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Rabies/Lyssa/Rage/Hydrophobia: A Deadly Disease in Animals

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INTRODUCTION

Rabies is caused by *Lyssavirus*/Rhabdoviridae, which is a true neurotropic virus. Rabies is a viral non-suppurative encephalomyelitis affecting warm-blooded animals including humans (zoonotic) causes 100% mortality. The most important mode of transmission of this infection is through the bite of rabid animal. Contamination of skin wounds with infected saliva (rich in virus) of rabid animals (dog, fox, mongoose, vampire bats, raccoons etc.) is speculated to be the most potential source of infection. Although rare cases of in-utero transmission, milk, licking, inhalation (mines with bats) etc. are also reported. Stray dogs are main reservoir/carrier of rabies in India; Mongoose are wild reservoirs in India; Vampire bats are main reservoir in United States. Bats are asymptomatic carriers (as virus multiply in adipose tissue). Incubation period of this disease ranges from 1 week to 1 year, depending upon the virulence and quantity of virus in saliva, distance between the site of bite and CNS etc. Bites near to head than extremities are more likely to lead to rabies and more acute death in affected hosts.

Pathogenesis of infection

2. Centripetal spread

Replication of virus in myocytes/muscles cells and release into extracellular space (transmission of virus is through axons not through viremia)

⬇

Virus binds with acetylcholine receptors in motor end plates

⬇

Virus enters into the spinal cord/ventral horns at the rate of 3-4 mm/hour and undergo replication

⬇

Finally enters into brain stem, cerebral cortex and hippocampus leading to destruction of neurons

2. **Centrifugal spread** of virus occurs from CNS to other tissues like salivary glands (main site), tonsils, cornea etc.

Clinical symptoms

First sign in rabid animals is always change in behaviour.

1. **In dogs**

- **Dumb or paralytic form**

✓ Peculiar starring expression/vacant look
✓ Profuse salivation and inability to swallow
✓ Dropping of lower jaw causing inability to drink water due to paralysis of facial and laryngeal muscles called hydrophobia

- **Furious form**

✓ Aggressive, excited and violent anger/rages with red eyes
✓ Bite the inanimate or moving objects
✓ Clamping of jaws/chewing noisily with excessive foamy salivation
✓ Rabid wild animals (foxes, wolves etc.) or dogs attack humans and domestic animals

2. **Other animals**

- **Cattle:** bellowing (making deep loud cry)—characteristic feature, frequent micturition, off feed, stop of milk production
- **Horses:** rolling like colic

Pathological changes in rabies

1. **No gross lesions** (except congestion of meninges sometimes)
2. **Microscopic lesions**

- Diffuse encephalomyelitis with perivascular cuffing with lymphocytes in brain stem, hippocampus, Gasserian ganglion (mainly)
- Small nodules formed by the collections of proliferating microglial cells encroaching and replacing the affected neurons called Babes nodules (appears in Gasserian/trigeminal ganglion most earliest) followed by neuronophagia
- Intra-cytoplasmic inclusions in the neurons called Negri bodies (in hippocampus in dog, Purkinje cells of cerebellum in cattle). Negri bodies are 2-8 micro meter in diameter and have a distinct limiting membrane encircled by a narrow clear halo. Lyssa bodies are looking like Negri bodies but don't have any limiting membrane and are present in non-rabid animals
- Negri bodies are not well demonstrated with H& E staining technique but Mann' stain, Schleif staining methods can be used
- Seller's stain can be best used to demonstrate the Negri bodies in impression smear

Diagnosis

- Animal with abnormal behaviour must be kept in isolation for 10 days, if dies the laboratory examination must be done for confirmation
- IFAT- INDIRECT FLUORECENT ANTIBODY TEST (Gold standard OIE recommended test)
- Histological investigation of Negri bodies
- Habel's/Swiss mouse inoculation test
- Peroxidae-antiperoxidae staining technique

Fig. 1. Congestion in the meninges of a cattle died due to rabies

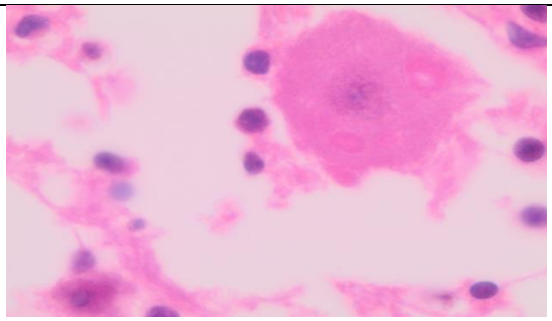

Fig. 2. Eosinophilic intracytoplasmic inclusions in the neuron on histopathology. H& E X100

Prevention and control

- Mass vaccination of stray dogs and wild animals (using vaccine baits)
- Population control of stray animals
- Education and awareness among people regarding rabies
- Veterinarians can play important role to control the rabies through animal birth control and mass vaccination in their respective areas