Rabies Elimination

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Rabies

- Rabies is an acute viral disease which causes fatal encephalitis in virtually all the warm-blooded animals including man
- Animal bites if managed appropriately, rabies is 100 percent preventable

This Presentation is dedicated to Dr.Louis Pasteur

Invented Rabies Vaccine in1885

History

- Rabies in India is known since Vedic periods as corroborated in Atherva Veda.
- The Latin word “Rabies”
- Sanskrit word “Rabhas” which means “to do violence”.
- Description by the Oriental physicians as far back as 3000 BC and the Greek physician Democritus in 500 BC and Celsus in First Century AD.

Ancient Pictures

Dr. Louis Pasteur

- **Legendary French scientist**
- **First vaccine derived from dried spinal cord**

Methods of Estimation of Rabies Burden

- Cause of death ensemble model (CODEm) approach
- Probability decision tree approach

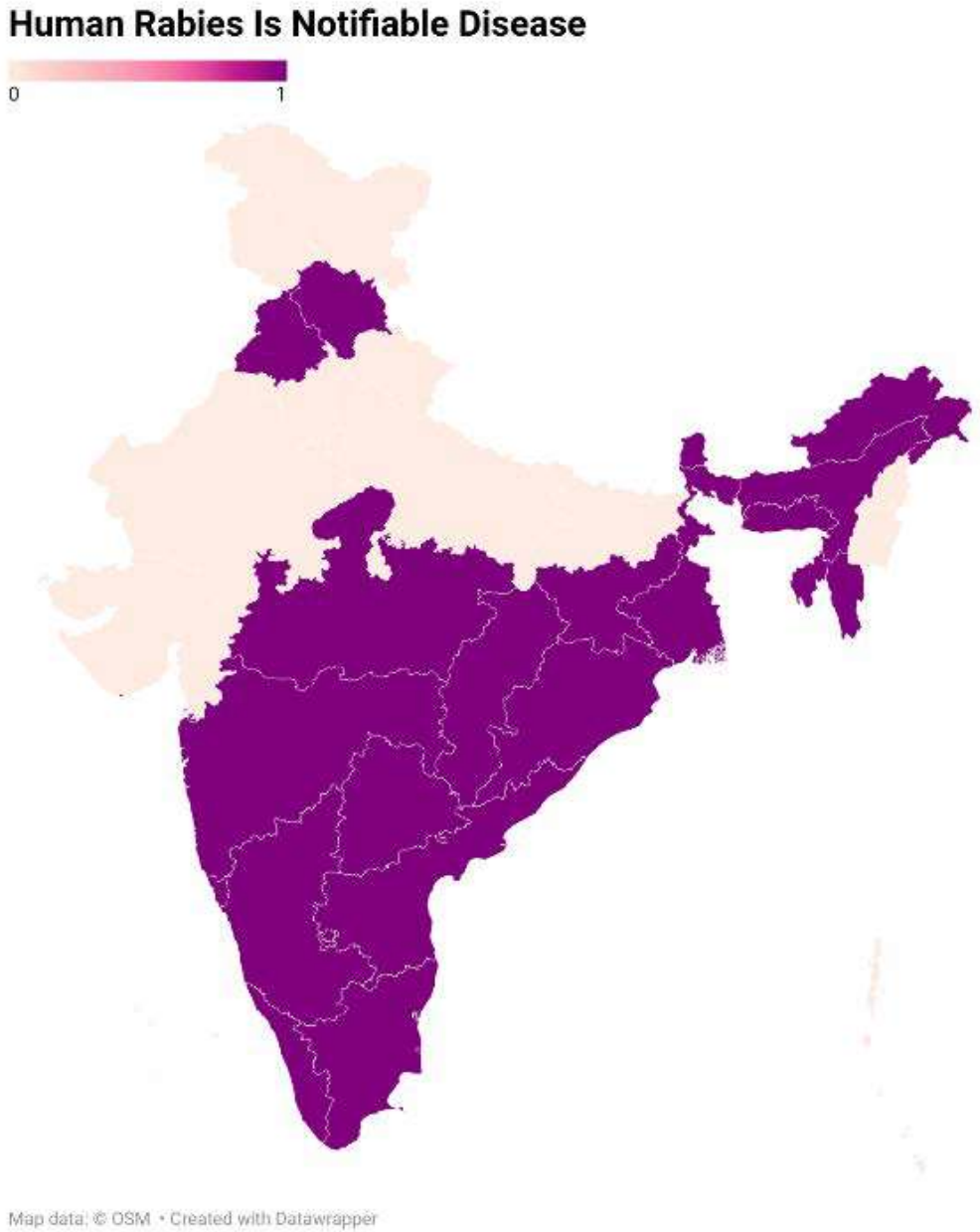
Human Mortality due to Rabies, 2025

Global	59,000
Asia	53,100
India	12,700 (Million deaths study, 2005)
	18-20,000 (WHO), 2022
	5726 (2022-23 NIE, ICMR)

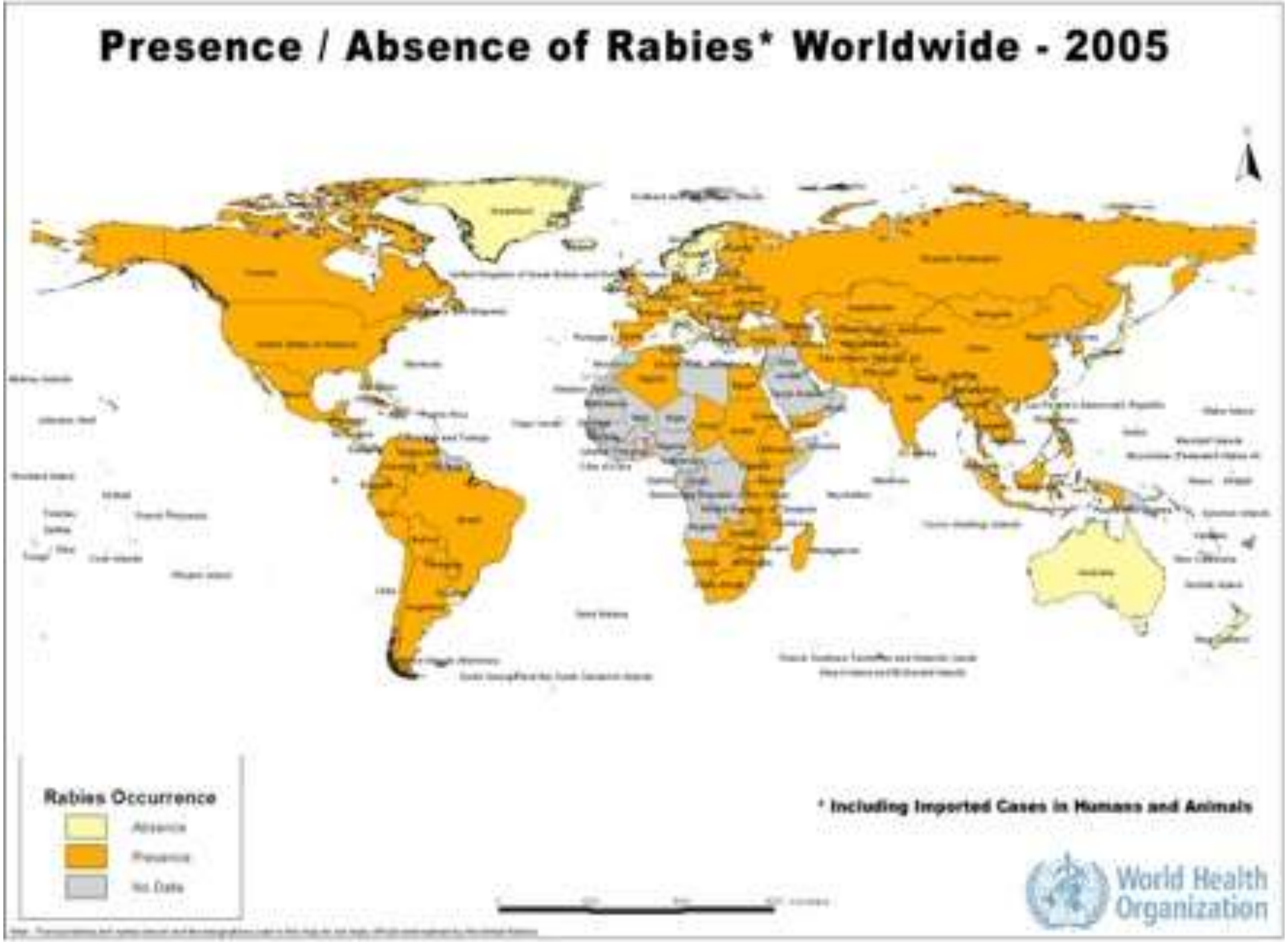
Animal Bites in India 2022-23

- Annually 91 lakhs people are bitten by animals, mostly dogs
- 25,000 bites per day

Notifiable Disease Status



Presence / Absence of Rabies* Worldwide - 2005

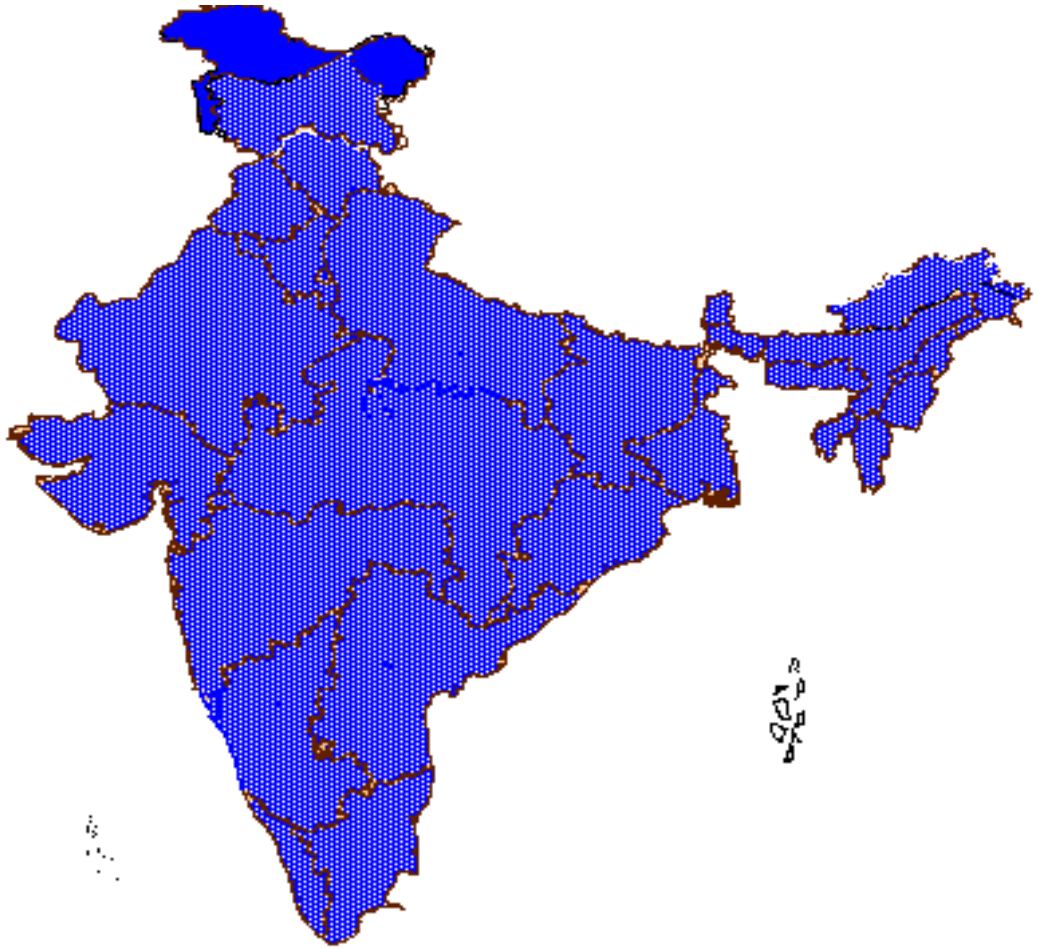


Rabies in India

- 96% of human rabies cases are due to bites from Rabid dogs.
- Reported through out the year
- Estimated dog population : 25 Million

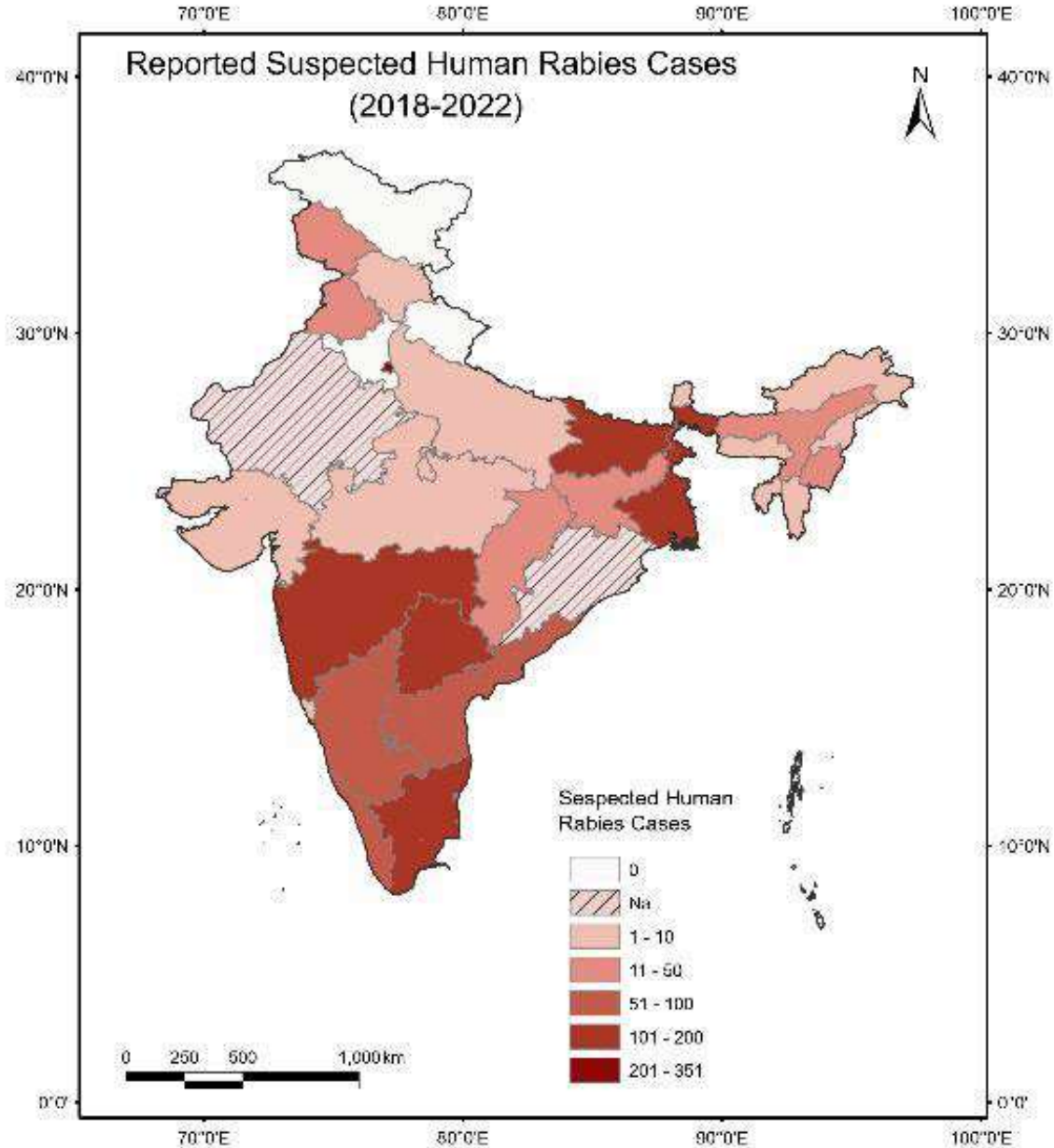
- Majority dogs: Stray, Un-owned and unprotected
- Numerous myths and notions are prevalent

India



Rabies is reported from all states except Lakshadweep and the Andaman and Nicobar Islands.

Reported Suspected Human Rabies Cases



Magnitude of the PET requirement

- Estimated 3 million people receive PET annually in India
- Data based on vaccine utilisation in both public and private sector
- About two-thirds, do not seek or do not get PET

Why there is a gap between reported number of animal bites and actuals?

- Many do not seek care
- Many do not get ARV even if they ask for due to availability and they are reported as injuries
- Animal bites are not notifiable events: Private hospital data are often not received

Why there is a gap between reported number of rabies deaths and actuals?

- Due to cremation/ burial procedures, rabies patients abscond themselves (by relatives) and they are not included in the reports
- In private, often they are diagnosed as encephalitis to avoid public health protocols
- Lack of lab facilities some cases are not diagnosed correctly

Animals transmitting Rabies in India

Domestic

- Dogs
- Cats

Peri-domestic

- Cows
- Buffaloes
- Sheep
- Goats
- Pigs
- Donkeys
- Horses
- Camels

Animals transmitting Rabies in India

Wild

- Foxes & Jackals
- Monkeys
- Mongoose
- Bears

Not reported

- Bats
- Rodents
- Birds
- Squirrel

Rabid dog

Furious Rabies

Courtesy of Dr. M. F. Aubert, France

Dumb Rabies

Courtesy of Dr. M. F. Aubert, France

Rabid Cat

© Merial

Rabid Sheep: Head-butting

Courtesy of Dr. P. Kitching, England

Rabid Goat

Rabid horse

Clinical Case of Rabies

(WHO definition)

- A subject presenting with an acute neurological syndrome (encephalitis) dominated by forms of hyperactivity (furious rabies) or paralytic syndromes (dumb rabies) progressing towards coma and death, usually by cardiac or respiratory failure, typically within 7- 10 days after the first sign, if no intensive care is instituted.

Classification of Rabies Cases

(WHO definition)

Suspected	A case that is compatible with clinical case definition
Probable	A suspected case plus a reliable history of contact with a suspected rabid animal
Confirmed	A suspected or probable case that is laboratory confirmed.

Laboratory Techniques

Intra-vitam diagnosis

- Viral antigen detection
- Viral RNA detection
- Virus isolation
- Viral antibody detection

Post-mortem diagnosis

- Viral antigen detection
- Viral RNA detection
- Virus isolation
- Viral antibody detection

Laboratory Criteria for Confirmation of a Clinical case of Rabies (WHO)

- One or more of the following laboratory criteria should be used to confirm a clinical case
  - Presence of viral antigens
  - Isolation of virus in cell culture or laboratory animals
  - Presence of viral specific antibodies in CSF or serum of unvaccinated person
  - Presence of viral nucleic acids detected by molecular methods in samples (e.g: brain biopsy, skin, saliva, concentrated urine) collected post mortem or intra vittam

Animals transmitting Rabies in India

- All wild animal bites are considered as category III exposures.
- Bites by Bats or Rodents do not ordinarily necessitate rabies vaccination.
- However, bites by bats or rodents in unusual circumstances may be considered for vaccination in consultation with an expert in the field of rabies.

Mode of Transmission

Common

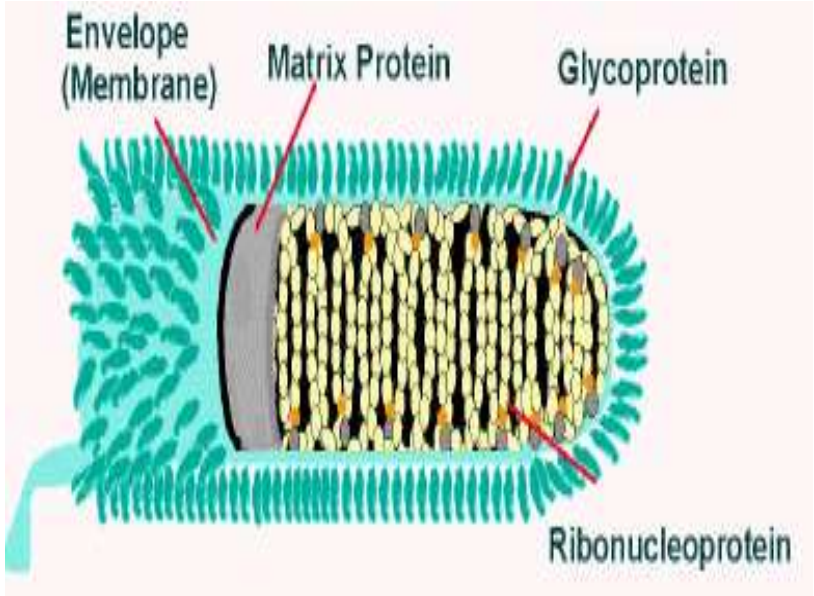
- Bites from infected animals
- Licks on Broken Skin/Mucous Membranes
- Scratches

Rare

- Inhalation
- Organ transplantation
- Ingestion
- ? Sexual

Structure of Rabies Virus

- Bullet Shaped.
- Enveloped Virus.
- Measures 75 nm x 180 nm.
- Numerous spikes present



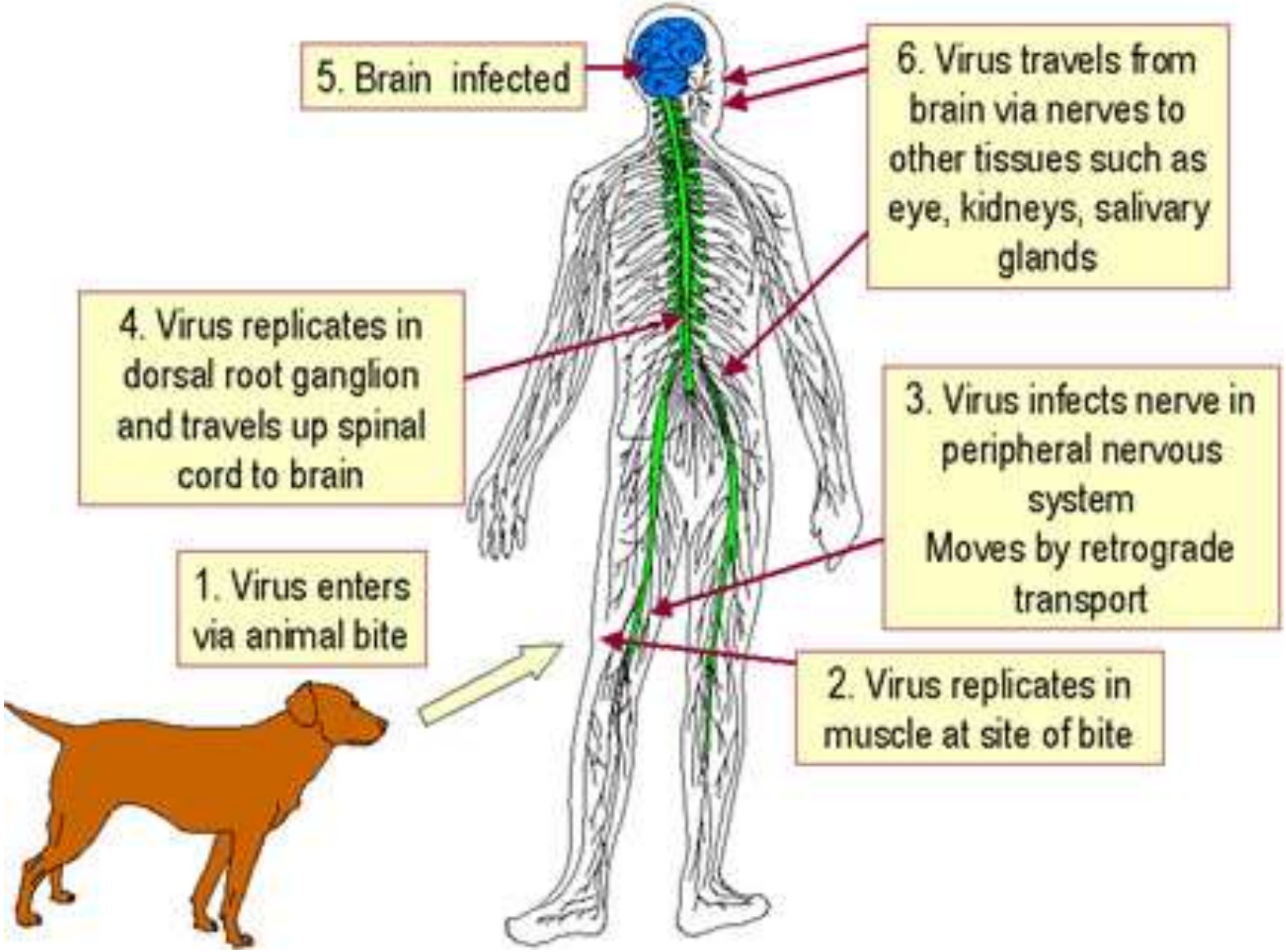
on the envelope, these are made up of glycoprotein.

- Glycoprotein necessary for viral attachment and also induce protective antibodies.

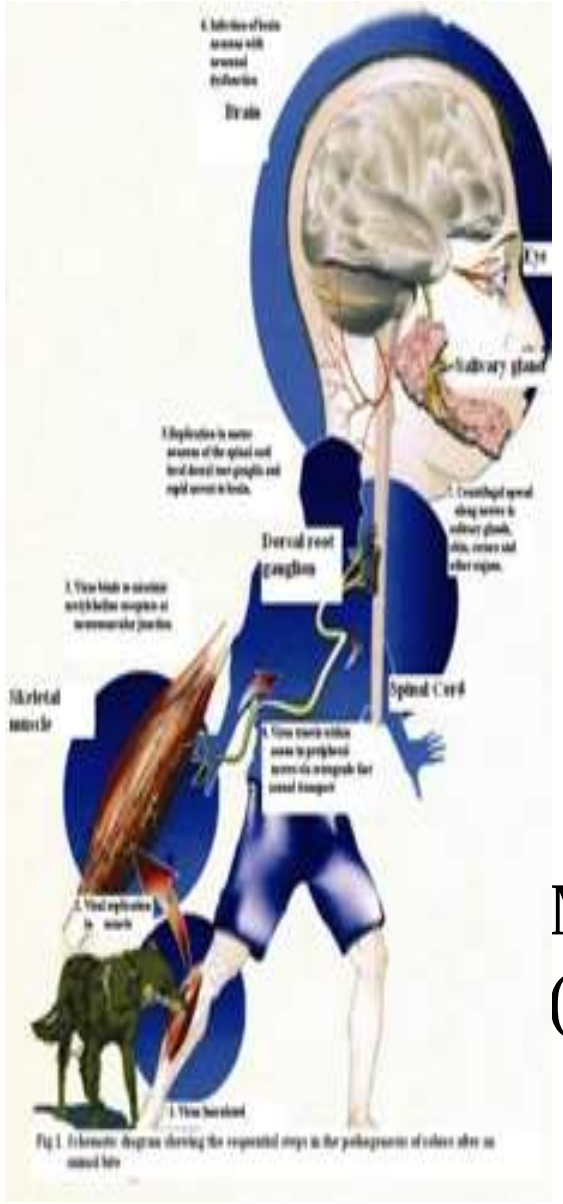
Inactivation of Rabies Virus

- At 60^0C within 35 seconds (sensitive to pasteurization and boiling)
- At pH < 4 or > 10
- By action of oxidizing agents, most organic solvents, surface acting agents, quaternary ammonium compounds, proteolytic enzymes, ultraviolet rays and X-rays
- Soaps and detergents
- Alcohol

Pathogenesis of Rabies



Pathogenesis



Brain

Salivary glands &
Other organs

Spinal cord

Dorsal root ganglia

Peripheral nerves

Local treatment &
RIG

Multiplication locally
(in the muscle fibres)

Note:
The virus is neurotropic and there is no viraemia in rabies.

Incubation Period (in man)

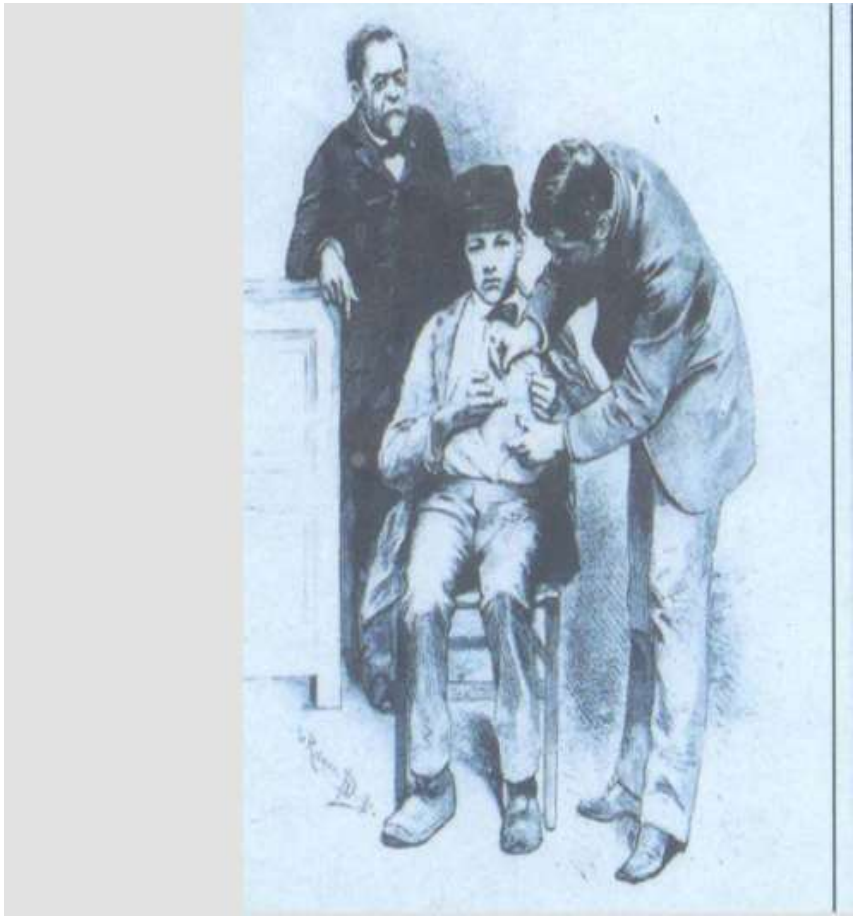
- Ranges between 6 days to 6 years.
- More than 6 months in less than 1%
- Bites on the head or face – up to 1 month.
- Bites on the extremities - up to 3 months.

Incubation period depends upon

- The site of bite
- Severity of bite
- Number of wounds
- Amount of virus injected
- Species of biting animal
- Protection provided by clothing
- Treatment undertaken, if any

Animal Bite Management

Medical Emergency



Category-I No exposure

- **Type of contact**
  - Touching or feeding of animals
  - Licks on intact skin
  - Contact of intact skin with secretions/ excretions of rabid animal/ human case
- **Recommended PEP**
  - None if reliable case history is available
  - Wash exposed area with water and soap and apply antiseptic

Caution: If you have doubt, safely categorise as category II

Category-II Minor exposure

- Type of contact
  - Nibbling of uncovered skin
  - Minor scratches or abrasions without bleeding
- Recommended PEP
  - Wound management
  - Anti Rabies Vaccine

Category-III Severe Exposure

- **Type of contact**
  - Single or multiple transdermal bites or scratches
  - Licks on broken skin
  - Contamination of mucous membrane with saliva i.e: licks
- **Recommended PEP**
  - Wound management
  - Rabies immunoglobulin (HIG)
  - Anti Rabies Vaccine (ARV)

Caution

- Bites by wild animals and bites in forest areas should be considered as category- III exposure and treated accordingly

Serious Exposures

- Bites on the Head,

  Face, Hands, Genitalia
- Multiple bites
- Extensive lacerations

- Single Furious Dog biting several people, pet animals, farm animals
- Bites by
  - proven rabid animals
  - more than one animal
  - wild animals

Category-III Severe Exposure

Approach to Post-Exposure Prophylaxis

- Management of animal bite wound
- Passive Immunisation
  - –Rabies Immunoglobulin (RIG)
- Active Immunisation
  - –Anti-Rabies Vaccines (ARV)

Management of animal bite wounds

Wound Management- Do's

- Mechanical
  - Wash the wound with running tap water
- Chemical
  - Wash the wound with soap and water
  - Apply disinfectants
- Biological
  - Infiltrate Immunoglobulins in the depth and around the wound in category-III exposures

Suturing only if required (1-2 loose sutures) and only after administration of RIGs.

Application of antiseptics

- Povidone iodine
- Alcohol
- Chloroxylenol (Dettol)
- Chlorhexidine gluconate
- Cetrimide solution (savlon)

Wound Management- Don’ts

- Do not touch the wound with bare hands
- Do not apply irritants like soil, chillies, chalk, betel leaves etc

Passive Immunisation

Passive Immunization

- **Human Rabies Immunoglobulin (HRIG)**
  - **20 IU/kg body wt. Maximum of 1500 IU**
  - **Does not require any prior sensitivity testing**
- **Equine Rabies Immunoglobulin (ERIG)**
  - **40 IU/kg body wt. Maximum of 3000 IU**
  - **ERIG must be administered only after the Test dose**

Anti-rabies sera should be brought to room temperature before administration

Test Dose for equine Immunoglobulin

- Inject 0.1 ml ERIG diluted 1:10 in normal saline intra-dermally into the flexor surface of the fore arm to raise a bleb of about 3-4 mm diameter
- Inject an equal amount of normal saline as a negative control on the flexor surface of the other fore arm

Test Dose for equine Immunoglobulin

- After 15 minutes an increase in diameter to >10 mm of induration surrounded by flare is taken as positive skin test, provided the reaction on the saline test was negative
- An increase or abrupt fall in blood pressure, syncope, hurried breathing, palpitations and any other systemic manifestations should be taken as positive test

Infiltration of RIG in wounds

- Infiltrate as much as possible into and around the wounds; remaining if any to be given Intra Muscularly at a site away from the site where vaccine has been administered.
- Inject RIGs into all wounds (anatomically feasible).
- If RIGs is insufficient (by volume) dilute it with sterile normal saline (up to equal volume).
- Presently available preparations are very safe. However, equine serum must be administered with full precautions.

RIG infiltration

Active Immunisation for Post-Exposure Prophylaxis

Good Bye to

Nervous Tissue Vaccine

Production stopped since

December 2004, due to Severe

Neurological Complications

Intramuscular ARV

Essen Regimen (Intra-Muscular)

Day 0	:	1st dose
Day 3	:	2nd dose
Day 7	:	3rd dose
Day 14	:	4th dose
Day 28	:	5th dose
Day 90	:	6th dose (optional)

IM vaccination site

- Deltoid or antero-lateral aspect of thigh
- Gluteal region not recommended due to poor absorption

Points to remember

- Day 0 (D_0)
  - Day of 1st dose of vaccine given, not the day of bite.
- All modern Tissue Culture Vaccines (TCVs) are equally effective and safe.
- Never inject the vaccines into the gluteal region.

Points to remember

- Interchange of vaccines acceptable in special circumstances but not to be done routinely.
- Reconstituted vaccine to be used immediately within 6 hours
- Vaccine dosage is same for all age groups.

Intradermal ARV

Intra Dermal Regimens for Post Exposure Treatment

- Approved by the WHO
- Cost effective
- Viable alternative to replace Nerve Tissue Vaccine in India
- Studies in India confirm safety and efficacy
- Approved by DCGI for use in India.

Updated Thai Red Cross Schedule (2-2-2-0-2)

- Dose
  - 0.1ml/ID Site
  - injection of 0.1ml of reconstituted vaccine per ID site and on two such ID sites (0.1 + 0.1 ml per person per dose)
- Site
  - Upper arm over each Deltoid area, an inch above the insertion of deltoid muscle

Intradermal Schedule (2-2-2-0-2)

Day 0

Day 3

Day 7

Day 28

Materials required

- A vial of rabies vaccine approved for IDRV and its diluent
- 2 ml disposable syringe with 24 G needle for reconstitution of vaccine
- Disposable 1 ml (insulin) syringe (with graduations up to 100 or 40 units) with a fixed 28 G needle
- Disinfectant swabs (e.g: 70 % ethanol, isopropyl alcohol) for cleaning the top of the vial and the patient’s skin

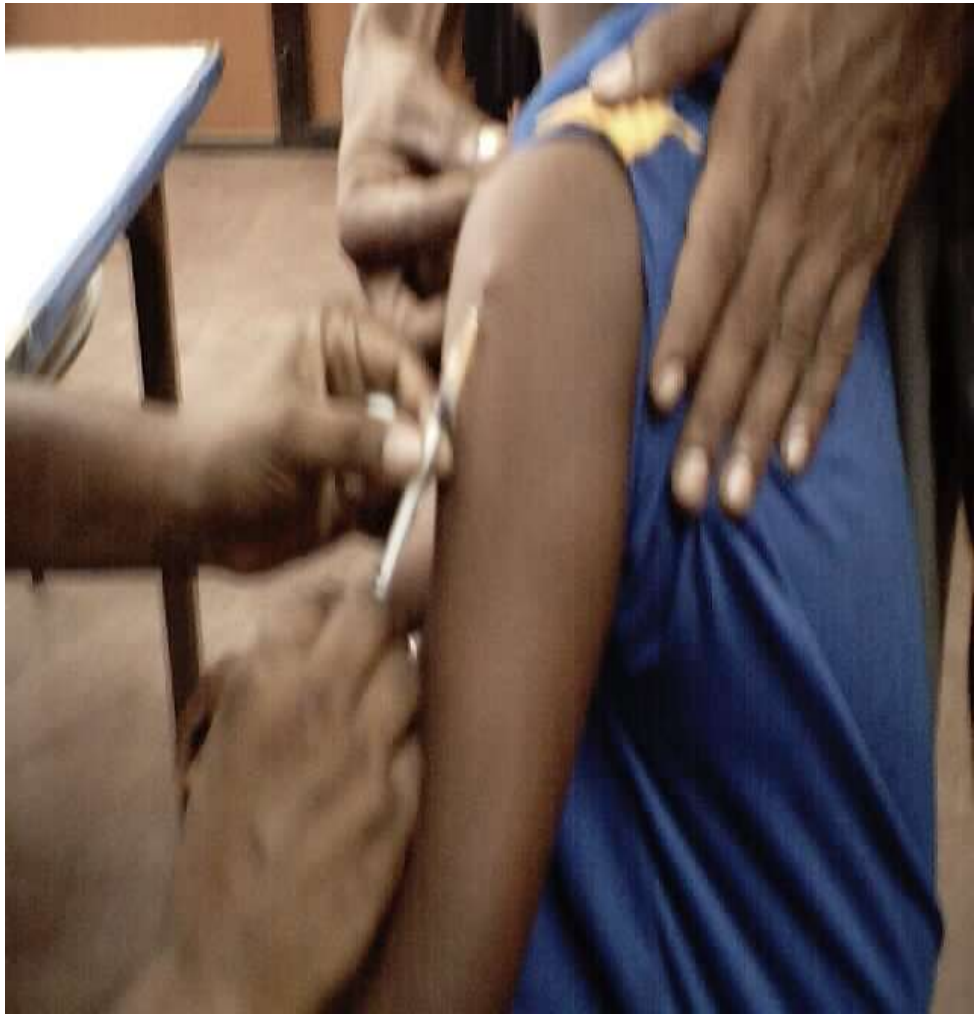
ID Injection technique

- Using aseptic technique, reconstitute the vial of freeze-dried vaccine with the diluent supplied by the manufacturer
- With 1 ml syringe draw 0.2 ml (up to 20 units if a 100 units syringe is used or 8 units if 40 units syringe is used (0.1 ml per site in 2 sites)
- Expel the air bubbles from the syringe carefully

ID Injection Technique

- Using the technique of BCG inoculation, stretch the surface of the skin and insert the tip of the needle with the bevel upwards, almost parallel to the skin surface
- Inject half the volume at one site and the remaining half at the other site
- An inch above the insertion of deltoid muscle is the preferred site
- If the needle is correctly placed inside the dermis, considerable resistance is felt while injecting the vaccine

Intra Dermal Administration of ARV



Correct technique for ID injection

General guidelines for IDRV

- Must be administered by trained staff
- Reconstituted vaccine should be used as soon as possible or at least within 6 hours
- Vaccine when given intra-dermally should raise a visible and palpable bleb in the skin

General guidelines for IDRV

- In the event that the dose is given inadvertantly given subcutaneously or intramuscularly or in the event of spillage, a new dose should be given intradermally in nearby site
- Animal bite victims on chloroquine therapy should be given ARV by IM route

Medical advice to Vaccinee

- No dietary restriction.
- No restriction of physical exercise.
- Avoid immune suppressants (Steroids, anti-malarials) if possible.
- Best to avoid consumption of alcohol during the course of treatment.

Medical advice to Vaccinee

- Complete the course of vaccination.
- Address and contact details should be collected from every client and followed up
- Client should be informed that Inj.Tetanus toxoid (TT or Td) should not be counted as ARV dose

Category III exposures

Transdermal injury on the back

Lacerations on the scalp

Extensive lacerated bites on the face

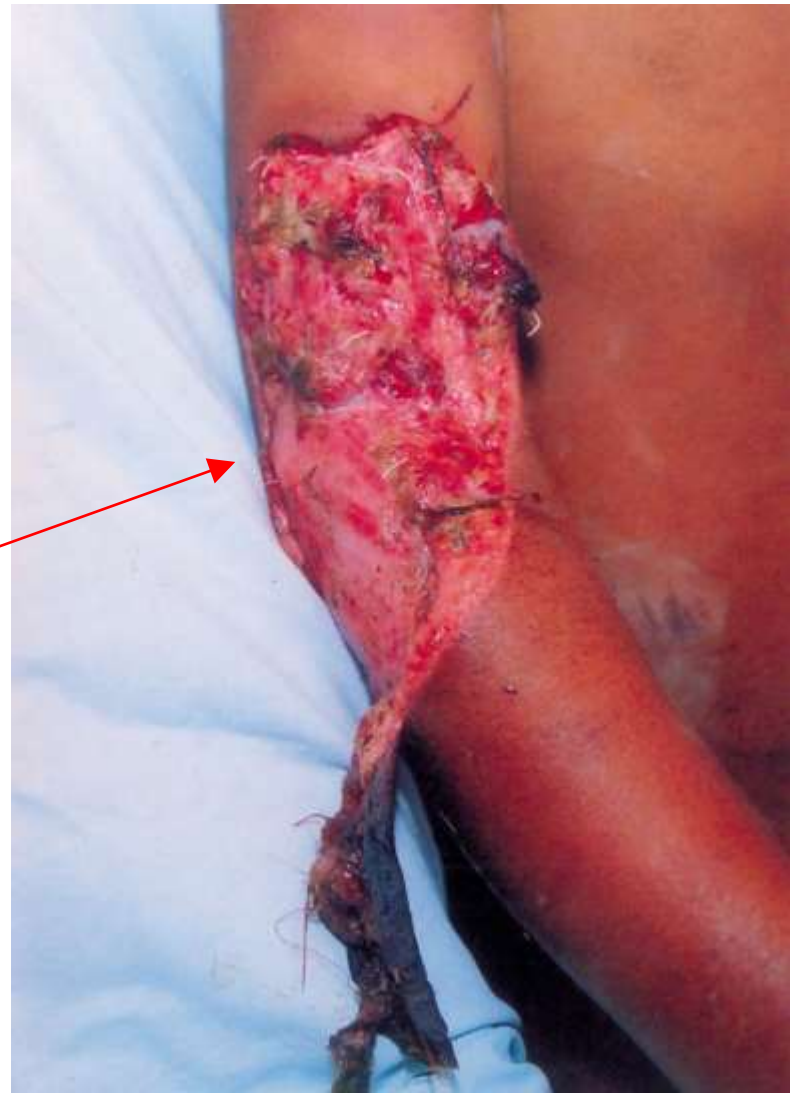
Bites on the face of a child

Multiple bites on the face of a child

Bite on the face in an adult

Multiple bites by many dogs

Severe laceration caused by dog bite



Extensive laceration of the foot

Bite on the genitalia

Sutured bite wounds
Apply only loose stitches if absolutely

Gap between what we know and what we do

- **Expertise and effective tools are available**
- **Need timely and appropriate utilization**
- **Prevent human and animal deaths due to rabies**

Together we can prevent rabies

Acknowledgement for Resources

- World Health Organisation
- National Centre for Disease Control (NCDC), New Delhi
- Association for Prevention and Control of Rabies in India (APCRI)
- Pasteur Institute, Coonoor
- All Human and Veterinary Doctors who are struggling to prevent rabies deaths

Thank you