

# Rabies

*- Fatal but Preventable*

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**Rabid dog**



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# Rabies

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Rabies is known to mankind since time immemorial. Human and animal deaths are reported almost everyday due to Rabies now a days. It is a fatal viral disease that causes encephalomyelitis in warm-blooded animals. The rabies virus infects the brain. Once the rabies virus reaches the brain and symptoms begin to show, at this stage the infection is virtually untreatable and usually fatal within days and death results. It is a unique disease with several exceptions. It has a wide range of hosts that no other known disease has. It is zoonotic disease which affects both animals and human. It exhibits different symptoms in different species. For example, **Hydrophobia (fear of water) is a predominant symptom in human beings but animals never exhibit hydrophobia.** Its incubation period ranges from days to months.

The peculiarity of rabies is the immunization starts after infection enters the body. Once the symptoms are onset the death is inevitable and the doctor becomes a spectator. Death in Rabies is most painful and horrible for the patient and his / her family. This disease is also called as Lyssa, mad dog disease or hydrophobia in human. However, **Rabies is 100% preventable and curable with immunisation** before symptoms are exhibited. In India, Lakshadweep, Andaman and Nicobar islands are said to be free from Rabies.

The Rabies is caused by a virus called Rhabdo virus. It is bullet shaped and neurotropic virus. It is the weak and fragile virus. Dogs are worst victims of rabies but all dogs are not rabid. The virus can be killed by all standard disinfectants. It can be killed by any detergent, weak alkali or acid. The virus dies in a few hours of drying.

## 1. The virus spread

**The rabies virus usually spread through saliva. 1 ml of saliva contain one million rabies viruses.**

- 1a. Sylvatic cycle:** In the forest, wild animals and reservoir hosts harbor the virus. The dogs accompany their master during hunting and collecting the forest produce. If, such dog receives bite from wild rabid animal, the dog gets infected with rabies. They in turn spread disease in the villages and towns.

**1b. Urban cycle:** In urban areas, rabies virus spreads from rabid dog to healthy dogs, animals and human. Because of the long incubation period, the affected animal exhibits symptoms after a long time.

## 2. Portals of Entry

Rabies virus cannot gain entry into body through intact skin. It enters through cut skin, injuries, wounds etc. It can enter through conjunctiva and mucous membrane. The usual way of transmission is bite of rabid animal.

## 3. Localization of Rabies virus

Rabies virus gets localized mostly in certain tissues than the other. The virus concentrations are high in nervous system and salivary glands. The concentrations are lower in mammae, Pancreas, spleen and blood.

## 4. Disease transmission

### 4a. Direct transmission:

The disease is transmitted through bite of rabid dog or through any other rabid animal. Ninety six percent of human rabies is due the bite of dogs (96.2%). The bite of rabid carnivore –wolves, foxes, jackals and dogs and cats is more dangerous. Bite of a herbivore - horse, cattle and sheep is less dangerous.

- **Flesh of Rabid animal:** The meat of rabid animal possesses rabies virus. The meat of rabid animal is also infective.
- **Droplet infection:** Droplet (airborne - spread through air) infection is also proved in heavily infested bat caves.

### 4b. Indirect transmission

Indirect transmission is very rare and the following two incidences are recorded.

- A military officer was bitten by his pet dog which exhibited rabies symptoms. The officer received Anti Rabies Vaccine (ARV). A few days later the dog died of rabies. The dog was buried. A soldier was sent to get the dog's chain from the dead dog. The soldier died of rabies. It is concluded that the chain was contaminated with virus. The military officer who received ARV survived. But the soldier who did not receive any bite from the dog died of rabies.
- A boy was bitten by a rabid dog. His trousers were torn due to dog bite. His mother mend (stitch) the tear. She received the prick while stitching. Later she

died of rabies. The son who received the vaccination was survived. The mother who did not see even the dog died of Rabies.

It indicates that the virus contaminated items i.e. chains, clothes, furniture, and carpets are also pose risk of infection.

#### 4c. Other modes of transmission

- Milk from rabid animal: Milk of rabid animal (cows and buffaloes) has rabies virus. If such milk is consumed without boiling, there is a risk.

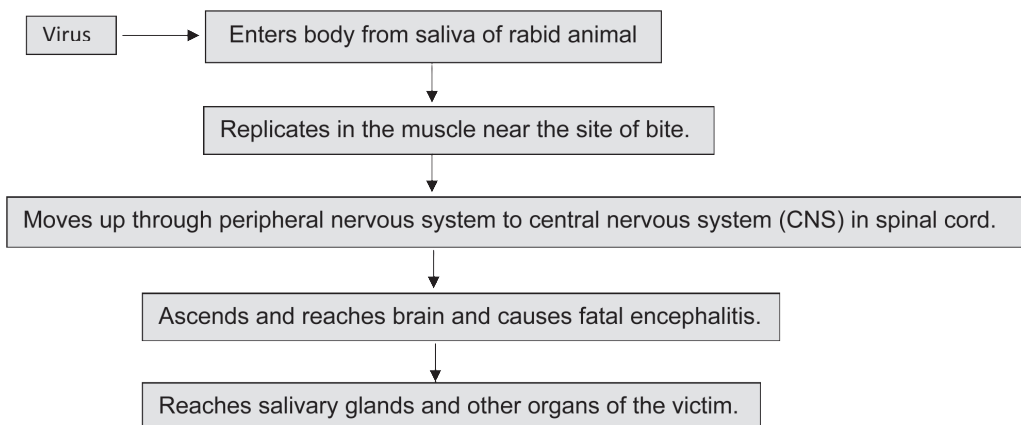
### 5. Period of infectivity of saliva

Virus is excreted from rabid animal at least 6 days before the onset of rabies symptoms. Usually the animal dies within 4 days after onset of rabies symptoms (6 days + 4 days = 10 days). So, last 10 days are considered as “period of infectivity”.

- The severity and period of incubation depend on the quantum of virus deposited at the site of the bite.
- Mere lick of a rabies animal poses fewer problems.
- Lacerated wound caused by the bite is dangerous.
- The bite on fore head, face, head and neck is more dangerous.
- The bite on the nerve is more dangerous (even the bite is on extremities-legs or hands).
- The bite on the extremities (hands and legs) is less dangerous.
- The bite on fingers is very dangerous.

### 6. Virus journey from bite to brain

*The virus moves at the speed of 3 mm per hour.*



## 7. Incubation period

In general, the incubation period is one month to three months. However, there is a great variation in incubation period. The shortest incubation period recorded is 10 days and the longest recorded is 3 years in human.

## 8. Factors influencing the Risk

- **The race:** Non Europeans have 3.7 times more risk – due to clothing.
- **Severity of bite:** Licks are less dangerous.
- **Superficial bite:** Less dangerous
- **Deep and extensive:** Bite at finger is more dangerous. Punctured wounds are more dangerous (dog bite).
- **More bites:** More dangerous.
- **Position of the bite:** Bite on fingers is more dangerous next to head, face and neck.
- **Clothing:** Bite through cloth is less dangerous.
- **Delay in starting of treatment:** Mortality is double if treatment started after 14 days of bite.
- **Species of bite:** The bite of wolf > jackals > dog > cat > herbivore > human are dangerous.

## 9. Rabies symptoms

**Rabid animal / human usually acts strangely**

### 9a. Symptoms in human

- Early symptoms are typical unpleasant sensation, itching, heaviness and tingling, hypersensitivity, muscular twitching muscular reflex at the site of bite.
- Headache, insomnia, Dryness of mouth and painful sensation of the throat are the early symptoms.
- Both pupils are dilated.
- Salivation, lacrimation and pyrexia are noticed.
- Spasms of muscles of deglutination occur when the patient to swallow food or water.
- The patients feel thirsty and ask for water, when water is offered they shiver and afraid of water.



- Hydrophobia (fear of water) is a characteristic symptom of rabies.
- Later mere seeing of water or sound of water may be sufficient to cause spasms and convulsions.
- The patients are mentally excited. They become talkative, fussy, make sharp impulsive movements (jump out of bed) run around and shouting.
- Patient feels remarkably energetic.
- The patients seem to become endowed with remarkable strength. They bend beds, iron window bars, and break open window doors. Destroy door and furniture.
- Patients become highly intolerant for external stimulus – such as sudden noise, bright light or cold air.
- Respiratory distress occurs due to paralysis of diaphragm.
- Profuse salivation and patient is unable to swallow saliva.
- Weight loss and emaciation is very marked. In no other disease the weight loss is so rapid.
- Finally the period of paralysis sets in, the spasms disappear, the patient can swallow and drink and creates a false impression that he is improving. This condition is called 'ominous calm'. But it is an indication of advancing death.
- There may be paralysis of legs, bladder and paralysis of heart and death results.
- The clinical picture is not same in all patients. The duration i.e. "from onset of symptoms to death" is 2-3 days and rarely upto 5-6 days.

## 9b. Symptoms in cattle

Cattle do not exhibit hydrophobia - fear for water unlike human.

- Off feed and water for 2-3 days.
- Change in behaviour and irritable.
- They excite on seeing dog and poultry and try to attack them.
- They dig the ground with fore legs and excavate soil.
- Though the animal is off feed, you can see froth on the lips (as if masticating).
- Frothy salivation.
- Butting and Striking of head against the wall / trees etc. It may get injured and bleed but it will not give up.
- Eating sand is an important symptom.

- Dribbling of urine and frequent micturition
- Tucked up abdomen is a striking symptom.
- Sexual excitement even in young ones.
- Cows and buffaloes exhibit signs of heat.
- Cow and buffaloes remain in heat for several days. They allow bulls to mount and serve for several times and several days.
- Bellowing.
- Extreme emaciation in few days because of profuse salivation and frequent urination.

**Differential diagnosis :** a)Trypanosomiasis b)Poisoning c) allergic reactions d) choke or foreignbody in the mouth / oesophagus.

**Differential diagnosis:** Meningitis, Hysteria and Epilepsy

### 9c. Symptoms in dogs

Rabid dogs do not fear for water. The symptoms are extremely variable. The diagnosis is difficult even for experienced veterinarians. There are two forms of rabies in dogs namely- furious and dumb form of rabies. In furious form the dog is aggressive and in dumb form the dog exhibits paralytic symptoms.

#### ■ Early symptoms

- The dogs show disinclination to take food followed by nervous symptoms such as restlessness.
- The dog is desirous to hide.
- The rabid dog runs away for a long distance and from home.
- The dog does not recognise its owner.
- It will not respond to usual commands (some rabid dogs obey its master till its death).
- The dog behaves as if it is catching flies. It is a manifestation of hallucination and imaginary objects.

#### ■ Later symptoms

- The dogs become dangerously aggressive.
- The rabid dog bites inanimate objects- wooden logs, trees, iron bars etc.

- Paralysis of jaw (masseter) muscles. It is called **dropped jaw** the characteristic symptom for Rabies.
- The colour of tongue changes to coffee colour.
- Paralysis of hind legs then it advances towards head.
- The dogs suffer from convulsions and death results.

**Differential diagnosis:** a) Lodging of bone / foreign body in the mouth, b) Allergic reactions c) Gingivitis and severe pruritis.

#### 9d. Symptoms in cats

- The symptoms are similar to that of dogs. Seventy five percent of cases are furious form. During the early stage, restless movements of forelimbs, uneasy facial expressions are seen. Cats tend to be more aggressive than dogs. Muscular incoordination and seizures are also common.

#### 9e. Symptoms in horses

- Lameness, aimless walking, staggering gait and difficulty in walking are early symptoms. There is a marked excitement, aggressiveness and sometimes calm. Salivation and sexual excitement are common. Signs of colic, biting and self mutilation are seen

#### 9f. Symptoms in sheep and goat

- The symptoms are similar to that of cattle. Butting is the important sign. Butting of other animals and objects, sexual excitement. Excitation phase is followed by depression, weakness, paralysis, and death.

#### 9g. Symptoms in pigs

- Hyperexcitement and difficulty in walking are commonly seen. Pigs attack on other pigs and jumps to other pens

#### 9h. Symptoms in fowls

- Fowls do not show any violent symptoms. They are sleepy. Loss of appetite paralysis of legs, bloodlessness and cyanosis of comb and wattles are frequently observed symptoms.

### 10. Classification of human patients based on degree of risk

Classification of patients according to the nature of bite is very important. The decision for treatment, post bite AR Vaccination and administering of immunoglobulin are decided basing on the classification. Depending on severity, the patients are classified in to three Categories viz., Category I, Category II and Category III. Vaccination is indicated for Category II and III patients.

### Category I

- Licks on intact skin
- Licks on intact mucous membrane –mouth, nose, anus, genitalia and conjunctiva
- Bites without blood
- Person drinking unboiled milk

■ Treatment: - simple cleaning with soap water

### Category II

- Licks on freshly cut skin.
- All bites and scratches on fingers.
- All bites and scratches on body with blood

■ Treatment: - cleaning with soap water and ARV (Anti Rabies Vaccine) course.

### Category III

- Licks on freshly cut wound on head, face and neck.
- Bites on lacerated wounds.
- All bites of wolf and jackal.

■ Treatment: Cleaning with soap water, Rabies immunoglobulins and administration of ARV course.

## 11. Wound management

Wound management is very important to prevent rabies. The rabies virus enters body of the victim through bite or scratch or lick. At the site of the bite, virus stays for a considerable time. It multiplies there and moves towards brain at speed of 3 mm per hour through nerve. It is advisable to remove as much saliva / virus as possible from the wound by thorough cleaning with soap water.

Wash the wound immediately with **running water for 10 minutes** with **detergent (washing) soap**. If the patient is unaware of cleaning the wound immediately, wash the wound at the earliest possible. For cleaning the wound, carbolic soap or detergent soap may be used. After washing and drying the wound, apply **Povidine iodine (Betadine)**, Alcohol, Dettol or Savlon. In case of deep wounds flush them with any of the above antiseptics. If the bite is through cloth, change the clothes. Do not apply leaf juice ( pasaru-jilledu palu), chilli powder, lime, turmeric and salt etc. on the wound.

**Suturing of wound:** Avoid suturing of the wound. If surgically unavoidable, loose sutures may be applied.

**Cauterization:** Cauterization with carbolic acid or any type of cauterization is not recommended now a days as it leaves very bad scar. It does not confer any additional advantage over 'cleaning the wound with water and soap for 10 minutes'.

**Tetanus Toxoid and Antibiotic:** Tetanus toxoid (T.T) should be given and a suitable antibiotic course may be started.

## 12. Post bite vaccination or Post Exposure Prophylaxis (PEP)

In many cases, the incubation period is prolonged. Prolonged incubation is an advantage to start immunization and achieve immunity before the virus reaches the brain and kills the patient.

**Example:** A courier is carrying a message of death sentence on 'dog bitten person' by a horse, where as we are sending another courier by an Aero plane with a message to remove the death sentence on the patient. The first courier can be compared with rabid dog bite where as second courier is like a vaccination. The virus stays for sometime at the site of the bite and multiplies there. It gain access to the nerve and move at the speed of 3 mm per hour. There by it will take a long time to reach the brain. Meanwhile if the patient is given vaccination, he develops immunity in short time and the patient is protected against rabies.

### No injections around naval now a days

Nerve Tissue Vaccine -NTV (Semple's vaccine) has to be given for 7 days daily around the navel. It is so painful. With the advent of cell culture vaccines, Production of Nerve Tissue Vaccine has been stopped since December 2004. (Recommended by The World Health Organization.)

### 12a. Cell culture vaccines (CCV)

Cell culture vaccines (CCV) are being used now. These cell culture vaccines are efficient with no or least reactions and less painful. Different CCVs are available as

1. Human Diploid Vaccine (HDCV).
2. Purified Chick Embryo Cell Vaccine (PCEC).
3. Purified Vero Cell Rabies Vaccine (PVRC).
4. Purified Duck Embryo Vaccine (PDEV).

The vaccinations are given intramuscularly in 5 doses. The schedule is called “Essen Schedule”. The course should be started on ‘0’ day and given on 3rd day, 7th day, 14th day, 28th and 90th days which is optional. Ninetieth day optional vaccination may be given to those who are immunologically deficient such as aged people, who are under steroid therapy. Here, ‘0’ day indicates the starting day of vaccination.

In case, any patient is not aware of vaccination schedule and does not take vaccine on the first day of the bite, and comes for a treatment at a later date. He may not be denied for the vaccination. In this case the starting day of vaccination is the ‘0’ day irrespective of date of bite.

### **Site of inoculation (vaccination).**

The vaccine should be given at a site where there is good blood supply and facilitate quick absorption. It should not be given at fat deposited areas like gluteal region. Deltoid region (upper arm) is the best site (human). In case of young children – antero lateral part of thigh (outside of the thigh).

Dog - Best site for inoculation (vaccination) is at thigh muscles

Cattle - The best site for inoculation is the neck region.

### **Storage of vaccine**

Vaccine should be preserved and transported in ice (2° to 8° C). There should not be any break in the cold chain.

### **Dosage**

The dosage is same for all - either young, lean, or fatty. It is said that dosage is same for an elephant or a miniature dog. All the vaccines should have **2.5 IU** of antigen in each dose to meet the W H O recommendation.

### **Change of brand of vaccine**

Generally the brand and ingredient in case of ‘deworming’ agent are changed periodically to prevent drug resistance. Where as, for rabies vaccine, the brand need not be changed for entire course. However under unavoidable circumstances, if the same brand is not available, in such case other available brand can be used.

### **Test for immunity**

Ultimately the production of antibodies against rabies is important at the end of PEP. The titer of 0.5 IU per ml or more in serum as tested by Rapid Fluorescent Focus inhibition test is the conformity of immunity. Full immunity (100% of the patients) can be achieved by 28th day vaccinations (i.e. 5<sup>th</sup> injection) and in general 98% of patients achieve the immunity after 14th day vaccination (4<sup>th</sup> injection).

### **Animals, bites, risk and care.**

- Bite of wild animals (Wolf, Jackal) is dangerous. It should be treated as category III.
- Bite of monkey also requires treatment and vaccination for rabies.
- Bite of rats, mice, squirrel and rabbit seldom require treatment.
- Pregnancy, lactation, infancy and old age are no contra-indication for rabies vaccination. Post bite vaccination is a life saving procedure and free from reactions and contra indications.
- For HIV/AIDS patients Immunoglobulins and vaccination have to be given in case of rabid animal bite. Wound management is very important. Anti rabies anti body estimation must be done after 10 days of completion of course.

**Provoked and unprovoked bite:** Basing on the history of the bite we can decide whether it is rabid or healthy dog, if the dog bites without any provocation, it could be rabid dog. If a dog bites with provocation like teasing the dog, hurting, while playing, nursing bitch, disturbing the dog while it is eating – The dog may not be a rabid dog.

***As a general rule if the dog is surviving beyond 10 days after bite we can come to a conclusion that it may not be a rabid dog.*** The virus is excreted through saliva 6 days prior to the symptoms are exhibited. The rabid dog dies after 4 days of exhibiting the symptoms. If rabies is affected to a dog it dies within 6 months. But the symptoms are exhibited only the last 4 days before it dies. If the dog bites in these 10 days it is infective. If the dog bites either human or dogs or other animals during the last 10 days the disease spreads, if proper care is not taken the bitten victim dies of rabies.

### **12b. Intra Dermal Rabies Vaccination –IDRV (Human)**

It is 100% safe, highly effective and less expensive. The regimen consists of administration of 0.1 ml anti rabies vaccine given **intradermally (I.D)** for both arms. These two ID vaccines are given at deltoid region. This can be given for pre and post bite prophylaxis. Routine vaccine (antigen) is administered in muscles. The antigen in the vaccine is absorbed by blood vessels and takes them to antibody producing Cells and the antibodies are produced. This process requires more vaccine. In ID technique, the antigen is carried to lymph node then to reticulo-endothelial cell. At reticulo- endothelial cells the antibodies are produced promptly.

## **Dose, site and schedule for IDRV (2-2-2-0-2) (human)**

Schedule is 0, 3, 7 and 28 days (no vaccination on 14th day). Dosage is 0.1 ml of reconstituted vaccine at each site. Two ID injections for two arms at deltoid area on 0 day, 3rd day, 7th day and 28<sup>th</sup> day (2-2-2-0-2) are given. Here also '0' day means the starting vaccination.

## **Guidelines for using IDRV (human)**

- Verorab, Rabipur, Pasteur institute Vaccines and Abhayrab vaccines can be used for IDRV. These vaccines have 2.5 IU or more.
- The reconstituted vaccine should be used within 8 hours and discard after.
- Ethenol 70 % or Isopropyl alcohol may be used for disinfectant swab. The disinfectant should dry before vaccination.
- Insulin syringe may be used.
- If the vaccine goes subcutaneously, inject another dose intradermally.
- Visible and palpable bulb should be formed after IDRV.
- Patients who are on Chloroquine (anti malarial) therapy IDRV is not indicated. They have to follow ARV Intramuscular.

## **12c. Use of Rabies immunoglobulins (RIGs) (human)**

When the bite is on the face / neck [category III] the incubation period is very short. Immunity is achieved in 14 days during the normal course of vaccination (5 days). There is a risk for the category III patients. Hence, a ready made immunity (resistance) called passive immunity is required to kill the rabies virus. Rabies immunoglobulins are marketed as Hyper RAB and Imogam Rabies-HT etc. Immunoglobulins bind rabies virus and kill them. The virus is no longer infective.

### **Two types of RIGs are available**

1. Equine Rabies immunoglobulins (ERIGs) are obtained from horse blood. These horses are hyper immunized and immunoglobulins are collected from them. Dosage is 40 IU/kg body weight and given maximum of 3000 IU.

Test dose has to be given prior to administration

2. Human Rabies Immunoglobulins (HRIG) is obtained from human and is free from side effects. Dosage is 20 IU/Kg body weight and given maximum of 1500 IU.

No test dose is required.



<b>Rabies immunoglobulins</b>	<b>Anti Rabies vaccine</b>
It is given at one time (1st day or upto 7days)	It is a course given on 0,3,7,14 and 28 day
These are antibodies	These are antigens
Dose is according to body weight	Dose is same for all – regardless of age and weight
Brought to room temperature before giving	Cold chain should be maintained
It is given at the site of the bite	It is given at the deltoid region

### **How to use RIG**

- Dose should be calculated according to body weight.
- Infiltrate (administer) entire RIG around the wound deeply (Intramuscularly)
- If some serum is left as per calculated dose, it may be given I/M
- It should not be administered at the site of vaccination.
- Use of excess dose (over and above) the body weight dose will suppress the antibody production from normal vaccination.
- It may be given on the day of bite. If, RIG was not administered when vaccination was begun, it can be administered upto 7th day after giving first dose of vaccination.
- Same syringe should not be used for RIG and vaccination.
- RIG should be preserved at cool temperature but should be brought to room temperature before administration.
- Immunoglobulins and vaccination can be given on the same day but given at different sites.

### **If RIG is not available.....**

In circumstances, where RIG is not available, greater emphasis should be given to wound cleaning followed by vaccination. The only change in routine vaccination is two doses of injections (vaccinations) for both the arms on '0' day may be given. Rest of vaccines on 3, 7, 14, 28th days are same. However this is not a replacement to immunoglobulins.

## Differences between Rabies immunoglobulins and Anti Rabies vaccine

### 13. FAQ (Frequently Asked Questions)

1. How to know whether a dog is a rabid or healthy?

**Ans:** Basing on the nature of bite we can decide, whether it is a healthy dog or a rabid dog generally rabid dog bites on head. If a healthy dog bites it leaves the victim after bite, goes back a few yards and growls with low voice. If a rabid dog bites, it will not show the tendency to leave the victim. It will hold the victim with jaws for a longtime. In some cases the dog will not leave the victim while it was beaten and killed. Rabid dog bites without provocation, enquire the neighbors about the nature of the dog, history of dog that is it a pet dog or a new stray dog etc. New stray dog could be a rabid dog.

2. How to protect my dog from Rabies?

**Ans:** Give ARV at the age of 2-3 months and then yearly vaccination.

3. What has to be done in case of Rabid dog bite?

**Ans:** Wash the wound with detergent soap water for 10 minutes. Five ARV vaccinations are to be given on 0, 3, 7, 14, 28th day. Follow the vaccination as per the schedule. In case, there is break for one or two days, continue the vaccination from that day as rescheduled.

4 If, calf is bitten by rabid dog. What precautions are to be taken?

**Ans:** There is a potential danger for the calf and its mother to get the Rabies. Do not allow the calf to suckle. Apply muzzle to calf to prevent suckling. Rear the calf by bottle feeding or concentrate or grass depending on the age. Immunise both calf and its mother.

5. What are the preventive measures for high risk personnel like veterinarians, their assistants and dog catchers?

**Ans:** High risk individuals and professionals should take **pre exposure immunization**. The recommended schedule is three injections 0, 7, and 21 (or 28) days. This schedule offers 100% immunity. The immunity is maintained up to 2 years. To maintain immunity, he has to take booster for 2 to 5 years.

6. A person took a full course of immunization. He was bitten by a rabid dog after one year. Does he need to take Immunoglobulins?

**Ans:** There is no need to take immunoglobulins, but he should be given two ARV injections on '0' day and on 3rd day to boost immunity. Wound cleaning is important as discussed earlier.

7. Is there any harm to take vaccination, if the animal not rabid?

**Ans:** There is no harm. There is nothing wrong to take full course, even if the dog is not rabid. It is better to start vaccination, on the day of bite. If the animal is surviving beyond 10 days of bite, then you can stop vaccination.

8. A person took preventive immunization. Later he was bitten by a Rabid dog. What measures he has to take?

**Ans:** He should take two ARV vaccines on '0' day and on 3rd day to boost immunity. Wound cleaning is important.

9. What has to be done to maximize immunity?

**Ans:** Deworming is important along with vaccination to get rid of worm burden.

- Don't use cortisones during course of vaccination.
- Give full course of immunization and do not stop the vaccination in the middle of the course.

10. How to avoid dog bites?

**Ans:**

- Do not touch or play with unfamiliar dogs.
- Even the familiar dog may be touched in presence of its master. Do not get panic by seeing the dog, just get courage and stand still and talk to the dog. Make a pleasant sounds and say No...No... Explore the possibilities to escape wisely from dog in a split second rather life threatening escape.
- Do not stare at the rabid dog.
- Pay attention to typical warning signs of unfriendly dogs-such as snarling (showing teeth and angry expression), a stiff stance, and ears laid back.
- Do not leave children unattended in the vicinity of stray dogs.
- Advise the children to avoid strange dogs and growling dogs.
- Do not try to run away on seeing the dog , as dogs naturally love to chase and catch things.
- If dogs are fighting, do not try to seperate them up by hand. Pour water on them from a distance, make loud noise and big cry.
- If the dog is biting continuously and has no tendency to leave, hit the dog with available objects.

11. Whether blood transfusion transmits rabies?

**Ans:** Blood has less concentration of virus. So far, there is no report that rabies is transmitted through blood transfusion. It is very likely that the blood transfusion may transmit disease during the infective stage. Pasteur inoculated rabies virus by two routes one by intracranially and another by intravenous route. Where as, organ transplantation can transmit rabies. Corneas collected from a person died of Rabies were transplanted to two persons these two persons developed rabies and died.

12. Is there any possibility of transmission through sex?

**Ans:** Yes. The virus is excreted through all natural secretion viz. saliva, lacrimation and semen etc. There are reports that the rabies was transmitted through sex during infective stage.

13. Is there any oral preventive vaccine?

**Ans:** .Yes. Oral antirabies vaccines are being used for wild animals and dogs in developed countries.

14. Is there any possibility of a healthy dog excreting virus in the saliva?

**Ans:** Yes. Very rarely healthy street dogs can excrete virus in the saliva. They are infective. They harbor the virus and live a healthy life.

15. Can rabies be associated with other disease?

**Ans:** The rabid dog may suffer from other disease simultaneously. Rabies may associate with other diseases just by coincidence. One clinical report says that the dog is suffering from liver disorder. Symptoms of rabies are also noticed. It indicates that the dog is suffering from both liver disorder and Rabies also. Bone fractures and rabies can also occur at the same time.

16. How to handle a rabid dog?

**Ans:**

- Rabid dog should be caged and observe for symptoms for 10 days. If it is rabid euthanize, cut the head, preserve in ice and take to lab for examination.
- There is no system to catch the Rabid dog. There are no facilities with the department or any voluntary organization to cage and observe suspected dogs.
- Under these circumstances, it is better to kill the suspected dog. There are incidences where a single rabid dog had bitten 26 people and a numerous cattle in Krishna district.

- Children are worst victims of Rabid dog bite. They may receive bite near the head, which is dangerous. If the bite is small, they don't tell to parents or parents may not notice the same.

17. Is there any one survived after onset of rabies symptoms?

**Ans:** In human, so far 5 patients are survived. They took the full course of vaccination. At the end of the immunization, they were attacked by rabies and showed symptoms of rabies but survived.

18. What is recorded longest incubation period?

**Ans:** Rabies is affected to a person after 3 years of bite but is very rare.

19. What are the Indigenous medicines that work against rabies?

**Ans:** There are no known Indigenous medicines that work against rabies to our knowledge. There is one homoeo medicine called hydrophobianum. Its use may be studied for preventing Rabies. (Note: The owners are advised not to keep their hands into the mouth of a rabid animal in an attempt to put any medication.)

20. Why do people neglect the rabid bite?

**Ans:** The wounds are simple and no sepsis. They heal automatically. There are no immediate complications. People are under the impression that there is no problem with rabid dog bite. But the symptoms of rabies are seen after months of bite.

21. What about the rabies transmission through Bats India?

**Ans:** Rabies transmission through bat is very rare in India. Only one case was reported from Srikakulam. Andhra Pradesh (a study by Pasteur Institute, Coonoor). We need not worry. Vampire bat bites and rabies transmission are seen in America.

22. A strange beautiful dog is standing in front of my gate. What precautions are to be taken to rear such dogs?

**Ans:** It may be a rabid dog or it might have been attacked by stray dogs. Do not try to touch the dog. Give the anti rabies vaccine immediately. Its behaviour should be observed for a month or so.

23. Is there anyone survived after attack of rabies without immunization?

**Ans:** One girl survived. She was under induced coma, with ketamine etc. She survived with some brain related problems.

24. What is the age of youngest animal affected with rabies?

**Ans:** Twenty one days old calf was affected with rabies. One day old piglet was affected.

25. What are the specimens those are to be sent for laboratory for examination?

**Ans:** The head is cut by taking adequate precautions. Whole head preserved in ice in completely leak proof container and sent to rabies laboratory for examination and confirmation. The hippocampus in the brain has the highest concentration of "Negri bodies". Corneal impression smears from dead for the presence of Negri bodies to confirm the rabies.

### **14a. Controlling dog population in India-Is it a tough task?**

**Ans:** Dogs attain sexual maturity at the age of six months to nine months. They deliver (whelp) 4 to 12 pups in one litter. The average litter size is six pups. The bitch conceives and delivers twice in a year. Males can identify an oestrus bitch by vaginal discharges from several miles. The ova of a bitch remains fertile for one week so the chances of getting pregnant are more. In other species ova can survive only for 10-12 hours. The estrogen level in bitches during estrus is 18 times more - means more desire. Males and females have strong desire to mate.

#### **Why to control dog population?**

**Ans:**

- If we control rabies 30,000 people can be saved from death per year in India.
- 1,500 crore of rupees can be saved per year.
- Dogs compete with human for their food.
- They compete with livestock for their food.
- Stray dog hosts several diseases and are potentially transmissible to man.
- Stray dogs kill backyard poultry birds.
- Stray dogs kill young calves.
- Stray dogs kill sheep and goat.
- Stray dogs transmit Rabies to milch animals – cows and buffaloes- it is great loss to the farmers.
- An observational report from the Wellington Cantonment, Coonoor, Tamil Nadu, by the Health Superintendent in 2010, states that since they started door-to-door collection of garbage the dog population that used to be very big has drastically declined.
- In India, Jaipur is an example of a city where rabies control through mass vaccination and neutering of dogs has resulted in eradication of human rabies.

- Street dogs suffer from chronic dermatitis, tick infestation and Venereal granuloma etc. no one cares for them.
- Dogs are mainly responsible for rabies transmission (96.2%).

## 14b. Animal Birth Control (ABC) programme -difficulties

ABC programme is implemented only in cities. Villages and towns are not covered by ABC programme.

- Male castration is not a 100% fool proof to control dog population. For example, out of one hundred male dogs 99 of dogs are castrated (removing testis) and one dog is not castrated. This one dog is sufficient to mate and make hundreds bitches pregnant.
- Female sterilization is a major surgery. Very few surgeons – 1 or 2 Veterinarians in each District can perform this operation.
- Identification (marking) of vaccinated / spayed dogs very is difficult.
- If only few dogs are operated from a huge population the sensibility of the program will be questioned when **no result are observed after a year**.

However, if two full-time teams work for round the clock for six months, they can achieve the 70-80% neutered and vaccinated dogs and the impact is clearly visible. The team comprises of surgeon, dog catcher, van and other facilities.

Good result can be achieved if the ABCs are done before the start of breeding season.

## 14c. Road map to control dog population and rabies.

1. Rabies monitoring cell may be established at district level and state level.
2. Dog census may be collected by door to door survey.
3. Ownerless stray dogs may be sheltered with the help of voluntary organisation. Stray dogs can be reared at one place easily. There by, we can reduce their suffering. Veterinary aid can also be provided.
4. All the veterinarians in the district may be trained in sterilisation (family planning) operations for both male and female dogs. This responsibility may be entrusted to district hospitals.
5. All dogs (pet and stray) dogs may be vaccinated yearly.
6. This activity shall generate revenue to Municipalities and panchayats. They may charge pet (dog) owners for vaccination etc.
7. Licensing and marking of all vaccinated dogs.

8. Garbage and food waste should not be thrown in the streets. This will reduce dog population.
9. Govt. and local bodies may take up dog control as a continuous programme but not as one time event.
10. Rabies control and dog control may be campaigned like pulse polio and AIDS programmes.

## 15. Facts and figures about Rabies – W.H.O study

- 15 million people are bitten by animals, mostly dogs,
- Since 1985, India has reported an estimated 25,000–30,000 human deaths from rabies annually (20,565 deaths 2003).
- The majority of people who die of rabies are male adults of poor or low-income and from rural areas.
- Most animal bites in India (96.2%) are by dogs, of which about 60% are stray and 40% pets. The incidence of animal bites is 17.4 per 1000 population. **One person is bitten by dog for every 2 seconds**, and someone dies from rabies every 30 minutes. The annual number of person-days lost because of animal bites is 38 million, and the cost of post-bite treatment is about \$25 million.
- India has approximately 25 million dogs, with an estimated dog: man ratio of 1:36. The dog population is increasing rapidly
- In India, 80%,of dogs are stray dogs.
- Upto 1998 the population of stray dogs in India was kept under check by civic authorities. Due to killing of dogs. In Nepal, 86-97% of dogs are accessible to parenteral vaccination.
- In the latest survey, only 39.5% of bite victims washed the wounds with soap and water. Only 46.9% victims of received rabies vaccination and 40.5% received full course.
- However, the use of human rabies immunoglobulin was low (2.1%).
- Sixty percent of victims resort to indigenous treatment.
- Approximately 5,00,000 people in India receive every year the post-exposure vaccination treatment that consists of 5 vaccine doses and costs Rs. 1500.



- Forty percent cases are children aged between 5-15 years. They do not inform to their parents. Even if they inform, they inform at a later date.

## LOUIS PASTEUR (1822-95)

*Luck favours only prepared mind*

He is a greatest scientist who discovered vaccine for rabies. It is surprising to note that Pasteur is basically a **chemist**. He discovered the **vaccine for Rabies** before the virus was discovered. The virus was discovered in the year 1898 whereas Louis Pasteur discovered the vaccination for rabies in the year 1885 (July the 6th) itself. On this day Joseph Meister a 9 years old boy was given first vaccination of rabies – a syringe full of vaccine from desiccated rabbit spinal cord. This day is observed as **world zoonosis day**.

He discovered the **vaccination for Anthrax**. He was the inventor of the process of **pasteurization**. Thus he saved wine and dairy industry. Pasteur rescued the French **silk worm** industry by controlling disease of silk worm. He discovered the vaccination for **Fowl cholera** and saved the poultry industry. He is famous for his '**germ theory**'. He discovered Anaerobiosis. He proved that germs are responsible for infection. He advocated the **aseptic conditions for surgery**. There are many such innovations. Every student of science should study his life and achievements.

## Research opportunities

- Explore new chemicals and biologicals for birth control methods in both male and female that causes permanent aspermia and anovulation mainly in stray dogs.
- Studies on use of cadmium chloride to lower fertility in dogs.
- Low cost immunity estimation techniques
- Production of low cost RIGs.
- Tracking the Rabies cases.
- IDRV for animals.
- Contraceptive pills for bitches.
- Male repellent sprays.

## References

- Reports of National institute of communicable diseases.
- Reports of Pasteur Institute, Coonoor.
- Reports of (important Rabies references) of world Health Organization, Geneva 2008.
- Original communications of louis pasteur





**Dog bite on face**



**Rabies in human**



**Buffalo affected with rabies**



**Rabid dog bite**