衞生防護中心
Centre for Health Protection

Scientific Committee on Emerging and Zoonotic Diseases

Prevention and Control of Rabies

Purpose

This paper summarizes the local situation and raises issues for discussion on the prevention and control of rabies in Hong Kong.

Introduction

2. Rabies is a zoonotic viral disease that produces an almost invariably fatal encephalitis in humans and most other mammals.[1] Dogs remain the primary reservoir in developing countries, whereas wildlife species serve as hosts in developed nations.[2] According to the recent report of the World Health Organization (WHO) Expert Consultation on Rabies, human mortality from endemic canine rabies was estimated to be 55 000 deaths per year (90% CI: 24 500 – 90 800) with 56% of the deaths estimated to occur in Asia and 44% in Africa. The majority of these deaths occur in rural areas.[3]

3. Hong Kong shares a land border with the Mainland where rabies is endemic. No indigenous case of rabies has been reported in Hong Kong for years, and a rabies control programme is in place to guard against reintroduction of rabies into Hong Kong. However, international or national travellers may acquire the infection from rabies-endemic countries/areas and present with illness while in Hong Kong. The disease is incurable but preventable. In light of the changing epidemiology of rabies overseas, it is timely to review the prevention and control measures in Hong Kong.

Local situation

4. In Hong Kong, notification of suspected cases of human rabies and animal rabies are obligatory under the Quarantine and Prevention of Disease Ordinance (Chapter 141) and the Rabies Ordinance (Chapter 421) respectively.

5. Indigenous human rabies was last reported in 1981, and the last reported human case was an imported case which occurred in 2001. (Chart 1) The last case of animal rabies was reported in 1987 (Chart 2).

Chart 1. Human rabies cases in Hong Kong, 1946 - 2004

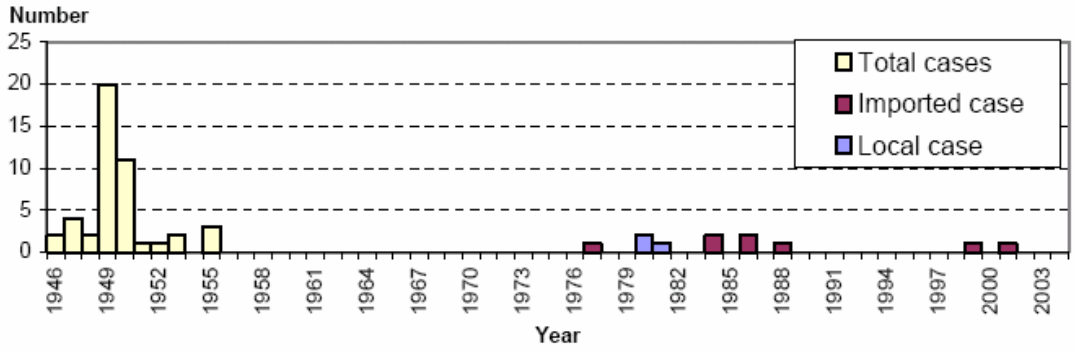
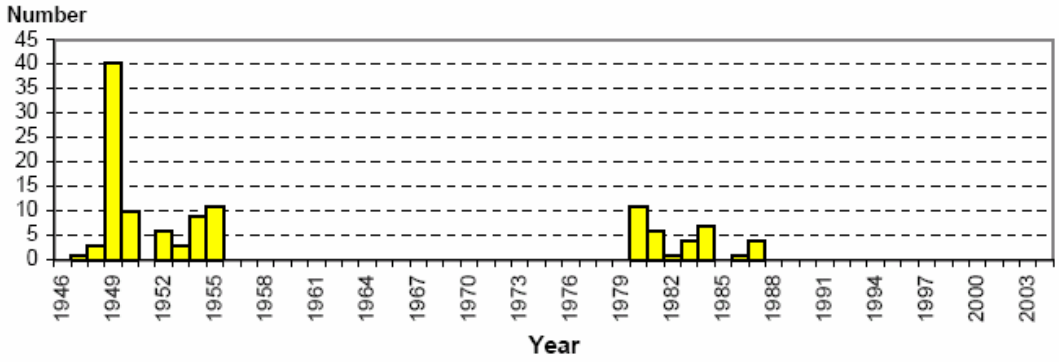


Chart 2. Animal rabies cases in Hong Kong, 1946 - 2004



6. The last outbreak of rabies occurred between 1980 and 1988, in which eight cases of human rabies and 34 cases of animal rabies (32 in dogs and two in cats) were reported. Five of the human cases resulted from exposures to dogs in the Mainland, two were bitten by dogs in Sheung Shui, and one gave no history of dog bite. One rabid dog was imported from the Mainland and the other 33 rabid animals came from the Northern New Territories.[4]

7. In the past 16 years, there have been two imported cases of human rabies. Both patients had history of dog bite in their home country (the Philippines).

8. Among the rabid animals recorded in Hong Kong since 1946, 95% were dogs and 3% were cats, and there were one pig (1%) and one cattle (1%).[5]

9. Data on anti-rabies prophylaxis for patients with bite wounds are collected regularly from public hospitals. During 2000 - 2004, a total of 10 225 persons with bite wounds received anti-rabies prophylaxis at public hospitals (mean: 2 045 patients per year; range: 1 421 – 2 576). One percent of these patients received rabies vaccine and immunoglobulin, and the rest received only rabies vaccine.

10. Under the provisions of the Rabies Ordinance, Chapter 421, Section 24, all animals that bite humans must be reported to the police. The animal will be detained for 7 days from the date of the bite and observed by a government veterinary officer. Any animal that dies or displays clinical signs consistent with rabies within the 7-day detention period will be autopsied and the brain will be examined for the presence of rabies. Between 1999 and 2003, a total of 697 animals were tested for rabies (mean: 139 per year; range: 89 – 214), and the results were negative.

11. Other preventive measures against rabies, backed by law, include the following:

- importation control for animal, carcass and animal product;
- quarantine requirements for international transfer of animals;
- prevention of animal smuggling;
- compulsory dog identification system and dog vaccination requirement;
- making it an offence to abandon an animal;
- requiring dogs in a public place to be under control; and
- removal of stray dogs.

12. Animals not under control in public places can be seized by the Agriculture, Fisheries and Conservation Department (AFCD) and detained as strays. Detained strays are examined for the presence of a microchip, and if so identified, the owner is advised. On payment of a pound fee, the owner can reclaim their animal. If they fail to do so, they may be deemed to have abandoned their animal and be subject to an additional penalty.

13. AFCD also promotes responsible pet ownership which includes aspects that help to prevent feral stray dogs:

- careful consideration before getting a dog,
- have the dog neutered to prevent unwanted breeding and aggression, and
- take unwanted dogs to the nearest Animal Management Centre of AFCD or to the Society for the Prevention of Cruelty to Animals (SPCA) instead of abandoning them.

14. Stray dogs are most likely unvaccinated and thus constitute an important potential reservoir for the spread of rabies. Control of stray dogs and prevention of animal smuggling are important in view of a higher number of rabies cases in Guangdong in 2004.

15. Laboratory staff working in rabies diagnostic laboratory, AFCD staff working with wildlife and animal control staff receive pre-exposure vaccination against rabies. Travellers to rabies-endemic countries are advised to avoid contact with animals. Pre-exposure vaccination is recommended for travellers whose activities in rabies-endemic areas may involve special risk (e.g. animal handling) or travellers who will have a prolonged stay in the endemic areas, particularly for visits to remote rural regions without medical facilities. Travellers are advised to seek medical treatment when bitten by an animal.

16. In summary, the main elements of the rabies control programme in Hong Kong include disease surveillance systems on animal and human rabies, diagnostic laboratory, pre-exposure vaccination, wound management and post-exposure prophylaxis, animal importation control, licensing and vaccination of dogs, and control of stray animals.

Report of WHO Expert Consultation on Rabies

17. The WHO Expert Consultation on Rabies met in Geneva in October 2004, and the prepublication report has just been uploaded to the WHO website in June 2005.[3]

18. The report provides new data on the estimated burden of rabies and its distribution in the world. It also reviews recent progress in the classification of lyssaviruses, rabies pathogenesis and diagnosis, rabies pre- and post-exposure prophylaxis, the management of rabies patients, and canine as well as wildlife rabies prevention and control. The definition of a "rabies-free country or area" has been revised and the definition of "provisionally rabies-free country or area" is introduced.

Highlights for discussion

Definition of "rabies-free country"

19. Unlike the definition of "rabies-free country" in the OIE Terrestrial Animal Health Code,[6] the revised definition given by the WHO Expert Consultation on Rabies specified that "no case of indigenously acquired infection by a lyssavirus has been confirmed in humans or any animal species, including bats, at any time during the previous 2 years" and that the surveillance "system should include or be able to have easy access to one rabies laboratory using WHO recommended techniques for rabies diagnosis,

which tests a minimum number of samples from suspect cases belonging to the major susceptible domestic and wild animal species present in the country and reports only negative results". (Table 1) Is Hong Kong rabies-free?

Table 1. Comparison of the definitions for rabies-free country

OIE Terrestrial Animal Health Code (2004) – Article 2.2.5.2
A country may be considered free from rabies when: 1. the disease is notifiable; 2. an effective system of disease surveillance is in operation; 3. all regulatory measures for the prevention and control of rabies have been implemented including effective importation procedures; 4. no case of indigenously acquired rabies infection has been confirmed in man or any animal species during the past 2 years; however, this status would not be affected by the isolation of a European Bat Lyssavirus (EBL1 or EBL2); 5. no imported case in carnivores has been confirmed outside a quarantine station for the past 6 months.
WHO Expert Consultation on Rabies
A rabies-free country or area – for the purpose of assisting public health authorities in assessing the risk of rabies associated with contact with animals and the need for rabies post-exposure prophylaxis **–** is defined as one in which: – no case of indigenously acquired infection by a lyssavirus has been confirmed in humans or any animal species, including bats, at any time during the previous 2 years; and – an adequate surveillance system is in operation. The system should include or be able to have easy access to one rabies laboratory using WHO recommended techniques for rabies diagnosis, which tests a minimum number[1] of samples from suspect[2] cases belonging to the major susceptible domestic and wild animal species present in the country and reports only negative results. National public health and veterinary authorities in collaboration with relevant international entities should define the appropriate number of samples to be tested from the different susceptible wild and domestic species. National authorities should ensure that the samples are collected homogenously throughout the country and on a regular basis during the year. Priority has to be given to the examination of animals showing abnormal behaviour, suspected of being rabid, and those found dead such as road kills. For domestic animals, in particular dogs and cats, the number of samples to be tested should be between 0.01% and 0.02% of the estimated population. Serology for wild animals should be considered as an indicator of the rabies situation; and – an effective import policy is implemented, i.e. measures to prevent the importation of rabies, especially those proposed in section 10.2, are in place. Additional measures may also be in place, such as vaccination of dogs and other pets, and animal population management activities.
[1] To be decided by the relevant regional or international authority. [2] Suspect cases may need be defined, e.g. as individuals of susceptible species showing encephalitis-like symptoms or dying of an unknown cause.

Classification of lyssaviruses

20. Rabies virus is no longer the only virus causing rabies. Other genotypes of lyssaviruses have been characterized and have caused fatal encephalitis in human, clinically indistinguishable from classic rabies.[7] Lyssaviruses show a broad range of antigenic cross-reactivity at the nucleocapsid level, allowing the use of similar reagents for diagnosis by immunofluorescence.[3]

21. There are seven genotypes delineated, and four other lyssaviruses pending characterization as new genotypes. (Table 2) The genotypes further segregate in two phylogroups; and experimental evidence obtained so far indicates that vaccine strains (all belonging to genotype 1 within phylogroup I) are ineffective for protection against infection by lyssaviruses from phylogroup II.[3]

Table 2. Classification of lyssaviruses

Phylogroup	Genotype	Species	Abbreviation (ICTV)[a]	Geographical origin	Potential vector(s)
Isolates characterized					
I	1	Rabies virus	RABV	Worldwide (except several islands)	Carnivores (worldwide); bats (Americas)
I	4	Duvenhage virus	DUVV	Southern Africa	Insectivorous bats
I	5	European bat lyssavirus type 1	EBLV-1	Europe	Insectivorous bats (*Eptesicus serotinus*)
I	6	European bat lyssavirus type 2	EBLV-2	Europe	Insectivorous bats (*Myotis* sp.)
I	7	Australian bat lyssavirus	ABLV	Australia	Frugivorous/insectivorous bats (*Megachiroptera*/*Microchiroptera*)
II	2	Lagos bat virus	LBV	Sub-Saharan Africa	Frugivorous bats (*Megachiroptera*)
II	3	Mokola virus	MOKV	Sub-Saharan Africa	Unknown
Isolates to be characterized as new genotypes					
–	–	Aravan virus	ARAV	Central Asia	Insectivorous bats (isolated from *Myotis blythi*)
–	–	Khujand virus	KHUV	Central Asia	Insectivorous bats (isolated from *Myotis mystacinus*)
–	–	Irkut virus	IRKV	East Siberia	Insectivorous bats (isolated from *Murina leucogaster*)
–	–	West Caucasian bat virus	WCBV	Caucasian region	Insectivorous bats (isolated from *Miniopterus schreibersi*)

[a] ICTV = International Committee on Taxonomy of Viruses.

Bats

22. Bats are the exclusive vectors in five genotypes, and only genotype 1 also includes terrestrial vectors (mainly carnivores). Genotype 1 corresponds to the classical rabies virus and is spread in domestic or wild animals worldwide. Genotypes 2 – 7 have a narrower geographical and host-range distribution.[3]

23. In the Americas, a large number of genetically and antigenically distinct genotype 1 variants circulate in different bat species.[3] European bat lyssaviruses have been recognized since 1985, and Australian bat lyssavirus were isolated in 1996.[3] In Asia, there has been a survey for lyssaviruses among

bat populations in Thailand in 2002 – 2003: 16 out of 394 samples had detectable neutralizing antibodies against Aravan virus, Khujand virus, Irkut virus or Australian bat lyssavirus while none had evidence of neutralizing antibodies against rabies virus.[8] What is the risk of bat-associated rabies in Hong Kong?

24. Transmission of rabies virus can occur from minor, seemingly unimportant, or unrecognized bites from bats.[9] However, the limited injury inflicted by a bat bite may be unrecognized or dismissed as unimportant by the person, resulting in failure to seek post-exposure prophylactic treatment.

25. "Exposures to bats" is classified by the WHO Expert Consultation on Rabies as Category III exposure in its recommendation for post-exposure prophylaxis. (Table 3) Shall we promulgate the updated recommendation?

Table 3. Type of contact, exposure and recommended post-exposure prophylaxis

Category	Type of contact with a suspect or confirmed rabid domestic or wild[a] animal, or animal unavailable for testing	Type of exposure	Recommended post-exposure prophylaxis
I	Touching or feeding of animals Licks on intact skin	None	None, if reliable case history is available
II	Nibbling of uncovered skin Minor scratches or abrasions without bleeding	Minor	Administer vaccine immediately[b] Stop treatment if animal remains healthy throughout an observation period of 10 days[c] or if animal is proven to be negative for rabies by a reliable laboratory using appropriate diagnostic techniques
III	Single or multiple transdermal bites or scratches, licks on broken skin Contamination of mucous membrane with saliva (i.e. licks) Exposures to bats[d]	Severe	Administer rabies immunoglobulin and vaccine immediately. Stop treatment is animal remains healthy throughout an observation period of 10 days or if animal is found to be negative for rabies by a reliable laboratory using appropriate diagnostic techniques

[a] Exposure to rodents, rabbits and hares seldom, if ever, requires specific anti-rabies post-exposure prophylaxis.
[b] If an apparently healthy dog or cat in or from a low-risk area is placed under observation, the situation may warrant delaying initiation of treatment.
[c] This observation period applies only to dogs and cats. Except in the case of threatened or endangered species, other domestic and wild animals suspected as rabid should be humanely killed and their tissues examined for the presence of rabies antigen using appropriate laboratory techniques.
[d] Post-exposure prophylaxis should be considered when contact between a human and a bat has occurred unless the exposed person can rule out a bite or scratch, or exposure to a mucous membrane.

Transmission via transplants

26. There have been reports in the 1980s on transmission of rabies through corneal transplants.[9] Recent incidents have occurred through transplants of organs (including liver, kidney, pancreas and lung) or vascular-segment in the United States (in 2004) and Germany (in 2005).[10, 11] Are donor-screening practices in Hong Kong adequate to prevent transmission of rabies?

Advice sought

27. Members are invited to note the report and discuss on the implications for the prevention and control of rabies in Hong Kong.

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