

Rabies

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Outline

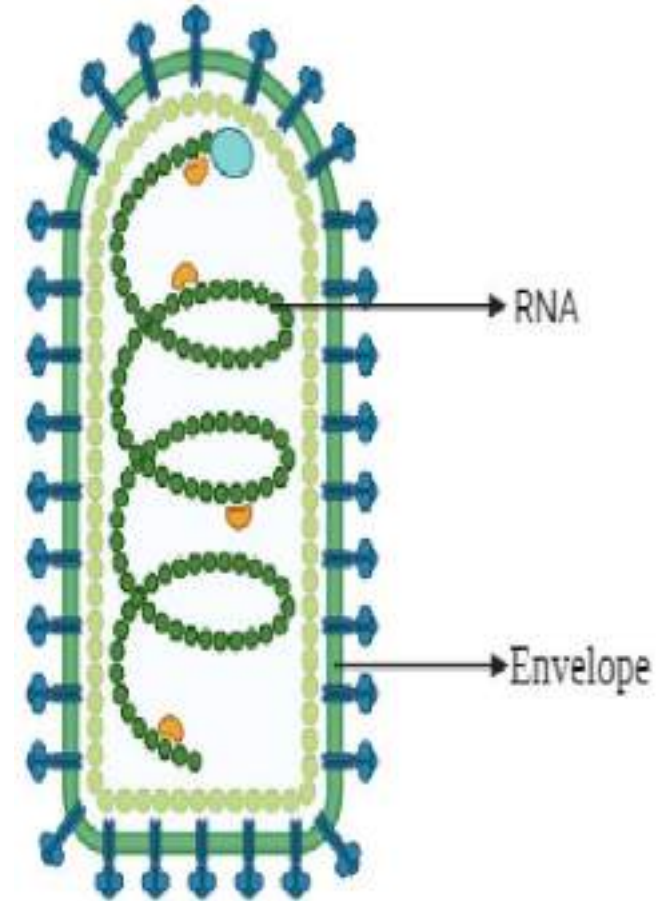
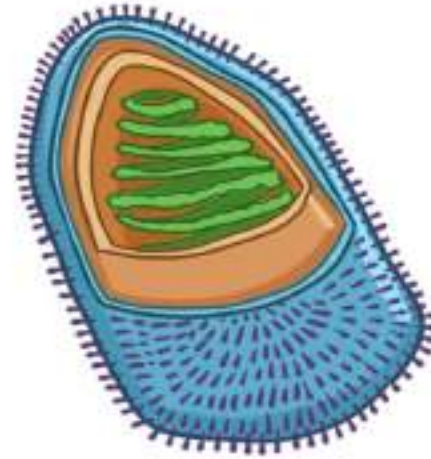
- Introduction
- Etiology
- Pathophysiology
- Clinical presentation
- Diagnosis
- Treatment and Prevention

Introduction

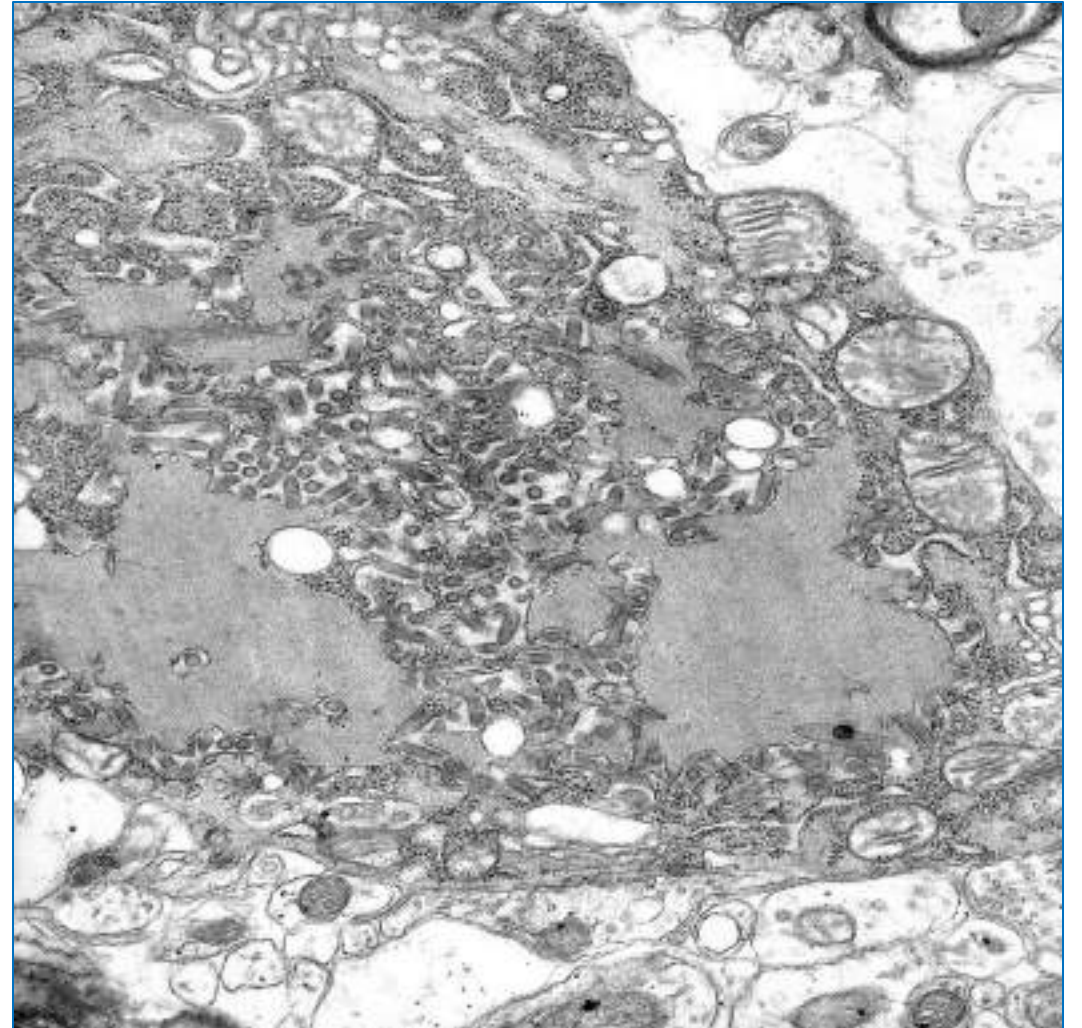
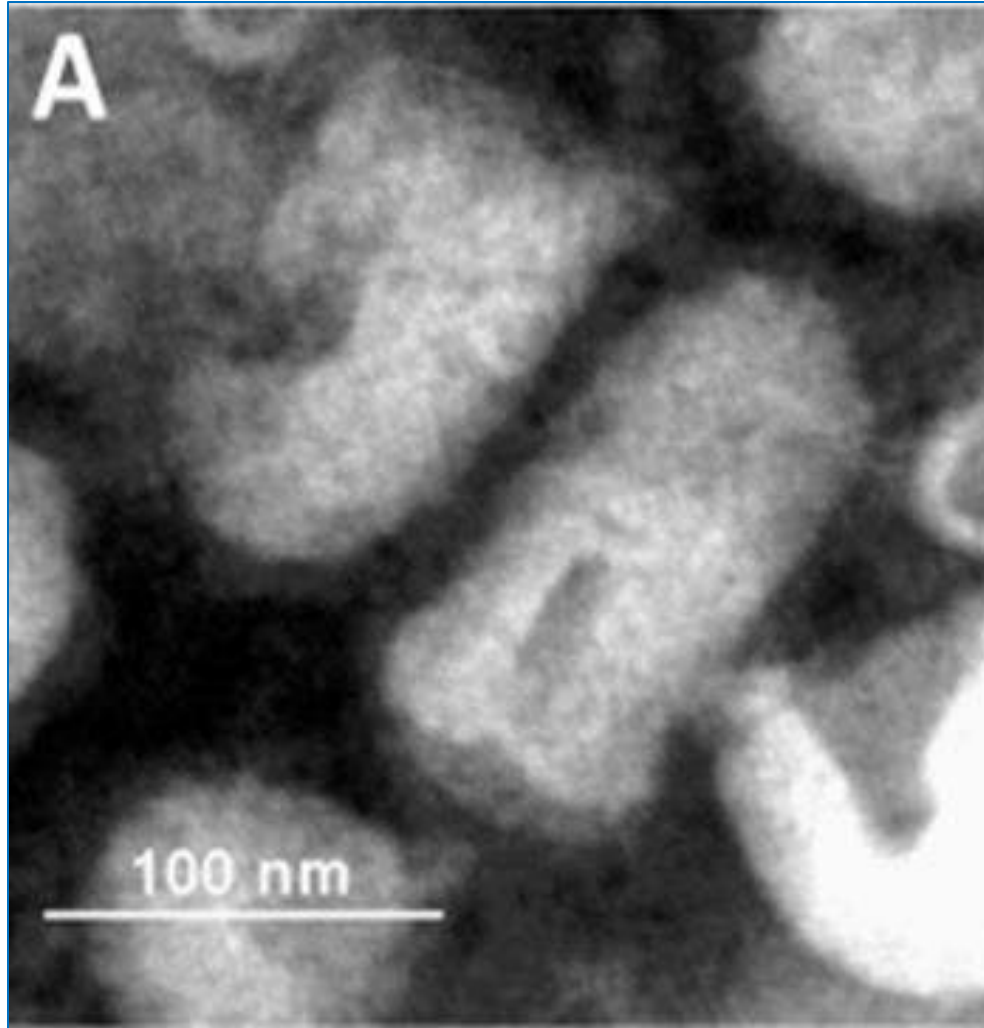
- Rabies is a **neurotropic virus** transmitted through the **bite of an infected animal**.
- Rabies is an acute, progressive, and nearly always **fatal viral disease** that affects the **central nervous system** of humans and other mammals.
- Incidence worldwide: ~ 60,000 people die of rabies each year.

Etiology

- Taxonomy:
 - Family: Rhabdoviridae
 - Genus: Lyssavirus
- RNA genome: single-stranded, linear, negative-sense
- Structure:
 - Rhabdoviruses are rod or bullet shaped
 - Helical ribonucleoprotein core
 - Enveloped
 - Glycoprotein spikes on the virus surface



Etiology

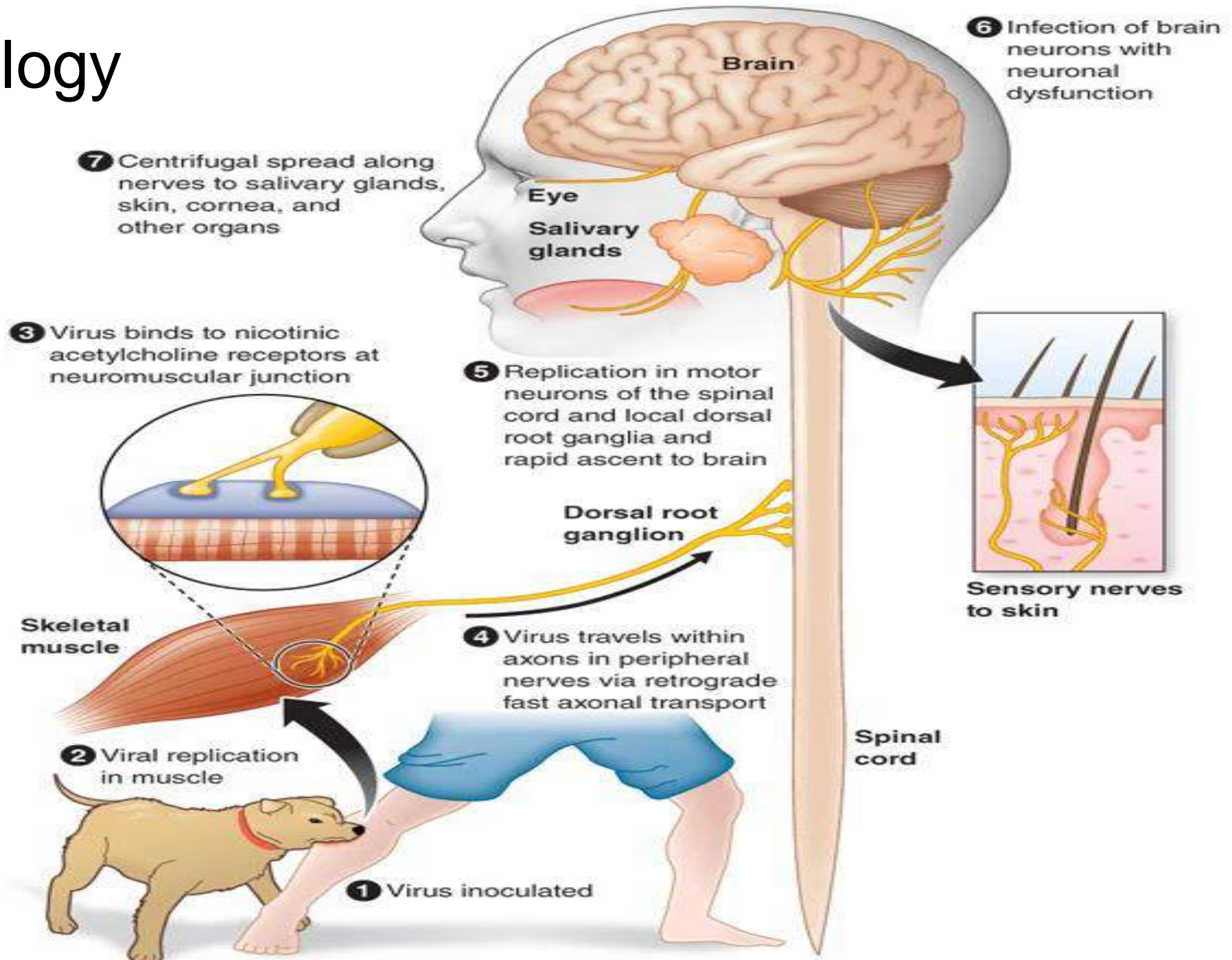


Etiology- Transmission

- Human infection is almost always due to a **bite** by an infected mammal.
 - Most common animal reservoir worldwide: **dogs** ($\geq 90\%$)
 - Most common animal reservoirs in the US: **bats, raccoons, and foxes**
- Rare:
 - Organ transplant
 - Transplacental
 - Inhalation of aerosolized virus

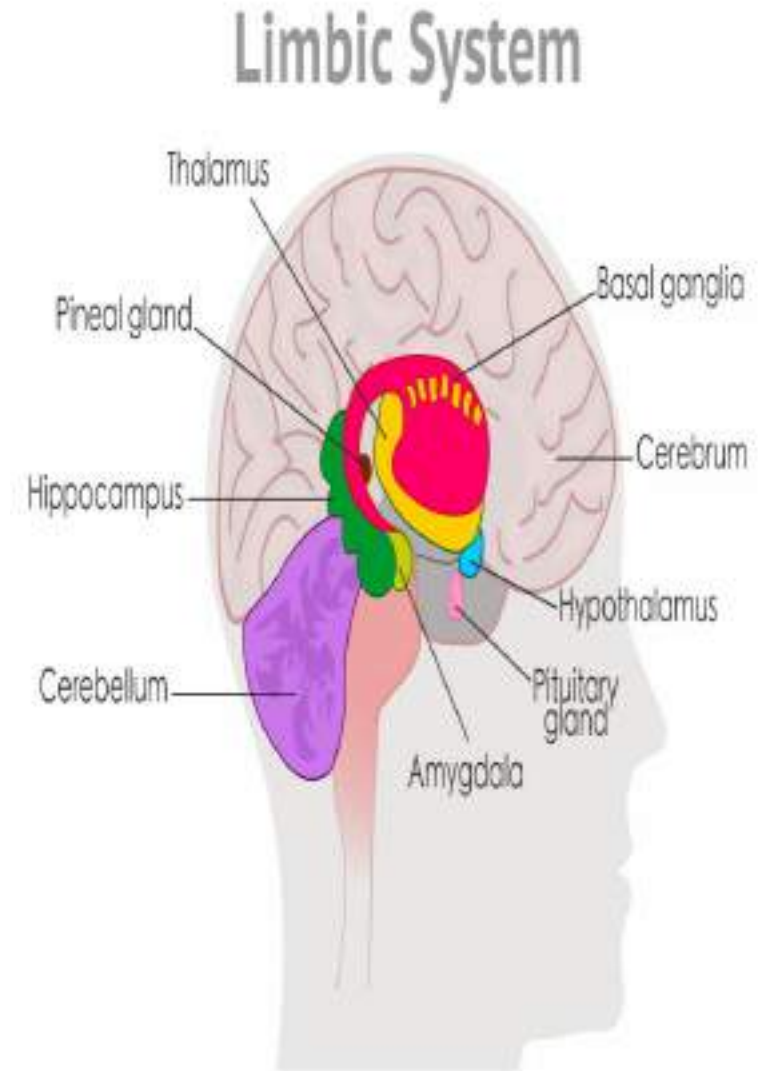


Pathophysiology



Pathophysiology

- Rabies virus binds the ACh receptor of peripheral nerves in the bite wound → migrates retrogradely along the axonal microtubules (using motor **protein dynein**) → enters the CNS → infects the brain
- Diencephalon, hippocampus, and brainstem are involved first
- Causes acute, progressive, and fatal encephalitis → encephalitic rabies
- Causes ascending flaccid paralysis → paralytic rabies



Clinical features

General

Incubation period: 4–12 weeks average → Shorter in children and with bites closer to the CNS

- **Prodromal symptoms:**

- Prodromal period lasts 0–10 days.
- Flu-like symptoms (e.g., fever, malaise, headache, cough)
- Pain, paraesthesia, and pruritus near the bite site

Clinical features: **Acute neurologic period**

Acute neurologic period lasts 2–7 days.

Encephalitic rabies (~ 80% of cases):

- Pharyngeal muscle spasms:
 - **Hydrophobia:** Rabies patients experience involuntary, painful pharyngeal muscle spasms when trying to drink; later on in the disease, the sight of water alone may provoke nausea or vomiting.
 - Aerophobia
 - Choking, and Coughing

Clinical features: **Acute neurologic period**

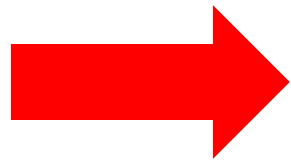
Encephalitic rabies (~ 80% of cases):

- Hyperactivity and agitation
- Altered mental status: Confusion, Hallucinations
- Increased deep tendon reflexes
- Muscle fasciculations and contractions: Facial grimacing
- Autonomic instability: hypersalivation, sweating, lacrimation, pupil dilation, fever, tachycardia
- Seizures

Clinical features: **Acute neurologic period**

Paralytic rabies (~ 20% of cases)

- Ascending, flaccid paralysis
- Absent deep tendon reflexes
- Muscle fasciculations
- Respiratory failure and death



Coma and death within days to weeks of the development of neurological symptoms

Clinical presentation

INCUBATION PERIOD → 1-3 months

~ depends where it enters the body

EARLY PHASE SYMPTOMS:

- ~ MALAISE
- ~ HEADACHE
- ~ FEVER
- ~ PARESTHESIA



CLINICAL PHASE SYMPTOMS:

* ENCEPHALITIC RABIES

- ~ FEVER
- ~ HYDROPHOBIA
- ~ FOAMING at the MOUTH
- ~ ↑ SALIVA PRODUCTION
- ~ SWEATING
- ~ DILATED PUPILS
- ~ AGITATED & AGGRESSIVE
- ~ COMA

* PARALYTIC RABIES

- ~ PARALYSIS that MOVES UP the BODY

USUALLY FATAL

- ~ respiratory failure from spasms



Diagnosis

- Suspect rabies in patients with potential exposure and clinical features of rabies.
- **Several tests** using **multiple specimens** must be performed because virus and antibody detection vary throughout disease. **Identifying rabies virus** antigen or nucleic acid confirms the diagnosis.
- Specimens that can be tested: saliva, CSF, serum, tissue (skin from the nape of the neck or brain)

Diagnosis

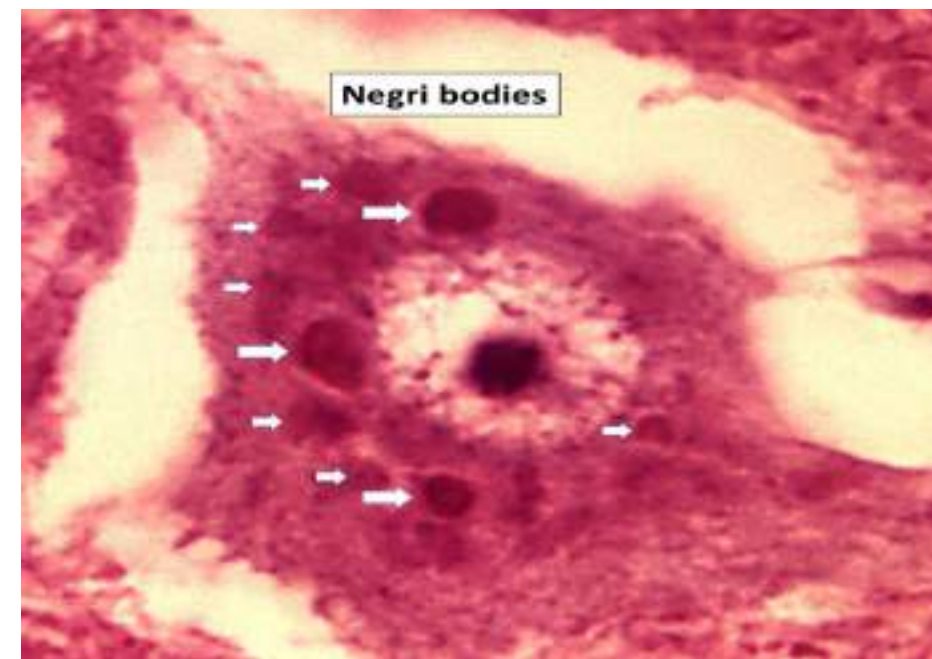
Antemortem diagnosis

- Antibody titers
- PCR to detect viral RNA
- Isolation of virus (viral culture)
- Immunofluorescent staining of biopsy specimens for viral antigen

Postmortem diagnosis

Postmortem brain tissue autopsy

- Immunofluorescent staining of viral antigen in infected CNS tissue
- Histopathological findings: **Negri bodies** (eosinophilic cytoplasmic inclusion bodies typically found in the cerebellum and hippocampus)



Treatment

- There is no effective treatment for symptomatic rabies, and few patients survive.
- Palliative care
- Life support measures can prolong the clinical course but rarely affect the outcome.

Prevention

Prevention is the mainstay of care.

- Vaccinate susceptible species (dogs and cats).
- **Preexposure prophylaxis** with rabies vaccine is indicated for:
 - Travel to endemic areas
 - Veterinarians
 - Animal handlers

Prevention

Postexposure prophylaxis:

- Local wound cleaning
- Human rabies immune globulin: Given only once to previously unvaccinated people → Provides immediate antibodies
 - Inject as much as possible at the bite site (infiltrate into the wounds).
- Rabies vaccine:
 - 1st dose given as soon as possible after exposure.
 - Additional doses are given on days 3, 7, and 14 after the 1st vaccination.

Thank you