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Popular Article

Common Viral Diseases Encountered in Captive Asian Elephants

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Abstract

The Asian elephant (*Elephas maximus)* is the largest living terrestrial mammal on the asian continent and they are important for biodiversity and regional ecosystem balance. Today it is classified as endangered according to the IUCN red list. The main threat to elephant population worldwide is poaching, habitat fragmentation, population growth and viruses. EEHV is a highly fatal, multi systemic hemorrhagic disease and one of the most important causes of mortality of juvenile Asian elephant in captivity. FMD is a highly contagious, acute viral disease of cloven-hoofed animal characterized by vesicle formation on tongue, palate and erosive lesions on foot slipper. Elephant pox virus is a serious, contagious disease caused by orthopoxvirus and characterized by pustules on the trunk, head. Rabies is a deadly viral infection that spreads through saliva of infected animal characterized by neurological excitement, paralysis. Encephalomyocarditis is an acute febrile disease of Elephant, Swine and Captive Zoo animals and may induce encephalitis, myocarditis.

Keywords: Asian elephants, Virus, FMD, EEHV, Rabies, Capitivity

Introduction

The Asian elephant (Elephant *maximus)* is the largest living terrestrial mammal on the asian continent and they are important for biodiversity and regional ecosystem balance. Through seed dispersal, biomass removal, nutrient cycling and other processes that ultimately shape forest communities, Elephant play a critical role in tropical forest ecosystem. Today it is classified as endangered according to the IUCN red list. The main threat to elephant population worldwide is poaching, habitat fragmentation, population growth and viruses. The common viral diseases affecting captive Asian Elephants are Elephant Endotheliotropic Herpesvirus, Foot and mouth disease, Elephant pox, Rabies, Encephalomyocarditis.

1.Elephant Endotheliotropic Herpes Virus

EEHV is a highly fatal, multisystemic hemorrhagic disease and one of the most important causes of mortality of juvenile Asian elephant in captivity.

1.1.Etiology

Herpes virus inclusions were first discovered in lung nodules of asymptomatic elephants. The second herpes virus was reported in Vulvar lymphoid lesions and skin papilloma. Both Elephant Endotheliotropic Herpes viruses (EEHV) were occur in African elephant which is the primary host, one of which infects Asian elephant. EEHV belongs to the genus proboscidae, subfamily Betaherpesvirinae. It consists of seven known members EEHV1A, EEHV1B, EEHV2, EEHV3, EEHV4, EEHV5, EEHV6.

1.2.**Epidemiology**

This disease affects only elephants not other animals. Initial outbreak is in the USA in 1995. Then EEHV reported in 10 elephants in North American zoos.

1.3.**Transmission**

It can spread through mucosal secretions like vaginal secretion, nasal secretion, saliva, breast milk, trunk to trunk contact.

1.4.Clinical signs

Clinical signs include,

- Lethargy,
- Fever,
- Bloody diarrhoea,
- Facial/neck oedema,
- Tongue cyanosis,
- Lameness,
- Nervous signs: staggering gait, drowsiness, cerebral hypoxia, may lead to death within 24 to 48 hours.

1.5.**Diagnosis**

- **PCR** can be used to extract viral DNA from whole blood and tissues (at necropsy heart, liver, tongue, intestine) to detect EEHV types1-7.
- **ELISA** can be performed which is based on the glycoprotein B sequence.
- At necropsy pericardial effusion, myocardial petechial and ecchymosis haemorrhages may be found.

1.6. **Treatment**

Antiviral drugs: Famciclovir at 8-15mg/kg BW QID on first day, followed by BID for 3 weeks orally/rectally. Acyclovir can also be used.

Diuretics: Furosemide at 0.6mg/kg.

Antibiotics: Amoxicillin (11mg/kg), Ampicillin (8mg/kg), Ceftiofur (2mg/kg).

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NSAID: Meloxicam / Flunixin at 0.6mg/kg.

1.7. **Vaccination**

Currently no vaccine available in India. US developed vaccines are still under study. Given the variety of strains and sub strains present in the virus, a comprehensive vaccine programme needs to be created.

2.Foot and Mouth Disease

It is a highly contagious acute vesicular disease. It affects cloven hoofed animals such as cattle, Buffalo and over 70 wildlife species.

2.1. Etiology

Causative agent is Aphthosvirus sp. Family picornoviridae. 7 serotypes are known (O, A, C, Asia1, SAT1, SAT2, SAT3).

2.2. **Transmission**

Field transmission can occur through direct contact with the infected animal, respiratory aerosol, inanimate vectors like vehicles, instruments, animate vectors like human. It can also occur through contaminated feed and water.

2.3. Clinical signs

- First clinical sign could be loss of appetite, lameness, mild fever.
- Followed by vehicle formation on tongue, palate, inner mucous membrane of trunk with the exudate from nostril may occur.
- Copious salivation and frequent drooling. Recumbency resulted from severe lameness.
- Erosive lesions on foot slipper. Elephant found it difficult to walk and move around because the foot with blisters turned into open sores. Severe lameness may lead to recumbency.

2.4.Diagnosis

- FMD can be diagnosed by PCR, ELISA.
- EM help in rapid diagnosis.
- CF, AGID, IFA, ELISA used to identify viral antigen from tissue (Samples to be collected vesicular epithelium tags in phosphate saline, Blood in CaEDTA).

2.5.Management

- In adult elephant FMD is not usually fatal. In young one may lead to myocarditis. To overcome reluctance to eat provide soft food.
- Foot slipper sloughs need long term dressings and protective boots.
- With appropriate medical care majority of the elephant will survive.

2.6.Vaccination

Numerous distinct antigenic strains are making the process of vaccination complicated.

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3. Elephant Pox

Elephant pox virus is a serious, contagious disease caused by Ortho poxvirus and characterized by pustules on the trunk, head**.**

3.1. Etiology

It is caused by Elephant pox virus of genus Ortho poxvirus, Family Poxviridae.

3.2. Epidemiology

There have been reports of an elephant pox outbreak in Sri Lanka and India. In European zoos there were 22 outbreaks of elephant pox between 1960 and 1986.

3.3. Transmission

Elephant pox can be transmitted by rodents. Elephants and humans may get the infection through direct contact with an infected elephant's sores or mucous. Virus contaminated objects also act as source of infection.

3.4. Clinical signs

- The elephant may have high fever and difficulty in swallowing certain foods/liquids. Dysphagia due to sores in mouth.
- Subsequently, the animal develops pustules on the skin of the head and trunk.
- Then, pustules may rupture, releasing a clear, purulent/bloody fluid.
- Eventually they dry out and crust formation ends up in unpigmented scars.
- As a secondary complication nails and soles get affected.

3.5. Diagnosis

- Based on clinical signs.
- Light microscopy detects eosinophilic intracytoplasmic inclusion (Bollinger Bodies).
- Electron microscopy can reveal viral particle and Bollinger Bodies.
- In Histopathology lesions can be observed in pericardium, epicardium, spleen, and liver serosa surface.

3.6. Treatment

- Antibiotics to prevent secondary bacterial infection.
- If the corium gets exposed, dressings and special boots will be needed.

3.7. Vaccination

At first an MVA strain of vaccine was used, followed by Lister (Elstree) strain to prevent infection in Germany.

4. Rabies

A deadly viral infection that spreads through saliva of infected animal.

4.1. Etiology

Rabies is caused by lyssa virus of family Rhabdoviridae. It appears as Bullet shaped and

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approximately 60-175nm in size. This virus can be easily inactivated by sunlight.

4.2. Epidemiology

At present rabies occurs in most part of the world except in Japan, UK, New Zealand, Antarctica, Australia, Hawaii island and Switzerland. It has Very high incidence in India. Evan (1910) documented the first case of rabies in elephant based on the history and clinical signs, attributed to bites of rabid dog.

4.3. Transmission

- Most commonly through bites of rabbit dog in elephant's trunk or limb.
- In North America elephants are at risk of bitten by rabid wild carnivore (dog, raccoons, skunks).
- In North American insectivores' bat may possibly spread the rabies virus to elephant.

4.4. Clinical signs

- Initially anorexia / behavioural changes may be there.
- **Neurological Excitement stage**: Some animal may show signs of sudden aggression (try to attack people with trunk).
  Hyperventilation, Hypertension.
- **Paralytic phase:** It may follow excitement phase**,** directly enter this phase from prodromal stage. Signs include hemiplegia, Flaccidity of tail, asymmetrical paralysis, Incontinence, and coma.

4.5. Diagnosis

- Fluorescent Antibody Test- gold standard test for diagnosis of rabies. It needs impression smears taken from the hippocampus, brainstem, cerebellum. Slides are examined under fluorescent microscopy after applying monoclonal or polyclonal anti rabies virus reagent. Apple green areas indicate positive case.
- Demonstration of Negri bodies (intracytoplasmic magenta red colour bodies) in impression smear collected from hippocampus, cerebellum, brainstem.
- ELISA, SVN, RT-PCR.
- Animal inoculation.
- Virus isolation by tissue culture.

4.6. Treatment

- Currently no treatment is available for rabies.
- Suspected elephant should be isolated.

4.7. Vaccination

- Currently no vaccine is validated. Killed vaccines are used in certain endemic areas.

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- One report by Ramiro Isaza *et al.* (2006) showed the ability of Asian elephant to develop humoral immunity after immunization with a commercially available monovalent inactivated rabies virus vaccine.

5.Encephalomyocarditis

Encephalomyocarditis is an acute febrile disease of Elephant, Swine and Captive Zoo animals and may induce encephalitis, myocarditis.

5.1. Etiology

It is caused by Encephalomyocarditis virus, genus cardiovirus, family Picornoviridae. Picornavirus are small, non-enveloped and have single stranded RNA.

5.2. Epidemiology

Several mammalian species are susceptible to infection. e.g. Pig, Primates, Rodents act as a reservoir host. In South Africa, United States, Australia Asian elephant have contracted EMC.

5.3. Transmission

Faeco oral route, feed and water contaminated by rodent urine. Elephant to Elephant transmission is not reported.

5.4. Clinical signs

- Many elephants die without showing any clinical sign.
- In less acute cases animal may show Lethargy, depression, Anorexia, Dyspnoea.
- Myocarditis, Hydro pericardium, Ascites, Pulmonary oedema can also occur.

5.5. Diagnosis

- Isolation of the virus in tissue culture.
- HA, HI test.
- PCR.
- Gross lesion at necropsy includes hydrothorax, hydro pericardium, pale streaks in myocardium can be appreciated.
- Histopathology- myocardial necrosis and degeneration.
- Electron microscopy – viral particle can be seen.

5.6. Treatment

For EMC no specific treatment is available. Prevention can be done by rodent control.

5.7. Vaccination

During an outbreak of EMC in the US inactivated vaccines were used.

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