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Control of Rabies Outbreak through 'One Health Approach' – A Case Study

A. Aneesh*

RAJ R&V SQN NCC, Rajasthan Veterinary and Animal Sciences University, Bikaner

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Abstract

An unusual disease manifested by acute neurological signs and mild to moderate rectal temperature was reported amongst mules stationed at Binnaguri was reported. At the onset of symptoms mules were segregated into doubtful, in-contact and apparently healthy groups. Necropsies on dead animals were conducted with necessary precautions and brain samples collected and the disease was diagnosed as Rabies by direct Fluorescent Antibody Technique. Disinfection of premises and complete restriction on any kind of move was imposed. The outbreak was controlled using one health approach

Key words: Mules, One health, Outbreak, Rabies

Rabies is a highly fatal panzootic disease caused by Lyssavirus (Rhabdoviridae) which is a single stranded, negative sense, non-segmented RNA that infects the nervous system and salivary glands. All species of domestic animals are susceptible to Rabies (Blanton *et al*., 2006). Rabies virus is highly neurotropic in the infected host causing acute, progressive and fatal encephalomyelitis. Viral transmission occurs mainly via animal bite and once the virus is deposited in the peripheral wounds, centripetal passage occurs towards the central nervous system. Rabies should be suspected in patients with concomitant history of animal bite and traditional clinical presentation, but lack of such clues makes ante-mortem diagnosis a major challenge (Rupprecht *et al*.,2002). The incidence of equine Rabies compared with that in other animals is low, but the disease is of epidemiological importance as rabid horses may serve as a source of infection for humans. Two clinical forms of Rabies are recognized in the horse as in other species; the dumb or paralytic type - primarily due to damage to the spinal cord and the furious form mainly due to damage to the brain.

Rabies is a major public health threat causing an estimated 59,000 human deaths every year across the globe (Hampson *et al.,* 2015), while approximately 20,000 people die annually in India. It is endemic throughout the country with the exception of Andaman, Nicobar and Lakshadweep Islands (Aneesh, 2017). A novel strategy for combating Rabies is the interdisciplinary "One Health approach". The American Veterinary Association defines One Health as "the collaborative effort of multiple disciplines - working locally, nationally, and globally - to attain optimal health for people, animals and the environment" (Tan *et al*., 2017).

Binnaguri, West Bengal (India) has a history of several previous Rabies outbreaks and considered to be endemic for the disease since last 4 decades. It is located at 26°46' 0N latitude and 89°2' 60E longitude at an altitude of 216 meters above sea level. The town is known for expansive tea estates, surrounding deciduous forests and the mule stables are located in a natural elephant corridor. The location is known for the presence of wild carnivores such as leopards, wild dogs and rodents like mongoose and rats. Stray dogs and cattle were also frequently seen in and around the mule lines due to porous perimeter fencing.

Case Presentation

In December 2020, an unusual disease among mules stationed at Binnaguri was reported.

**Corresponding author* : Email : aneeshayinippully@gmail.com

Table I: Category of Exposure (animal attendants and veterinary staff)

Category	Description	Prophylaxis
Category I	Touching or feeding animals, animal licks on intact skin (no exposure)	Wash exposed skinsurfaces, no PEPrequired.
Category II	Nibbling of uncovered skin, minor scratches or abrasions without bleeding (exposure)	Wound washing and immediate vaccination,RIG is not indicated.
Category III	Single or multiple transdermal bites or scratches, contamination of mucous membrane or broken skin with saliva from animal licks, exposures due to direct contact with bats (severe exposure)	Wound washing and immediate vaccination,RIG administration isrecommended.

Four animals died showing symptoms ranging from snorting, pyrexia, hindleg lameness, biting and self-inflicting behaviour, colic, circling movements, ataxia, in- coordination of limbs, paralysis and death. All the affected mules died within 2-4 days of showing initial symptoms.

Management and Outcome

Segregation and Treatment

Animals on the farm were segregated in 3 groups.

The details of animals placed in each group are given in.

- **Doubtful group**(**N= 4**) – This included all animals that exhibited any clinical or behavioural signs. Animals of this group were not allowed to mix with healthy animals and maintained separately.
- **In-contact group** (**N= 38**)– This included all animals which were suspected to have come in contact with suspected animals or same animal handlers even if they did not manifest any symptoms.
- **Apparently Healthy group (N= 281)** - All remaining animals were placed in apparently healthy group.

Mules showing initial symptoms were immediately segregated from other animals and isolated in separate stables. Dedicated animal handlers and nursing attendants for these suspected animals were separately allotted. Watering and feeding arrangements, line gears and dung disposal for these three groups were catered separately. Physical separation of minimum 100 meters was ensured between these groups. Regular monitoring of all apparently healthy and in-contact animals were carried out for any symptoms of the disease. In-contact personnel were provided with personnel protective equipment (PPE) including rubber gloves, aprons, face masks and gum boots. Used PPE was disposed of by proper incineration.

Classification of exposure and Prophylaxis

All animal and human exposures were classified based on the WHO guidelines into category I,II and III (O'Brien and Nolan, 2019), mentioned in detail as (Table I). The vaccination requirement was determined based on the level of exposure. Post Exposure Prophylaxis (PEP) in equines were carried out using chemically inactivated vaccine (Raksharab) containing inactivated Rabies virus with a potency > 1.0 I.U. per dose. The virus is propagated in BHK-21 cell line, inactivated with an aziridine compound and concentrated aluminium hydroxide is added as an adjuvant. Doubtful and in-contact animals were vaccinated on 0, 3rd, 7th, 14th, 28th and 90th day of suspected contact @ 1 ml s/c. No animal was given passive immunisation using Rabies immunoglobulin (RIG) due to absence of any category III exposure. All apparently healthy animals were given pre-exposure vaccination using same vaccine on 0, 7th and 28th days. The details of prophylaxis carried out among animals are given in (Table II). As per the directions of medical authorities the following prophylaxis was carried out among humans as mentioned in (Table III).

Actions post death

Necropsies were carried out under due care

Table II: Details of Animal Prophylaxis

Category	No of animals	Action
Category I	281	PrEP
Category II	42	PEP
Category III	-	-

Table III: Details of Human Prophylaxis

Category	No of Individuals	Action
Category I	208	PrEP
Category II	120	PEP
Category III	02	PEP and RIG

and precautions. The natural orifices of the carcasses were plugged with cotton wool soaked in 20% phenol. After necropsy examination the carcasses were transported to the burial site in the designated carrier after double wrapping with plastic sheets. Necropsy examination was conducted at a designated area around one km away from the animal lines. The carcasses were disposed by burial since appropriate incineration facilities were not available and also to reduce carbon footprint. Carcasses were buried at least 5 feet depth after sprinkling adequate quantity of quick lime, aqueous solution of sodium hydroxide and landfill.

Differential diagnosis of disease

Symptoms shown by the animals in this out break were neurological in nature. So, the differential diagnosis was carried out for Theileriosis, Japanese encephalitis, Trypanosomiasis, Babesiosis, Equine herpes virus disease (EHV 1 & 4) and Nematodiasis. The diagnosis of disease was done by rapid Rabies Ag test kit and Seller's staining and further validated by direct Fluorescent Antibody Technique.

Disinfection of Premises

Paved floors, walls and permanent standings were disinfected by burning litter straw over the surface and by using blow lamp on the walls followed by washing thrice with 5 % solution of carbolic acid and 10% chlorinated lime coating. Soil surface of day standings occupied by infected animals were scrapped off and burnt using litter straw. Mangers, drains and day standings were sprinkled with chlorinated lime, blow lamped and exposed to sunlight for a fortnight. Water troughs and sidewalls were painted with chlorinated lime. All bedding or excrements in contact with suspected animals were destroyed by incineration. All the disinfection procedures were repeated on fortnightly basis. The vehicle used for transportation of carcasses was thoroughly disinfected using sodium hydroxide solution, blow lamp and exposing to sunlight. Animal handlers and veterinary staff were educated on risk of transmission of disease and precautions to be adopted.

Movement restriction and liaison

Restriction on movement of animals and animal attendants were imposed till the completion of prophylaxis. Stables have been kept under active surveillance for a period of one year. Additional fencing was also constructed to surround the animal stables to prevent any entry of carnivores to animal premises. Veterinary bodies of West Bengal State and Jalpaiguri District (India) were communicated about the incidence of Rabies for strict monitoring and adoption of measures to check transmission of the zoonotic disease in civil population and close liaison with veterinary and livestock development office has been maintained.

Discussion

One health approach employed can be a guiding source for control of any public health emergencies occurring in any developing or underdeveloped country in future. Due to repeated re-emergence of this viral disease and consequent threat to human and animal lives and economic losses involved, on the recommendation of veterinary authorities prophylactic anti-rabies vaccination has been added in the schedule of annual vaccinations/inoculations of army equines.

The controlof zoonotic diseases such as Rabies requires inter-disciplinary and inter-sectoral collaboration. This fact is recognised globally by the concept of 'one-Health agenda' currently encouraged by the Food and Agriculture Organization (FAO), World Health Organization (WHO) and World Organization for Animal Health (OIE) (Adomako *et al*.,2018). Rabies represents an economic burden globally

for all countries due to huge expense of human post-exposure treatment, diagnosis, surveillance and immunization of domestic animals and wildlife, requires more attention towards control of the disease and research on its various aspects (Toloueiand Mostofi, 2017). As in other warm-blooded animals, equine. Rabies is a severe and rapidly progressive neurological disease (Wilkins and Del Piero, 2007). Although Rabies in horses is low (around 5% of the total cases reported) and relatively uncommon, it's potential for human exposure makes it lethal (Fernanda, 1914). WHO recommends that immunizing70% of dogs will be sufficient to prevent or control outbreaks of dog Rabies (Coleman and Dye,1996). One need not be clairvoyant to state that 'one health approach' is only the effective approach to prevent or control zoonotic diseases such as Rabies.

Conclusion

The dreaded Rabies outbreak was controlled at Binnaguri through multipronged approach. This incidence is a classic example of coordinating the efforts of veterinarians, medical practitioners, laboratory, local population and administrators to tackle a public health problem.

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