals, including major terrestrial reservoirs in raccoons, skunks, foxes, and coyotes. In addition to the terrestrial reservoirs for rabies, several species of insectivorous bats also serve as reservoirs for the disease.

Wildlife is the most important potential source of infection for both humans and domestic animals in the United States. Reducing the risk of rabies in domestic animals and limiting contact with wild animals are central to the prevention of human rabies. Vaccination of all domestic dogs, cats, and ferrets coupled with the systematic removal of stray animals that are at risk of exposure to rabid wildlife, are basic elements of a rabies control program. Georgia law (Rabies Control Law-O.C.G.A-31-19) requires that all owned dogs and cats be vaccinated against rabies by a licensed veterinarian using approved vaccines in accordance with the national *Compendium of Animal Rabies Prevention and Control* (see pages 50-60). Domestic ferrets need to be vaccinated against rabies according to the national *Compendium of Animal Rabies Prevention and Control* (see pages 50-60), and Georgia law (O.C.G.A-27-5-5).

In the United States, indigenously acquired rabies among humans has declined markedly in recent years. The decline is, in part, due to vaccination and animal control programs begun in the 1940s that have practically eliminated the domestic dog as a reservoir of rabies and also to the development of effective human rabies vaccines and rabies immune globulin. During 1980-2004, a total of 56 cases of human rabies were reported in the United States (including two in Georgia- during 1991 and 2000, respectively.) Among the 55 cases for which rabies-virus variants were obtained, 35 (64%) were associated with insectivorous bats, most commonly the silver-haired and eastern pipistrelle bats. More than half (57%) of these human cases occurred during August-November, coincident with a seasonal increase in prevalence of rabid bats detected in the United States. Despite the substantial number of cases of human rabies attributable to bat exposure, the importance of these exposures is often overlooked or under-estimated. In many of these cases, the bat bite was presumably not recognized nor the risk of rabies appreciated in order to seek appropriate medical attention.

Human rabies is a completely preventable disease if the risk of acquisition is appreciated and appropriate rabies postexposure prophylaxis (consisting of wound care as well as both active and passive immunization) is obtained. Because rabies is a fatal disease, the goal of public health (in coordination with the medical community) is, first, to prevent human exposure to rabies by education and, second, to prevent the disease by administering rabies postexposure prophylaxis (PEP) if exposure occurs. Tens of thousands of people are successfully treated each year after being bitten by an animal that may have rabies.

Although the decision to provide postexposure prophylaxis rests with the patient and his or her physician, valuable consultations can be provided by the Georgia Poison Center, District and County health departments, or the Epidemiology Branch, Division of Public Health (see page 2 for contact information).

Legal Authority

The primary responsibility for the control of rabies in Georgia rests with county boards of health. Chapter 31-19-1 of the Official Code of Georgia Annotated (O.C.G.A.) empowers and requires each county board of health to adopt and promulgate rules and regulations for the prevention and control of rabies (See pages 47-49).

Principles of Rabies Control

As a zoonotic disease, the foundations of rabies control rest upon preventing the disease in animals, preventing the disease in humans, and methods to decrease the likelihood of exposure between humans and animal rabies vectors. Public education regarding rabies exposure risk is paramount. The following principles apply:

- **Rabies Exposure.** Rabies is transmitted only when the virus is introduced into bite wounds, open cuts in skin, or onto mucous membranes.
- **Human Rabies Prevention.** Rabies in humans can be prevented either by eliminating exposures to rabid animals or by providing exposed persons with prompt local treatment of wounds combined with appropriate postexposure prophylaxis (including both passive antibody administration and active immunization with cell culture vaccines). In addition, preexposure vaccination should be offered to persons in high-risk groups, such as veterinarians, animal handlers, and certain laboratory workers.
- **Domestic Animals.** Local governments should initiate and maintain effective programs to ensure vaccination of all dogs, cats, and ferrets and to remove strays and unwanted animals from the community. Recommended vaccination procedures and the licensed animal vaccines are specified in the *Compendium of Animal Rabies Prevention and Control* (See pages 50-60). In addition, adjunct procedures which enhance rabies control include: 1) identification systems (e.g. metal/plastic tags, microchips; please refer to individual County requirements) to verify animal rabies vaccination status; 2) local domestic animal licensure requirements; 3) requirement of interstate health certificates prior to domestic animal travel; 4) implementation of regulations governing imported domestic animals; 5) establishment of a local animal control agency responsible for stray control, leash laws, and issuance of citations for failure to vaccinate animals.
- **Rabies in Wildlife.** The control of rabies among wildlife reservoirs is difficult. Vaccination of free-ranging wildlife or selective population reduction is not always feasible. Rabies control relies upon prevention of exposure to wildlife rabies reservoirs. This can be accomplished via public

education about wildlife rabies risk and recommendations regarding avoidance of contact with wild animals. Leash laws and other control of domestic animals will reduce exposure of pets to potentially rabid wildlife.

Control Methods in Animals

Animal Vaccination Protocols

Parenteral animal rabies vaccines should be administered only by a licensed veterinarian. This is the only way to ensure that a responsible person can be held accountable and to assure the public that the animal has been properly vaccinated. Within 28 days after primary vaccination, a peak rabies antibody titer is reached, and the animal can be considered immunized. An animal is currently vaccinated and is considered immunized if the primary vaccination was administered at least 28 days previously and vaccinations have been administered in accordance with the *Compendium of Animal Rabies Prevention and Control* (See pages 50-60). Regardless of the age of the animal at initial vaccination, a second vaccination should be administered 1 year later. Because a rapid anamnestic response is expected, an animal is considered currently vaccinated immediately after a booster vaccination.

- **Dogs, cats, and ferrets.** All dogs, cats, and ferrets should be vaccinated against rabies and revaccinated in accordance with the *Compendium of Animal Rabies Prevention and Control* (See page 58). For many licensed vaccines, the age at primary vaccination is 3 months, but be aware that for some newer combination rabies vaccines, this age is 8 weeks. If a previously vaccinated animal is overdue for a booster, it should be revaccinated with a single dose of vaccine and placed on an annual or triennial schedule, depending on the type of vaccine used.
- **Livestock.** Vaccinating all livestock against rabies is neither economically feasible nor justified from a public health standpoint. However, strong consideration should be given to vaccinating livestock that are particularly valuable or that might have frequent contact with humans, such as show animals or those in petting zoos (refer to *the Compendium of Animal Rabies Prevention and Control* for specific vaccines licensed for use in livestock, page 58). Horses traveling interstate or with significant public contact (riding stables, etc.) should be currently vaccinated against rabies.
- **Other Animals**
 - Wild.** No parenteral rabies vaccine is licensed for use in wild animals. Because of the risk for rabies in wild animals (especially raccoons, skunks, coyotes, foxes, and bats), the Georgia Department of Natural resources has rigid regulations which prohibit the keeping of wild and wild/domestic hybrids as pets. For further information, please see www.dnr.state.ga.us

- **Maintained in Exhibits and in Zoological Parks.** Captive animals that are not completely excluded from all contact with rabies vectors can become infected with rabies. Moreover, wild animals might be incubating rabies when initially captured; therefore, wild-caught animals susceptible to rabies should be placed in strict isolation for a minimum of 6 months before being exhibited. Employees who work with animals at such facilities should receive preexposure rabies vaccination. The use of pre- or postexposure rabies vaccinations for employees who work with animals at such facilities might reduce the need for euthanasia of captive animals. Carnivores and bats should be housed in a manner that precludes direct contact with the public.

Management of Animals Exposed to Rabies

Any animal potentially exposed to rabies virus by a wild, carnivorous mammal or a bat that is not available for testing should be regarded as having been exposed to rabies.

Dogs, Cats, and Ferrets

- **Unvaccinated** dogs, cats, and ferrets exposed to a rabid animal should be euthanized immediately. If the owner is unwilling to have this done, the animal should be placed in strict isolation (see Definitions, page 45) for 6 months and vaccinated either upon entry to isolation OR 1 month before being released. Animals with expired vaccinations need to be evaluated on a case-by-case basis. Strict isolation should be conducted under the authority of the designated local rabies control agency in which the place, manner, and provisions of the confinement are specified. For example, strict isolation may take place in an animal control facility, or a double-walled isolation pen at home, depending on local requirements. At the first sign of illness or behavioral change in the animal, the local rabies control agency should be notified and the animal should be evaluated by a veterinarian. If clinical signs are suggestive of rabies, the animal should be immediately euthanized and tested for rabies.
- **Currently vaccinated** (see Definitions, page 45) dogs, cats, and ferrets should be revaccinated immediately, kept under the owner's control, and observed at home for 45 days for clinical signs of rabies. During the observation period (see Definitions, page 46) the animal should not be permitted to roam freely and should be restricted to leash walks, if applicable. At the first sign of illness or behavioral change in the animal, the local rabies control agency should be notified and the animal should be evaluated by a veterinarian. If clinical signs are suggestive of rabies, the animal should be immediately euthanized and tested for rabies.

Livestock

- All species of livestock are susceptible to rabies; cattle and horses are the most frequently infected. Livestock exposed to a rabid animal and **currently vaccinated** with a vaccine approved by USDA for that species should be revaccinated immediately and observed for 45 days.
- **Unvaccinated** livestock should be euthanized immediately. If the animal is not euthanized it should be kept under close observation for 6 months. Any illness in an animal under observation should be reported immediately to the local health department. If signs suggestive of rabies develop, the animal should be euthanized and the head shipped for testing as described in Part I.A.8. of the *Compendium of Animal Rabies Prevention and Control* (See page 51).
- Handling and consumption of tissues from exposed animals may carry a risk for rabies transmission. Risk factors depend in part on the site(s) of exposure, amount of virus present, severity of wounds, and whether sufficient contaminated tissue has been excised. If an exposed animal is to be slaughtered for consumption, it should be done immediately after exposure.
- Barrier precautions should be used by persons handling the animal and tissues and all tissues should be cooked thoroughly. Historically, federal guidelines for meat inspectors required that any animal known to have been exposed to rabies within 8 months be rejected for slaughter. USDA Food and Inspection Service (FSIS) meat inspectors should be notified if such exposures occur in food animals prior to slaughter.
- Rabies virus may be widely distributed in tissues of infected animals. Tissues and products from a rabid animal should not be used for human or animal consumption. However, pasteurization temperatures will inactivate rabies virus; therefore, drinking pasteurized milk or eating thoroughly cooked animal products does not constitute a rabies exposure.
- Multiple rabid animals in a herd or herbivore-to-herbivore transmission is uncommon; therefore, restricting the rest of the herd if a single animal has been exposed to or infected by rabies is usually not necessary.

Other Animals

- Other animals bitten by a rabid animal should be euthanized immediately. Animals maintained in USDA-licensed research facilities or accredited zoological parks should be evaluated on a case-by-case basis. Consultations can be provided by the Epidemiology Branch, Division of Public Health.

Management of Animals that Bite Humans

Dogs, Cats, and Ferrets

- A healthy dog, cat, or ferret that bites a person should be quarantined for 10 days, **no matter if the animal is currently vaccinated or not**. Administration of rabies vaccine is not recommended during the quarantine period.
- Quarantine conditions should prevent direct contact with other animals or persons. The quarantine shall be conducted under the authority of the designated local rabies control agency in which the place, manner, and provisions of the quarantine are specified. For example, quarantine may take place in a kennel in a veterinary hospital, animal control facility, commercial boarding establishment or a pen at home, depending on local requirements.
- At the first sign of illness or behavioral change in the animal, the local rabies control agency should be notified and the animal should be evaluated by a veterinarian. If clinical signs are suggestive of rabies, the animal should be immediately euthanized and tested for rabies and the exposed person notified.
- Any stray or unwanted dog, cat, or ferret that bites a person may be euthanized immediately (or following the locally-specified impoundment period to give owners sufficient time to claim animals) and the head submitted for rabies examination.

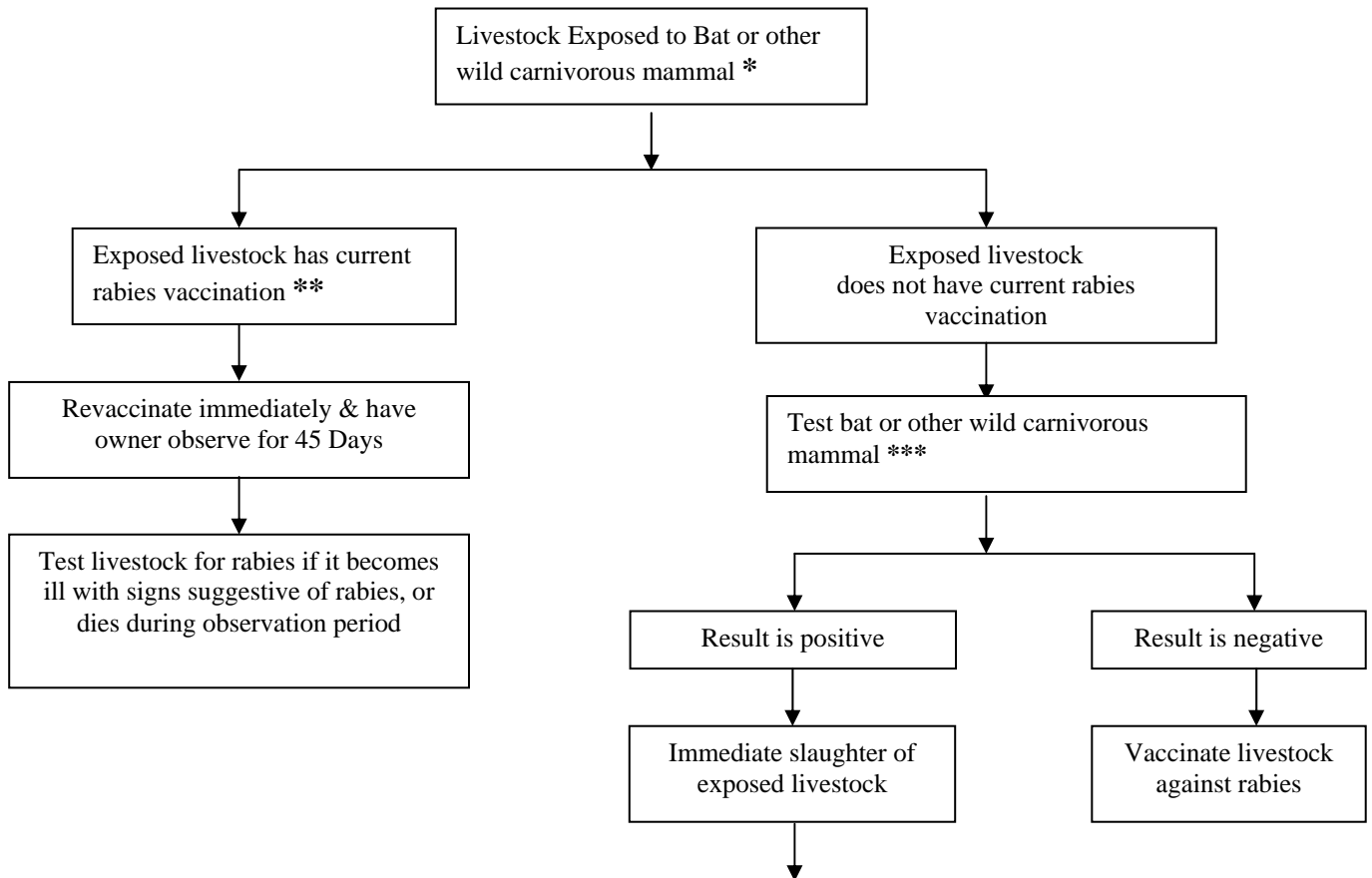
Other biting animals (wild animals, animals maintained in zoological parks, canine or feline wild/domestic hybrids, etc.)

- No parenteral rabies vaccines are licensed for use in animals other than dogs, cats, ferrets, and some livestock.
- Since the duration of clinical signs and the period of virus shedding are unknown for many species, quarantine may not be a feasible management strategy. Most wild mammals that bite or otherwise expose persons should be **considered** for euthanasia and rabies examination. Prior vaccination of an animal might not preclude the necessity for euthanasia and testing if the period of virus shedding is unknown for that species.
- Management of animals other than dogs, cats, and ferrets depends on the species, the circumstances of the bite, the epidemiology of rabies in the area, and the biting animal's history, current health status, and potential for exposure to rabies. The Epidemiology Branch, Division of Public Health, should be consulted when circumstances warrant.

Wildlife

- Most wild mammals that bite or otherwise expose persons should be considered for euthanasia and rabies examination. Since the duration of clinical signs and the period of virus shedding are unknown for these species, an appropriate quarantine or isolation period cannot be ascertained. Assessing rabies risk and the need for rabies diagnostic testing can be guided by the following:
 - **Wild Carnivores**: Raccoons, skunks and foxes are the terrestrial animals most often infected with rabies. All bites by such wildlife must be considered possible exposures to the rabies virus. Signs of rabies among wildlife cannot be interpreted reliably; therefore, any such animal that exposes a person should be euthanized at once (without unnecessary damage to the head) and the brain should be submitted for rabies testing.
 - **Rodents and lagomorphs** (squirrels, rats, mice, hamsters, guinea pigs, gerbils, chipmunks, rabbits): are almost never found to be infected with rabies and have not been known to transmit rabies to humans. Bites by these animals are usually not considered a rabies risk and do not warrant rabies testing unless the animal is sick or behaving in an unusual manner. Rodents that are considered to be a rabies risk include woodchucks or groundhogs (*Marmota monax*) because they are frequently large enough to survive the attack of a rabid carnivore. **Approval must be obtained from the Georgia Public Health Laboratory or the Epidemiology Branch of the Division of Public Health prior to submitting a rodent for rabies testing.**
 - **Bats**: A bat that bites, scratches, or has any direct physical contact with a person should be safely captured (see page 41 for instructions), immediately euthanized, and the entire animal sent to the laboratory for rabies examination. People usually know when they have been bitten by a bat. However, because bats have small teeth that may leave marks that are not easily seen, there are situations in which rabies testing and medical advice should be sought even in the absence of an obvious bite wound. These include awakening to find a bat in the room, finding a bat in the room of an unattended child, having a bat physically brush against you, or finding a bat near a mentally impaired or intoxicated person. In these situations a bite cannot be definitively ruled out. If physical contact occurs or the situations above occur, and the bat is not available for testing (i.e. escapes from house, etc.) rabies postexposure prophylaxis should also be administered as soon as possible.
 - **Other wild animals** (opossums, otters, polecats, beavers, weasels, etc.): In most situations involving non-reservoir species, the rabies risk is relatively low. The risk is higher and, consequently, rabies testing may be indicated if the animal is found in a rabies-endemic area, has opportunity for exposure to rabies reservoirs, is large enough to survive an attack by a rabid animal, or is ill or exhibiting abnormal behavior (for example, we have found many rabid bobcats in Georgia).

PROTOCOL FOR LIVESTOCK POSSIBLY EXPOSED TO RABIES



If Owner Refuses Euthanasia:

1. Close observation for 6 months.
2. If slaughtered within 7 days of exposure, tissues are fit for consumption.
3. Neither tissues nor milk from a rabid animal should be used for human or animal consumption
4. Test livestock if it becomes ill with signs suggestive of rabies, or dies during confinement period.
5. Federal guidelines for meat inspectors require that any animal known to have been exposed to rabies within 8 months be rejected for slaughter

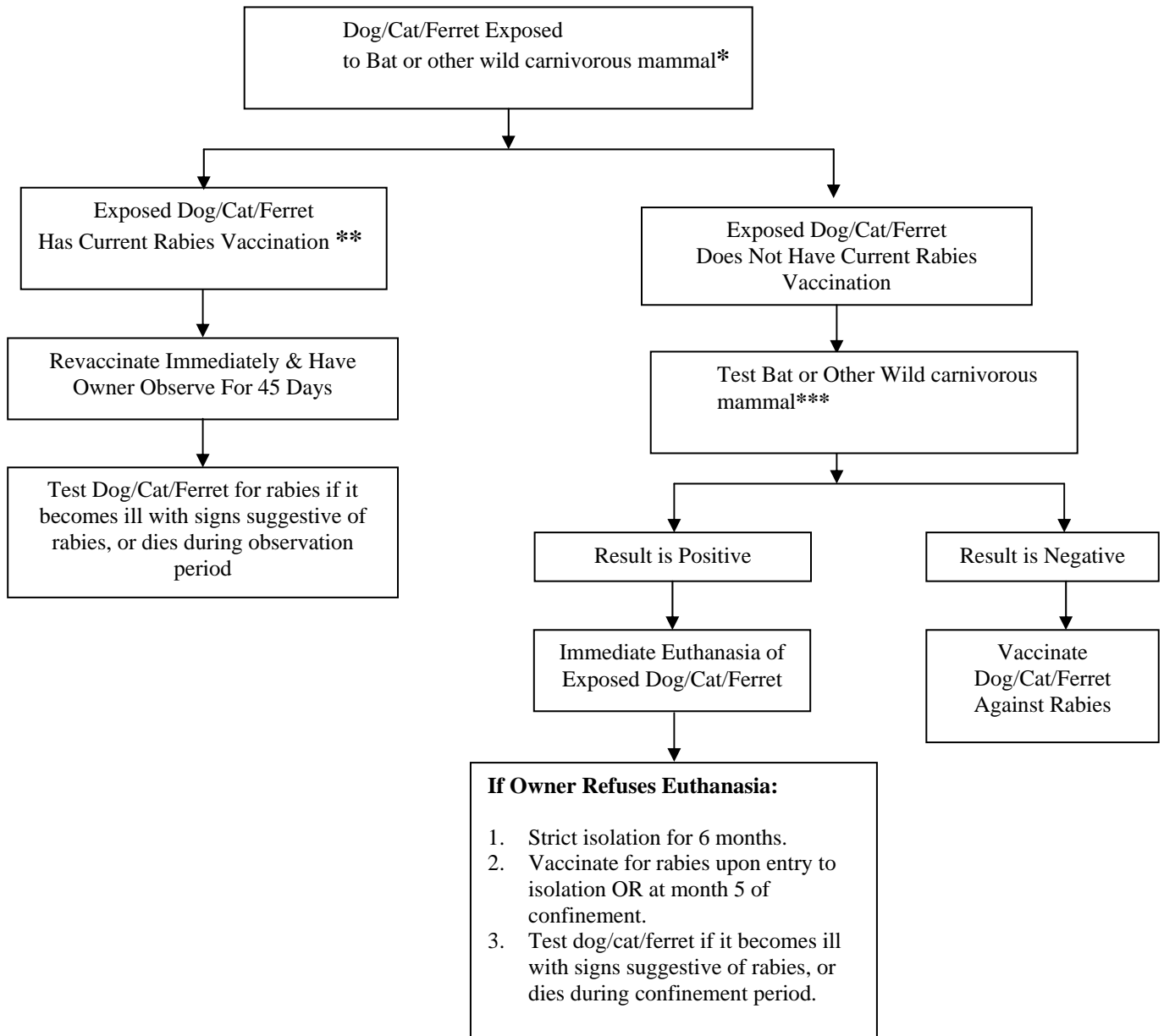
NOTE: Herbivore to herbivore transmission is rare. Restriction of the rest of the herd may not be necessary.

* Consultations regarding animal exposures can be provided by the Epidemiology Branch of the Division of Public Health at 404-657-2588.

** An animal is currently vaccinated if the primary rabies vaccine was administered by a veterinarian at least 28 days previously and booster vaccines have been administered on an annual or triennial schedule, according to vaccine label.

***If bat or wild animal is NOT available for testing, must proceed as if result is positive.

PROTOCOL FOR DOGS, CATS, AND FERRETS POSSIBLY EXPOSED TO RABIES



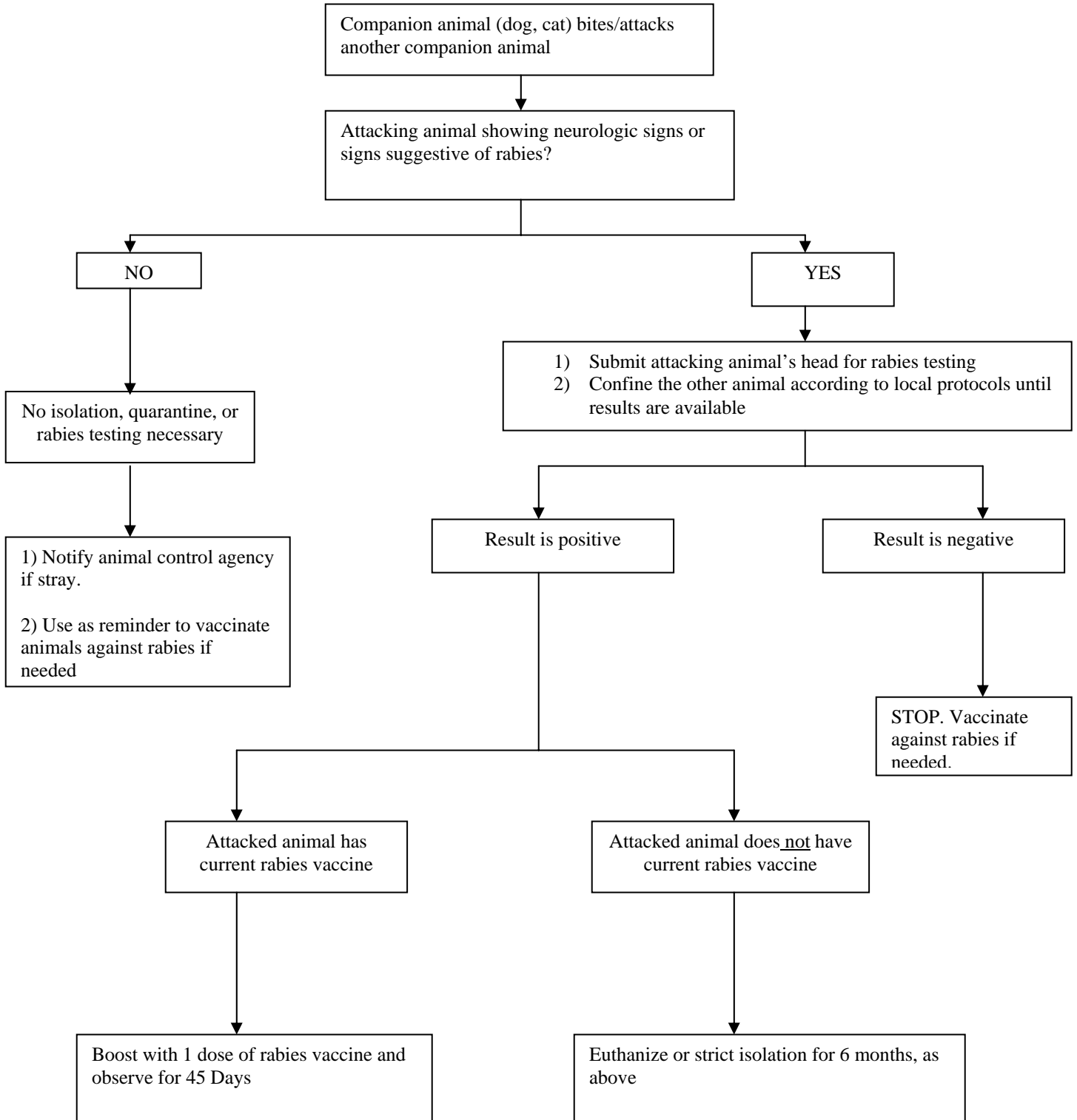
* Consultations regarding animal exposures can be provided by the Epidemiology Branch of the Division of Public Health at 404-657-2588.

** An animal is currently vaccinated if the primary rabies vaccine was administered by a veterinarian at least 28 days previously and booster vaccines have been administered on an annual or triennial schedule.

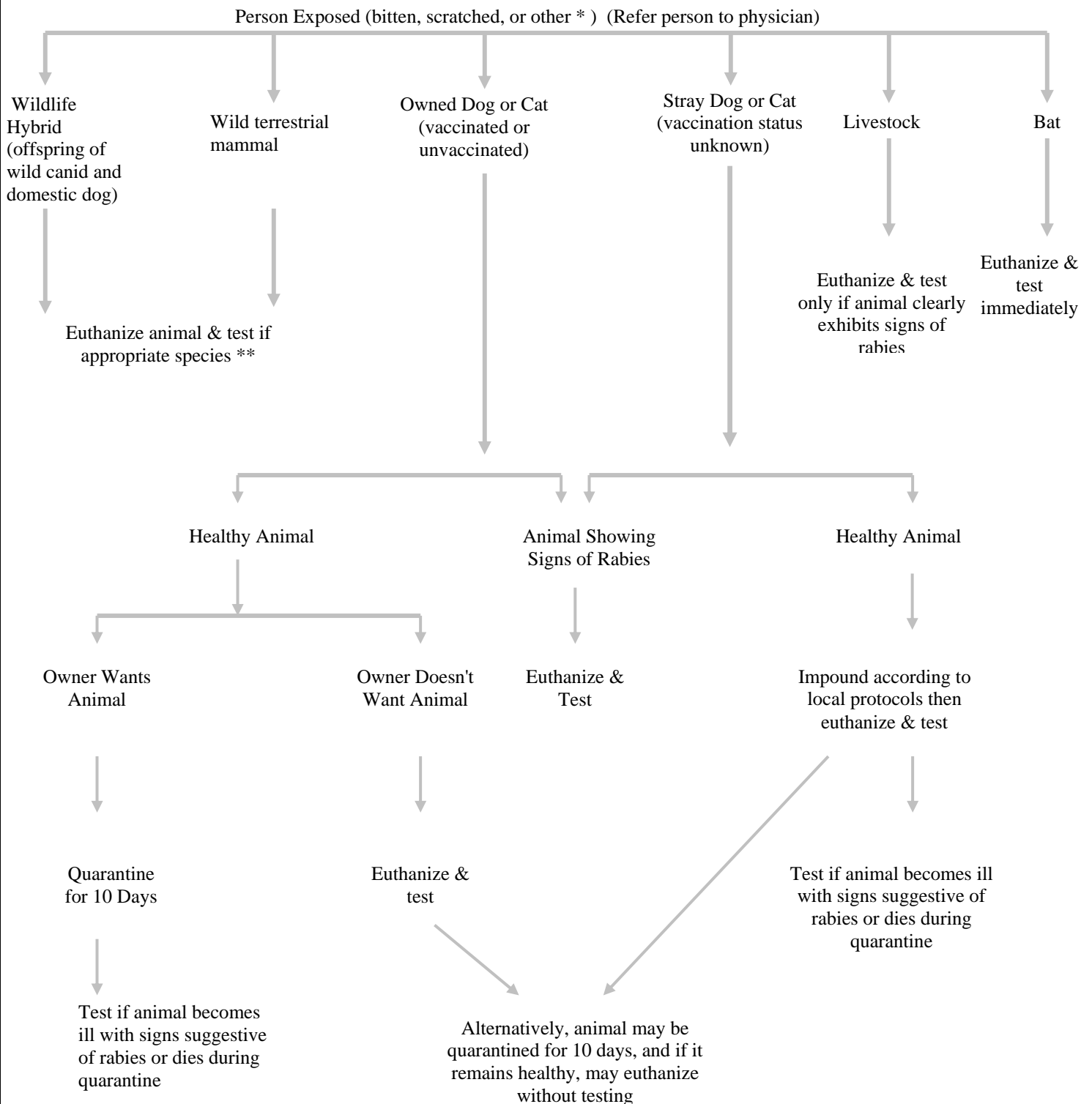
*** If bat, attacking dog or wild animal is NOT available for testing, must proceed as if result is positive.

PROTOCOL FOR COMPANION ANIMAL TO COMPANION ANIMAL EXPOSURES/ENCOUNTERS

Note: If healthy, dog-to-dog, dog-to-cat, or cat-to-cat encounters are not generally considered a rabies risk in the United States (other than in Texas or other areas with endemic dog-to-dog transmission).



RABIES PROTOCOL FOR ANIMALS WHICH HAVE BITTEN PEOPLE



* Consultations regarding exposure can be provided by the Georgia Poison Center, 24 hours a day, 7 days a week, at 1-800-282-5846 or 404-616-4000.

** The following animals are NOT CONSIDERED LIKELY TO HAVE RABIES and will not be tested except by special arrangements with the Epidemiology Branch of the Georgia Division of Public Health at 404-657-2588: chipmunk, gopher, hamster, mouse, rat, squirrel, gerbil, guinea pig, mole, rabbit, hare, shrew, vole.

Control Methods in Humans

Prevention of human rabies depends on eliminating exposure to rabid animals and providing exposed persons with prompt local treatment of their wounds, combined with appropriate rabies postexposure prophylaxis (PEP) consisting of both passive antibody administration and immunization with cell culture vaccines. In addition, preexposure vaccination is recommended for persons in high-risk groups, such as veterinarians, animal handlers, and certain laboratory workers.

Rabies Biologics

In general, two types of rabies products are available in the United States, namely, rabies vaccines and rabies immune globulin. Rabies vaccines induce an active immune response that includes the production of neutralizing antibodies. This antibody response requires approximately 7-10 days to develop and usually persists for greater than or equal to 2 years. Rabies immune globulin (RIG) provides a rapid, passive immunity that persists for only a short time (half-life of approximately 21 days).

Two formulations of inactivated rabies vaccines are currently licensed for preexposure and postexposure prophylaxis in the United States (see below). When used as indicated, both types of rabies vaccines are considered equally safe and efficacious. A full 1.0-mL IM dose is used for both preexposure and postexposure prophylaxis. There are no currently approved formulations for the intradermal dose and route for preexposure vaccination; all must be administered intramuscularly. Usually, an immunization series is initiated and completed with one vaccine product. No clinical studies have been conducted that document a change in efficacy or the frequency of adverse reactions when the series is completed with a second vaccine product.

- Rabies biologics -- United States, 2007

- A. Vaccines

1. **Human Diploid Cell Vaccine (HDCV):** HDCV is prepared from the Pitman-Moore strain of rabies virus grown on MRC-5 human diploid cell culture, concentrated by ultrafiltration, and inactivated with beta-propiolactone. It is approved for **intramuscular (IM) administration only**, and is supplied in a single-dose vial containing lyophilized vaccine that is reconstituted in the vial with the accompanying diluent to a final volume of 1.0 mL just before administration.

Please note: HDCV formerly was supplied in an alternate form for intradermal administration under the name *Imovax Rabies I.D.®*, which has recently been withdrawn from the market. **There are no currently licensed formulations for the intradermal dose and route for preexposure vaccination.**

- Manufacturer: Sanofi Pasteur
- Product names: *Imovax Rabies*®

2. **Purified Chick Embryo Cell Vaccine (PCEC)**: PCEC became available in the United States in autumn 1997. It is prepared from the fixed rabies virus strain Flury LEP grown in primary cultures of chicken fibroblasts. The virus is inactivated with beta-propiolactone and further processed by zonal centrifugation in a sucrose density gradient. It is formulated for **IM administration only**. PCEC is available in a single-dose vial containing lyophilized vaccine that is reconstituted in the vial with the accompanying diluent to a final volume of 1.0 mL just before administration.

- Manufacturer: Novartis/Chiron Corporation
- Product name: *RabAvert*®

B. Rabies Immune Globulin (RIG)

- The two RIG products licensed in the United States are antirabies immunoglobulin (IgG) preparations concentrated by cold ethanol fractionation from plasma of hyper-immunized human donors. Rabies neutralizing antibody, standardized at a 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; the recommended dose is 20 IU/kg body weight. Both RIG preparations are considered equally efficacious when used as described.
 - Manufacturers: Bayer Corporation Pharmaceutical Division and Sanofi Pasteur.
 - Product names: *BayRab*™® and *Imogam Rabies-HT*®

Rabies Preexposure Vaccination

Preexposure vaccination should be offered to persons in high-risk groups, such as veterinarians, animal handlers, and certain laboratory workers. Preexposure vaccination also should be considered for other persons whose activities bring them into frequent contact with rabies virus or potentially rabid bats, raccoons, skunks, cats, dogs, or other species at risk for having rabies. In addition, international travelers might be candidates for preexposure vaccination if they are likely to come in contact with animals in areas where dog rabies is enzootic and immediate access to appropriate medical care, including biologics, might be limited.

Preexposure prophylaxis is administered for several reasons. First, although preexposure vaccination does not eliminate the need for additional therapy after a rabies exposure, it simplifies therapy by eliminating the need for RIG and decreasing the number of doses of vaccine needed -- a point of particular importance for persons at high risk for being exposed to rabies in areas where immunizing products might not be available or where they might be at high risk for adverse reactions. Second,

preexposure prophylaxis might protect persons whose postexposure therapy is delayed. Finally, it might provide protection to persons at risk for inapparent exposures to rabies.

- Preexposure vaccination regimens are as follows (also see Table below):
 - **Intramuscular Primary Vaccination**
 - Three 1.0-mL injections of HDCV or PCEC should be administered intramuscularly (deltoid area) -- one injection per day on days 0, 7, and 21 or 28.

Rabies preexposure prophylaxis schedule -- United States, 2007

Type of vaccination	Route	Regimen
Primary	Intramuscular	HDCV or PCEC; 1.0 mL (deltoid area), one each on days 0*, 7, and 21 or 28
Booster	Intramuscular	HDCV or PCEC; 1.0 mL (deltoid area), day 0* only

HDCV= human diploid cell vaccine; PCEC = purified chick embryo cell vaccine

*Day 0 is the day the first dose of vaccine is administered.

Source: CDC. Human rabies prevention -- United States, 1999: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 1999; 48 (no. RR-1).

Note: Because the antibody response has been satisfactory after these recommended preexposure prophylaxis vaccine regimens, routine serologic testing to confirm seroconversion is not necessary except for persons suspected of being immunosuppressed.

Preexposure Booster Doses of Vaccine

Following completion of the preexposure primary vaccination regimen, certain persons whose activities bring them into frequent contact with rabies virus or potentially rabid animals may need a **booster** dose of vaccine if their rabies-neutralizing antibody level falls below an acceptable level (see below). The following table provides guidelines based upon level of risk:

Risk category	Typical populations	Booster recommendations
Continuous	Rabies research lab workers Rabies biologics production workers	Serologic testing* every 6 months; booster vaccination when antibody levels below acceptable level**
Frequent	Rabies diagnostic lab workers Spelunkers Veterinarians and staff Animal Control Officers (endemic areas) International travelers to canine rabies-endemic areas for >30days	Serologic testing* every 2 years; booster vaccination when antibody levels below acceptable level**
Infrequent	Animal Control Officers (non-endemic areas) Veterinarians (non-endemic areas) Veterinary students	No serologic testing* or booster vaccination needed

*Refer to pages 37-38 for information about serologic testing.

** Minimum acceptable antibody level is complete virus neutralization at 1:5 serum dilution by RFFIT. Booster dose should be administered if the titer falls below this level.

Source: CDC. Human rabies prevention -- United States, 1999: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 1999; 48 (no. RR-1).

Postexposure Therapy for Previously Vaccinated Persons

If exposed to rabies, persons who have been previously vaccinated with either the recommended preexposure OR postexposure regimen should receive **TWO-IM** doses (1.0 mL each) of vaccine, one immediately and one 3 days later. RIG is unnecessary and should not be administered to these persons.

Rabies Postexposure Vaccination

In general, postexposure prophylaxis (PEP) is indicated for persons exposed to a rabid animal in order to prevent infection with rabies virus. In the United States, the PEP regimen consists of local wound treatment, administration of one dose of immune globulin (with the exception of persons who have previously received complete vaccination regimens, either preexposure or postexposure), and 5 doses of rabies vaccine over a 28-day period. Rabies immune globulin and the first dose of rabies vaccine should be given as soon as possible after exposure. Additional doses of rabies vaccine should be given on days 3, 7, 14, and 28 after the first vaccination. See chart below for specific schedule and administration instructions.

Rabies Postexposure Prophylaxis Schedule

Vaccination Status	Treatment	Regimen*
Not previously vaccinated	Local Wound Cleansing	PEP should always begin with immediate cleansing of all wounds with soap and water. If available, a virucidal agent such as a povidone-iodine solution should be used to irrigate the wounds.
	RIG	Administer 20 IU/kg body weight. If anatomically feasible, the full dose should be infiltrated around the wound(s) and any remaining volume should be administered IM at an anatomical site distant from vaccine administration. RIG should not be administered in the same syringe as vaccine. Because RIG might partially suppress active production of antibody, no more than the recommended dose should be given.
	Vaccine	HDCV or PCEC 1.0 mL, IM (deltoid area)**, one each on days 0 [#] , 3, 7, 14, and 28.
Previously vaccinated***	Local wound cleansing	PEP should always begin with immediate cleansing of all wounds with soap and water. If available, a virucidal agent such as a povidone-iodine solution should be used to irrigate the wounds.
	RIG	RIG should not be administered.
	Vaccine	HDCV or PCEC 1.0 mL, IM (deltoid area)**, one each on days 0 [#] and 3.

*These regimens are applicable for all age groups, including children.** The deltoid area is the only acceptable site of vaccination for adults and older children. For younger children, the outer aspect of the thigh may be used. Vaccine should never be administered in the gluteal area. *** Any person with a history of preexposure vaccination with HDCV or PCEC; prior postexposure prophylaxis with HDCV, PCEC. # Day 0 is the first day of vaccine administration, not necessarily the day of exposure.

Source: CDC. Human rabies prevention -- United States, 1999: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 1999; 48 (no. RR-1).

Assessing Need for PEP

Administration of rabies PEP is a medical urgency, not a medical emergency. Persons who have been bitten by animals suspected or proven to be rabid should begin PEP as soon as possible. However, very long incubation periods (up to 1 year) have been reported in humans. Thus, when a documented or likely exposure has occurred, PEP is indicated regardless of the length of the delay, provided the clinical signs of rabies are not present. Under most circumstances, PEP should not be initiated while the biting, healthy dog/cat/ferret is still in 10-day quarantine. However, during the 10-

day quarantine period, begin PEP at the first sign of rabies in a dog, cat, or ferret that has bitten someone.

Health care providers should evaluate each possible exposure to rabies and when necessary consult with the Georgia Poison Center or public health officials regarding the need for rabies PEP.

In the United States, the following factors should be considered in the rabies risk assessment before PEP is initiated:

- type of exposure (bite vs. nonbite)
- the geographic location of the incident
- the type of animal that was involved
- circumstances of the exposure (provoked or unprovoked)
- the vaccination status of animal
- whether the animal can be safely captured and tested for rabies

In general, the highest risk of rabies transmission is associated with bite exposure from terrestrial wild carnivores or bats (see **Decision Trees A and A-1**). Raccoons, skunks, foxes, and coyotes are the terrestrial animals most often infected with rabies. All bites by such wildlife must be considered possible exposures to the rabies virus. PEP should be initiated as soon as possible after patients are exposed to wildlife unless the animal has already been tested and shown not to be rabid. In addition, bats are increasingly implicated as important wildlife reservoirs for variants of rabies virus transmitted to humans. In all instances of potential human exposures involving bats, the bat in question should be safely collected, if possible, and submitted for rabies diagnosis. Rabies PEP is recommended for all persons with bite, scratch, or mucous membrane exposure to a bat, unless the bat is available for testing and is negative for evidence of rabies. PEP might also be appropriate even if a bite, scratch, or mucous membrane exposure is not apparent when there is reasonable probability that such exposure might have occurred (see pages 40-41 for more specific information about bats and rabies).

The likelihood of rabies in a domestic animal varies by region; hence, the need for PEP also varies. In the continental United States, rabies among dogs is reported most commonly along the United States-Mexico border and sporadically in areas of the United States with enzootic wildlife rabies. During most of the 1990s, more cats than dogs were reported rabid in the United States. The majority of these cases were associated with the epizootic of rabies among raccoons in the eastern United States. The large number of rabies-infected cats might be attributed to fewer cat vaccination laws, fewer leash laws, and the roaming habits of cats. In many developing countries, dogs are the major vector of rabies; exposures to dogs in such countries represent an increased risk of rabies transmission. In the United States, a currently vaccinated dog, cat, or ferret is unlikely to become infected with rabies (see **Decision Tree B**). Although all species of livestock are susceptible to rabies, they are infrequently found

to be infected (see **Decision Tree C**). Cattle and horses are among the most frequently reported rabid livestock; in many cases these animals have a previously reported history of exposure to a wildlife rabies reservoir, such as raccoon, skunk, or bobcat.

Small rodents (e.g., squirrels, hamsters, guinea pigs, gerbils, chipmunks, rats, and mice) and lagomorphs (including rabbits and hares) are almost never found to be infected with rabies and have not been known to transmit rabies to humans (see **Decision Tree D**).

An unprovoked attack by an animal is more likely than a provoked attack to indicate that the animal is rabid. Bites inflicted on a person attempting to feed or handle an apparently healthy animal should generally be regarded as provoked.

Refer to chart below and to the Decision Trees on pages 23-27 for specific guidelines.

Rabies Postexposure Prophylaxis Guide

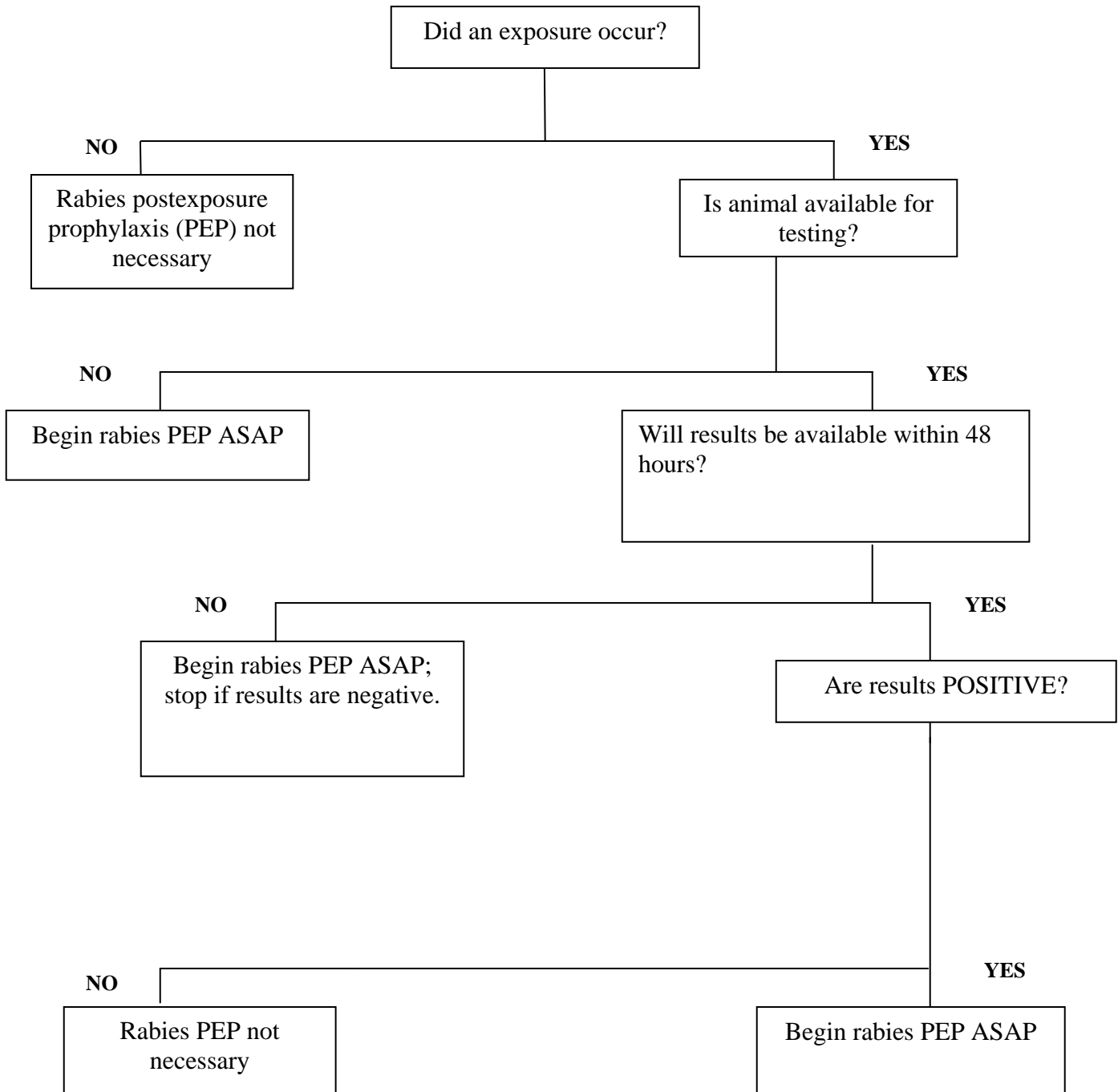
Animal type	Evaluation and disposition of animal	Postexposure prophylaxis recommendations
Dogs, cats, and ferrets	-Healthy and available for 10 day quarantine -Rabid or suspected rabid -Unknown (e.g., escaped)	Persons should not begin PEP unless animal develops clinical signs of rabies.* Immediate PEP. Consult Georgia Poison Center or public health officials.
Skunks, raccoons, bobcats, foxes and most other carnivores; bats	Regarded as rabid unless animal proven negative by laboratory tests**	Consider immediate PEP.
Livestock, small rodents, lagomorphs (rabbits and hares), large rodents (woodchucks and beavers), and other mammals	Consider individually.	Consult Georgia Poison Center or public health officials. Bites of squirrels, hamsters, mice, rats, most other rodents, and rabbits almost never require PEP. Larger rodents may be a risk.

*During the 10-day quarantine period, begin PEP at the first sign of rabies in a dog, cat, or ferret that has bitten someone. If the animal exhibits clinical signs of rabies, it should be euthanized immediately and tested.

**The animal should be euthanized and tested as soon as possible. Discontinue vaccine if rabies test results are negative.

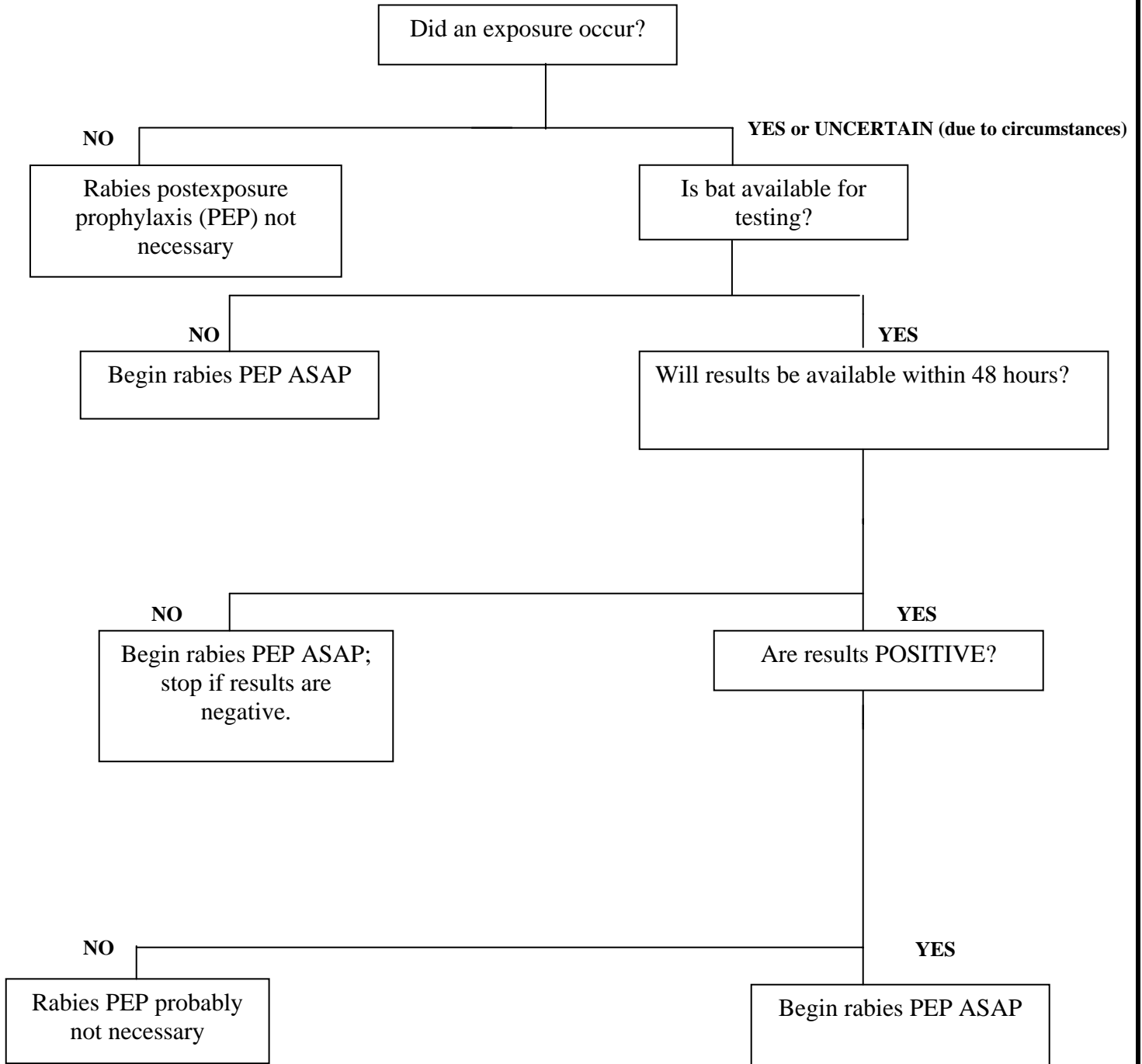
Decision Tree A HIGH RISK ANIMALS

Decision Tree for Wild Carnivore (Raccoon, Fox, Skunk, etc.) Exposure



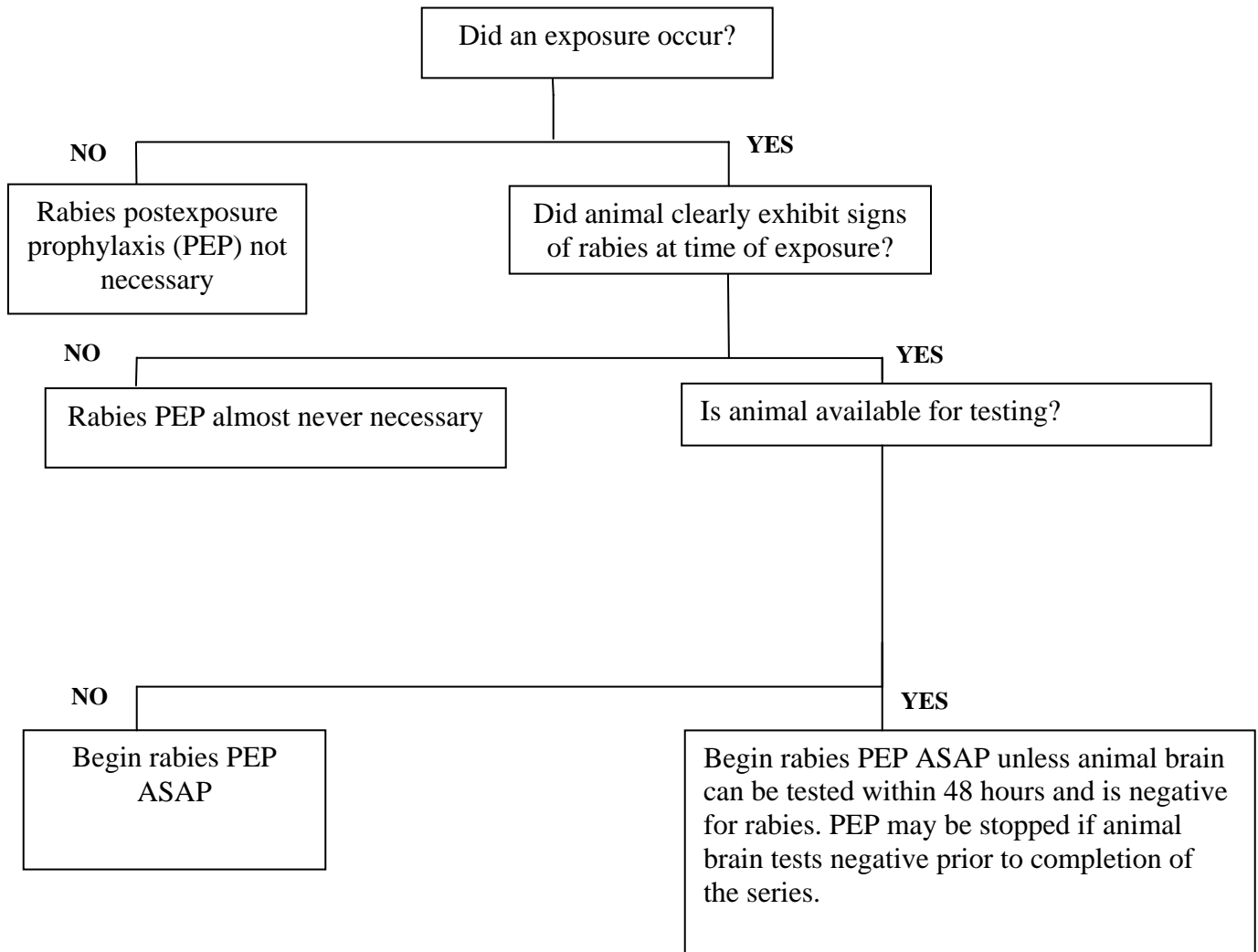
Decision Tree A-1 HIGH RISK ANIMALS

Decision Tree for Bat Exposure



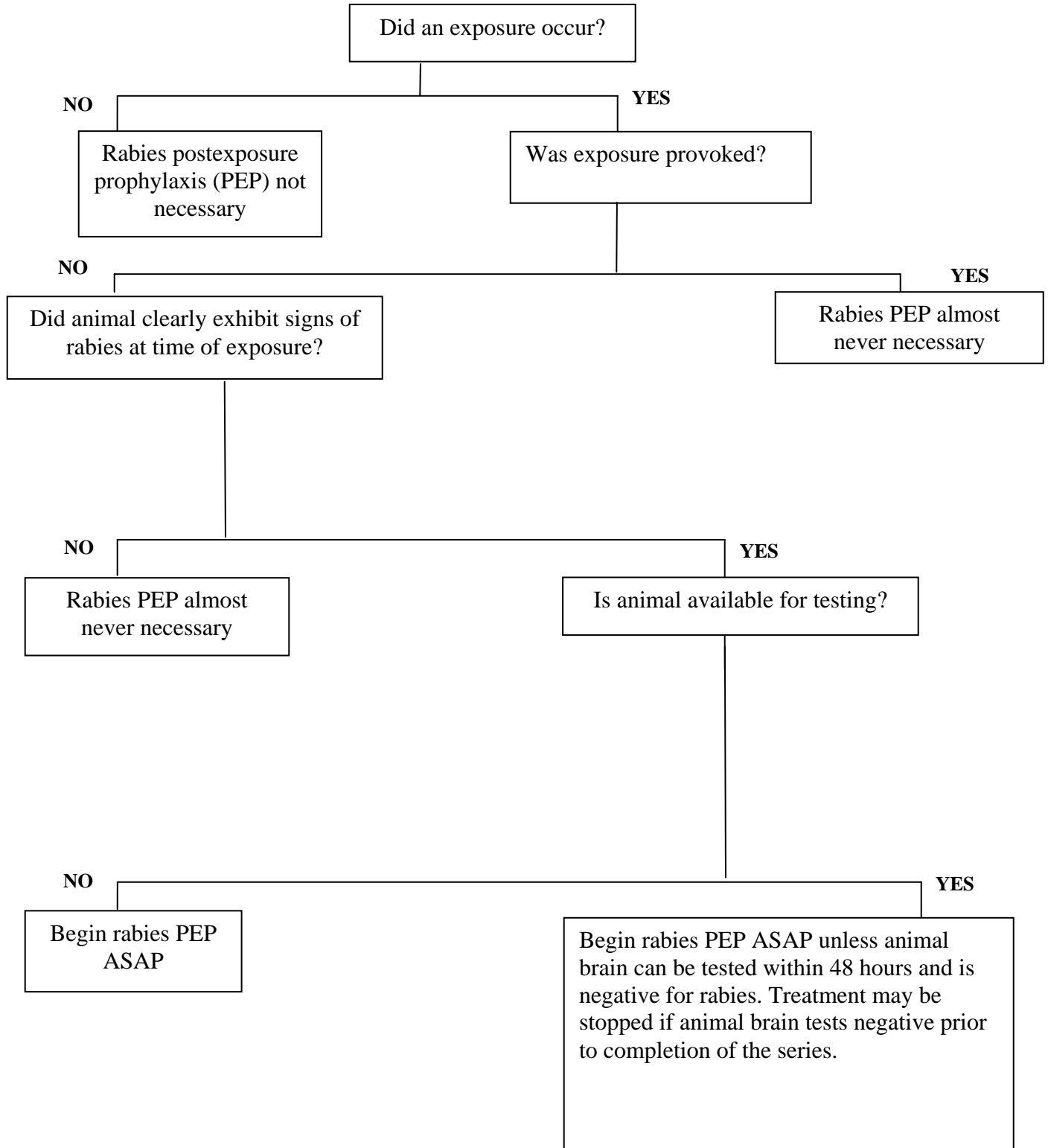
Decision Tree C LOW RISK ANIMALS

Decision Tree for Livestock Exposure



Decision Tree D
VERY LOW RISK ANIMALS

Decision Tree for Rodent & Rabbit Exposure



Hospital Emergency Departments And/Or Health Departments that Stock or Can Obtain Rabies Prophylactic Biologics Within 24 Hours, By County in Georgia, January 2007.

COUNTY	NAME	CITY	TELEPHONE (main #)	DISTRICT
APPLING	Appling Healthcare System	Baxley	912-367-9841	9-2
BACON	Bacon County Hospital	Alma	912-632-8961	9-2
BALDWIN	Oconee Regional Medical Center	Milledgeville	478-454-3505	5-2
BARROW	Barrow Community Hospital	Winder	770-867-3400	10-0
BARTOW	Cartersville Medical Center	Cartersville	770-382-1530	1-1
BEN HILL	Dorminy Medical Center	Fitzgerald	229-424-7100	8-1
BERRIEN	Berrien County Hospital	Nashville	229-543-7100	8-1
BIBB	Coliseum Medical Center	Macon	478-765-7000	5-2
BIBB	Medical Center of Central GA	Macon	478-633-1000	5-2
BROOKS	Brooks County Hospital	Quitman	229-263-4171	8-1
BULLOCH	East Georgia Medical Center	Statesboro	912-486-1000	9-2
BURKE	Burke County Medical Center	Waynesboro	706-554-4435	6-0
CANDLER	Candler County Hospital	Metter	912-685-5741	9-2
CARROLL	Tanner Medical Center	Carrollton	770-836-9666	4-0
CHARLTON	Charlton Memorial Hospital	Folkston	912-496-2531	9-2
CHATHAM	Candler General Hospital	Savannah	912-819-6000	9-1
CHATHAM	Memorial Medical Center	Savannah	912-350-8000	9-1
CHATHAM	St. Joseph's Hospital	Savannah	912-819-4100	9-1
CLARKE	Athens Regional Medical Center	Athens	706-549-9977	10-0
CLARKE	St. Mary's Hospital of Athens	Athens	706-548-7581	10-0

COUNTY	NAME	CITY	TELEPHONE (main #)	DISTRICT
COBB	Cobb County Health Department	Marietta	770-514-2345	3-1
COBB	Wellstar Cobb Hospital	Austell	770-732-4000	3-1
COBB	Wellstar Kennestone Hospital	Marietta	770-793-5000	3-1
COFFEE	Coffee Regional Medical Center	Douglas	912-384-1900	9-2
COLQUITT	Colquitt Regional Medical Center	Moultrie	229-985-3420	8-2
COOK	Memorial Hospital of Adel	Adel	229-896-8000	8-1
CRISP	Crisp Regional Hospital	Cordele	229-276-3100	7-0
DEKALB	Dekalb Medical Center	Decatur	404-501-1000	3-5
DOUGHERTY	Phoebe Putney Memorial Hospital	Albany	229-883-1800	8-2
DOUGHERTY	Southwest Health District	Albany	229-430-6257	8-2
DOUGLAS	Wellstar Douglas General Hosp	Douglasville	770-949-1500	3-1
EFFINGHAM	Effingham County Hospital	Springfield	912-754-6451	9-1
EMANUEL	Emanuel County Hospital	Swainsboro	478-237-9911	6-0
EVANS	Evans Memorial Hospital	Claxton	912-739-2611	9-2
FLOYD	Floyd Medical Center	Rome	706-802-2000	1-1
FULTON	Grady Memorial Hospital	Atlanta	404-616-4307	3-2
FULTON	Hughes Spalding Children's Hospital	Atlanta	404-785-6000	3-2
GLYNN	SE GA Regional Medical Center	Brunswick	912-466-7000	9-1
GORDON	Gordon Hospital	Calhoun	706-629-2895	1-1

COUNTY	NAME	CITY	TELEPHONE (main #)	DISTRICT
GWINNETT	Gwinnett Medical Center Lawrenceville	Lawrenceville	770-995-4321	3-4
GWINNETT	Gwinnett Medical Center Duluth	Duluth	678-584-6800	3-4
HALL	Northeast Georgia Medical Center	Gainesville	770-535-3553	2-0
HENRY	Henry Medical Center	Stockbridge	770-389-2200	4-0
HOUSTON	Houston Medical Center	Warner Robins	478-922-4281	5-2
IRWIN	Irwin County Hospital	Ocilla	229-468-3800	8-1
JACKSON	BJC Medical Center	Commerce	706-335-1416 (pharmacy #)	10-0
JASPER	Jasper Memorial Hospital	Monticello	706-468-6411	5-2
JEFF DAVIS	Jeff Davis Hospital	Hazlehurst	912-375-7781	9-2
JEFFERSON	Jefferson Hospital	Louisville	478-625-7000	6-0
JENKINS	Jenkins County Hospital	Millen	478-982-4221	6-0
LAURENS	Fairview Park Hospital	Dublin	478-275-2000	5-1
LIBERTY	Liberty Regional Medical Center	Hinesville	912-369-9400	9-1
LOWNDES	South Georgia Medical Center	Valdosta	229-333-1000	8-1
MCDUFFIE	McDuffie Regional Medical Center	Thomson	706-595-1411	6-0
MONROE	Monroe County Hospital	Forsyth	478-994-2521	5-2
MUSCOGEE	Doctors Hospital	Columbus	706-494-4262	7-0
MUSCOGEE	Medical Center - Columbus	Columbus	706-571-1000	7-0
MUSCOGEE	St. Francis Hospital	Columbus	706-322-8281	7-0
PEACH	Peach Regional Medical Center	Fort Valley	478-825-8691	5-2
PUTNAM	Putnam General Hospital	Eatonton	706-485-2711	5-2

COUNTY	NAME	CITY	TELEPHONE (main #)	DISTRICT
ROCKDALE	Rockdale Medical Center	Conyers	770-918-3000	3-4
SPALDING	Spalding Regional Medical Center	Griffin	770-228-2721	4-0
SUMTER	Sumter Regional Hospital	Sumter	229-924-6011	7-0
THOMAS	John D. Archbold Memorial Hospital	Thomasville	229-228-2000	8-2
TIFT	Tift Regional Medical Center	Tifton	229-382-7120	8-1
TOOMBS	Meadows Regional Medical Center	Vidalia	912-537-8921	9-2
TROUP	West Georgia Medical Center	LaGrange	706-882-1411	4-0
UPSON	Upson Regional Medical Center	Thomaston	706-647-8111	4-0
WALTON	Walton Regional Medical Center	Monroe	770-267-8461	10-0
WARE	Satilla Regional Medical Center	Waycross	912-283-3030	9-2
WASHINGTON	Washington County Medical Center	Sandersville	478-552-3901	5-2
WAYNE	Wayne Memorial Hospital	Jesup	912-427-6811	9-2
WILKES	Wills Memorial Hospital	Washington	706-678-2151	6-0

LABORATORY DIAGNOSIS OF RABIES

General Principles of Rabies Diagnosis in Animals

The rapid and accurate laboratory diagnosis of rabies infections in animals is essential for timely administration of rabies postexposure prophylaxis and may also aid in defining current epidemiologic patterns of rabies and in recognizing the need for the development of rabies control programs. In Georgia, animal rabies diagnosis is provided by the three laboratories of the Georgia Public Health Laboratory (GPHL) in accordance with the established national standardized protocol for rabies testing. (http://www.cdc.gov/ncidod/dvrd/rabies/Professional/publications/DFA_diagnosis/DFA_protocol-b.htm)

The direct fluorescent antibody test (dFA) is most frequently used to diagnose rabies in animals. All rabies laboratories in the United States perform this test on the brain tissue of animals suspected of having rabies. This test has been thoroughly evaluated for more than 40 years, and is recognized as the most rapid and reliable of the tests for routine use. The dFA test is based on the principle that an animal infected by rabies virus will have rabies virus protein (antigen) present in its tissue. Because rabies is present in nervous tissue (and not blood like many other viruses) the ideal tissue to test for the presence of rabies antigen is brain. The most important part of a dFA test is fluorescein-labeled anti-rabies antibody. When labeled antibody is added to rabies-suspect brain tissue, it will bind to rabies antigen if it is present. Unbound antibody can be washed away and the areas where the antigen has bound antibody will appear as a bright fluorescent apple green color when viewed with a fluorescence microscope. If rabies virus is absent, there will be no staining.

Specimen collection and labeling

A key factor in obtaining reliable laboratory results is the condition of the specimen when received by the laboratory. Shipping of specimens should be coordinated with the county health department or animal control officer. Containers for shipment are available from county health departments or from GPHL Laboratory Supply (404-327-7904).

- **Submission Guidelines**

1. Only specimens received in good condition with at least two identifiable brain parts are approved for reporting test results.
2. For a specimen to be accepted for testing, there must have been exposure of a human or domestic animal to the suspected rabid animal.
3. The laboratories are not equipped to handle whole carcasses: Only the HEAD is accepted as a specimen, except for bats and animals of similar size,

which should be submitted whole. Whole carcasses of any larger animal will be returned to the sender for resubmission of the HEAD ONLY.

4. The following guidelines are recommended for the removal of animal heads: (whenever possible, this procedure should be performed by a person who has received preexposure rabies vaccine.)

- Rubber gloves and protective clothing as well as face and eye protection should be worn while the head is being removed and packaged.
- Sever the head between the foramen magnum and the atlas. Local veterinarians or trained animal control personnel can assist in this removal.
- Allow fluids and blood to drain from the head. Keep as clean as possible and place the head in a double plastic bag for transport to the laboratory.
- If fleas or ticks are present, spray insecticide into the plastic bag containing the head before closing. Do not send maggots.
- Cutting surfaces and instruments should be thoroughly cleaned with detergent and water and disinfected. Gloves should also be cleaned and disinfected or discarded following use.

5. Only brain material (not the entire head) of very large animals (e.g. cows, horses, etc.) will be accepted due to limitations for handling in the laboratory. Removal of the brain should only be attempted by a veterinarian. Whole heads of large animals received by the laboratory will be returned to the sender for resubmission of the BRAIN ONLY.
6. Rodents (rats, mice, gerbils, hamsters, guinea pigs, chipmunks, voles, squirrels, moles, etc.) and rabbits are not usually involved in the rabies cycle and will not be accepted for testing without prior arrangements with the Epidemiology Branch (404-657-2588) or the State Public Health Laboratory to which the specimen is being sent (Atlanta (Decatur): 404-327-7900; Albany: 229-430-4122; Waycross: 912-285-6000.)
7. If specimens cannot be delivered to the laboratory immediately, refrigerate but DO NOT FREEZE. Frozen specimens cannot be tested until they thaw, which may cause a delay in reporting.
8. Do NOT send tissue in a preservative such as formalin, as rabies testing cannot be performed on such specimens.

Laboratory Submission Form

- A Rabies History/Report Form #3062 should accompany each specimen submitted for rabies examination. This form should be filled out completely and legibly, making sure to include accurate addresses and phone numbers for use in reporting results. If you do not have a GPLH submitter code, please call GPLH at 404-327-7900 to have one assigned to you prior to submission.
- Blank forms may be found on page 36 of this manual and also on the Georgia Division of Public Health website at <http://health.state.ga.us>.

Specimen Shipment Guidelines

Containers for shipment are available from county health departments or from GPLH Laboratory Supply (404-327-7904). Rabies testing is available Monday through Friday.

- Properly package the specimen by placing the severed animal head in a double plastic bag and secure the bag by twisting and knotting. For bats or similar size animals, do not remove the head, but submit whole. For large animals (e.g. cows, horses, etc.) submit the BRAIN ONLY (consult the attending veterinarian).
- Place the large plastic bag into the styrofoam container. Add cold packs. **DO NOT USE DRY ICE.**
- Place the sealed bag containing the specimen on top of the cold packs in the container. Seal the styrofoam shipper. Place the completed submission form in the brown envelope, and tape to the lid of the sealed shipper. Place the shipper in the cardboard box and tape the address for shipment. Do not seal the box until shipment, so the agent can inspect the container.
- The package should be shipped PREPAID to the nearest Public Health laboratory using the method of shipment that will assure prompt delivery. **CONTAINERS WITH SPECIMENS CANNOT BE SENT THROUGH THE MAIL.** Addresses and telephone numbers of laboratories are as follows:

Albany Regional Laboratory 1109 N. Jackson Street Albany, Georgia 31701-2022 Telephone: 229-430-4122	Atlanta (Decatur) Laboratory 1749 Clairmont Road Decatur, Georgia 30033-4050 Telephone: 404-327-7900	Waycross Regional 1101 Church Street Waycross, Georgia 31501-3525 Telephone: 912-285-6000
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- Any bite case with a strong probability of human rabies exposure should be handled with utmost speed. Where possible, hand deliver such specimens

after telephoning ahead to advise the laboratory of the expected time of arrival.

- Avoid shipping specimens on weekends or holidays unless prior approval has been obtained from the laboratory manager. Special instructions regarding labeling will be needed to ensure that weekend courier or security personnel are notified to receive the specimen from the carrier. A better alternative is to place the specimen in double plastic bags as described above and refrigerate until shipment can be made when the laboratory is in operation Monday through Friday, unless the test result is urgent.

Reporting and interpretation of results

Rabies testing is available Monday through Friday. Due to the time required for tissue fixation, reports will ordinarily be issued the next business day following receipt of the specimen, provided that the specimen is received by 10:00 a.m. Reporting will be delayed on specimens that are frozen.

- Specimens received on Friday or those involved in emergency situations (severe human head or neck exposures or human exposures for which emergency testing has been approved by the Epidemiology Branch at 404-657-2588) will be tested and reported the same day received, provided they arrive in the laboratory by 10:00 a.m. Otherwise, results will be reported the following business day.
- If the brain is decomposed or damaged to the point that the laboratory is uncertain as to whether the specimen is, in fact, the appropriate brain tissue, testing will not be done unless there is human exposure. Report will read "**UNSATISFACTORY**" with the comment: "Test requires at least two identifiable brain parts." With human exposure, routine testing is performed. If **POSITIVE**, the report will so state. If **NEGATIVE**, a report of "**UNSATISFACTORY**" will be made with the comment: "Test requires at least two identifiable brain parts." In this situation, an unsatisfactory test result should be managed as if **POSITIVE**.
- All positive, negative, and unsatisfactory rabies results are telephoned immediately to the submitter listed on the Rabies History/Report Form, with follow-up electronic reporting (if available) or hard copy of the report sent by mail.

Serologic Testing Issues

All persons tested during several CDC studies 2-4 weeks after completion of preexposure and postexposure rabies prophylaxis in accordance with ACIP guidelines have demonstrated an antibody response to rabies. Therefore, serum samples from patients completing preexposure or postexposure prophylaxis do not need to be tested to document seroconversion unless the person is immunosuppressed. If titers are obtained, specimens collected 2-4 weeks after completing the preexposure or postexposure prophylaxis regimen should completely neutralize challenge virus at a 1:5 serum dilution by the Rapid Fluorescent Focus Inhibition Test (RFFIT). Although antibody levels do not define a person's immune status, they are markers of continuing immune response.

In animals, neutralizing antibody titers have been shown to be imperfect markers of protection. Antibody titers will vary with time since the last vaccination. Titers do not directly correlate with protection because other immunologic factors also play a role in preventing rabies, and our abilities to measure and interpret those other factors are not well developed. Therefore, evidence of circulating rabies virus antibodies should not be used as a substitute for current vaccination in managing rabies exposures or determining the need for booster vaccinations in animals.

- Considering these issues, serologic testing to quantitate antibody levels after rabies vaccination in humans and animals is applicable in the following cases:

- A person at "continuous risk" of exposure to rabies should have a serum sample tested for rabies antibody every six months (see page 18). This includes rabies laboratory workers and rabies biologic production workers.
- A person at "frequent risk" of exposure to rabies should have a serum sample tested for rabies antibody every two years (see page 18). This includes: rabies diagnostic workers, spelunkers, veterinarians and their staff, animal control workers, wildlife workers, and travelers visiting foreign areas of endemic rabies for more than one month.
- Some "rabies-free" jurisdictions may require evidence of vaccination and rabies antibodies in domestic animals (dogs and cats) for importation purposes. CONTACT INDIVIDUAL COUNTRIES FOR IMPORT REQUIREMENTS. Keep in mind there is not an established "protective" titer in animals. Titers do not directly correlate with protection because other immunologic factors also play a role in preventing rabies, and our abilities to measure and interpret those other factors are not well developed. Therefore, evidence of circulating rabies virus antibodies should not be used as a substitute for current vaccination in managing rabies exposures or determining the need for booster vaccinations in animals.

There are two types of RFFIT tests depending on the request: a screen test simply tells the patient/client if a booster of rabies vaccine is indicated and serum is tested at two dilutions. An end-point titer is used to determine the exact titer and is tested at serial five-fold dilutions until an end-point is reached. This test is indicated for those who want to know their exact titer and for animals being exported to some rabies free countries. Testing requires two milliliters (mls) of serum.

Laboratories conducting rabies serologic testing

(Note: phoning the laboratory in advance for correct forms, testing costs, and proper instructions is recommended).

- ☆ Mosier Hall
Kansas State University
1800 Denison Avenue
Manhattan KS 66506-5600
785-532-4483
e-mail: rabies@vet.ksu.edu
Forms and information also available on the web at
www.vet.ksu.edu/depts/rabies/index.htm

- ☆ Atlanta Health Associates, Inc.
309 Pirkle Ferry Road, Suite D300
Cumming, GA 30040
770-205-9091
800-717-5612
770-205-9021 (fax)

- ☆ Auburn University Virology Laboratory
College of Veterinary Medicine
Dept. of Pathobiology, Virology Lab
261 Greene Hall
Auburn University, AL 36849-5519
334-844-2659

RABIES CONTROL DURING DISASTER RESPONSE

Animals may be displaced during and after manmade or natural disasters and require emergency sheltering (<http://www.bt.cdc.gov/disasters/hurricanes/katrina/petshelters.asp>). Animal rabies vaccination and exposure histories are often not available for displaced animals and disaster response creates situations where animal caretakers may lack appropriate training and previous vaccination. For these situations it is critical to implement and coordinate rabies prevention and control measures to reduce the risk of rabies transmission and the need for human PEP. Public health officials and other response partners should consider the following control measures, when feasible:

- Examine each animal at a triage site for signs of rabies.
- Isolate animals exhibiting signs of rabies pending evaluation by a veterinarian.
- Ensure that all animals have a unique identifier.
- Administer a rabies vaccination to all dogs, cats and ferrets unless reliable proof of vaccination exists.
- Adopt minimum standards for animal caretakers that include personal protective equipment, previous rabies vaccination, and appropriate training in animal handling.
- Maintain documentation of animal disposition and location, e.g. returned to owner, died or euthanized, adopted, relocated to another shelter, address of new location.
- Provide facilities to confine and observe animals involved in exposures.
- Report human exposures to appropriate public health authorities.

BATS AND RABIES



An emerging pattern in the epidemiology of human rabies in the United States is that bat-related virus variants (most commonly from the silver-haired and eastern pipistrelle bats) were identified from 35(64%) of the 55 cases of human rabies diagnosed in the United States during 1980-2004. The majority of cases did not report a definitive history of bat bite, but many reported physical or other contact with bats. Rabies is transmitted only when the virus is introduced into bite wounds or open cuts in skin or onto mucous membranes. However, these epidemiologic data suggest that transmission of rabies virus can occur from minor, seemingly unimportant, or unrecognized bites from bats. Awareness of the facts about bats and rabies can help people protect themselves, their families, and their pets.

- **Bat Rabies Prevention Tips**

- It is not possible to tell if a bat has rabies by looking at it. Rabies can be confirmed only in a laboratory. However, any bat that is active by day, is found in a place where bats are not usually seen (for example, in a room in the house or on the lawn), or is unable to fly, is far more likely than others to be rabid. Such bats are often the most easily approached. Therefore, it is best never to handle any bat.
- Bat bites are not always visible. Therefore, in situations in which a bat is physically present and there is a possibility of exposure, the person should seek medical advice and the bat should be safely captured (see below) and submitted to a rabies laboratory for testing. If rabies cannot be ruled out by laboratory testing, or, if the bat is not available for testing, people with a reasonable probability of an exposure may be recommended for rabies postexposure prophylaxis. Scenarios that **may** indicate a reasonable probability of exposure to rabies include:

- A child picks up a live bat;
- An adult touches a bat without seeing the part of the body they touched;
- A bat flies into a person and touches bare skin;
- A person steps on a bat with bare feet;
- A person awakens to find a bat in the room with him/her;
- A bat is found near an infant, toddler, or mentally impaired or intoxicated person.

Assistance with bat capture may be provided by a local animal control agency or health department. If professional help is immediately unavailable, the bat may be safely captured by following these steps:

Safe bat capture

- Equipment needed: leather workgloves; small box or coffee can; piece of cardboard; tape.
 - When the bat lands, approach it slowly, while wearing the gloves, and place the box or coffee can over it. Slide the cardboard under the container to trap the bat inside.
 - Tape the cardboard to the container securely, and punch very small holes (1/8 inch or less in diameter) in the cardboard, allowing the bat to breathe.
 - If any possible contact between the bat and a person or domestic animal has occurred, do not release the bat. Contact the health department or animal control agency to make arrangements for rabies testing.
 - If no human or pet exposure has occurred, take the container outdoors immediately and release the bat away from people and pets.
-
- Some bats live in buildings, and there may be no reason to evict them if there is little chance for contact with people. However, bats should always be prevented from entering living quarters or occupied spaces in homes, churches, schools, and other similar areas where they might contact people and pets. Assistance with "bat-proofing" homes can be provided by an animal-control or wildlife conservation agency. Another excellent resource is Bat Conservation International at www.batcon.org
 - If there is suspicion that a pet or domestic animal has been bitten by a bat, contact a veterinarian or health department for assistance immediately and have the bat tested for rabies. Remember to keep vaccinations current for cats, dogs, ferrets, and other animals.

Citation is given to the Centers for Disease Control for information contained in the brochure, "Bats and Rabies: A Public Health Guide"

FREQUENTLY-ASKED QUESTIONS (FAQ) ABOUT RABIES

What is the incubation period of rabies in animals and humans?

The incubation period is the time between exposure and onset of clinical signs of disease. The incubation period may vary from a few days to several years, but typically lasts 1 to 3 months. This period is quite long because the rabies virus spreads slowly through the nerves to the spinal cord and brain. There are no signs of illness during the incubation period; rabies virus is not transmissible during this time. When the virus reaches the brain, it multiplies rapidly and passes to the salivary glands. At this point clinical signs of rabies are evident and rabies virus could be transmitted via saliva.

How can I protect my pet from rabies?

First, visit your veterinarian with your pet on a regular basis and keep rabies vaccinations up-to-date for all cats, ferrets, and dogs. Second, maintain control of your pets by keeping cats and ferrets indoors and keeping dogs under direct supervision. Third, spay or neuter your pets to help reduce the number of unwanted pets that may not be properly cared for or vaccinated regularly. Lastly, call animal control to remove all stray animals from your neighborhood since these animals may be unvaccinated or ill.

Why does my pet need the rabies vaccine?

Although the majority of rabies cases occur in wildlife, most humans are given rabies vaccine as a result of exposure to domestic animals. This explains the tremendous cost of rabies prevention in domestic animals in the United States. While wildlife are more likely to be rabid than are domestic animals in the United States, the amount of human contact with domestic animals greatly exceeds the amount of contact with wildlife. Your pets and other domestic animals can be infected when they are bitten by rabid wild animals. When "spillover" rabies occurs in domestic animals, the risk to humans is increased. Pets are therefore vaccinated by your veterinarian to prevent them from acquiring the disease from wildlife, and thereby transmitting it to humans.

Can a vaccinated animal ever get rabies?

Rabies is rare in vaccinated animals. If such an event is suspected, it should be reported immediately to District public health officials and the Epidemiology Branch. The laboratory diagnosis should be confirmed and the virus characterized by a rabies reference laboratory. A thorough epidemiologic investigation should be conducted.

Can I use rabies titers as a substitute for current vaccination or in the management of domestic animals exposed to rabies?

No, rabies titers alone are only one marker of immunity and may not indicate absolute protection. Titers do not directly correlate with protection because other immunologic factors also play a role in preventing rabies, and our abilities to measure and interpret those other factors are not well developed.

Will the rabies vaccine make me sick?

Adverse reactions to rabies vaccine and immune globulin are not common. Newer vaccines in use today cause fewer adverse reactions than previously available vaccines. Mild, local reactions to the rabies vaccine, such as pain, redness, swelling, or itching at the injection site, have been reported. Rarely, symptoms such as headache, nausea, abdominal pain, muscle aches, and dizziness have been reported. Local pain and low-grade fever may follow injection of rabies immune globulin.

What if I cannot get rabies vaccine on the day I am supposed to get my next dose?

Consult with your doctor or state or local public health officials for recommended times if there is going to be a change in the recommended schedule of shots. Rabies prevention is a serious matter and changes should not be made in the schedule of doses.

Should I be concerned about rabies when I travel outside the United States?

Yes. Rabies and rabies-like viruses occur in animals anywhere in the world. When traveling, it is always prudent to avoid approaching any wild or domestic animal.

The developing countries in Africa, Asia, and Latin America have additional problems in that dog rabies is common there and human PEP may be difficult to obtain. The importance of rabid dogs in these countries, where tens of thousands of people die of the disease each year, cannot be overstated. Unlike programs in developed countries, dog rabies vaccination programs in developing countries have not always been successful. Before traveling abroad, consult a health care provider, travel clinic, or health department about your risk of exposure to rabies and how to handle an exposure should it arise. Medical assistance should be obtained as soon as possible after an exposure.

Can rabies be transmitted from one person to another?

The only documented cases of rabies caused by human-to-human transmission, although extremely rare, occurred among recipients of transplanted corneas and other solid organs. Investigations revealed that the donors had died of an illness compatible with or proven to be rabies. Stringent guidelines for acceptance of donor corneas have reduced this risk. In addition to transmission from corneal transplants, bite and nonbite exposures inflicted by infected humans could theoretically transmit rabies, but no such cases have been documented. Casual contact, such as touching a person with rabies or contact with non-infectious fluid or tissue (urine, blood, feces) does not constitute an exposure and does not require postexposure prophylaxis. In addition, contact with someone who is receiving rabies PEP does not constitute rabies exposure and does not require postexposure prophylaxis.

*Citation is given to the Centers for Disease Control for information contained in their rabies website:
<http://www.cdc.gov/ncidod/dvrd/rabies/default.htm>*

DEFINITIONS

- **Currently Vaccinated Against Rabies** - An animal is “currently vaccinated” and is considered immunized against rabies if a vaccination certificate documents that the animal received a USDA-approved primary rabies vaccine from a licensed veterinarian at least 28 days previously and that booster vaccinations have been administered on an annual or triennial schedule, in accordance with the *Compendium of Animal Rabies Prevention and Control* (see pages 50-60) or as described on the individual vaccine label.
- **Exposure**
Rabies exposure occurs when the virus is introduced into bite wounds or open cuts in skin or onto mucous membranes. Two categories of exposure, bite and nonbite, should be considered:
 - **Bite**: Any penetration of the skin by teeth constitutes a bite exposure. All bites, regardless of location, represent a potential risk of rabies transmission. Keep in mind that bites by some animals, such as bats, can inflict minor injury and thus be undetected.
 - **Nonbite**: The contamination of open wounds, abrasions, mucous membranes, or theoretically, scratches, with saliva or other potentially infectious material (such as neural tissue) from a rabid animal constitutes a nonbite exposure. Nonbite exposures from terrestrial animals rarely cause rabies. However, occasional reports of transmission by nonbite exposure suggest that such exposures constitute sufficient reason to consider postexposure prophylaxis.
- **Non-Exposure** - Other contact by itself, such as being in the vicinity of, petting or handling an animal, or coming in contact with blood, urine, or feces does NOT constitute an exposure and does NOT require PEP. Because desiccation and ultraviolet irradiation inactivate the rabies virus, in general, if the material containing the virus is dry, the virus can be considered noninfectious.
- **Confinement** - A general term referring to the restriction of an animal to a building, pen, or other escape-proof enclosure to monitor for clinical signs of rabies. There are **two specific types of confinement**, depending upon the circumstances of the encounter:
 - **Quarantine** (for animal-human encounters)—the **10-day** period of confinement for a domestic animal (dog, cat, or ferret **only**) which has bitten a person, **no matter if the animal is currently vaccinated or not**. Quarantine conditions should prevent direct contact with other animals or persons. The quarantine shall be conducted under the authority of the designated local rabies control agency in which the place, manner, and

provisions of the quarantine are specified. For example, quarantine may take place in a kennel in a veterinary hospital, animal control facility, commercial boarding establishment or a pen at home, depending on local requirements. At the first sign of illness or behavioral change in the animal, the local rabies control agency should be notified and the animal should be evaluated by a veterinarian. If clinical signs are suggestive of rabies, the animal should be immediately euthanized and tested for rabies and the exposed person notified.

- **Strict Isolation** -(for animal-animal encounters)--confinement of an animal exposed or potentially exposed to rabies in a manner that prevents direct contact with other animals or persons. In most cases, this term applies to an **unvaccinated** domestic animal exposed to a rabid wild animal; the duration of strict isolation should be **six months**. Strict isolation should be conducted under the authority of the designated local rabies control agency in which the place, manner, and provisions of the confinement are specified. For example, strict isolation may take place in an animal control facility, or an isolation pen at home, depending on local requirements. At the first sign of illness or behavioral change in the animal, the local rabies control agency should be notified and the animal should be evaluated by a veterinarian. If clinical signs are suggestive of rabies, the animal should be immediately euthanized and tested for rabies and the exposed person notified. Note that the animal should be vaccinated against rabies upon entry into isolation OR one month prior to isolation exit.
- **Observation period** -(animal-animal encounters) for **currently-vaccinated** domestic animals (dogs, cats, ferrets, and in some cases, livestock) exposed to a rabid wild animal, the observation period is the **45-day** period in which the animal is kept under the owner's control to monitor for clinical signs of rabies to develop. During the observation period, the animal should not be permitted to roam and should be restricted to leash walks, if applicable. At the first sign of illness or behavioral change in the animal, the local rabies control agency should be notified and the animal should be evaluated by a veterinarian. If clinical signs are suggestive of rabies, the animal should be immediately euthanized and tested for rabies and the exposed person notified.
- **Provoked Attack** - An attack is considered to be "provoked" if a domestic animal is placed in a situation such that an expected reaction would be to bite or attack. Examples include invasion of an animal's territory, attempting to pet or handle an unfamiliar animal, startling an animal, breaking up an animal fight, running or bicycling past an animal, assisting an injured or sick animal, trying to capture an animal, or removing food, water, or other objects in the animal's possession.
- **Unprovoked Attack** - An attack or bite is considered to be "unprovoked" when none of the above conditions for a "provoked" attack are met; essentially, the animal strikes for no apparent reason.

GEORGIA RABIES CONTROL LAW

Administrative rules and regulations—As to control of rabies, see Official Compilation of Rules and Regulations of the State of Georgia, Rules of Department of Human Resources, Chapter 290-5-2.

I. OPINIONS OF THE ATTORNEY GENERAL

- **Control of rabies generally is delegated to county boards of health, and control of dangerous drugs is vested with the State Board of pharmacy and state drug inspector (now director of Georgia Drugs and Narcotics Agency).** 1975 Op. Atty. Gen. No. 75-23.
- **Expense of confining animals included in county board's budget—Local county boards of health should prescribe rules for prevention and control of rabies by providing for vaccination, tagging, and certification of dogs, and for confinement of any animal which exhibits any signs of rabies; cost of such confinement would be an expense of county board of health to be included in its budget which is submitted to local taxing authorities under provision of section 31-3-14, 1965-66 Op. Atty. Gen. No. 65-21.**
- **Responsibility of county boards of health regarding strays and unwanted dogs—Local county boards of health should adopt rules and regulations relative to catching and impounding of strays and unwanted dogs.** 1965-66 Op. Atty. Gen. No. 65-21.

II. OFFICIAL CODE 31-19, CONTROL OF RABIES

31-19-1. Responsibility for Control

Each county board of health shall have primary responsibility for the control of rabies within its jurisdiction. Such boards, in addition to their other powers, are empowered and required to adopt and promulgate rules and regulations for the prevention and control of such disease.

31-19-2. Powers of department in infected area.

The department (DHR) may declare any county or any area therein or any group of counties or areas therein where rabies exists to be an infected area and may provide for immunization and such other measures as shall be indicated for the prevention and control of the disease.

31-19-3. Licensing and regulation of animals by local authorities.

The governing authorities of each county and municipality are authorized and required, in the control of rabies, to require regulation or licensing of animals.

31-19-4. Duty of notification.

It shall be the duty of any person bitten by any animal reasonably suspected of being rabid immediately to notify the appropriate county board of health. It shall be the duty of the owner, custodian, or person having possession and knowledge of any animal which has bitten any person or animal or of any animal which exhibits any signs of rabies to notify the appropriate county board of health and to confine such animal in accordance with rules and regulations of the county board of health.

31-19-5. Inoculation of canines and felines against rabies.

The county boards of health are empowered and required to adopt and promulgate rules and regulations requiring canines and felines to be inoculated against rabies and to prescribe the intervals and means of inoculation, the fees to be paid in county sponsored clinics, that procedures be in compliance with the recommendations of the National Association of State Public Health Veterinarians for identifying inoculated canines and felines, and all other procedures applicable thereto. As used in this chapter, the term "inoculation against rabies" means the administering by a licensed veterinarian of antirabies vaccine approved by the department.

31-19-6. Certificates of inoculation: tags.

Reserved. Repealed by Ga. L. 1992, p. 2089, sec. 2, effective July 1, 1992.

31-19-7. County rabies control officer.

(a) The county board of health shall appoint a person who is knowledgeable of animals to be the county rabies control officer. It shall be the duty of the county rabies control officer to enforce this chapter and other laws which regulate the activities of dogs.

(b) The county governing authority of each county is authorized to levy a fee not to exceed 50 cents for each dog, such fee to be collected by the veterinarian administering the antirabies vaccine required by this chapter. This fee shall be in addition to that provided for in Code Section 31-19-5. If any county has no resident veterinarian, the out-of-county veterinarian administering the antirabies vaccine and collecting the fee provided for by this Code section shall forward to the treasurer of the county of the dog owner's residence the fee prescribed by that county's governing authority.

(c) The fees collected under this Code section shall be used to help in paying the salary of the county rabies control officer.

31-19-8. Joint administration of chapter by adjoining counties.

The governing authority of each county may devise and implement plans whereby this chapter, as amended, is administered jointly with one or more adjoining counties.

31-19-9. Applicability to municipalities with rabies control laws.

This chapter shall not apply to municipalities which already have a rabies control law unless and until such law is repealed.

31-19-10. Penalty.

Any person who violates any provision of this chapter or any rule or regulation adopted pursuant thereto shall be guilty of a misdemeanor.

Compendium of Animal Rabies Prevention and Control, 2007*
National Association of State Public Health Veterinarians, Inc. (NASPHV)

Rabies is a fatal viral zoonosis and a serious public health problem (1). The disease is an acute progressive encephalitis caused by a lyssavirus. Multiple viral variants are maintained in wild mammal populations in the United States. All mammals are believed to be susceptible to the disease and for purposes of this document, use of the term “animal” refers to mammals.

The recommendations in this compendium serve as a basis for animal rabies prevention and control programs throughout the United States and facilitate standardization of procedures among jurisdictions, thereby contributing to an effective national rabies control program. This document is reviewed annually and revised as necessary. These recommendations do not supersede state and local laws or requirements. Principles of rabies prevention and control are detailed in Part I; Part II contains recommendations for parenteral vaccination procedures; all animal rabies vaccines licensed by the United States Department of Agriculture (USDA) and marketed in the United States are listed in Part III.

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Council of State and Territorial Epidemiologists (CSTE)
National Animal Control Association (NACA)

Part I: Rabies Prevention and Control

A. PRINCIPLES OF RABIES PREVENTION AND CONTROL

1. **RABIES EXPOSURE:** Rabies is transmitted only when the virus is introduced into bite wounds, open cuts in skin, or onto mucous membranes from saliva or other potentially infectious material such as neural tissue (2). Questions about possible exposures should be directed promptly to state or local public health authorities.

2. **PUBLIC HEALTH EDUCATION:** Essential components of rabies prevention and control include ongoing public health education, responsible pet ownership, routine veterinary care, and professional continuing education. The majority of animal and human exposures to rabies can be prevented by raising awareness about: rabies transmission routes; avoiding contact with wildlife; and appropriate veterinary care. Prompt recognition and reporting of possible exposures to medical professionals and local public health authorities

is critical.

- 3. HUMAN RABIES PREVENTION:** Rabies in humans can be prevented either by eliminating exposures to rabid animals or by providing exposed persons with prompt local treatment of wounds combined with the administration of human rabies immune globulin and vaccine. The rationale for recommending preexposure and postexposure rabies prophylaxis and details of their administration can be found in the current recommendations of the Advisory Committee on Immunization Practices (ACIP) (2). These recommendations, along with information concerning the current local and regional epidemiology of animal rabies and the availability of human rabies biologics, are available from state health departments.
- 4. DOMESTIC ANIMALS:** Local governments should initiate and maintain effective programs to ensure vaccination of all dogs, cats, and ferrets and to remove strays and unwanted animals. Such procedures in the United States have reduced laboratory-confirmed cases of rabies in dogs from 6,949 in 1947 to 76 in 2005 (3). Because more rabies cases are reported annually involving cats (269 in 2005) than dogs, vaccination of cats should be required (3). Animal shelters and animal control authorities should establish policies to ensure that adopted animals are vaccinated against rabies. The recommended vaccination procedures and the licensed animal vaccines are specified in Parts II and III of the compendium respectively.
- 5. RABIES IN VACCINATED ANIMALS:** Rabies is rare in vaccinated animals (4). If such an event is suspected, it should be reported to state public health officials, the vaccine manufacturer, and USDA, Animal and Plant Health Inspection Service, Center for Veterinary Biologics (Internet: <http://www.aphis.usda.gov/vs/cvb/html/adverseeventreport.html>; telephone: 800-752- 6255; or e mail: CVB@usda.gov). The laboratory diagnosis should be confirmed and the virus characterized by a rabies reference laboratory. A thorough epidemiologic investigation should be conducted.
- 6. RABIES IN WILDLIFE:** The control of rabies among wildlife reservoirs is difficult (5). Vaccination of free-ranging wildlife or selective population reduction might be useful in some situations, but the success of such procedures depends on the circumstances surrounding each rabies outbreak (see Part I. C.). Because of the risk of rabies in wild animals (especially raccoons, skunks, coyotes, foxes, and bats), the AVMA, CSTE, NACA, and NASPHV strongly recommend the enactment and enforcement of state laws prohibiting their importation, distribution, and translocation.
- 7. RABIES SURVEILLANCE:** Laboratory-based rabies surveillance and variant typing are essential components of rabies prevention and control programs. Accurate and timely information is necessary to guide human postexposure prophylaxis decisions, determine the management of potentially exposed animals, aid in emerging pathogen discovery, describe the epidemiology of the disease, and assess the need for and effectiveness of vaccination programs for wildlife.
- 8. RABIES DIAGNOSIS:** Rabies testing should be performed in accordance with the established national standardized protocol for rabies testing (http://www.cdc.gov/ncidod/dvrd/rabies/Professional/publications/DFA_diagnosis/DFA_protocol-b.htm) by a qualified laboratory that has been designated by the local or state health department (6,7). Euthanasia should be accomplished in such a way as to maintain the integrity of the brain so that the laboratory can recognize the anatomical parts (8). Except in the case of very small animals, such as bats, only the head or brain (including brain stem) should be submitted to the laboratory. To facilitate laboratory processing and prevent a delay in testing, any animal or animal specimen being submitted for testing should preferably be stored and shipped under refrigeration and not be frozen. Chemical fixation of tissues should be avoided to prevent significant testing delays and because it may preclude reliable testing. Questions about testing of fixed tissues should be directed to the local rabies laboratory or public health department.

- 9. RABIES SEROLOGY:** Some “rabies-free” jurisdictions may require evidence of vaccination and rabies virus antibodies for animal importation purposes. Rabies virus antibody titers are indicative of a response to vaccine or infection. Titers do not directly correlate with protection because other immunologic factors also play a role in preventing rabies, and our abilities to measure and interpret those other factors are not well developed. Therefore, evidence of circulating rabies virus antibodies should not be used as a substitute for current vaccination in managing rabies exposures or determining the need for booster vaccinations in animals (9-11).

B. PREVENTION AND CONTROL METHODS IN DOMESTIC AND CONFINED ANIMALS

- 1. PREEXPOSURE VACCINATION AND MANAGEMENT:** Parenteral animal rabies vaccines should be administered only by or under the direct supervision of a veterinarian. Rabies vaccinations may also be administered under the supervision of a veterinarian to animals held in animal control shelters prior to release. Any veterinarian signing a rabies certificate must ensure that the person administering vaccine is identified on the certificate and is appropriately trained in vaccine storage, handling, administration, and in the management of adverse events. This practice assures that a qualified and responsible person can be held accountable for properly vaccinating the animal.

Within 28 days after initial vaccination, a peak rabies virus antibody titer is reached and the animal can be considered immunized. An animal is currently vaccinated and is considered immunized if the initial vaccination was administered at least 28 days previously or booster vaccinations have been administered in accordance with this compendium.

Regardless of the age of the animal at initial vaccination, a booster vaccination should be administered 1 year later (see Parts II and III for vaccines and procedures). No laboratory or epidemiologic data exist to support the annual or biennial administration of 3- or 4-year vaccines following the initial series. Because a rapid anamnestic response is expected, an animal is considered currently vaccinated immediately after a booster vaccination.

(a) DOGS, CATS, AND FERRETS

All dogs, cats, and ferrets should be vaccinated against rabies and revaccinated in accordance with Part III of this compendium. If a previously vaccinated animal is overdue for a booster, it should be revaccinated. Immediately following the booster, the animal is considered currently vaccinated and should be placed on a schedule depending on the labeled duration of the vaccine used.

(b) LIVESTOCK

Consideration should be given to vaccinating livestock that are particularly valuable. Animals that have frequent contact with humans (e.g., in petting zoos, fairs, and other public exhibitions) and horses traveling interstate should be currently vaccinated against rabies (12,13).

(c) CONFINED ANIMALS

(1) WILD

No parenteral rabies vaccines are licensed for use in wild animals or hybrids (the offspring of wild animals crossbred to domestic animals). Wild animals or hybrids should not be kept as pets (14-17).

(2) MAINTAINED IN EXHIBITS AND IN ZOOLOGICAL PARKS

Captive mammals that are not completely excluded from all contact with rabies vectors can become infected. Moreover, wild animals might be incubating rabies when initially captured; therefore, wild-caught animals susceptible to rabies should be quarantined for a minimum of 6 months. Employees who work with animals at such facilities should receive preexposure rabies vaccination. The use of

pre- or postexposure rabies vaccinations for handlers who work with animals at such facilities might reduce the need for euthanasia of captive animals that expose handlers. Carnivores and bats should be housed in a manner that precludes direct contact with the public (12).

2. **STRAY ANIMALS:** Stray dogs, cats, and ferrets should be removed from the community. Local health departments and animal control officials can enforce the removal of strays more effectively if owned animals have identification and are confined or kept on leash. Strays should be impounded for at least 3 business days to determine if human exposure has occurred and to give owners sufficient time to reclaim animals.

3. IMPORTATION AND INTERSTATE MOVEMENT OF ANIMALS:

- (a) **INTERNATIONAL.** CDC regulates the importation of dogs and cats into the United States. Importers of dogs must comply with rabies vaccination requirements (42 CFR, Part 71.51[c] (<http://www.cdc.gov/ncidod/dq/animal.htm>)) and complete CDC form 75.37 (<http://www.cdc.gov/ncidod/dq/pdf/cdc7537-05-24-04.pdf>). The appropriate health official of the state of destination should be notified within 72 hours of the arrival into his or her jurisdiction of any imported dog required to be placed in confinement under the CDC regulation. Failure to comply with these confinement requirements should be promptly reported to the Division of Global Migration and Quarantine, CDC (telephone: 404-639-3441).

Federal regulations alone are insufficient to prevent the introduction of rabid animals into the United States (18,19). All imported dogs and cats are subject to state and local laws governing rabies and should be currently vaccinated against rabies in accordance with this compendium. Failure to comply with state or local requirements should be referred to the appropriate state or local official.

- (b) **INTERSTATE.** Before interstate movement (including commonwealths and territories) dogs, cats, ferrets, and horses should be currently vaccinated against rabies in accordance with the compendium's recommendations (see Part I. B.1.). Animals in transit should be accompanied by a currently valid NASPHV Form 51, Rabies Vaccination Certificate (<http://www.nasphv.org>). When an interstate health certificate or certificate of veterinary inspection is required, it should contain the same rabies vaccination information as Form 51.
- (c) **AREAS WITH DOG-TO-DOG RABIES TRANSMISSION.** Canine rabies virus variants have been eliminated in the United States (3). Rabid dogs have been introduced into the continental United States from areas with dog-to-dog rabies transmission (18,19). This practice poses the risk of introducing canine-transmitted rabies to areas where it does not currently exist. The movement of dogs for the purposes of adoption or sale from areas with dog-to-dog rabies transmission should be prohibited.

4. ADJUNCT PROCEDURES: Methods or procedures which enhance rabies control include the following:

- (a) **IDENTIFICATION.** Dogs, cats, and ferrets should be identified (e.g., metal or plastic tags or microchips) to allow for verification of rabies vaccination status.
- (b) **LICENSURE.** Registration or licensure of all dogs, cats, and ferrets may be used to aid in rabies control. A fee is frequently charged for such licensure, and revenues collected are used to maintain rabies- or animal-control programs. Evidence of current vaccination is an essential prerequisite to licensure.
- (c) **CANVASSING.** House-to-house canvassing by animal control officials facilitates enforcement of vaccination and licensure requirements.
- (d) **CITATIONS.** Citations are legal summonses issued to owners for violations, including the failure to vaccinate or license their animals. The authority for officers to issue citations should be an integral part of

each animal-control program.

- (e) **ANIMAL CONTROL.** All communities should incorporate stray animal control, leash laws, animal bite prevention and training of personnel in their programs.
- (f) **PUBLIC EDUCATION.** All communities should incorporate educational programs covering responsible pet ownership, bite prevention, and appropriate veterinary care.

5. POSTEXPOSURE MANAGEMENT: This section refers to any animal exposed (see Part I. A.1.) to a confirmed or suspected rabid animal. Wild, mammalian carnivores or bats that are not available for testing should be regarded as rabid animals.

- (a) **DOGS, CATS, AND FERRETS.** Unvaccinated dogs, cats, and ferrets exposed to a rabid animal should be euthanized immediately. If the owner is unwilling to have this done, the animal should be placed in strict isolation for 6 months. Rabies vaccine should be administered upon entry into isolation or 1 month prior to release to comply with preexposure vaccination recommendations (see Part I.B.1.a.). There are currently no USDA licensed biologics for postexposure prophylaxis of previously unvaccinated domestic animals, and there is evidence that the use of vaccine alone will not reliably prevent the disease in these animals (20). Animals with expired vaccinations need to be evaluated on a case-by-case basis. Dogs, cats, and ferrets that are currently vaccinated should be revaccinated immediately, kept under the owner's control, and observed for 45 days. Any illness in an isolated or confined animal should be reported immediately to the local health department. If signs suggestive of rabies develop, the animal should be euthanized and the head shipped for testing as described in Part I.A.8.
- (b) **LIVESTOCK.** All species of livestock are susceptible to rabies; cattle and horses are the most frequently infected (3). Livestock exposed to a rabid animal and currently vaccinated with a vaccine approved by USDA for that species should be revaccinated immediately and observed for 45 days. Unvaccinated livestock should be euthanized immediately. If the animal is not euthanized it should be kept under close observation for 6 months. Any illness in an animal under observation should be reported immediately to the local health department. If signs suggestive of rabies develop, the animal should be euthanized and the head shipped for testing as described in Part I.A.8.

Handling and consumption of tissues from exposed animals may carry a risk for rabies transmission. Risk factors depend in part on the site(s) of exposure, amount of virus present, severity of wounds, and whether sufficient contaminated tissue has been excised. If an exposed animal is to be slaughtered for consumption, it should be done immediately after exposure.

Barrier precautions should be used by persons handling the animal and tissues and all tissues should be cooked thoroughly. Historically, federal guidelines for meat inspectors required that any animal known to have been exposed to rabies within 8 months be rejected for slaughter. USDA Food and Inspection Service (FSIS) meat inspectors should be notified if such exposures occur in food animals prior to slaughter.

Rabies virus may be widely distributed in tissues of infected animals (21). Tissues and products from a rabid animal should not be used for human or animal consumption (22). However, pasteurization temperatures will inactivate rabies virus; therefore, drinking pasteurized milk or eating thoroughly cooked animal products does not constitute a rabies exposure.

Multiple rabid animals in a head or herbivore-to-herbivore transmission is uncommon; therefore, restricting the rest of the herd if a single animal has been exposed to or infected by rabies is usually not necessary.

- (c) **OTHER ANIMALS.** Other mammals bitten by a rabid animal should be euthanized immediately. Animals maintained in USDA-licensed research facilities or accredited zoological parks should be evaluated on a case-by-case basis.

6. MANAGEMENT OF ANIMALS THAT BITE HUMANS:

- (a) **DOGS, CATS, AND FERRETS.** Rabies virus may be excreted in the saliva of infected dogs, cats, and ferrets during illness and/or for only a few days prior to illness or death (23-25). A healthy dog, cat, or ferret that bites a person should be confined and observed daily for 10 days (26); administration of rabies vaccine to the animal is not recommended during the observation period to avoid confusing signs of rabies with possible side effects of vaccine administration. Such animals should be evaluated by a veterinarian at the first sign of illness during confinement. Any illness in the animal should be reported immediately to the local health department. If signs suggestive of rabies develop, the animal should be euthanized and the head shipped for testing as described in Part I.A.8. Any stray or unwanted dog, cat, or ferret that bites a person may be euthanized immediately and the head submitted for rabies examination.
- (b) **OTHER BITING ANIMALS.** Other biting animals which might have exposed a person to rabies should be reported immediately to the local health department. Management of animals other than dogs, cats, and ferrets depends on the species, the circumstances of the bite, the epidemiology of rabies in the area, the biting animal's history, current health status, and potential for exposure to rabies. Prior vaccination of these animals may not preclude the necessity for euthanasia and testing.

7. OUTBREAK PREVENTION AND CONTROL:

The emergence of new rabies virus variants or the introduction of non-indigenous viruses poses a significant risk to humans, domestic animals and wildlife (27-34). A rapid and comprehensive response includes the following measures:

- (a) Characterize the virus at a national or regional reference laboratory.
- (b) Identify and control the source of the introduction.
- (c) Enhance laboratory-based surveillance in wild and domestic animals.
- (d) Increase animal rabies vaccination rates.
- (e) Restrict the movement of animals.
- (f) Evaluate the need for vector population reduction.
- (g) Coordinate a multi-agency response.
- (h) Provide public and professional outreach and education.

8. DISASTER RESPONSE:

Animals may be displaced during and after manmade or natural disasters and require emergency sheltering (<http://www.bt.cdc.gov/disasters/hurricanes/katrina/petsshelters.asp>, www.hsus.org/disaster and <http://www.avma.org/disaster/default.asp>) (35). Animal rabies vaccination and exposure histories are often not available for displaced animals and disaster response creates situations where animal caretakers may lack appropriate training and previous vaccination. For these situations it is critical to implement and coordinate rabies prevention and control measures to reduce the risk of rabies transmission and the need for human post exposure prophylaxis.

- (a) Coordinate relief efforts of individuals and organizations with the local emergency operations center prior to deployment.
- (b) Examine each animal at a triage site for signs of rabies.
- (c) Isolate animals exhibiting signs of rabies pending evaluation by a veterinarian.
- (d) Ensure that all animals have a unique identifier.
- (e) Administer a rabies vaccination to all dogs, cats and ferrets unless reliable proof of vaccination exists.
- (f) Adopt minimum standards for animal caretakers that include personal protective equipment, previous rabies vaccination, and appropriate training in animal handling (see Part I.C.).
- (g) Maintain documentation of animal disposition and location (e.g. returned to owner, died or euthanized, adopted, relocated to another shelter, address of new location).

- (h) Provide facilities to confine and observe animals involved in exposures (see Part I.A.1.).
- (i) Report human exposures to appropriate public health authorities (see Part I.B.6).

C. PREVENTION AND CONTROL METHODS RELATED TO WILDLIFE

The public should be warned not to handle or feed wild mammals. Wild mammals and hybrids that bite or otherwise expose persons, pets, or livestock should be considered for euthanasia and rabies examination. A person bitten by any wild mammal should immediately report the incident to a physician who can evaluate the need for postexposure prophylaxis (2).

Translocation of infected wildlife has contributed to the spread of rabies (28-32); therefore, the translocation of known terrestrial rabies reservoir species should be prohibited. While state-regulated wildlife rehabilitators and nuisance wildlife control operators may play a role in a comprehensive rabies control program, minimum standards for persons who handle wild mammals should include rabies vaccination, appropriate training, and continuing education.

- 1. CARNIVORES.** The use of licensed oral vaccines for the mass vaccination of free-ranging wildlife should be considered in selected situations, with the approval of the state agency responsible for animal rabies control (5, 36). The distribution of oral rabies vaccine should be based on scientific assessments of the target species and followed by timely and appropriate analysis of surveillance data; such results should be provided to all stakeholders. In addition, parenteral vaccination (trap-vaccinate-release) of wildlife rabies reservoirs may be integrated into coordinated oral rabies vaccination programs to enhance their effectiveness. Continuous and persistent programs for trapping or poisoning wildlife are not effective in reducing wildlife rabies reservoirs on a statewide basis. However, limited population control in high-contact areas (e.g., picnic grounds, camps, suburban areas) may be indicated for the removal of selected high-risk species of wildlife (5). State agriculture, public health, and wildlife agencies should be consulted for planning, coordination, and evaluation of vaccination or population-reduction programs.
- 2. BATS.** Indigenous rabid bats have been reported from every state except Hawaii and have caused rabies in more than 40 humans in the United States (37-42). Bats should be excluded from houses, public buildings, and adjacent structures to prevent direct association with humans (43,44). Such structures should then be made bat-proof by sealing entrances used by bats. Controlling rabies in bats through programs designed to reduce bat populations is neither feasible nor desirable.

Part II: Recommendations for Parenteral Rabies Vaccination Procedures

- A. VACCINE ADMINISTRATION:** All animal rabies vaccines should be restricted to use by, or under the direct supervision of a veterinarian (45) except as recommended in Part I.B.1. All vaccines must be administered in accordance with the specifications of the product label or package insert.
- B. VACCINE SELECTION:** Part III lists all vaccines licensed by USDA and marketed in the United States at the time of publication. New vaccine approvals or changes in label specifications made subsequent to publication should be considered as part of this list. Any of the listed vaccines can be used for revaccination, even if the product is not the same as previously administered. Vaccines used in state and local rabies control programs should have at least a 3-year duration of immunity. This constitutes the most effective method of increasing the proportion of immunized dogs and cats in any population (46). No laboratory or epidemiologic data exist to support the annual or biennial administration of 3- or 4-year vaccines following the initial series.
- C. ADVERSE EVENTS:** Currently, no epidemiologic association exists between a particular licensed vaccine product and adverse events, including vaccine failure (47,48). Adverse events should be reported to the vaccine manufacturer and to USDA, Animal and Plant Health Inspection Service, Center for Veterinary Biologics (Internet: <http://www.aphis.usda.gov/vs/cvb/html/adverseeventreport.html>; telephone: 800-752-6255; or e-mail:

CVB@usda.gov).

- D. WILDLIFE AND HYBRID ANIMAL VACCINATION:** The safety and efficacy of parenteral rabies vaccination of wildlife and hybrids have not been established, and no rabies vaccines are licensed for these animals. Parenteral vaccination (trap-vaccinate-release) of wildlife rabies reservoirs may be integrated into coordinated oral rabies vaccination programs as described in Part I. C.1. to enhance their effectiveness. Zoos or research institutions may establish vaccination programs, which attempt to protect valuable animals, but these should not replace appropriate public health activities that protect humans (9).
- E. ACCIDENTAL HUMAN EXPOSURE TO VACCINE:** Human exposure to parenteral animal rabies vaccines listed in Part III does not constitute a risk for rabies virus infection. Human exposure to vaccinia-vectored oral rabies vaccines should be reported to state health officials (49).
- F. RABIES CERTIFICATE:** All agencies and veterinarians should use NASPHV Form 51 (revised 2007), Rabies Vaccination Certificate, or equivalent which can be obtained from vaccine manufacturers, NASPHV (<http://www.nasphv.org>) or CDC (<http://www.cdc.gov/ncidod/dvrd/rabies/professional/professi.htm>). The form must be completed in full and signed by the administering or supervising veterinarian. Computer-generated forms containing the same information are also acceptable.

Part III: Rabies Vaccines Licensed and Marketed in the U.S., 2007

Product Name	Produced By	Marketed By	For Use In	Dosage	Age at Primary Vaccination ^a	Booster Recommended	Route of Inoculation ^h
A) MONOVALENT (Inactivated)							
DEFENSOR 1	Pfizer, Incorporated License No. 189	Pfizer, Incorporated	Dogs Cats	1 ml 1 ml	3 months ^b 3 months	Annually Annually	IM ^c or SC ^d SC
DEFENSOR 3	Pfizer, Incorporated License No. 189	Pfizer, Incorporated	Dogs Cats Sheep Cattle	1 ml 1 ml 2 ml 2 ml	3 months 3 months 3 months 3 months	1 year later & triennially 1 year later & triennially Annually Annually	IM or SC SC IM IM
RABDOMUN	Pfizer, Incorporated License No. 189	Schering-Plough	Dogs Cats Sheep Cattle	1 ml 1 ml 2 ml 2 ml	3 months 3 months 3 months 3 months	1 year later & triennially 1 year later & triennially Annually Annually	IM or SC SC IM IM
RABDOMUN 1	Pfizer, Incorporated License No. 189	Schering-Plough	Dogs Cats	1 ml 1 ml	3 months 3 months	Annually Annually	IM or SC SC
RABVAC 1	Fort Dodge Animal Health License No. 112	Fort Dodge Animal Health	Dogs Cats	1 ml 1 ml	3 months 3 months	Annually Annually	IM or SC IM or SC
RABVAC 3	Fort Dodge Animal Health License No. 112	Fort Dodge Animal Health	Dogs Cats Horses	1 ml 1 ml 2 ml	3 months 3 months 3 months	1 year later & triennially 1 year later & triennially Annually	IM or SC IM or SC IM
RABVAC 3 TF	Fort Dodge Animal Health License No. 112	Fort Dodge Animal Health	Dogs Cats Horses	1 ml 1 ml 2 ml	3 months 3 months 3 months	1 year later & triennially 1 year later & triennially Annually	IM or SC IM or SC IM
PRORAB-1	Intervet, Incorporated License No. 286	Intervet, Incorporated	Dogs Cats Sheep	1 ml 1 ml 2 ml	3 months 3 months 3 months	Annually Annually Annually	IM or SC IM or SC IM
CONTINUUM RABIES	Intervet, Incorporated License No. 286	Intervet, Incorporated	Dogs Cats	1 ml 1 ml	3 months 3 months	1 year later & triennially 1 year later & quadrennially	SC SC
IMRAB 3	Merial, Incorporated License No. 298	Merial, Incorporated	Dogs Cats Sheep Cattle Horses Ferrets	1 ml 1 ml 2 ml 2 ml 2 ml 1 ml	3 months 3 months 3 months 3 months 3 months 3 months	1 year later & triennially 1 year later & triennially 1 year later & triennially Annually Annually Annually	IM or SC IM or SC IM or SC IM or SC IM or SC SC
IMRAB 3 TF	Merial, Incorporated License No. 298	Merial, Incorporated	Dogs Cats Ferrets	1 ml 1 ml 1 ml	3 months 3 months 3 months	1 year later & triennially 1 year later & triennially Annually	IM or SC IM or SC SC
IMRAB Large Animal	Merial, Incorporated License No. 298	Merial, Incorporated	Cattle Horses Sheep	2 ml 2 ml 2 ml	3 months 3 months 3 months	Annually Annually 1 year later & triennially	IM or SC IM or SC IM or SC
IMRAB 1	Merial, Incorporated License No. 298	Merial, Incorporated	Dogs Cats	1 ml 1 ml	3 months 3 months	Annually Annually	SC SC
IMRAB 1 TF	Merial, Incorporated License No. 298	Merial, Incorporated	Dogs Cats	1 ml 1 ml	3 months 3 months	Annually Annually	SC SC
B) MONOVALENT (Rabies glycoprotein, live canary pox vector)							
PUREVAX Feline Rabies	Merial, Incorporated License No. 298	Merial, Incorporated	Cats	1ml	8 weeks	Annually	SC
C) COMBINATION (Inactivated rabies)							
Equine POTOMAVAC + IMRAB	Merial, Incorporated License No. 298	Merial, Incorporated	Horses	1 ml	3 months	Annually	IM
CONTINUUM DAP-R	Intervet, Incorporated License No. 286	Intervet, Incorporated	Dogs	1 ml	3 months	1 year later & triennially	SC
CONTINUUM Feline HCP-R	Intervet, Incorporated License No. 286	Intervet, Incorporated	Cats	1 ml	3 months	1 year later & quadrennially ^e	SC
D) COMBINATION (Rabies glycoprotein, live canary pox vector)							
PUREVAX Feline 3/ Rabies	Merial, Incorporated License No. 298	Merial, Incorporated	Cats	1ml	8 weeks	Annually	SC
PUREVAX Feline 4/ Rabies	Merial, Incorporated License No. 298	Merial, Incorporated	Cats	1ml	8 weeks	Annually	SC
E) ORAL (Rabies glycoprotein, live vaccinia vector) - RESTRICTED TO USE IN STATE AND FEDERAL RABIES CONTROL PROGRAMS							
RABORAL V-RG	Merial, Incorporated License No. 298	Merial, Incorporated	Raccoons Coyotes	N/A	N/A	As determined by local authorities	Oral

a. Minimum age (or older) and revaccinated one year later.

b. One month = 28 days

c. Intramuscularly

d. Subcutaneously

e. Non-rabies fractions have a 3-yr duration (see label)

Rabies Vaccine Manufacturer Contact Information

Manufacturer	Phone Number	Internet Address
Fort Dodge Animal Health	800-533-8536	http://www.wyeth.com/divisions/fort_dodge.asp
Intervet, Incorporated	800-835-0541	http://www.intervetusa.com
Merial, Incorporated	888-637-4251	http://us.merial.com/
Pfizer, Incorporated	800-366-5288	http://www.pfizerah.com
Schering-Plough Corporation	800-521-5767	http://www.spah.com/usa/

ADVERSE EVENTS: Adverse events should be reported to the vaccine manufacturer and to USDA, Animal and Plant Health Inspection Service, Center for Veterinary Biologics (Internet: <http://www.aphis.usda.gov/vs/cvb/html/adverseeventreport.html>; telephone: 800-752-6255; or e-mail: CVB@usda.gov).

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