

## Epidemiology, Prevention and Control Methods of Rabies in Wild Animals: Review Article

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**Abstract:** In Africa there are 4 serotypes of this neurotropic virus present. In sub-saharan Africa, there are at least 33 carnivorous spp. and 23 herbivorous spp. affected. Endemic rabies, caused by viverrid and canid biotypes has been identified in certain burrow dwelling species (genet, mongoose and civets). Classic Serotype/Genotype 1 rabies virus found in dogs is worldwide and other viruses are probably more a curiosity than serious clinical threat. Serotype/Genotype 2 or Lagos Bat Virus was discovered in the 1950s and since found in Central African Republic, Natal South African and in Zimbabwe. The epidemiology of rabies in wildlife is complex. Transmission probably only occurs in a short window during clinical disease, a long term carrier state probably does not exist. Relatively few species can be described to be true reservoirs in nature. Recent work suggests rabies persists sub-clinically in hyaena in the Serengeti and there is emerging evidence for antibody positive wild dogs suggesting recovery from infection. Much of the epidemiology of rabies in wild animals in Africa remains to be elucidated but the domestic dog undoubtedly remains the main source. A remarkable story of rabies affecting African wildlife involved the impacts of rabies on kudu in Namibia where up to 50,000 were reported dead 20% of the population in an epizootic that lasted from 1977-1985. Transmission was believed to occur through allo-grooming behaviour stimulated by sick kudu salivating profusely. The disease declined naturally and there have been no similar outbreaks in this species across Africa.

**Key words:** Control Methods • Epidemiology • Prevention • Rabies • Wild Animals

### INTRODUCTION

The most important animal families in maintaining rabies cycles are *Canidae* (dogs, foxes, jackals, wolves etc.), *Mustelidae* (skunks, martens, weasels, ferrets stoats etc.), *Viverridae* (mongooses, meerkat etc.), *Procyonidae* (raccoon etc.), *Chiroptera* (> 1,200 species of bats). Wild (sylvatic) rabies: This is a type of rabies cycle in which wild carnivores such as jackals, foxes, skunks, mongooses, wolves play an important role as vector. This rabies cycle usually reverts to urban cycle due to frequent contact between rabid wild carnivores and stray dogs. The most common victims are dogs, cattle and man [1].

The vampire rabies (paralytica): This type of rabies is particularly important in Latin America and is transmitted by bite of bats. These bats usually transmit the bovine paralytic rabies and maintain the cycle in endemic

areas while cattle and man are victims [2]. Therefore, the objective of this paper was to review information regarding wild animal rabies epidemiology and its prevention and control methods.

Clinical signs are not definitive but generally involve acute behavioral alterations. Details of reported signs are available in the literature and largely fall into early acute neurologic signs followed by a paralytic phase. As a reportable disease suspicion often warrants euthanasia and submission of refrigerated brain material is optimal but samples can be preserved in 50% saline-glycerine solution when local access to laboratories is limited. The definitive test is the rabies Fluorescent Antibody Test, which is rapid, sensitive and specific. PCR is valuable but liable to technical error. Routine histology with demonstration of non-suppurative encephalitis and negri bodies is also useful but not specific. Antibodies occur in late stage or recovered animals

and can be detected by virus neutralisation or ELISAS indicating exposure to antigen or vaccine. CSF VN antibody is diagnostic of infection. Natural immunity in wildlife probably varies [3].

Control is through vaccination and historically through population control although the latter is largely ineffective, unfeasible and ecologically disruptive. Oral bait vaccination of red fox (*Vulpes vulpes*) was beneficial in Europe where few susceptible species exist with disease reduced to minor proportions by the mid 1990s although now, sporadic localised breakdowns occur. The cost of the approach was high at hundreds of millions of dollars but the benefits probably justified the approach with human and animal rabies rare. This approach applied in North America has been less successful where the epidemiology is more complex with more species involved. The availability of effective safe and potent veterinary vaccines is the best hope of reducing environmental loads of dog rabies virus which is the primary zoonotic risk and ensuring a healthy domestic animal population. This is easier said than done with poor communities where dog populations are near-feral and short lived with high reproductive rates. The future focus on control will need to be on this compartment of the rabies epidemiology. The situation in Africa will remain problematic for some years to come for reasons of the complexity of the epidemiology on the continent with such a wide range of affected species and large numbers of unvaccinated and feral domestic dogs. Workers exposed to wildlife rabies should be well aware of the species involved and take appropriate precautions and ensure regular vaccination of personnel [4]. This review should help in better understanding wild animals rabies epidemiology, prevention and control methods.

**Pathogenesis:** After inoculation of infectious saliva by bite, the virus may either persist and replicate in the striated muscles of inoculation site for two weeks or follow a relatively rapid centripetal to the central nervous system, with replication and dissemination prior to the development of a significant immune response. After peripheral nerve entry, virus moves centripetally with in axons to the CNS at the estimated rate of 3 mm/hour. Once virus reaches the brain, it spread centrifugally to a variety of organs, the spread in to the salivary gland, which represents the final phase of infection, is important from animal to animal and from animal to human transmission [5]. Hematogenous spread can occur but is rare. Although the disease usually is fatal

once clinical signs appear, recovery has been recorded in several animals, including man [6]. The primary lesions produced are in the CNS and spread from the site of infection occurs only by way of the peripheral nerves. This method of spread accounts for the extremely variable incubation period, which varies to a large extent with the site of the bite. Bites on the head usually result in a shorter incubation period than bites on the extremities. The severity and the site of the lesions will govern to a large extent whether the clinical picture is primarily one of irritative or paralytic phenomena. The two extremes of the paralytic or dumb form and the furious form are accompanied by many cases that lie somewhere between the two. Gradually ascending paralysis of the hindquarters may be followed by severe signs of mania, which persist almost until death. Destruction of spinal neurons results in paralysis, but when the virus invades the brain, irritation of higher centers produces manias, excitement and convulsions. Death is usually due to respiratory paralysis. The clinical signs of salivation, indigestion and pica, paralysis of bladder and anus and increased libido all suggest involvement of the autonomic nervous system, including endocrine glands [7].

### Epidemiology

**Rabies in Wildanimals:** In nature, rabies in wildlife is perpetuated in much the same way as with urban rabies: One or two mammalian species in a given ecosystem, typically carnivores and bats, are responsible for maintain its cycle in their respective ecosystem [8]. According to Jackson and Wunner [9] the major wild life reservoirs for different variants of rabies virus vary by continent and by geographic regions with in continents.

In many countries, wildlife rabies has become of increasing importance as a threat to domestic animals and human [10]. During the past 30 years, rabies in domestic animals has steadily decreased in the United States; whereas annual occurrence in wild animals has increased. Wild animals accounted for 92% of all reported cases of rabies in 1995, a decrease from 1994 [7]. Eshetu *et al.* [11] record in his study hyena, jackal, mongoose and cervical cat were included among the wild animals examined for rabies during the 10 year period (1990-2000). From the total of 13 brain samples of hyena examined, 9 of them were laboratory confirmed rabies cases and also in other study by Paulos *et al.* [12] indicates among wild mammals examined for rabies during the last 3 years (1999-2002) at the zoonoses laboratory of EHNRI, five of the six foxes examined were found to be positive for rabies.

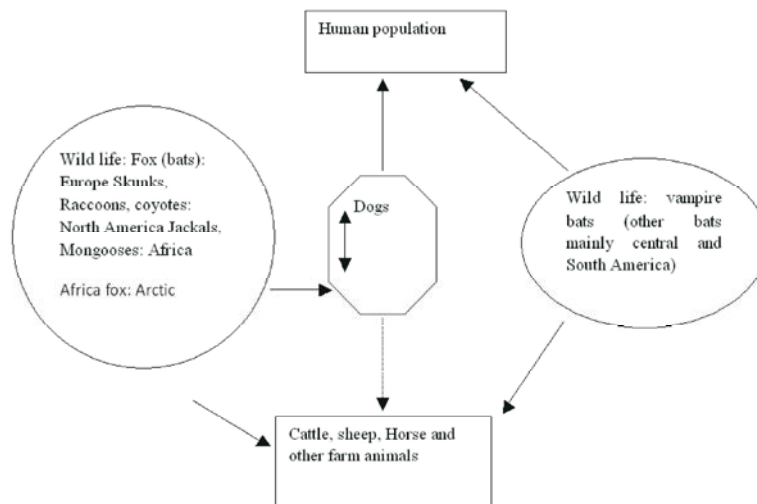


Fig. 1: Transmission of rabies from wildlife reservoirs to humans and to domestic animals [15].



Fig. 2: Geographical locations of different wildlife vectors / reservoirs of rabies[7].

Wild rabies is an ongoing danger for man and domestic animals. When wild animals are rabid, they approach towns and may attack humans and domestic animals. It should also be kept in mind that a longer proportion of wild carnivores shed the virus in saliva than do dogs. In areas where canine rabies has been eradicated, the disease may be reinforced by wild carnivores if the canine population is not adequately immunized [8].

**Prevention and Control Methods:** Vaccination of wildlife rabies was first attempted in the USA 50 years ago, after other methods of control had failed. Subsequently, it was demonstrated that an attenuated rabies virus strain given orally protected foxes against rabies. Currently, oral immunization of wildlife in fat or fish meal bait, in Switzerland, Germany

and neighbouring countries has succeeded in halting the advance of rabies in Europe [13, 10, 14]. An oral vaccinia-rabies glycoprotein recombinant virus vaccine (V-RG) proved effective at controlling rabies in foxes in Europe [15].

The public should be warned not to handle wildlife. Wild mammals and hybrids that bite or otherwise expose persons, pets or livestock should be considered for euthanasia and rabies examination. State regulated wildlife rehabilitators may play a role in a comprehensive rabies control program. Minimum standards for persons who rehabilitate wild mammals should include rabies vaccination, appropriate training and continuing education. Translocation of infected wild life has contributed to the spread of rabies; therefore, the translocation of known terrestrial rabies reservoir species should be prohibited [4, 16].



Fig. 3: Rabies affects all warm-blooded animals [15].

Depending on geographic location, there are many different wildlife vectors / reservoirs of rabies

- Vampire-bats in South America,
- Foxes in Europe and North America,
- Skunks in North America,
- Mongoose in Africa,

### CONCLUSIONS

Controlling access of wildlife species which are likely to come into contact with the farm livestock in particular areas or through vaccination of the wildlife. To create awareness, pet owners and the public should be educated to educate about the importance of restriction for dogs and cats and advise them against keeping wild animals as a pet. The most effective method of preventing, the entry of rabies into a country free of the diseases is important of a, quarantine period 4-6month on all imported days. Controlling access of wild life species which are likely to come into contact with the farm live stock in particular areas or through vaccination of the wild life.

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