

## Rabies Exposure Risk among Foreign Backpackers in Southeast Asia

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**Abstract.** Rabies remains a problem in Southeast Asia where large numbers of backpackers visit each year. During May–June 2008, a survey study was conducted of foreign backpackers in Bangkok, Thailand to assess their risk of rabies exposure. Eight hundred seventy (870) questionnaires were collected and analyzed. The median age of the backpackers was 25.5 years. Most of them were European (68.4%), followed by North American (13.2%). Although 80.7% had sought health information before traveling, only 55.6% had received information about rabies. Only 18.1% had completed pre-exposure rabies vaccination (3 shots) before travel, whereas 70.9% had not been vaccinated for rabies at all. In this study, the incidence of being licked was 3.56%, and of being bitten 0.69%, on average stays of 30.06 days in Southeast Asia. More than a half (54%) of exposures occurred in the first 10 days after arrival in Southeast Asia.

### INTRODUCTION

Rabies remains a problem in most countries of Southeast Asia, where stray dogs and cats are common. Financial, political, and cultural issues are the main barriers to public health authorities' controlling the disease in animals.<sup>1</sup> Local people and travelers in this area are inevitably at risk of exposure to the rabies virus if bitten or licked by an infected animal. Pre-exposure prophylaxis is an excellent preventive measure against rabies in travelers. However, it is expensive, and the cost-benefit relationship is not clear, so that it has limited application in general travel-medicine practice.<sup>2,3</sup>

Backpackers were considered to be a special group of travelers, who might be at high risk of contracting rabies. However, the risk of rabies exposure among this particular group in Southeast Asia was unknown. Therefore, this study was conducted to determine the incidence and risk of exposure to rabies, i.e., by being bitten or licked by animals, during their travels in Southeast Asia. The secondary objective was to assess their knowledge, attitudes, and practices toward the risk of rabies.

### MATERIALS AND METHODS

This was a cross-sectional, questionnaire-based study. Data were collected from foreign backpackers in the Khao San Road area, which is a famous backpacker center in Bangkok, Thailand. The questionnaire was drafted, tested, and revised before actual data collection. The final version of the questionnaire comprised four parts, i.e., general information about the travelers, rabies pre-exposure preparations, knowledge about rabies, and the details of any animal exposure (being bitten/licked). The sample size was calculated using the estimated risk from a previous study<sup>4</sup> and the estimated number of backpackers in Khao San area from Tourism Authority of Thailand (TAT) data.<sup>5</sup> To achieve a 95% confidence level, we required at least 826 samples.

The study was approved by the Ethics Committee of the Faculty of Tropical Medicine, Mahidol University.

An accidental sampling method was used in data collection. Backpackers from non-Southeast Asian countries were invited to join the study by answering a written questionnaire. The team of investigators was available to help if needed.

**Statistical analysis.** All statistical analyses were performed using SPSS for Windows (version 10.0.7, SPSS Inc., Chicago, IL) software. Continuous data were presented as mean with standard deviation (for normally distributed data), or median with range (for non-normally distributed data). Categorical data were presented as numbers and percentage. The student *t* test was used to compare means of two groups, whereas the  $\chi^2$  was used for categorical data, as appropriate; a *P* value of < 0.05 was regarded as statistically significant.

### RESULTS

During the period May–June 2008, 870 questionnaires were collected and evaluated. The median age of the respondents was 25.5 years; 52% of the total was male. Most of the backpackers were European (68.4%), followed by North American (13.2%). Their main reason for travel was tourism (91.4%); 27% of the travelers had been traveling in other Southeast Asian countries besides Thailand. The detail demographic data of the study participants are shown in Table 1.

**Attitudes and pre-travel preparations for the risk of rabies.** Although 80.7% had sought travel health information before travel, only 55.6% had received information about rabies. Only 18.1% of backpackers had completed a course of pre-exposure rabies vaccinations (3 shots) before travel, 11.0% had received only 1 or 2 shots, whereas 70.9% had not been vaccinated for rabies at all. Among those who had not been vaccinated for rabies, 61.8% cited the cost of the vaccine, 11.8% did not know of or were unaware of the risk of rabies, whereas 9.3% thought it unnecessary. The detailed data are shown in Table 2.

**Backpackers' knowledge about rabies.** Almost all backpackers (95.7%) knew that they could get rabies if bitten by an infected animal. However, only 59% of them knew that being licked on an area of broken skin could also transmit rabies. Ninety-eight percent of backpackers knew that dogs could carry rabies, but only 63.1% of backpackers were aware that cats could also carry rabies. Moreover, 40% of backpackers thought that the bite of a healthy-looking dog/cat posed no risk of rabies. Details of the knowledge assessment are shown in Table 3.

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TABLE 1  
Demographic and travel characteristics (N = 870)

	n	%
Sex		
Male	452	52.0
Female	417	48.0
Age (year) [median 25.5 yr; range 14–73 yr]		
14–30	637	73.2
31–45	171	19.7
46–60	55	6.3
> 61	7	0.8
Nationality		
European	595	68.4
North American	115	13.2
Asia-Pacific	152	17.5
South-Central American	6	0.7
African	1	0.1
Reason for travel (N = 839)		
Tourism	767	91.4
Work or business	28	3.3
Visiting friends and relatives	19	2.3
Education and research	11	1.3
Other	14	1.7
Have Traveled to		
Thailand	870	100.0
Lao PDR	132	15.2
Cambodia	124	14.3
Vietnam	111	12.8
Malaysia	49	5.6
Singapore	30	3.4
Indonesia	23	2.6
Myanmar	10	1.1
Philippines	4	0.5

**Relationship between travel-clinic visit and backpackers' knowledge.** Of the 870 backpackers studied, 397 (45.6%) had received pre-travel health advice from a travel clinic; 70% of the backpackers in the travel-clinic group had received information about rabies, which was significantly higher than the control group (70.55% versus 46.56%,  $P < 0.001$ ). Although the overall vaccination rate against rabies found in this study was low, backpackers in the travel-clinic group had a higher vaccination rate (33.51% versus 24.49%,  $P = 0.001$ ).

When the detail of each knowledge item was analyzed, it was found that the backpackers in the travel-clinic group had

TABLE 2  
Attitude of backpackers toward rabies risk

	n	%
Had sought any travel health information before leaving		
Yes	702	80.7
No	167	19.2
Received information about rabies before this trip		
Yes	480	55.6
No	384	44.4
Received vaccination against rabies (N = 862)		
Yes, complete 3 shots	156	18.1
Yes, 1–2 shots	95	11.0
No	611	70.9
Reason for not being vaccinated (N = 611)		
It is too expensive	374	61.2
I did not know/aware about rabies	72	11.8
I think it is not necessary	57	9.3
Doctor/nurse did not recommend rabies shot	39	6.4
It is too expensive and may not be necessary	20	3.3
Doctor/nurse did not inform us	17	2.8
Limited time frame before departure	11	1.8
Other reason	21	3.4

TABLE 3  
Backpackers' knowledge about rabies

Questions	Yes (%)	No (%)
1. You may get rabies if you		
are bitten by an infected animal	95.7*	4.3
are licked by an infected animal on broken skin	59.0*	41.0
have contact with animal saliva on normal skin	11.5	87.9*
consume contaminated food/drinks	10.9	88.5*
2. Animal that could carries rabies		
Dog	98.5*	1.5
Cat	63.1*	36.8
Snake	5.9	94.1*
Chicken	9.8	90.2*
Bat	52.8*	47.2
Monkey	78.3*	21.7
3. If you have already had a complete course (3 shots) of rabies vaccine before travel, and you are bitten by a dog, there is no need to have a booster.	18.8	81.2*
4. The bite of a healthy-looking dog/cat poses no risk of rabies	39.9	60.1*

\* Correct answer.

better knowledge scores than the control group in all respects, although the differences were not statistically significant in most cases. The details are shown in Table 4.

**Risk of rabies exposure.** On an average stay of 30.06 days in Southeast Asia, 31 of 870 backpackers (3.6%) had been licked, whereas 6 of 870 backpackers (0.69%) had been bitten. More than half (54%) of exposures took place within the first 10 days after arrival in Southeast Asia. The animals most commonly encountered were dogs, followed by cats and monkeys. Among those who were bitten, only 67% (4/6) sought medical care, and only 50% (3/6) received post-exposure treatment. Details of exposure are shown in Table 5.

## DISCUSSION

To our knowledge, this was the first study focusing on the risk of exposure to rabies among backpackers in Southeast Asia. In our study, the incidence of being bitten was 6.9 per 1,000 travelers, whereas the incidence of being licked was 36 per 1,000 travelers in an average stay of 30 days. This incidence of exposure was lower than the previous study conducted among general foreign travelers in Thailand.<sup>4</sup> In that study, the incidence of being bitten and being licked were 13/1,000 and 89/1,000, respectively, in an average stay of 17 days.<sup>4</sup> The lower incidence in our study did not support the general belief that backpackers may carry a higher risk of animal exposure than general travelers. However, our study was conducted 14 years after the previous one, so some changes may have affected the risk of exposure, such as the urbanization of areas attractive to tourists, the control of stray dogs and cats, and travelers' behavior changes. Better rabies awareness among travelers might be the important factor, i.e., only 1.1% of travelers in the previous study had received rabies vaccine before their trip, whereas up to 29% of backpackers in our study had received pre-exposure rabies vaccine.

Although the incidence of potential rabies exposure in Southeast Asia was lower than previously reported, it was still high when compared with other studies. A study of Israeli travelers<sup>6</sup> and the U.S. Peace Corps<sup>2</sup> found incidences of 2.66/1,000 per month, and 43.6/1,000 travelers per year, respectively. However, there were significant differences between

TABLE 4  
Relationship between travel clinic visit and backpackers' knowledge

Questions (correct answer)	Travel clinic (%)	Control group (%)	P value
<b>Pre-travel preparation</b>			
1. Receive information about rabies	70.55	46.56	< 0.001*
2. Vaccination against rabies	33.51	24.49	0.001*
<b>Knowledge</b>			
	Travel clinic (% know)	Control group (% know)	P value
1. You may get rabies if you			
are bitten by an infected animal (True)	97.71	94.68	0.026*
are licked by an infected animal on broken skin (True)	62.09	56.71	0.124
have contact with animal saliva on normal skin (False)	87.53	88.61	0.641
consume contaminated food/drinks (False)	89.57	87.59	0.384
2. Animal that could carry rabies			
Dog (True)	99.49	97.73	0.034*
Cat (True)	65.57	61.36	0.268
Snake (False)	94.68	93.69	0.549
Chicken (False)	89.37	90.66	0.545
Bat (True)	55.95	52.02	0.268
Monkey (True)	84.05	75.25	0.002*
3. If you have already had a complete course (3 shots) of rabies vaccination before travel, and you are bitten by a dog, there is no need to have a booster (False)	83.50	80.71	0.307
4. The bite of a healthy-looking dog/cat poses no risk of rabies (False)	63.52	57.51	0.085

\*Statistical significance.

the studies, such as the study population, destination, and definition of rabies exposure, so that it is not possible to compare these incidence rates directly.

However, it is clear that travelers are at risk of rabies exposure and the disease is virtually fatal once symptoms develop. Therefore, many international guidelines recommend pre-exposure rabies vaccination for travelers in rabies-endemic areas.<sup>7-9</sup> Nevertheless, only 18.1% of our study population had undergone a complete course of rabies vaccinations before travel, whereas 70% had never been vaccinated for rabies at all. The main reason cited was the cost of the vaccine, as recognized and discussed in many papers.<sup>2,3,10-12</sup> Length of stay in an area of rabies risk is also a factor considered by some doctors before recommending vaccination. Although it is logical to assume that travelers' staying longer carry a higher risk, the risk to short-term travelers should not be neglected. In our study, over half (54%) of exposures took place in the first 10 days after arrival in Southeast Asia. Another study, of 320 cases, by the GeoSentinel network, showed that animal-associated injuries occurred in a median trip duration of 23 days.<sup>12</sup>

In addition to vaccination, health education is important to prevent misconceptions and misunderstandings. In our study, 41% did not know they could get rabies if an infected animal licked their broken skin; 37% did not know that cats could

carries rabies; and 20% did not know that they must get a booster shot after being bitten even though they had completed their pre-exposure course of vaccinations. These misunderstandings were serious and very dangerous and may result in travelers not receiving appropriate post-exposure treatment. These findings are not unique to our backpacker group, and have been confirmed in several other studies.<sup>13,14</sup>

Our subgroup analysis of the group who had visited a travel clinic, and those who had not, found that significantly more members of the travel clinic group had received information and vaccinations against rabies than the control group. Unfortunately, even in the travel clinic group, the serious misunderstandings mentioned previously still existed in comparable percentages to the control group. This contrasted with the knowledge toward malaria risk, where some serious misunderstandings were less common among the travel clinic group than the control group.<sup>15</sup>

These findings, and evidence from some previous studies, might suggest that health education regarding the risk of rabies was not routinely provided in travel clinics.<sup>16,17</sup> Ideally, all travelers to a rabies risk area should have practical knowledge about rabies and all common misunderstanding should be explored and corrected in the pre-travel visit.

In our study, six backpackers were bitten, and only four sought medical care. This finding underlined the lack of awareness of the risk of rabies among backpackers, which could lead to fatal consequences. The combination of health education and pre-exposure vaccinations in high-risk travelers may be a good strategy. Since in a real situation, standard post-exposure treatment including rabies immunoglobulin may not be available, especially in rural areas. For example, a survey in Thailand found that rabies immunoglobulin was available in only 64% of public hospitals.<sup>18</sup> Availability may be more limited in other countries in Southeast Asia.<sup>19,20</sup> Travelers without prior rabies immunization, if bitten may become necessary to be transferred or even evacuated to the nearest standard medical facility. It will usually be difficult and costly in the real situation. The use of pre-exposure vaccine among individuals who travel in remote area

TABLE 5  
Risk of rabies exposure

	n	%
Total number of backpackers	870	100
During this trip in Southeast Asia*		
Number of backpackers bitten	6	0.69
Number of backpackers licked	31	3.6
Among the exposure group (N = 37)		
Exposure within the first 10 days	20	54
Exposure on days 11-30 of the trip	9	24
Exposure > 30 days after arrival	8	22

\*Average stay = 30.06 days.

may be reasonable. However, the cost-benefit of pre-exposure vaccine is still debatable, especially in the policy-makers level.

This study had certain limitations. First, we could not analyze the incidence of rabies exposure in a country-specific fashion. Although we collected the detailed itinerary of each backpacker, the number of travelers visiting any specific country was too small to enable separate analysis; therefore, we reported the incidence of rabies exposure as a specific region. Second, it may be argued that data from backpackers in Thailand may not represent the whole backpacker group in Southeast Asia. However, Bangkok serves as a main transport hub in the region and most backpackers use Bangkok as their base before exploring the rest of Southeast Asia. Of our backpackers, 27% had already traveled to other Southeast Asian countries besides Thailand. Although imperfect, data from Bangkok may broadly represent backpackers in the region.

In conclusion, this study showed that despite backpackers in Southeast Asia being at significant risk of exposure to rabies, they were inadequately informed and prepared for this life-threatening risk. Assessment of the risk of rabies and appropriate management should be routinely included in pre-travel visits.

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