

Rabies prophylaxis in Western Australia: the impact of Australian bat lyssavirus

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Abstract

Post-exposure rabies prophylaxis is provided by the Health Department of Western Australia to persons exposed to potentially rabid animals overseas. In addition, since the discovery of Australian bat lyssavirus in 1996, rabies prophylaxis has been provided to persons exposed or likely to be exposed to Australian bats. This article reviews the provision of rabies prophylaxis in Western Australia from July 1991 to December 1997. During this period, 101 persons received rabies post-exposure prophylaxis in Western Australia. Exposure occurred outside Australia in 91% of cases. Dogs were the most frequent source of exposure (62.4%) and Thailand was the most frequent country of exposure (34.7%). However in 1997, Australian bat exposures accounted for 37.5% of all post-exposure prophylaxis. No pre-exposure prophylaxis was given until 1997, when eight persons received rabies vaccine to protect them against possible infection with Australian bat lyssavirus. Until the epidemiology of Australian bat lyssavirus is more clearly defined, the Lyssavirus Expert Group has recommended rabies prophylaxis be given for all Australian bat exposures. In the context of Australian bat lyssavirus as an emerging infectious disease it is important to have baseline data on rabies prophylaxis to allow for future assessment of its impact.

Introduction

Rabies is one of the oldest and most feared human infections. Once symptoms appear, rabies

has the highest case fatality rate, virtually 100%, of any known human infection. Illness can be prevented by the use of rabies vaccines and human rabies immunoglobulin (HRIG) when

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exposures are recognised and treatment initiated before the onset of symptoms.¹ The routine schedule for rabies post-exposure prophylaxis (PEP) recommended by the Commonwealth Department of Health and Family Services is a single dose of 20 IU per kg of body mass of HRIG administered immediately, together with 1.0 ml of the vaccine, and then four further doses of the vaccine administered on days 3,7,14 and 28.²

Although Australia is described by the World Health Organization (WHO) as being rabies free,² many West Australians travel to rabies endemic countries each year where contact with a rabid animal may occur. In addition, the discovery of Australian bat lyssavirus (ABL), which is closely related to classical rabies virus,³ in a New South Wales fruit bat in 1996⁴ and the subsequent fatal case of ABL infection in a Queensland bat carer later that year,⁵ poses a new threat of rabies-like illness to Australians. Laboratory studies suggest that rabies vaccine and rabies immunoglobulin protect against infection with ABL.⁶ A multi-disciplinary Lyssavirus Expert Group was established by the National Centre for Disease Control, which developed protocols for pre- and post-exposure prophylaxis,⁷ and guidelines for Australian bat surveillance.³ The recommendations for the provision of rabies PEP for persons bitten or scratched by any bat in Australia and pre-exposure prophylaxis for persons who have ongoing contact with bats are similar to those for travellers exposed to rabies virus overseas (see Box page 153).

This article aims to provide baseline data on the administration of rabies prophylaxis in Western Australia prior to, and since, the recommendation that it be used to protect against ABL infection.

Methods

All rabies vaccines and HRIG treatments are provided by the Central Immunisation Clinic of the Health Department of Western Australia. Since the beginning of July 1991, information about each request for prophylaxis has been collected. For PEP this includes the requesting doctor's name and place of practice, the patient's name, address, date of birth, date of bite, type of animal, anatomical location of the bite, country of exposure, and amount of vaccine and HRIG dispensed. Where rabies vaccines were for pre-exposure prophylaxis, only data regarding the date of distribution, the person's name, date of birth, nationality and place of employment were collected.

The average annual costs for the provision of HRIG and post-exposure rabies vaccine were calculated using total costs for each of these divided by the number of years and persons treated.

Data were analysed using Epi Info 6.04.⁸

Results

From 1 July, 1991 to 31 December, 1997 there were 101 persons considered by a medical practitioner to require rabies PEP (Figure 1). Ninety-two (91%) of the exposures occurred overseas. The nine Australian exposures comprised one person who was bitten by a quarantined tiger in Perth and eight persons who were either bitten or scratched by a bat. The latter eight were treated after November 1996. A further eight persons were considered to require rabies pre-exposure prophylaxis to protect them against ABL.

Dog bites accounted for the greatest proportion of exposures, followed by monkeys and then bats (Table 1).

Thailand accounted for the greatest number of exposures followed by Vietnam, Indonesia, the Philippines, and Australia (Table 2). The frequency of countries of exposure for 1997 varied markedly compared with previous years with the greatest number of exposures occurring in Australia (37.5%), followed by Thailand (31.3%) and then the Philippines (12.5%).

The median age of persons given PEP was 34 years, and the modal age group was 20 to 29 year olds (Figure 2).

No other information, such as the length of stay overseas, whether the animal was domestic or wild or whether the animal was subsequently tested for rabies, was routinely collected. For Australian bat exposures, no data were available to indicate in which State or Territory the person was exposed.

Preliminary analysis of the 1998 data indicate that eight persons had been provided with rabies PEP between January and May 1998. All of these were for Australian bat exposures.

In 54 (54%) cases rabies PEP had commenced in the country/state/territory of exposure and the remaining doses of vaccine were distributed to the patient's doctor for completion of the course. This leaves 47 cases (47%) who had PEP commenced in Western Australia. A total of 33 doses of HRIG and 372 doses of vaccine were distributed, with a median of four doses of vaccine issued for each case.

The average annual cost during the period for HRIG was \$2,587 (\$510 per person receiving HRIG) and \$3,568 (\$230 per person treated) for rabies vaccine.

Discussion

The demand for rabies prophylaxis in Western Australia has risen marginally since the discovery of ABL. Fewer persons reported overseas exposures to potentially rabid animals in 1997 than in the preceding two years. However, in 1997 over one third of all PEP was provided to persons exposed to Australian bats, increasing to 100% of all PEP

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Figure 1. Number of persons receiving rabies prophylaxis in Western Australia, July 1991 to December 1997, by reason and year

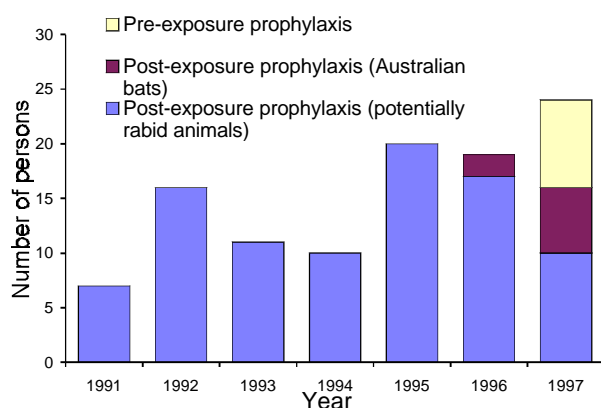
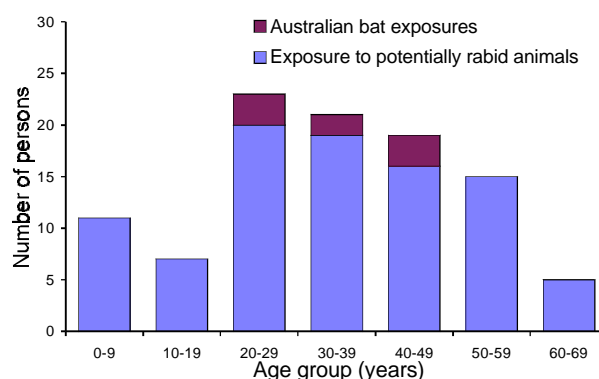


Figure 2. Number of persons receiving rabies post-exposure prophylaxis in Western Australia, July 1991 to December 1997, by reason and age group



provided to date in 1998. In addition, all pre-exposure prophylaxis was provided to persons who have ongoing contact with Australian bats. These data suggest that the use of rabies prophylaxis for protection against ABL infection may continue to rise, at least until the epidemiology of ABL is more clearly defined.

ABL has been reported in bats in the Northern Territory, Queensland, New South Wales and Victoria, but not in Western Australia, South Australia, or Tasmania.³ Much of the bat sampling so far has been opportunistic and has focused on eastern Australia, not allowing firm conclusions to be drawn about the distribution of ABL.³ It is likely that West Australians are at a much lower risk of bat exposures than persons living in eastern Australia as a result of lower bat numbers in populated areas of Western Australia (John Edwards, Chief Veterinary Officer, Agriculture Western Australia, personal communication).

Table 1. Percentage of bites causing potential rabies or Australian bat lyssavirus exposure from different animals

Animal	Bites	
	Number	Percentage
Dog	63	62.4
Monkey	18	17.8
Bat*	8	7.9
Cat	6	5.9
Rat	2	2.0
Camel	1	1.0
Goat	1	1.0
Lion cub	1	1.0
Tiger*	1	1.0
Total	101	100.0

* Australian exposures

Table 2. Percentage of bites causing potential rabies or Australian bat lyssavirus exposure from each country, July 1991 to December 1997.

Country	Bites	
	Number	Percentage
Thailand	35	34.7
Vietnam	11	10.9
Indonesia	10	9.9
Philippines	10	9.9
Australia	9	8.9
India	6	5.9
Africa	5	5.0
Turkey	3	3.0
Hong Kong	2	2.0
Armenia	1	1.0
Azerbaijan	1	1.0
Borneo	1	1.0
Brazil	1	1.0
China	1	1.0
Jordan	1	1.0
Oman	1	1.0
Singapore	1	1.0
Sri Lanka	1	1.0
USA	1	1.0
Total	101	100.0

There have been two cases of classic rabies reported in Australia.^{9,10} In both these cases the diagnosis was only made post-mortem. Even in the United States of America where rabies is endemic, rabies was not diagnosed until post-mortem examination in two of four cases detected in 1997.^{11,12} Since the discovery of ABL, retrospective reviews of hospital discharge data were undertaken in Queensland, the Northern Territory and Victoria¹³⁻¹⁵ and a similar study is underway in New South Wales.¹⁶ No cases of lyssavirus infection have been detected retrospectively to date from these studies. However, the Northern Territory and Victorian studies did identify cases of unexplained fatal encephalitis for which an infectious agent was not excluded as the cause. These findings suggest that rabies-like illness could go undetected in Australia. This, together with the uncertainty about the distribution of ABL and the confirmation of a human case, highlights the need for consideration of Lyssavirus infection in cases of encephalitis of unknown aetiology.

For West Australians, most potential rabies exposures occur in South East Asia, usually from dog or monkey bites. These data may underestimate the number of West Australians who receive, or who should receive, rabies PEP, as they do not include persons who either completed their PEP overseas/interstate or never received any.

With only just over 12 months of West Australian data post-ABL discovery it is difficult to accurately predict the future impact on rabies prophylaxis demand. It is likely that ABL has had a greater effect on rabies prophylaxis demand in States and Territories in which there is a greater probability of bat exposure, and where ABL has been identified in local bats.

All Australians who routinely handle bats should receive rabies immunisation and all bat exposures involving bites or scratches should be given PEP. However, use of the vaccine for local indications must not take precedence over overseas exposures.

Continued surveillance of both bat populations and unexplained serious neurological disease in humans will increase our understanding of the epidemiology of ABL. This understanding is vital for the development and maintenance of appropriate treatment and vaccination recommendations for persons exposed to Australian bats. In the context of this emerging infectious disease it is important to have baseline data on HRIG and rabies vaccine usage to allow for the future assessment of the impact of ABL in Australia.

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References

1. Fishbein DB, Bernard KW. Rabies virus. In: Mandell GL, Bennett JE, Dolin R, eds. Principles and Practice of Infectious Diseases, 4th ed. Vol. 2. New York: Churchill Livingstone, 1995:1527-1543.
2. Commonwealth Department of Human Services and Health. Rabies. Travel Safe. Health Information for International Travel. Canberra: Australian Government Publishing Service, 1995.
3. Garner G, Bunn C. Update on surveillance for Australian bat Lyssavirus. *Australasian Epidemiologist* 1997;4:27-30.
4. Crerar S, Longbottom H, Rooney J, Thornber P. Human health aspects of a possible *Lyssavirus* in a black flying fox. *Comm Dis Intell* 1996;20:325.
5. Allworth A, Murray K, Morgan J. A human case of encephalitis due to a lyssavirus recently identified in fruit bats. *Comm Dis Intell* 1996;20:504.
6. Fraser GC, Hooper PT, Hunt RA, et al. Encephalitis caused by a Lyssavirus in fruit bats in Australia. *Emerging Infectious Diseases* 1996;2:327-331.
7. Lyssavirus Expert Group. Prevention of human lyssavirus infection. *Comm Dis Intell* 1996;20:505-507.
8. Dean AG, Dean JA, Coulombier D, et al. Epi Info, Version 6.04: A Word-Processing, Database, and Statistics Program for Public Health on IBM-Compatible Microcomputers. Atlanta, USA: Epidemiology Program Office, Centers for Disease Control and Prevention, 1996.
9. Faoagali JL, De Buse P, Strutton GM, Samaratunga H. A case of rabies. *Med J Aust* 1988;49:702-707.
10. Grattan-Smith PJ, O'Regan WJ, Ellis pSJ, O'Flaherty SJ, McIntyre PB. Rabies. A second Australian case, with a long incubation period. *Med J Aust* 1992;156:651-654.
11. Centers for Disease Control and Prevention. Human rabies - Montana and Washington, 1997. *MMWR* 1997;46:770-774.
12. Centers for Disease Control and Prevention. Human rabies - Texas and New Jersey, 1997. *MMWR* 1998;47:1-5.
13. Gerrard J. Fatal encephalitis and meningitis at the Gold Coast Hospital, 1980 to 1996. *Comm Dis Intell* 1997;21:32-33.
14. Skull S, Krause V, Dalton C. NT retrospective search for lyssavirus in humans. The Northern Territory Communicable Diseases Bulletin 1997;4:11.
15. Lambert S, Dalton CB, Carnie JA. A review of fatal encephalitis in Victoria, 1993-1996. *Australasian Epidemiologist* 1997;4:20.
16. Jong K. Lyssavirus infection study. *New South Wales Public Health Bulletin* 1997; 8:10.

Rabies and Australian bat lyssavirus: recommendations for pre- and post-exposure vaccination^{1,2,3,4}

Travellers in rabies endemic countries are advised to avoid feeding and petting animals, particularly feral animals. Because bats can carry a number of serious diseases, persons are strongly discouraged from attempting to handle bats, particularly within Australia, but also overseas.

Pre-exposure vaccination

Recommended for those occupationally or recreationally at risk of being bitten or scratched by bats in Australia or potentially rabid animals overseas:

- Veterinarians, veterinary assistants, veterinary laboratory staff
- Wildlife officers
- Bat handlers, banders, carers, researchers
- Managers of display and research colonies of bats
- Members of indigenous communities who may catch bats for consumption
- Power line workers who frequently remove bats from power lines
- Cavers

Total of 3 doses (1ml each) rabies vaccine - given **intramuscularly*** on days 0, 7 and 28.

Post-exposure management

Recommended where there is a potential risk of transmission of rabies or Australian bat lyssavirus following exposure to a possibly infected animal.

1. Promptly clean the wound by washing thoroughly with soap and water.
2. Immediately administer 20 IU/kg rabies immunoglobulin (HRIG, 150 IU/ml) to those who have not been previously immunised or who do not have an adequate level of rabies immunity. Where the site permits, infiltrate half the dose into the wound and give the remainder **intramuscularly***. Do NOT administer

into adipose tissue. Do not give if post-exposure vaccination commenced more than 7 days previously.

3. Immediately commence post-exposure course of vaccination:

For persons who have not had pre-exposure prophylaxis: a total of 5 doses of rabies vaccine (1ml each) - given **intramuscularly*** on days 0, 3, 7, 14 and 28.

For persons who have had previous rabies vaccination: a total of 2 doses of rabies vaccine (1ml each) - given **intramuscularly*** on days 0 and 3.

Doctors can obtain rabies vaccine and immunoglobulin for post-exposure management through their State or Territory health authority. Neither HRIG nor vaccine should be withheld when there are clear indications for use. However, as HRIG is in short supply globally, each case should be considered individually and doctors should obtain the advice of their State or Territory health authority when assessing the need for vaccination. For exposures to Australian bats, the bat should be submitted for testing wherever possible and, where continuing exposure to bats is unlikely, post-exposure management may be modified in the event of a negative test result.

* **Intramuscularly** = the deltoid area (adults) or anterolateral thigh (young children)

References

1. National Health and Medical Research Council. The Australian Immunisation Handbook 6th Edition. AGPS. 1997.
2. Lyssavirus Expert Group. Prevention of human lyssavirus infection. *Comm Dis Intell* 1996;20:505-507.
3. National Centre for Disease Control. Bat lyssavirus information for public health authorities. Commonwealth Department of Health and Family Services. October 1997.
4. National Centre for Disease Control. Bat lyssavirus information for medical practitioners. Commonwealth Department of Health and Family Services. October 1997.

Lyssavirus Expert Group

The Lyssavirus Expert Group met on 15 June 1998 to consider a number of issues relating to Australian bat lyssavirus (ABL). Characterisation of strains of ABL by the Australian Animal Health Laboratory (AAHL) has shown that they are closely related to classic serotype 1 rabies virus, but form a separate genotype.

Diagnostic capability for ABL is improving and a list of available testing facilities is to be prepared by AAHL.

The Communicable Disease Network Australia New Zealand (CDNANZ) will be asked to consider extending the rabies case definition to include ABL as a notifiable disease.

Current recommendations for pre- and post-exposure vaccination with rabies vaccine were reviewed and intradermal vaccination and recommendations for booster doses for persons at continuing risk of exposure were discussed. The meeting also considered the circumstances in which it may be safe to delay administering prophylaxis following a bat exposure, pending the result of testing of the bat.

When finalised, the recommendations from the meeting will be submitted to CDNANZ for endorsement. Once endorsed, they will be published in *Communicable Diseases Intelligence* and on the *Communicable Diseases - Australia* website.