

Rabies

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Rabies is one of the oldest diseases known to man. There is a written description of the disease in 1930 BC nearly four thousand years ago. In spite of our knowledge of the disease and some effective vaccines, the disease is present in most countries of the world. It is reckoned that over 55,000 people a year die of rabies mainly in Africa and Asia. However, even developed countries such as the USA have recorded occasional deaths. Hong Kong along with Australia, New Zealand, UK, and Japan is one of the few areas where rabies has been absent for over 20 years. Any person travelling out from Hong Kong is therefore very likely to be going to a country where rabies is present.

The disease in man is terrifying (非常恐怖). Once a person develops the symptoms of rabies, he will die. Furthermore in the early stages, he is aware of what is happening to him. Usually a person declines and dies over a period of 2 to 10 days. The main symptoms are fever, anxiety, insomnia, confusion, agitation, abnormal behaviour, terror (驚駭), and hallucinations (幻覺), finally leading to delirium (精神錯亂). The patient usually dies of breathing failure.



A rabid dog with a little saliva drooling from its mouth.

An isolated dog with signs of aggression typical of the furious form of rabies.

The virus

The cause of the disease is a virus. It is given many different technical names, for example Lyssavirus or Rhabdovirus. It has a suitable shape for so dangerous a virus. It is shaped like a bullet. For the virus to kill a man it has to get into the brain. How it gets into the brain is best understood by considering where in the environment the virus can be found and how it moves from the environment to a position under the skin. Also one has to consider how it can get from under the skin into the brain. At each stage of this journey, there are things man can do to reduce the chance of the virus succeeding in reaching the brain.

It is important at this stage to point out that the virus is very easily killed by either soap or alcohol.

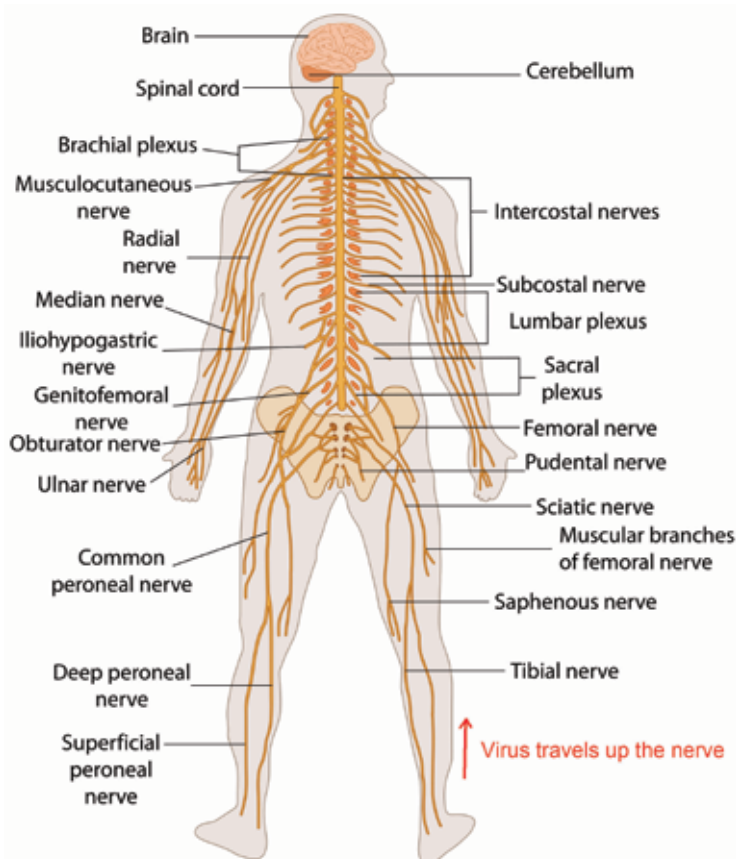
If you learn one thing from this document it is this: if you are outside Hong Kong and have a wound which is due to a bite or scratch from an animal, then you must immediately clean the wound for fifteen minutes with either soap or alcohol. People have died because they did not do that.

The Rabies virus travels up along the nervous system towards the brain

The virus has to move from under the skin towards the nearest nerve. Once it finds a nerve, it has to enter the nerve to start the process of infection. Cleaning the wound immediately after a bite is very effective in stopping the virus reaching the nerves. Though one should still go for post exposure prophylaxis (PEP) as well. The longer the distance the virus has to travel then the longer the incubation.

Rabies Epidemiology

In simple terms the epidemiology of a disease is where it can be found and how it spreads. Rabies has two epidemiologies: they are known by the technical terms sylvatic cycle and urban cycle. The sylvatic cycle is found mainly in the countryside. At that location, the virus moves from animal to animal 'cycling' round. This is achieved usually by the virus using one or two favoured species in one location, e.g. vampire bats (吸血蝙蝠) in South America and skunks (臭鼬) and raccoons (浣熊) in North America. The virus survives in this population of animals. Occasionally the virus goes to 'dead end hosts' such as cattle and man. These 'dead end hosts' rarely pass the disease on but as with all terrestrial animals infected with Rabies they die. To complete the cycle usually an animal has to bite another animal before it dies (See the diagram). In the urban cycle, the virus cycles mainly through only two species: dogs and cats.



Human nervous system source from the EMIRR.

Wood (Sylvatic cycle) maintenance hosts



South & Central America -
 North America -
 Europe -
 Africa & Asia -
 India & South Africa -

Vampire Bat
 Fox, skunk, bat and raccoon
 Fox
 Jackal
 Mongoose

City (Urban cycle) maintenance hosts





Cattle and other domesticated farm animals are frequent dead end hosts: cattle rarely pass on the disease. Infected bats, monkeys, raccoons, foxes, skunks, cattle, wolves, coyotes (土狼), dogs, mongooses (貓鼬) (normally yellow mongoose) or cats present the greatest risk to humans. Rabies may also spread through exposure to groundhogs (土撥鼠), weasels (鼬鼠), bears and other wild carnivores. Rodents (mice, squirrels, etc) are seldom infected.

Rabies Diagnosis

Some signs of Rabies in animals

- Fever
- 'Furious' (狂怒的) Aggressive
- Attack and bite with no warning
- Often sexually excited
- Drooling saliva (流口水)
- Paralysis. Usually the hindlegs lose their ability to walk first
- Fits
- Change in behavior
- 'Dumb' (沈默) Inactive
- Restlessness
- Change of voice and change in barking or mewing
- Horses and Cattle grind teeth
- Wild animals for example raccoons lose their fear of man and enter settlements

Simply speaking, rabies in animals should be diagnosed by a vet only. This is because while some cases are easy to diagnose many others are not. Please see the box with symptoms. You will see that rabies can be observed as both "Furious" and "Aggressive" and at other times as "Dumb" or "Inactive". This variety of symptoms is why a vet is required for the diagnosis. An owner should however, if they suspect rabies in an animal quickly get the assistance of a government vet. They should make sure the animal is contained or restrained so that it is less likely to affect anyone else. The most important change an owner should notice of a dog or cat incubating rabies is a change in its character. In most instances, friendly dogs become more vicious and vicious dogs become friendlier.

It is odd but one of the standard ways to perform the diagnosis of rabies in a dog is to do nothing apart from making sure the dog bites no one else. All one does is place the suspect dog in a kennel by itself for a fortnight and feed and water it. If it is alive after that period, it is very unlikely to be rabies. This is because once the symptoms start, rabies usually kills the dog in two to ten days. If the dog dies,



Patient with Rabies restrained in bed.

*Photo provided by
Centers for Disease Control and Prevention*

or is euthanased in extremis (垂死情況) then the head is sent to a laboratory to confirm the presence of the virus in the brain. If the doctors insist on a quicker diagnosis it is possible but dangerous. The dog is sedated (被用藥鎮靜) and samples for example from the eye are taken. These tests are not as accurate as the brain tests. One should however never kill a suspect case too early. The diagnosis gets very difficult then as the signs in the brain may not be too obvious.

Incubation period of Rabies

The term incubation period is very important when discussing rabies. Incubation period is the time from exposure to the virus to the start of clinical signs. If one understands how the incubation period can be long or short, one also gets clues on how to reduce the chance of getting rabies. Many viruses have a short incubation period usually about 3 to 7 days. However, rabies has an enormous variation in its incubation period. The shortest is about two to three weeks; the longest is around one year or more! The difference in time is due to the time it takes for the virus to move from under the skin up the nerves towards the brain. While other viruses often move through the blood and enter at the mouth and nose, rabies is completely different. So if a person is bitten on the foot then the incubation period is likely to be longer than if they were bitten on the neck. Other factors affecting the incubation period in man can be seen in the box.

Long Incubation Period

- Adult fit man
- Bite or scratch on the foot
- One small bite with little virus
- Previous rabies vaccination

Short Incubation Period

- Child
- Bite on the neck
- Many deep bites with much virus
- No rabies vaccination

Responsibilities concerning Rabies

With such an important disease there are important actions which individuals and governments should take. For the individual, these are the actions that they should take before being bitten and what to do if they are unlucky and have been bitten. For a government which is in a territory free of rabies, there are actions to be taken to maintain freedom and to be performed if the disease enters the territory.

Individual responsibilities

Before being bitten

- If there is an increased risk of meeting the virus; by profession (vet); or interests (studying bats or walking in the countryside in Asia): then consider getting vaccinated against rabies.
- Avoid contact with animals abroad (except in countries free of rabies).
- When abroad keep all scratches covered, or cleaned well and away from animals (if a person pets a cat incubating rabies, the cat could lick the scratch and place virus under the skin.)
- When abroad keep children away from high risk animals, dogs, cats, and wandering free roaming animals.
- Pet owners should ensure their pet is correctly licensed and vaccinated against rabies and receives its booster on time.
- Only import pets legally and those that are vaccinated properly.
- Try to make sure bats are not in the bedroom. This is particularly true in the Americas.



After being bitten

- Clean wound thoroughly for fifteen minutes with either soap or alcohol. If available, also use Povidine Iodine disinfectant.
- Go to a clinic and start the course of vaccinations and therapy against rabies. PEP varies from country to country but there are the World Health Organization (WHO) guidelines. This is usually a series of at least 4 injections. The injections should start as soon as possible after the bite but certainly less than 10 days after the bite.
- Even if vaccinated before with rabies vaccine, go for at least 2 shots of PEP.
- Try to make sure that the suspect animal does not bite anyone else. But at the same time do not take any more risks.
- Attempt to cage or imprison the animal until the authorities arrive. Again without risk to yourself.
- Inform the authorities and try to remain calm.





As part of a multifaceted approach reduce stray dog numbers.



Strictly maintain dog licensing regulations.

Government responsibilities to prevent an outbreak

1. Maintain effective border control and import control.
2. Maintain a rabies vaccinated dog population. Unless on an island.
3. Maintain dog licensing laws and the enforcement of these.
4. Reduce as far as possible stray cats and dogs.
5. Have a consistent approach to the public which keeps them alert to the government's requirements to stop rabies. It is important not to scare the public but also to make sure that they do not ignore the potential problem.
6. Monitor all suspect cases, e.g. biter dogs and peculiar symptoms seen in some cases.
7. Maintain a system of kennels for observing suspect cases.
8. Maintain a laboratory structure such that cases can be quickly confirmed as either positive or negative.
9. Regularly review prevention plans and investment with regard to rabies.
10. Finally make sure all relevant personnel bear rabies in mind. The simple reason being that the virus is very common in Asia.

Government responsibilities in the event of an outbreak or single case

1. Reassert all the matters 1 to 8 in prevention. Extra vaccine clinics may be needed. Dog catchers may have to work overtime. Extra vehicles and personnel may be required depending on size of problem.
2. Attempt to find the source and stop any repeat breakdowns.
3. Attempt to find all in contact persons and assess if they need PEP.
4. Find and assess in-contact animals and if necessary, isolate and observe them.
5. Manage media carefully emphasizing the need for extra care but ensuring there is no panic. Brief reporters on the absolute need to behave responsibly and not to upset families involved.
6. Liaises with medical and veterinary professions to make sure they understand what is happening.
7. Report to the the World Organisation for Animal Health (OIE).
8. Regularly review the outbreak and the success in controlling it. The aim is to find a date on which one can announce the outbreak is over.

Personal experience of Rabies

Hong Kong government vets who have worked abroad have seen rabies.

Below are some of their comments. There is also one comment from a government vet who saw the disease in Hong Kong in the eighties.

In Africa, a puppy, which the owner reported had stopped eating and drinking was flopping around and trying to hide all the time. Apart from being very depressed, I could not determine much else. It died the following day. It had bitten the owner before dying and being in a bad rabies area of Botswana, I advised that we check for rabies and yes you guessed it, it was positive and then the owner informed me that he could remember that the puppy had been in a fight several weeks before!

I saw an adult chow type dog at Sheung Shui kennels way back in the mid 80's. It had bitten someone and was being detained as per usual. If I remember correctly, it had something misleading like diarrhoea and after a cursory check, I asked the owner's private vet to follow up and have another look at it. He came round the following day and was suspicious that it may have rabies because it was so depressed. Sure enough he was right, it died a day or two later and it was positive!

I can never forget as a government vet entering the village and finding half the village in a panic. Mothers were grabbing their children and taking them home, people were chasing after dogs and so on. We found someone who was calm and he showed three tied up dogs that sure enough could for all different reasons have rabies. They all in different ways look peculiar. However, it turned out after we had done all the tests involving some very sophisticated American researchers that only one actually had rabies. Even so it was a lot of work getting all the village dogs revaccinated, even if the dog had an injection the week before we insisted it get another vaccination. We also had to spend some time liaising with the doctors.


Another case was a drooling, slobbering (流口水的) ox which was found to be pretty motionless in the middle of a thorn thicket. The farmer asked me to have a look at it and being in a calcium deficient area where botulism was common and these being the typical symptoms, I proceeded to stick my hand into its mouth, hands that had been torn to shreds by the thorns (棘), to prove to myself that it had typical paralysis of the tongue which occurs with botulism. Triumphantly I informed the farmer of my diagnosis but it died the next day and being in a bad rabies area where I was submitted for rabies check. Sure enough, bingo, positive for rabies. Having already been vaccinated against rabies with the human diploid cell vaccine, I proceeded to ring the manufacturers in Germany to ask what my chances were. They said 'pretty good', so for the next six months I sweated somewhat, but fortunately I am still here, some 40 years later, to tell this story!

The other case was submitted by the local Audobon Society. This fox was convulsing (痙攣) uncontrollably in a small dog carrier. We darted the fox through the carrier door and then euthanized it after it had been heavily sedated.

The rabies cases I saw were in Red Foxes in the USA. One fox was presented to our veterinary clinic by a good samaritan who collected the docile (馴服的) fox in a box and carried it to us. The fox was quiet, but alert with a head twitch and saliva dripping from its mouth. One clinician thought we should try to treat it but the senior veterinarian disagreed with her and told her euthanasia was the only option. We donned thick gloves, eye glasses and masks and euthanized the fox uneventfully. The brain was submitted for rabies testing and came back positive.

I was in a real hurry and so had a quick but thorough look at this cow tied to a tree. Finding little but a small fever and noticing it looked choked I stuck my hand down its throat. When I found nothing it dawned on me in my hurry I had been stupid: this was a case of rabies. The small wounds on the side of the cow were of course vampire bites. The farmer was upset when I told him and I was pretty upset too looking at the scratches on my arm that the cow's molars had made. Fortunately, there was a Rum factory nearby so they helped me to soak my whole arm in alcohol. Then I went to start the PEP. For the next month waking up in the morning was disturbing: you examine how your brain was working. It was unpleasant to say the least. Thank God for PEP.

The nightmare holiday, fiction that could easily become true



A Hong Kong family goes off for a week's holiday in Thailand. Mum, Dad, son aged 6 and daughter aged 8. The hotel is excellent and there are plenty of games for the children to play arranged by the hotel. On the last two days of the holiday the children notice a young cat which is often in the reception. They play with it and it plays back giving them a small bite. The next day they catch their plane for Hong Kong and after dies in bush outside the hotel premises. Because rabies is present in the saliva for at least 48 hours before the symptoms are seen the children have in fact been exposed to rabies. Mum and Dad have no idea that this has happened.



Maintain a system of kennels for enforcement purposes and observation of suspects.



Manage media carefully to encourage a concerted and practical response from the public while avoiding panic.

Strange facts about Rabies

- Starting at least 48 hours before an animal develops the signs of rabies, there is a lot of virus in its saliva. So one can get licked with rabies filled saliva by what appears to be a perfectly healthy animal.
- When a dog dies of furious rabies, at post mortem often one finds bits of sticks, broken bottles and rubbish in the stomach. The dog appears to want to eat anything.
- Man is more resistant to the virus than dogs.
- People sleeping on verandahs (陽台) in South America have been bitten by vampire bats and have later died of rabies.
- In developed countries, doctors have started a treatment for rabies called the Milwaukee protocol. So far of 35 people treated, 4 have survived.
- In man, the period between infection and the first flu-like symptoms is normally two to twelve weeks, but it can be as long as two years.
- The virus after it has reached the brain multiplies there. It then also moves on to many organs including the salivary glands which is why it is present in high concentrations in the saliva.
- In very rare cases, a transplant patient has become infected with rabies because the donor was incubating rabies.
- In Europe, successful control of rabies in foxes has been achieved by placing baits (餌) of food laced with rabies vaccine out in the woods. Some times helicopters were used to do this.
- A cow with rabies appears to be choked with something stuck in its throat. It is not uncommon for a vet to stick his hand down the throat, find no obstruction and then realize too late the cow has rabies. (Vets are trained not to do this but still they can forget.)
- There are at least ten other sicknesses with nervous signs which could be mistaken for rabies.



Two dogs showing the signs of "dumb" rabies quiet and lying down.

Conclusion

Every year rabies kills about 55,000 people mainly in Asia and Africa. But even developed countries such as the USA has recorded occasional deaths due to rabies. The disease is peculiarly nasty in that a person dying from rabies slowly goes mad or 'rabid'. The person often knows that this is happening to him. Once a person develops the nervous signs, he will die. While 55,000 a year may not seem many it is reckoned to be an underestimate. What rabies also does when it appears in a territory is to produce hysteria among healthy people. Mothers may refuse to send children to school. People may insist that their neighbors put their perfectly healthy and vaccinated dogs to sleep. Authorities have to spend extra effort controlling the disease and managing the output to the media correctly. Only a minority of territories have been free of the disease for many years, they include, UK, New Zealand, Australia, Hong Kong and Japan.

This freedom has been preserved in Hong Kong for three main reasons. (1) An effective border control. (2) Cooperation of the public with regard to vaccinating dogs. (3) An effective veterinary service.

With so much rabies in Asia there is no guarantee it will not come back.

If you learn one thing from this document it is this: when you are outside Hong Kong and have a wound which is due to a bite or scratch from an animal then you must immediately clean the wound for fifteen minutes with either soap or alcohol. Over the years a few people on holiday abroad have died because they did not do that.

2010 update

In 2010, on the island of Bali, there continues to be a serious outbreak of rabies. Any travelers from Hong Kong to Bali should, when planning their health prevention requirements, seek medical advice with respect to rabies. They may well be advised to complete a course of rabies vaccination before traveling.

Also reported in 2010, a northern-Arizona bat rabies strain has mutated to become contagious among skunks and now foxes, experts believe. The strain looks to be spreading fast, commanding attention from disease researchers across the United States. What is unusual is that the strain appears to have mutated so that foxes and skunks are now able to pass the virus on to their offspring — not just through biting and scratching but through simple socializing. Usually the secondary species—in this case, a skunk or fox bitten by a bat—is a dead-end host. The infected animal may become disoriented and even die but is usually unable to spread the virus, except through violent attacks.

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