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RABIES- A BRIEF REVIEW

Rabies is an acute viral encephalomyelitis. It is a natural disease of dogs, cats, bats and wild carnivores. However, all warm-blooded animals are susceptible. The disease is encountered worldwide except for some countries that have eradicated or remained free of rabies due to their natural protection as islands or by enforcing rigorous quarantine regulations. Rabies is endemic and at times epidemic throughout the Western Hemisphere in bats, dogs, foxes, skunks and raccoons. In nature, it is transmitted from animal to animal by means of a bite that introduces the virus-bearing saliva.

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GUIDELINES FOR MANAGING INDOOR BAT ENCOUNTERS

What should I do if I encounter a bat?

First, determine if there is any possibility that human or domestic animal contact with the bat has occurred (e.g., a bite, scratch, other direct contact, or if the bat may have been in close proximity to an unattended young child, or a sleeping or impaired person, or was in a room with an unattended pet.) If such possibilities cannot be ruled out, capture the bat, carefully avoiding direct contact with it and without damaging its head. To capture the bat, close windows, the room and closet doors, turn on lights if room is dark, and wait for the bat to land. Wearing gloves, cover the bat with a coffee can or similar container. Slide a piece of cardboard under the can trapping the bat. Tape the cardboard tightly to the can. Immediately contact your local health authority to arrange for rabies examination of the bat.

In the case of human contact, if the bat is found to be rabid, is not available for testing, or is untestable, the following guidelines apply:

- ⇒ rabies post-exposure treatment is clearly indicated if a person was bitten or scratched
- ⇒ treatment is also indicated if someone has had direct physical (skin or mucous membrane) contact with the bat, as a precaution against: (1) the possibility of an undetected minute skin penetration (i.e., bite, scratch); or (2) potential exposure to the virus through direct contact with the mucous membranes of the face
- ⇒ treatment is also appropriate, even in the absence of a known direct contact, if the bat was found in proximity to: (1) an unattended young child; (2) a sleeping individual; (3) an individual under the influence of alcohol or drugs or with other sensory or mental impairment.

In the case of domestic animal contact, if the bat is found to be rabid, is not available for testing, or is untestable, the following guidelines apply:

- ⇒ for a domestic animal with up-to-date rabies vaccination, the animal must be given a rabies vaccination booster within five days
- ⇒ for an unvaccinated animal, the animal must be euthanized or strictly confined for six months.

From the New York State Department of Health, Rabies Policies and Procedures, January 25, 1996. As quoted in the University of Florida Veterinary Extension Newsletter August 1966.

RABIES IN HORSES

There have been numerous reports in the media concerning outbreaks of rabies in several states in the Eastern United States. Most of these reports involved humans exposed to a rabid animal or animals suspected of being rabid. These are usually domestic pets or wild animals. Rabies in horses is

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relatively rare but horse owners should not ignore the disease for the following important reasons:

1. Horses as a species are very sensitive and susceptible to rabies if exposed.
2. The disease is usually fatal to horses and there is no effective treatment once infected.
3. There is small risk of transmission from a rabid horse to humans. There have been no documented cases of horse to human transmission but the remote possibility exists.

Rabies is caused by a virus from the rhabdovirus family. It is primarily a disease of wild animals (raccoons, skunks, foxes and bats). The disease can spread from these animals to humans, unvaccinated domestic pets, or livestock including horses. The virus is typically passed in the saliva from a bite wound. The incubation period (the time from exposure to manifestation of clinical symptoms) varies from 2 to 10 weeks depending on which part of the body is bitten.

It can be difficult even for a veterinarian to diagnose rabies in a living animal because the clinical signs are similar to other diseases which affect the horse's nervous system. The affected horse might exhibit some or most of these signs:

1. Depression
2. Anorexia (going off feed)
3. Excessive salivation
4. Difficulty swallowing
5. Colic
6. Incoordination
7. Paralysis
8. Convulsions
9. Hyperexcitability
10. Aggressive behavior

Death usually occurs within 3 to 5 days of the onset of signs. The veterinarian will consider other differential neurological diseases in arriving at a diagnosis, such as:

1. Tetanus
2. Botulism
3. Equine encephalomyelitis (EEE, WEE, VEE)
4. Equine protozoal myeloencephalitis (EPM)
5. Plant poisonings

There currently are no laboratory tests which can confirm Rabies in the live animal. A post-mortem (autopsy) test is required to give a definitive diagnosis.

There are vaccines available that a veterinarian can give to horses as early as three months of age prior to exposure in order to prevent the disease.

By Ken Gallagher, BS, DVM, Equine Extension Veterinarian, Michigan State University. As reported in Vet-Med Sept. 1995 by University Extension, Iowa State University.

RABIES IN CATTLE

In 1995, eight cows were diagnosed with rabies in Pennsylvania. Seven of those eight cows were directly responsible for human exposure. Post-exposure prophylaxis for those exposed individuals was necessary.

The incubation period for rabies in livestock is from three weeks to about six months. Shorter incubation periods are seen in animals bitten around the head and neck. All of the different forms of rabies are possible in livestock from the aggressive (furious) form to depression (dumb) to flaccid tetraparesis or paraparesis (paralytic). When it comes to any neurologic disorder in cattle in endemic areas, Rabies should be included on the differential diagnosis list.

Early clinical signs include loss of appetite, depression, and ataxia which progresses to muscle twitching, hyperesthesia and proprioceptive deficits. An animal may rub a pruritic area, resulting in wool or hair loss and skin ulceration. Cattle may run into fences or charge. The furious forms progress to convulsions, coma, bloating or flaccidity of the tail and anus. Paralytic forms may progress into seizures or coma. Death usually occurs within 11 days of onset of signs.

In dairy cattle and other cattle that are closely observed, grinding of the teeth and a change of voice and excessive bellowing (vocalization) are often noted.

There is no cure, prevention by vaccines is the only intervention in endemic areas.

From: Penn State Herd Health Memo May 1996. As quoted in Herd Health Memo, University of Kentucky Sept. 1966. And from the book, Raising Healthy Dairy Cattle Under Primitive Conditions by Dr. William T. Testerman, published by Christian Veterinary Mission.

EDITOR'S NOTE

Rabies can occur in all farm animals. However there are few situations in developing areas where preventive vaccination of farm animals would be practical. This would be in the case of valuable breeding animals.

The higher priority in vaccination should be given to dogs and cats which are much more likely to spread the disease to humans.

In many areas the vampire bat would be of much concern in the spread of Rabies. Keeping animals in screened or lighted areas at night will prevent much exposure to bats.

It is important for animal owners to contact the nearest veterinarian if their animal exhibits neurological signs, especially if there are behavioral changes. Some of the diseases listed as differentials can be treated. But if an animal is rabid, or suspected of being rabid certain precautions in handling and confinement should be followed.

Any confirmed or even suspicious cases should always be reported to Animal Health Regulatory or Public Health officials.

FACTS ABOUT RABIES

Each year more than 35,000 human rabies deaths and at least 6.5 million rabies post-exposure treatments are reported world wide, mostly in Asia and African countries. Apart from the direct affect of rabies on human health, current disease prevention and control activities in people and animals cost about 400 million dollars per year in countries where canine rabies occurs.

Over the past five years, the number of rabies cases in animals has been reduced by 80% in those European countries conducting campaigns of oral immunization of wildlife against rabies. Since 1978 more than 73 million vaccine baits were distributed in 14 countries. Oral vaccination of wildlife, a technique developed over the past 15 years under the leadership of WHO, OIE and other organizations will help to eventually eliminate rabies from terrestrial reservoirs in central Europe.

From: Tennessee Extension Animal Health Newsletter, March 1997, quoting from World Health Organization

RABIES:

GLOBAL CONSIDERATIONS, 1997

Keith Sikes, DVM, MPH, Retired Veterinary Director, CDC

EPIDEMIOLOGY

Throughout most of the world, the epidemiology of human rabies closely parallels the epizootiology of the disease in domestic animals. Human rabies has been reported on all continents except Antarctica and possibly Australia. Globally, most cases of human rabies originate in countries, mostly tropical, that have not yet controlled rabies in dogs. Human rabies has declined significantly only in countries where rabies in domestic animals has been controlled.

According to the most recent reports from surveillance conducted by the World Health Organization, dogs were responsible for 91% of all human rabies cases, cats for 2%, foxes for 1% and all other animals for less than 1%. However, in the U.S., Canada, and Western Europe, dogs and cats are only rarely responsible for rabies in humans. Between 1960 and 1996 in the U.S., only 8 (14%) of 59 cases resulted from dog (7 cases) or cats (1 case) bites in the U.S., the last such case was in 1979. At least 20 cases were probably acquired outside the U.S., 114 due to dogs and 5 of unknown source. The remaining cases were due to exposures to insectivorous bats, foxes, feral cats, skunks, a bobcat, a cornea transplanted from a patient with undiagnosed rabies, and from a laboratory aerosol. In Western Europe, 90% of recent human cases were attributable to wildlife exposures.

Countries of the world where the dog is the most important vector includes most of Africa, Asia, Central and South America, and Turkey. In most of Europe and Canada, the fox is the major vector. Various species of mongooses are important in Cuba, Grenada, the Dominican Republic, South Africa, India, Kenya, Sri Lanka, and Zimbabwe. The jackal is a major vector in Algeria, Bangladesh, Botswana, Ethiopia, Iran, Israel, Malawi, South Africa, Uganda and Zimbabwe. In much of Latin America vampire bats are significant vectors.

DIAGNOSTIC, SEROLOGIC ADVANCES

Rabies can still be diagnosed by histologic technique, i.e. Sellers staining for visualization of Negri bodies. However, that methodology should be used only when the fluorescent antibody (FA) test is

not available. The direct FA method of rabies diagnosis is considered the overall most sensitive and time saving procedure that can be used for rabies diagnosis. The mouse inoculation test is very sensitive for virus isolation, but 7 to 30 days are required for a positive test, whereas the FA method requires only 24 hours. In developing countries, the Rapid Rabies Enzyme Immuno-Diagnostic (RREID) has been used when their laboratories have difficulty using the direct FA test or where the purchase of a fluorescent microscope and its maintenance are prohibitively expensive. This test is done on plates containing wells and is a calorimetric test. It is described by WHO's document.

An important laboratory advancement in more technically equipped laboratories has been the use of monoclonal antibodies to identify virus isolates, particularly those that infect humans, i.e. whether the biting animal was a bat, fox, dog, cat, etc. This has been especially important in the U.S. where many of the human deaths have occurred without knowing when, where, or which species of rabid animal was responsible for effecting rabies transmission.

To determine rabies antibody titers, the Rapid Fluorescent Focus Inhibition Test (RFFIT) is now used by most laboratories. The RFFIT test can be performed in one day, whereas the mouse serum neutralization (MSN) test requires 14 days. Generally, all veterinarians should not only receive pre-exposure rabies vaccine, but also have an antibody titer test to make sure their titer is at least 1:25 or contains at least 0.5 International Units (IU). If so, they would merely be required to receive two booster doses of rabies vaccine (days 0 and 3) if they are exposed to a rabid animal.

Other laboratory tests that might be applicable within the next four years include the antigen binding tests, enzyme immunoassay (EIA), indirect immunofluorescence assay IFA or radioimmunoassay (RIA). Other tests may be used but they are not considered to be as sensitive, i.e., the complement fixation (CF) test, the immunoadherence hemagglutination (IAHA) test, and certain cell lysis tests.

RABIES VACCINES - ANIMAL USE

These can be divided into three groups: the modified live vaccines (MLV), inactivated tissue origin (TCO), and inactivated nervous tissue origin (NTO). The strains of virus used and the availability of vaccines vary from country to country. Safety is a

factor to be considered in selecting both inactivated and live vaccines. The problem of encephalitis associated with adult NTO inactivated vaccines can be eliminated by selecting an inactivated suckling mouse brain vaccine or an inactivated TCO vaccine. There are the only two general types licensed within the 23 vaccines that are commercially available in the U.S. in 1997*. The Flury LEP and Kissling strains (MLV types) were never recommended for cats. Vaccines with a 3-year duration of immunity are preferred by most rabies control authorities.

RABIES VACCINES - HUMAN USE

The human diploid cell vaccine (HDCV) has supplanted all other rabies vaccines for human use in the U.S. and Western Europe. However, HDCV is not universally used because of its extremely high cost. The Semple nervous tissue vaccine still predominates in Asia and Africa, while the suckling mouse brain vaccine is preferred in Latin America. Research in developing a cheaper vaccine that has the safety and potency of HDCV will remain a primary focus in the future.

FUTURE APPLIED RABIES RESEARCH

Besides the continuing need to develop safe and effective vaccines for humans and animals, as well as efficient laboratory diagnostic, serologic tests, considerable research is needed to deliver vaccines to the domestic animals, especially dogs, in the developing countries of the world. After all, this is where over 95% of the human rabies cases still occur. The dog to dog rabies cycle cannot be broken as it has been done in the economically blessed countries. Why can't the research of oral rabies vaccine be applied to "community" dogs in Africa, Asia and Latin America? Such methodology of vaccine in baits could be directed for canine vaccination much cheaper and effectively than in wild animals for whom it is now being applied in the U.S. and in Europe. Veterinarians and county officials should work together with vaccine manufacturers to first demonstrate such an application in a cooperative, well-selected area of the world, perhaps in one or two cities. Some of us believe this is a "natural" to further prevent human rabies in a cost-effective manner.

**1997 Compendium of Rabies Control: National Association of Public Health Veterinarians*