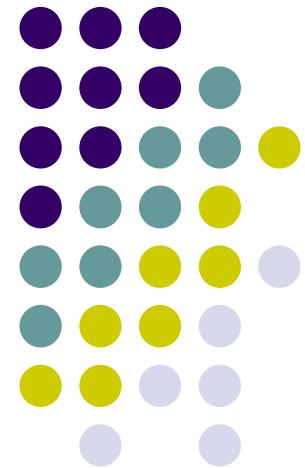
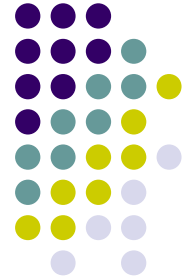


# RABIES

Presenter: J.J. Kambona (M.B.Ch.B; M.Med)



# OBJECTIVES



**At the end of this session each student will be able to:**

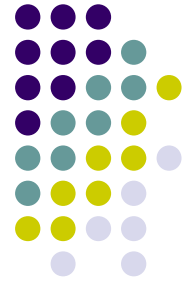
1. Define rabies.
2. Describe the epidemiology of rabies.
3. Describe the cause of rabies.
4. Describe the pathophysiology of rabies.
5. Describe the clinical features of rabies.
6. Describe the complications of rabies.
7. Describe the differential diagnoses of rabies.
8. Investigate patients with rabies.
9. Treat patients with rabies.
10. Describe the prognosis of patients with rabies.
11. Describe the preventive measures for rabies.

# Definition



- Rabies is a zoonotic disease with CNS manifestations caused by Rabies virus.

# Epidemiology



- Race: No predilection is known.
- Sex: No predilection is known.
- Age: No predilection is known.
- Reservoirs:
  - I. Unvaccinated domesticated animals such as dogs, cats and cattle.
  - II. Wild animals such as coyotes, wolves, jackals, foxes, raccoons, skunks and insect-eating bats.

# Epidemiology



## High risk exposures consists of :

- Contact with saliva or infected CNS tissues via the:
  - Bite of an infected animal.
  - Broken skin.
  - Mucous membrane.
  - Exposure to aerosolized secretions from infected animals.
- Ingestion of unpasteurized milk.
- Rabies infected donated organ: Corneal, kidney or liver transplants.

# Cause



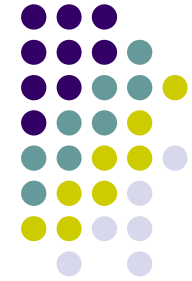
- Rabies virus.
- It is a bullet-shaped virion with a single-stranded RNA nucleocapsid core and lipoprotein envelop.
- Its nucleocapsid material comprises the negri bodies observed in the cytoplasm of infected neurons.
- The virus is inactivated by drying, ultraviolet rays, x-rays, trypsin, detergents and ether.

# Pathophysiology



- The rabies virus is transmitted in saliva or in aerosolized secretions from infected animals, typically via a bite.
- Upon inoculation, it enters the peripheral nerves.
- A prolonged incubation period follows, the length of which depends upon the size of the inoculum and its proximity to the central nervous system.

# Pathophysiology



- Amplification occurs until bare nucleocapsid spills into the myoneural junction and enters motor and sensory axons.
- The virus travels along these axons at a rate of 12-24 mm per day to enter the spinal ganglion.
- Its multiplication in the ganglion is held by the onset of pain or paraesthesia at the site of inoculum.



# Pathophysiology



- From the spinal ganglion, the virus spreads quickly, at a rate of 200-400 mm per day into central nervous system and spread is marked by rapidly progressive encephalitis.
- Thereafter, the virus spread to the peripheral and salivary glands.

# Clinical features



## History:

Natural history of rabies is divided into 5 phases:

### I. **Incubation period:**

- Average duration of incubation period is 20-90 days.
- The incubation period depends on distance of the wound to CNS and size of inoculum.
- Patient remains asymptomatic.

# Clinical features



- II. **Prodromal period:** (The virus enters CNS)
  - Average duration of the period is 2-10 days.
  - Paraesthesia or pain at the site of bite.
  - Malaise, anorexia, headache, fever, chills, pharyngitis, nausea, vomiting, diarrhoea, anxiety, agitation, insomnia and depression.

# Clinical features



## III. **Acute neurological period:**

- Average duration of the period is 2-7 days.

### A. **Furious rabies:**

Agitation, hyperactivity, restlessness, beating people, biting, seizures, confusion or hallucination.

### B. **Paralytic rabies:**

The patient is relatively quiet compared with a person with a furious rabies.

# Clinical features



## IV. Coma:

- This begins within 10 days of onset of symptoms; duration is variable.
- Without intensive supportive care, respiratory depression, arrest and death occurs shortly after coma.

# Clinical features



## v. **Recovery:**

- This is unlikely to occur unless a person has had pre- or post-exposure prophylaxis after the bite.
- Most cases results in death within 14 days.

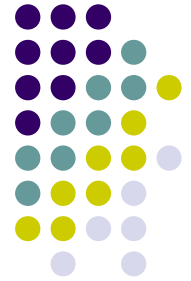
## Clinical features



### **Physical examination findings:**

- I. Incubation period:** No physical findings.
- II. Prodromal period:** Fever and agitation.

# Clinical features



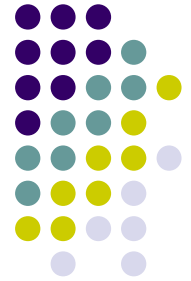
## III. Acute neurological period:

### A. Furious rabies:

- Delirium, psychosis, restlessness, beating people, fasciculations, seizures and aphasia.
- Hydrophobia and aerophobia (pathognomonic)
- Autonomic instability: Tachycardia, hypertension, hyperventilation, drooling of saliva, anisocoria, mydriasis, lacrimation, perspiration and postural hypotension.
- Cranial nerve palsies with diplopia and optic neuritis.



# Clinical features

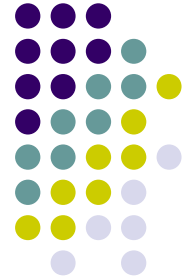


## **III. Acute neurological period:**

### **B. Paralytic rabies:**

- Fever and nuchal rigidity may occur.
- Paralysis is symmetrical and may be either generalized or ascending and may be mistaken for Guillain-Barré syndrome. The sensory system is spared.
- Delirium, stupor and then coma.

# Clinical features



## IV. Coma:

- Respiratory failure occurs within a week of neurological symptoms.
- Hypoventilation and metabolic acidosis predominate.
- Acute respiratory distress syndrome.
- Wide variations in blood pressure, arrhythmias and hypothermia.
- Bradycardia and cardiac arrest occurs.

# Complications



- Arrhythmias.
- Hypotension.

# Differential diagnoses



## A. Paralytic rabies:

- Guillain-Barré syndrome.
- Transverse myelitis.
- Poliomyelitis.
- Tetanus.

# Differential diagnoses



## **B. Furious rabies:**

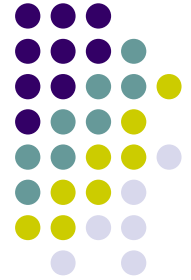
- Psychosis.
- Epilepsy.
- Viral encephalitis.
- Atropine poisoning.
- Space occupying lesion.
- Cerebrovascular accident.

# Investigations



- Saliva culture for rabies virus.
- Serology:
  - Rapid fluorescent focus inhibition test (RFFIT).
  - Polymerase chain reaction (PCR).
- Blood gas analysis.
- CSF analysis.
- Urinalysis.
- Full blood picture.
- Chest x-ray.
- Magnetic resonance imaging and CT-Scans of the brain.
- Brain autopsy.

# Treatment



## Passive immunization:

### A. No prior vaccination:

- **Developed countries:** Human rabies immunoglobulin (HRIG).
- **Developing countries:** Equine rabies immunoglobulin (ERIG).
- **Dose:** 20 IU/Kg most or all of solution is infiltrated around the wound, any remaining solution should be administered IM in the gluteus.

### B. Prior vaccination: Do not give HRIG or ERIG.

# Active immunization



Vaccines available in the developed world:

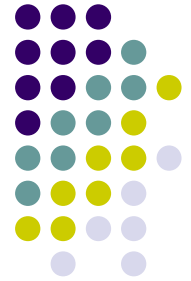
- Human diploid cell vaccine (HDCV).
- Rabies vaccine, adsorbed (RVA).

Vaccines available in the developing world:

- Semple type vaccine (STV).
- Suckling mouse brain vaccine (SMBV).



# Active immunization



## A. No prior vaccination:

Give series of HDCV, RVA, STV or SMBV.

- **Dose:** 1 ml IM deltoid on day 0, 7 and 21 or 28.

## B. Prior vaccination:

Give booster immunization series of HDCV, RVA, STV or SMBV.

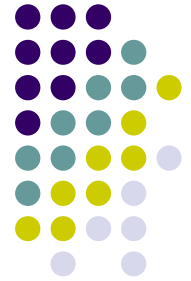
- **Dose:** 1 ml I.M deltoid on day 0 and 3.



# Treatment

- Because of the low prevalence of rabies in domesticated animals in developed world, health unvaccinated domesticated animals may be observed for 10 days for signs of illness.  
If the animal remains healthy, administer no treatment.
- Otherwise begin treatment on the exposed individual pending necropsy results of the animal.  
The treatment can be discontinued if the examination of the animal's brain is negative for rabies.

# Prognosis



- It is fair if post-exposure prophylaxis is administered exactly as recommended and in a timely fashion.
- If treatment is not received before the onset of symptoms (prodromal phase), the mortality rate is 100%.

# Prevention



- Universal and respiratory precautions during respiratory therapy are indicated for health care providers.
- Control of rabies in the domesticated animal population by active immunization.
- Screening of organ donors.
- Avoiding contact with unfamiliar or wild animals.
- Prompt vigorous cleansing of any injury or bite from any animal with a solution of 1 part soap and 4 parts water is critical and may reduce the risk of rabies transmission.
- Drink pasteurized milk and eat cooked meat.



# Pre-exposure prophylaxis

**Indication:** Individuals at high risk of rabies.

- Veterinarians.
- Veterinary students.
- Persons who regularly explore or walk in caves.
- Laboratory workers who are exposed to rabies virus or handle specimen considered high risk for rabies.
- Persons who visits countries where rabies is a significant problem (i.e. visits > 30 days).

# Post-exposure prophylaxis



## A. No prior vaccination:

- Give series of HDCV, RVA, STV or SMBV.
- Dose: 1 ml IM deltoid on day 0, 3, 7, 14, and 28.

## B. Prior vaccination:

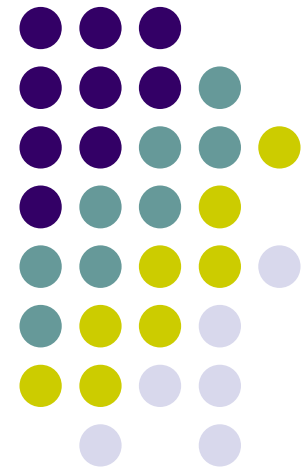
- Give booster immunization series of HDCV, RVA, STV or SMBV.
- Dose: 1 ml I.M deltoid on day 0 and 3.

## Alternative:

- 2-1-1 regimen i.e. 1 ml IM deltoid BID (1 dose on each deltoid) on day 0, then 1 ml IM deltoid on day 7 and 21).

**Thank you for your  
attention**

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# Reference



- Gompf S.G. Rabies.  
[www.emedicine.com/med/topic1374.htm](http://www.emedicine.com/med/topic1374.htm)  
Last updated: January 16, 2007.