SPECIAL ARTICLE

Rabies in wildlife -a review in Indian context

S. K Mukhopadhyay[1] & D. Borkotoky[2]

INTRODUCTION

Rabies is a latin word that means 'madness'. Rabies is one of the most important viral zoonotic diseases affecting man and warm blooded animal. The disease has been observed in free and captive carnivores more than any other mammalian species. Urban and sylvatic are two epidemiological cycles maintained independently with occasional spill over from sylvatic to urban foci. Human is an accidental and usually blind host. Rabies has been recognized in India since the Vedic period (1500–500 BC) and is described in the ancient Indian scripture Atharvaveda, wherein Yama, the mythical God of Death, has been depicted as attended by 2 dogs as his constant companions, the emissaries of death (Deshmukh, 2004). Most animal bites in India (91.5%) are by dogs, of which about 60% are strays and 40% pets. The incidence of animal bites is 17.4 per 1000 population. A person is bitten every 2 seconds, and someone dies from rabies every 30 minutes. The annual number of person-days lost because of animal bites is 38 million, and the cost of post-bite treatment is about $25 million (Sudarshan, 2004). The National Multicentric Rabies Survey 2003, carried out by the Association for Prevention and Control of Rabies in India(APCRI), reported about 133 wild animal rabies death in various Species viz. mongoose- 98, jackal- 13, deer- 11, bear- 1, wolf-1, lion-3, fox-1, rhinoceros-1, panther-1 during the period of 1992-2001. Through this literature an attempt is being made to ascertain the incidence of sylvatic rabies in India.

OCCURRENCES

Wild carnivores: During the period of 1967 to 1990 National Zoological Park New Delhi has encountered cases of rabies: 2 white tigress, a brown bear and a racoon. The tigress showed symptoms akin to dumb form of rabies. There was slight drooling of saliva and tachycardia. The animal was off fed and no rise of temperature. As the disease progressed, the animal was emaciated with wasting of muscle of hindquarter and remained recumbent till death. No prominent gross lesions were observed on necropsy. Laboratory investigation confirmed the case (Arora, 1990-91).

Brain specimen from a lioness, which died after showing clinical signs of rabies at Zoological Garden, Chatbir, Chandigarh was subjected to immunoflourescene test at Central Research Institute(CRI), Kasauli was found to be positive for rabies (Singh et al 1981). In the year 1987, a lion at Renuka Safari in Himachal Pradesh showed symptom of furious form, attacking other lions, biting & striking against wire fence(gums and teeth were injured in the process). The lion was hypersensitive to sound. Hoarse roaring and drooling of saliva was noted. Paralysis, loss of appetite and hydrophobia was also observed. Gradually the animal become cachectic with complete paralysis and had dilated pupils. The animal died on the fourth day after onset of symptoms. The case was confirmed at CRI Kasauli (Singh *et al*. , 1991)

Rao *et al*. 1980 confirmed rabies in three lions at Botanical Park, Bhubaneswar, Orissa. In the same park, Rao and Nayak (1984) confirmed the death of a tigress 'Kheri' by histopathological examination and Flourescene Antibody Test (FAT). Prior to her death the animal showed abnormal behaviour, frequent vomiting, incoordinated movement but was able to drink water. In National Park, Bannerghata, Bangalore a bear (*Melursus ursinus*) was diagnosed with

[1] Department of Veterinary Pathology, F/O Veterinary and Animal Science, WBUAFS, K. B. Sarani, Kolkata-37, West Bengal, Email id : skmpath@gmail. com

[2]KVK-ICAR NRC on Mithun, Porba, Phek, Nagaland

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rabies. The animal manifested typical symptoms of rabies. Brain tissue smear showed presence of nigri bodies and biological test proved positive for rabies infection (Vijayasarathi *et al*. , 1983).

In free living carnivores, the first report of the disease was in two royal Bengal tigers (*Panther tigris*). The first case was recorded in 1943 in Nagoan district and the second in 1950 near Saikowaghat in Assam. The tigers attacked human, cattle and dogs. In both the cases Histopathological studies of brain specimen conducted at Pasteur Institute, Shillong confirmed rabies infection (Pandit 1950-51). Three cases of mongoose-bite in human were reported. The brain of one mongoose was positive for rabies. Hence death of untreated bitten case was ascribed to mongoose bite (Grewal, 1932-33). Besides mongoose the disease is also reported in squirrels (Grewal & Nicholas, 1940).

The outbreak of rabies among jackals of Nilgiri hills in 1943 and 1956 and in Tamil Nadu in 1979 were responsible for decline in their population. The brain of jackals proved positive for rabies (Pandit, 1979). Rabies surveillance in free living wild animals was carried out during 1976-80 in Tarai area of Uttar Pradesh. A total of 10 wild cats, 1 civet cat, 16 mongooses, 4 jackals and 62 shrews were screened. Presence of Nigri bodies could only be detected in 2 mongoose & 2 shrewa conclusively, but in either case virus was not isolated (Sethi *et al.* , 1980). About 6 years old feral leopard (*Panther pardus*) manifested aberrant behaviour in Karnataka state attacking villagers. The brain specimens collected at necropsy subjected to laboratory investigations (i. e Seller's staining method of impression smear and biological testing in mice) led to the diagnosis of rabies (Jayakumar *et al*. , 1989).

A Small Indian Civet cats (*Viverricula indica*) was tranquillized by National Zoological Park, New Delhi in the year 1991. The animal was wandering aimlessly in the populated urban area and attacked passerby. Later the animal showed inappetance, excitement, restlessness, drooping head, lower jaw hanging fixedly, drooling of saliva and bumping into objects. Gradually the animal manifested incoordination of movement and muscle tremors of the hind quarters. The necropsy examination revealed severe congestion of the vital organs. Stomach and intestine were empty. The brain samples were sent to IVRI Izatnagar for pathological and virological diagnosis. Brain smear preparation made from inoculated mice was found positive for intracytoplasmic inclusion bodies indistinguishable from negri bodies as seen in rabies infection. The case was diagnosed as Furious rabies based on the clinical signs and course of illness coupled with biological findings (Arora, 1993).

Between 2007 and 2017,20 rabies suspected brain samples from dead animals covering different species of wild animals from different states of India such as Delhi (sambar deer, Himalayan sloth bear, hyena, and mongoose), Gujarat (hyena), Karnataka (wolf and bear), Punjab (jackal), Rajasthan (hyena), and Uttar Pradesh (bear) were submitted to ICAR - National Institute of Veterinary Epidemiology and Disease Informatics for confirmatory rabies diagnosis. The samples were subjected for direct fluorescent antibody test (dFAT), reverse transcription polymerase chain reaction (RT-PCR), and quantitative reverse transcriptase real-time PCR (RT-qPCR). The phylogenetic analysis of partial nucleoprotein gene sequences was performed. Of 20 samples, 11,10, and 12 cases were found positive by dFAT, RT-PCR, and RT-qPCR, respectively. Phylogenetic analysis showed that all Indian wild RVs isolates belonged to classical genotype 1 of Lyssavirus and were closely related to Arctic/Arctic-like single cluster indicating the possibility of a spillover of rabies among different species (Reddy *et al*. , 2019).

Jayson and Govind, 2014 reported a case of rabies in a mongoose in Kannur, Kerala. Mongoose species are known to be vectors of the rabies virus (Rhabdoviridae) (Rabies Survey Report 2003).

Proboscida: Based on history and clinical signs, perhaps the first case of rabies in Indian elephant attributed to the bites of rabid dog was described by Evan (1910) in his book entitled 'Diseases of Elephant'. An elephant was attacked and bitten by a rabid dog at night in Hyderabad. Symptoms of delirium supervened after one month of exposure. The animal gradually became anorexic but did not manifest the symptoms of hydrophobia. The elephant was furious, unruly and died suddenly. On the same occasion another elephant died after 15 days after the one alluded to, with the same symptoms.

In an another instance, paralytic rabies was recorded in a 25 year old elephant cow owned by the police station,

Paravatipur, Madras(Ramiah, 1932-33). The animal was biten on the left limb, trunk and tail by a rabid dog. Anti rabies vaccines was administered on the 9th day and the wounds were treated accordingly. On 43rd day, the cow developed sudden lameness of her hind limbs. Gradually hemiplegia progressed to parasis. She took meagre amount of grass and drunk water. The temperature of the animal ranged from 98.4 to 99.8 F. On 7th day of onset of symptoms, oedema developed on her head, neck and abdomen. She showed rapid pulse (70 /minute, Normal 30-35/minute). On the following day she was unconscious, sunken eyes, cyanotic mucus memebrane, rapid but feeble pulse, slow respiration but stertorous. The animal died on the 9th day. Brain sample sent to Pasteur Institute, Coonnor was positive for rabies.

A case of rabies was reported in an 8 years old male elephant calf belonging to Achhetty Village, Dharmpura district of Tamil Nadu. The calf was found lying in sternal recumbancy unable to get up. Hind limb and tail showed slight reflexes and there was difficulty in feeding and drinking water. Involuntary defecation was marked. The animal died following treatment. The brain impression smears and biological test conducted at Pasteur Institute, Coonoor revealed rabies (Gopal & Rao, 1968).

Aravind et al, 2006 confirmed a case of rabies in Indian elephant in Chivara, Kollam district, Kerela. The elephant was in lateral decumbency, posterior paralysis, subnormal rectal temperation and slow respiratory rate. The animal was off fed, dehydrated and did not pass urine and faeces. On post-mortem, petechial haemorrhage was observed in the intestinal mucus membrane. Speenomegally and meningeal congestion were prominent. Both positive FAT & PCR test confirmed rabies.

Perissodactylids: The first record of rabies in among Indian species of perissodactylids was clinically attributed to the death of an Indian One horned Rhinocerous(Rhinoceros Unicornis) in Kolkata(Das, 1968).

In Zoological Garden Lucknow, an 8 years old female rhinoceros died after showing clinical manifestation such as off fed, restlessness, frothy salivation, staggering gait, partial paralysis of lower jaw, biting tendency and head pressing against hard objects. Hydrophobia was not observed in the course of the disease. The animal succumbed after 6th day of onset of symptoms. Frothy exudate in the trachea and bronchi and severe congestion of the meningeal vessels were noted on necropsy. Histopathological examination revealed engorgement of blood vessel, marked neuronal degeneration, satellitosis and perivascular cuffing. Stained sections revealed nigrei bodies mainly in the pukenjee cells of the cerebellum. Mice inculated intracerebrally with brain suspension died after 5th day post inoculation showing typical paralytic symptoms. Brain impression smear stained with seller's stain revealed presence of negri bodies (Mukherjee *et al*. , 1984)

In the year 1992, a 29 years male rhinoceros of Zoological Park kanpur, Uttar Pradesh showed the symptom of excitement, aggressiveness, aimless movement, falling and rolling on the ground. Panting, groaning and drooling of saliva were other clinical symptoms noted. Staggering gait and exhaustion was conspicuously marked. Brain specimen to IVRI, Izatnagar (UP) for laboratory diagnosis confirmed rabies infestion(Arora, 1993).

Selvam *et at. ,* (2003) report a case of rabies at National Zoological Park, New Delhi. The rhino suddenly felt to the grown showing colic symptom with paddling movement of all four legs, conjunctivitis, panting, groaning and restlessness. The animal was off fed and died after 2 days. Typical symptoms of rabies were not observed in the case.

Artiodactyla: The reports on rabies in pigs are scanty (Jiang *et al.* , 2008 and Pessoa *et al.* , 2011). It accounts for only 0.1-1.1 % of the incidence of animal rabies (Dhillon & Dhingra, 1973). Although wild animals are suspected to be reservoirs of animal viruses like rabies, leading to the spread of the disease to the adjoining forest areas, the reports of confirmed rabies cases are few. A case of rabies in a wild pig was confirmed by FAT by Daly *et al.* 2014. On post mortem examination grossly frothy exudates in bronchi and lungs, petechial hemorrhages on the liver and diffuse hyperemia of the gastric mucosa were observed. Histologically pink staining protein rich exudates in the alveoli and bronchi were observed in the lungs, liver section revealed sinusoidal congestion and cloudy swelling of the hepatocytes and in the stomach necrosis of the superficial lining epithelial cells and infiltration of

polymorph nuclear leucocytes in the lamina propria were observed. These gross and histological findings indicated haemodynamic changes like hemorrhage and edema.

Primates: A case of meningoencephalitis in rhesus monkey with paralysis of ears and limbs was found positive for rabies (Gill & Singh, 1977).

Rodents: Bandicoots(*Bandicoota malabarica*) were found inapparent reservoir of rabies according to D'souza *et al.* (1968)

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