

Knowledge and Behavior of Tourists to Manu National Park, Peru, in Relation to Leishmaniasis

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Background: Tourists have been infected with *Leishmania braziliensis* and the lack of appropriate travel information on the disease has been documented. The aim of this study was to describe the knowledge and behavior of tourists booked on a trip to Manu National Park in Peru in relation to leishmaniasis and its prevention.

Methods: The clients of two tour operators in Cusco, Peru, represented the experimental and control group. The experimental group completed a questionnaire after the tour briefing the night before the trip and received the information leaflet. A second questionnaire was completed just before returning from the park. The clients in the control group did not receive the leaflet.

Results: Three hundred and seventy-three questionnaire pairs were collected (173 experimental, 200 control). Only 24 (6%) of all participants claimed to have heard of leishmaniasis. Of the 92.5% of tourists who read the leaflet, 156 (97.5%) found it informative, although 50 (32.5%) wanted more information. It was suggested that the leaflet should be distributed by tour operators (56.9%), general practitioners/family doctors (49%), and travel agents (47.1%). There was no significant difference in the use of preventive measures between the groups. One-third of the experimental group claimed to have paid more attention to protection due to the information given in the leaflet.

Conclusions: There is generally a lack of knowledge on leishmaniasis with a great feeling of need for more and detailed information. Correct and complete information on leishmaniasis should be included in the health advice for travelers to endemic areas.

Travelers to more distant, exotic, and tropical destinations are often exposed to a range of health hazards and need to be advised of the appropriate health issues. Advice on travel health consists mainly of information about appropriate behavior (hygiene, food, sexual encounters) and immunizations/prophylaxis, and concentrates on the prevention of diseases such as gastrointestinal infections, vectorborne infections, sexually transmitted infections/acquired immunodeficiency syndrome or hepatitis. Cutaneous leishmaniasis, a disease with a worldwide annual incidence of 300,000 cases from a population of 200 million at risk,¹ is very rarely included. Endemic in a number of tropical and subtropical areas

around the globe, many doctors in the “Western” world (where most tourists come from) do not know and, therefore, do not recognize the disease in returning travelers,^{2,3} let alone advise them about prevention. Sometimes, even published health advice⁴ does not contain preventive measures. As a result, few tourists are informed about the condition.

Leishmaniasis is a parasitic disease transmitted by infected sandflies. After being bitten, an ulcerous skin lesion develops that is usually self-healing after a number of weeks, leaving a typical scar the size of the ulcer. Numerous tourists have returned from overseas trips to endemic areas with such a reminder of their “Aleppo Boil” or “Oriental Sore.” Unfortunately, one parasite species, *Leishmania braziliensis*, can develop a mucocutaneous stage within months, years or even decades after the primary lesion.^{5,6} In this stage, individuals harboring the parasite develop mucosal lesions in the nose and mouth and — if untreated — disfiguring tissue destruction. *L. braziliensis* is prevalent in the rainforests of Central and South America. Coincidentally, these rainforests represent major tourist attractions, such as the national parks in Costa Rica and Peru.^{2,7} Although mainly a disease of the local population, visitors to endemic areas (tourists, researchers, military personnel) can become infected rapidly if no precautions are taken, such as the

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use of repellent and appropriate clothing. One study reports of leishmaniasis patients having been exposed to sandflies for anywhere between 12 hours and 3 years.⁷

Several studies on tourists returning home with leishmaniasis within the last 10 years may reflect the recent increase of adventure tourism to endemic areas.^{8,9} In one study, 58 travelers returning from Central and South America had been diagnosed with cutaneous leishmaniasis.² Eleven of the 12 tourists in that study who had traveled to Peru had been in forest areas in or near Manu National Park or Puerto Maldonado. A separate study presented 59 cases of cutaneous leishmaniasis infected with various leishmania species around the world.⁷ Interestingly, few of those remembered ever being bitten by sandflies. Of the 6 patients diagnosed with *L. braziliensis*, 5 had been infected in Peru.

Of 33 cases imported to Switzerland, 7 were diagnosed with *L. braziliensis*: 2 of those had acquired the disease in Peru.¹⁰ It is estimated that 30 to 60 cases of leishmaniasis are imported to Switzerland every year.⁶ Exact data are unavailable as the disease is not notifiable, often misdiagnosed, and spontaneous healing does occur. The same paper presented a patient with mucocutaneous leishmaniasis acquired during a trip to northern Bolivia.⁶ A case of an unusually rapid development of mucosal involvement following a cutaneous lesion is reported from New Zealand.¹¹ This patient had traveled extensively for 6 months through various Andean countries.

The number of individuals who proceeded to the mucosal stage seem few, which may be due to lack of documentation.⁶ However, one needs to acknowledge that the interval between the primary infection and the mucosal stage can be very long.⁷ This means that more cases may be seen in the future if, similar to the rate in the local population, 2 to 10% of the infected develop the potentially mutilating mucocutaneous disease. Nevertheless, as Rosbotham et al.¹¹ claim, it is "unwise to assume that healthy visitors to endemic areas cannot develop mucosal disease" (p.289).

The only effective prevention of the disease is not being bitten. Travelers to endemic areas need to be informed about prevalent diseases and the preventive measures. The primary level of disease prevention is informed health behavior.¹² Suitable information, presented in appropriate ways, allows individuals to change their behavior in order to avoid disease. Leaflets or pamphlets enjoy a growing popularity in health education and seem to be suitable for education that considers the principle of adult learning. A significant factor for adult learning is the notion of perceived threat¹³ facilitating a willingness to adopt required changes of behavior.

The need to educate travelers to endemic areas about leishmaniasis and effective preventive measures has been strongly emphasized.² Twenty-seven of 58

interviewed travelers (47%) had not heard of leishmaniasis, despite the fact that 17 of them had received health advice prior to their trip. Knowledge of the disease and compliance with preventive measures was poor. Consequently, all lesions of 63% of the patients had developed on areas that could have been protected by appropriate clothing. Knowledge of the appearance of the sandfly seems equally poor.⁷ Caumes et al.¹⁴ concluded their study on dermatoses related to travel by strongly suggesting that "travelers to tropical countries need to be informed of the risk of acquiring ... cutaneous leishmaniasis" (p. 547).

It is important to ascertain tourists' knowledge of leishmaniasis and their behavior in relation to preventive measures for the following reasons:

- (1) Some of the travelers could develop the mucosal stage of the disease with potential tissue destruction in the nose and mouth and possible disfigurement.
- (2) Infected travelers could infect others. Possible additional, even though very rare, modes of transmission such as blood-transfusions,¹⁵ liver transplantation,¹⁰ needle sharing, laboratory accidents, congenital transmission, sexual transmission, and theoretically possible person-to-person transmission via infected fluids have been discussed.¹
- (3) Some cutaneous leishmaniasis seem to be able to cause visceral leishmaniasis,^{16,17} a serious disease involving organs leading to a high mortality if untreated,⁵ particularly in human immunodeficiency virus-positive patients.⁶
- (4) Generally, vectorborne infections can be spread by infected individuals who move into areas where the vector is present but is not yet infected. This also applies to leishmaniasis.^{16,18} As a result, in addition to local travelers, tourists could also contribute to the spread of the parasite. Local people in endemic areas are often poor, without access to the expensive treatment. Untreated primary infections, however, have a higher rate of developing into the mucosal stage. Hence, a moral responsibility emerges for tourism, even if one argues that considering the complex nature of the disease and the various factors influencing the transmission, tourists play a minor role.

Methods

The aim of this study, which took place in the city of Cusco and the Reserved Zone of Manu National Park in Peru, was to describe the knowledge and behavior of tourists booked on a tour to Manu in relation to leishmaniasis and its prevention. The purpose of this study was fourfold: (1) to ascertain tourists' knowledge about cutaneous leishmaniasis, and the source and type of travel health advice received before embarking on this

specific tour; (2) to assess the usefulness of the content of an information leaflet on leishmaniasis and its prevention; (3) to examine if tourists' preventive behavior changed after receiving this information and if those tourists who had received information believed that their behavior had been influenced by the leaflet; and (4) to investigate if any of the participants contacted approximately 12 months after their trip had contracted leishmaniasis during their stay.

The following hypothesis was tested: There is a difference in preventive behavior between those tourists booked on a tour to Manu National Park who have received an information leaflet pertinent to leishmaniasis and those tourists who have not received this information.

Design of the Study

In this experimental study the main outcome measure was the proportion of tourists implementing preventive measures during their visit to the national park. A 15% difference between experimental and control group would be detected with a power of 0.8 and on a significance level of .05 by recruiting at least 100 tourists in each group. To prevent foreseeable interaction within the tours, one tour operator was selected at random whose clients constituted the control group, that is the group without the information leaflet. The clients of the second tour operator constituted the experimental group. Only English-speaking clients were approached. The first purpose of the study was met by both groups completing questionnaire I in Cusco after the briefing session the day before the trip. After that, a leaflet on leishmaniasis and its prevention was distributed to the intervention group to allow them to read the leaflet before reaching Manu and to implement the required preventive measures if they decided to do so. Questionnaire II was distributed at the end of the stay in Manu National Park. This questionnaire covered purposes two and three of the study.

Development of Questionnaires

Questionnaire I covered areas of previous travel, travel health advice sought and received, and advice/knowledge on leishmaniasis. Questionnaire II covered preventive behavior and, in the experimental group, content and usefulness of the leaflet. Open and closed questions were used. Additionally, participants were asked to leave contact details if they could be contacted again approximately 12 months after the study. Face validity of the questionnaires had been established. Conventional reliability tests could not be employed because the tourists are not available for a longer period of time as would be required for a test-retest, or because no other questionnaire covering the topic seemed to be available to allow a parallel-form-test.

Development of Leaflet

The first draft of the leaflet included a description of the disease, preventive measures, and a map indicating endemic areas. It was designed to give information but also to consider the tour operators' concern that it be not too frightening and possibly damaging for business. This draft was given to university staff with and without medical background for comment. After modifying the draft accordingly, the leaflet was tested on passengers leaving from Townsville airport. No further changes were necessary.

Data Collection

The study had been approved by the James Cook University Ethics Committee and was conducted in strict adherence to the guidelines in relation to the protection of subjects and data handling. The tour operators approached had expressed their interest in participating in the study. It was acknowledged that they might be concerned that tourists booked on a tour may cancel when they hear of a disease endemic in the destination area. The carefully designed questionnaires and leaflets considered this concern and the tour operators were shown the material before use.

In April/May 1999, a pilot study was conducted on location. No modifications to study design and tools were necessary, and a four-colour version of the leaflet was produced. At the commencement of the main data collection in August 1999, the researcher joined one trip each, per operator, as a participating client. Both operators organize briefings before the tours. After the briefing, the first questionnaire was distributed. In the intervention group, the information leaflet was then handed out after the collection of the completed questionnaires. The copies of the second questionnaire were given to the tour guides to distribute at the beginning of the return trip to Cusco, that is, either at the airstrip of Boca Manu while waiting for the plane, or on the truck returning to Cusco. After the researcher's departure from the study area, the questionnaires were handled by the staff of the operators. The completed questionnaires were collected by the guides, returned to the agencies' offices and sent to the researcher by mail. This data collection lasted until December 2000.

The author first joined tourists in the control group on an all-camping tour of 6 nights/7 days. The group consisted of seven international clients (plus the local guide, cook, boatman, and helper). In order to place the study in context, observations of the campsites, the treks, and the tourists' behavior in relation to the prevention of insect bites were made and documented in photos. On this trip, the opportunity arose to interview a health professional at Boca Manu Health Centre who confirmed that *L. braziliensis* was indeed endemic in the area

and patients were seen at the health center. The second field trip was made with clients of the intervention group. The 8 nights/9 days camping/lodging tour was joined by nine international clients (plus the local guide and three staff). Similar to the first trip, observations were made and photos were taken.

An additional aspect which depended on the cooperation of the participants was to ascertain if they had developed leishmaniasis after their trip. To answer this question, clients who volunteered a contact E-mail address were approached approximately 12 months after the trip. Findings of this follow-up will be presented in due time.

Results

Observations

It was of particular interest to observe how close people came to possible breeding sites of the *Lutzomyia* sandfly. In both groups, tents were erected very close to bushes and trees. Walks through the forest, particularly at night, obviously lead to tourists brushing along shrubs, bushes, and trees therefore, easily disturbing resting insects. Equally interesting was to see how tourists used preventive measures such as repellent and appropriate clothing. Generally, repellent was used often and generously with most wearing single, some double layered, appropriate clothing. Of concern was that momentarily exposed untreated skin, such as females' buttocks during "pee-breaks," was in some cases very severely attacked and bitten.

Questionnaires

Previsit. Overall, 373 tourists completed both questionnaires (experimental: $n = 173$; control: $n = 200$). The sample's demographic data are presented in Table 1.

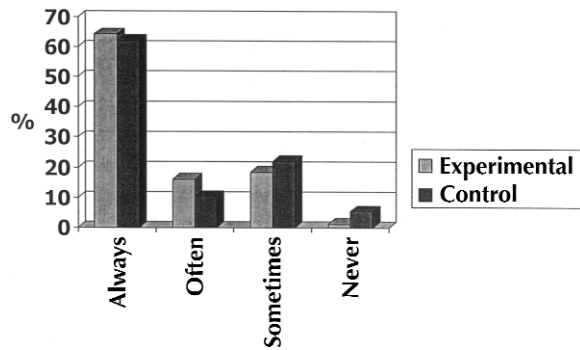


Figure 1 Seeks travel health advice.

Travel health advice seeking behavior. Figure 1 presents the findings on the subjects' usual travel health advice seeking behavior. Few people went on this specific trip without health advice. In the experimental group, 170 (98.3%) had received advice, 3 (1.7%) not, compared with 190 (95%) with advice and 10 (5%) without in the control group. The reasons why advice was not sought were being a health professional (2); doesn't get sick (5); had no time (1); too expensive (1); didn't know where to go (1); and other (6) (multiple responses). Interestingly, one person who claimed to never seek advice because he does not get sick, reported having been infected with leishmaniasis some 10 years ago in Brazil.

Advice on leishmaniasis. Since the tourists were traveling to an endemic area, it was important to ascertain if the advice received included leishmaniasis. The vast majority had not received this advice (experimental, $n = 170$: 157, 92.4%; control, $n = 198$: 187, 94.5%) (Fig. 2). Unfortunately, not all of those who had heard about the disease offered correct information. Some confused leishmania-

Table 1 Demographic Data

		Experimental ($n = 173$)		Control ($n = 200$)	
		<i>n</i>	%	<i>n</i>	%
Gender	Female	83	48.0	107	53.5
	Male	90	52.0	93	46.5
Age (mean, years)		38		36	
Occupation	Doctor	6	3.6	11	5.5
	Nurse	8	4.7	1	0.5
	Other health professional	5	3.0	6	3.1
	Veterinarian	—	—	6	3.1
	Biologist	4	2.4	—	—
	Other scientist	4	2.4	7	3.6
	Other occupation	142	84.0	165	84.2
First visit to Manu	Yes	172	99.4	199	99.5
Visited other tropical rainforests in Central or South America	Yes	59	34.1	45	22.5
Nights spent in Manu	Mean	6.5		6	
	Mode	8		6	

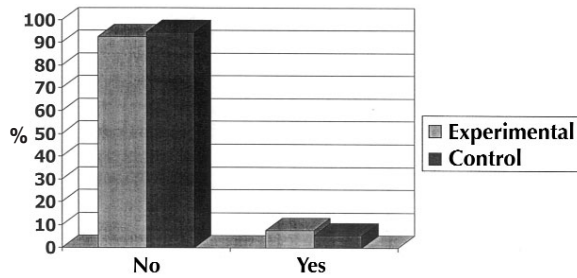


Figure 2 Received advice on leishmaniasis.

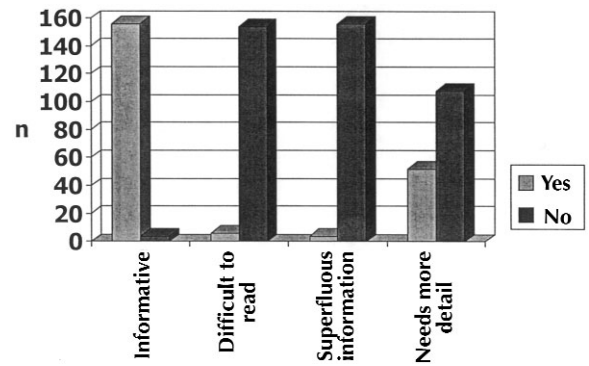


Figure 3 Assessment of leaflet (n = 160).

sis with Chagas' disease or schistosomiasis. Some preventive measures suggested were staying away from sandbanks, not walking barefoot, drinking clean water, and eating cooked food. Interestingly, of those who had heard about the disease, there was no significant difference between (a) doctors, health professionals, scientists and (b) all other occupations in relation to the accuracy of their knowledge on disease and prevention. The majority of narrative accounts in relation to travel health advice centered generally on dissatisfaction with inconsistent advice and on the lack of inclusion of leishmaniasis.

Postvisit. Information leaflet. After the trip, clients in the experimental group were asked about the information leaflet. The majority (160, 92.5%) had read the leaflet. Thirteen (7.5%) had not read it and their reasons were (multiple responses) did not appeal (2); did not want to know (1); not interested (1); no time (6); lost it (1); knows about leishmaniasis (1); other (3; 2 forgot, 1 planned to read it later). The assessment of the leaflet by those who read it is displayed in Figure 3. Most of the additional comments made were suggestions for the inclusion of more information. Although these accounts were copious, the major topics were much more detail on the disease (symptoms, treatment, prognosis), risk of infection, and photos of the ulcer.

Participants noted that they had no idea of the disease before reading the leaflet (e.g., "knew nothing about it before that leaflet," "had no previous knowledge," "I had never heard of it till now, why isn't it included in trop-

ical health manuals yet?" "never heard of it") and that they wished they had the information before the trip (e.g., "it would have been nice to know before the trip," "should know before arrival," "would have been good to know before we arrived here in Peru.")

The respondents felt the best place to distribute this leaflet was the tour operator (87, 56.9%), general practitioner/family doctor (75, 49%), the travel agent (72, 47.1%), other locations, for example the Internet or a travel clinic (46, 30.1%), and at the airport (19, 12.4%) (multiple responses, n = 153).

Preventive measures. The main purpose of this study was to assess if information changed people's preventive measures. The claim of 65 tourists (40.1%, n = 162) that the leaflet made them pay more attention to prevention, did not translate into a significant difference in measures being taken between the groups. Preventive measures taken by the experimental group: yes (166, 98.2%), no (3, 1.8%); by the control group: yes (195, 97.5%), no (5, 2.5%). A comparison of measures taken can be seen in Table 2.

"Other" measures were, for example, eating lemon, vitamin B or garlic; wearing dark clothes; staying in water (river); keeping the tent closed; not to sit down; using mozzy coils. Those who chose not to take measures did so because they did not worry about insects (1); found there was little chance to get ill (1); were only there for a few days (2); it was too hot to wear appropriate clothes

Table 2 Preventive Measures Taken (Multiple Responses Possible)

Measures	Experimental Group (166 Valid Respondents)			Control Group (194 Valid Respondents)		
	Responses	% of Responses	% of Respondents	Responses	% of Responses	% of Respondents
Repellent	164	34.7	98.8	189	38.8	97.4
Mosquito net	131	27.7	78.9	112	23.0	57.7
Protective clothes	163	34.5	98.2	178	36.6	91.8
Other	15	3.2	9.0	8	1.6	4.1
Total	473	100.0	284.9	487	100.0	251.0

(1); did not know the danger (1); did not know sandflies (1); read the information only at the end of the trip (1).

However, despite most people employing appropriate measures, insects still attacked successfully. Some of the comments: “we got bitten lots anyway, don’t seem to be deterred by DEET,” “despite repellent still not successful,” “none of the suggested counter measures seemed effective...undeterred by DEET,” “attacked very badly,” “very difficult to be vigilant for a long period of days in hot and humid conditions,” “managed to bite through clothes and repellent anyway,” “still got bitten,” “many times bitten,” “I got eaten alive,” “virtually impossible not to get some bites,” “repellent does not seem to work, even 100% DEET,” “I had a zillion of bites.”

Discussion

Few of the participants in this study arrived at Manu National Park without having sought travel health advice. However, the vast majority reported not being advised about leishmaniasis despite traveling to an endemic area. Although one might argue that travelers to Peru may not necessarily visit the jungle, the disease does occur in other areas of the country, albeit another parasite species. Also, tourists may only decide to go to the rainforest once they see the tours advertised in Cusco. Cusco, after all, is on the itinerary of most Peru-travelers.

Although the question about leishmaniasis being included in the travel advice was explicitly clear, it must be concluded from the responses that some people answered “yes” if they ever heard of the disease. However, even in that case, incorrect information recalled on disease and prevention is, similar to previous research,^{2,7} of concern. Likewise it is of concern that anything flying that cannot be identified as a mosquito is called a sandfly. If there was an insect on sand it was a sandfly—hence the emphasis of many to stay away from sandy riverbanks.

Generally, the information leaflet was very well received, particularly since the content was new to most. Although people assessing the leaflet during the development phase were happy with the amount of detail given, actual tourists to the endemic region turned out to be much more interested in further details. A healthy balance will need to be found here to inform sufficiently but not to scare. However, it has become clear that consumers want to be informed so that they can make their own decisions. Whereas it seems that the tourism industry generally prefers not to mention health issues too extensively to prevent a loss of business, and a similar concern by tour operators is understandable, one must remember that, even when it is about a well publicized and potentially fatal disease such as malaria, tourists do not cancel their trips (nor do many seem overly concerned

about prophylaxis). Furthermore, some of the disclaimers that tourists have to sign before embarking on certain tours (e.g., scuba-diving) are much more frightening. Also, from a legal point of view, an honest disclosure of important information is very advisable. It is argued here that a closer and more positive collaboration between health professionals and the tourism industry could go a long way in ensuring healthy travelers and healthy business.

Although the information given was very welcome, it did not make any difference in people’s prevention of bites. This may seem surprising or disappointing. However, only by having been on location personally can these results be interpreted in context. The reason for preventive measures being taken despite the uncomfortable heat and humidity was the, at the time, enormous discomfort from biting insects, not because health advice suggested these measures or for fear of arthropodborne illnesses. One could now argue that even if discomfort alone triggers correct behavior, this may be seen as good enough as long as it helps to protect people against an arthropodborne disease. However, there are times throughout the year with fewer insects attacking. This could put uninformed travelers at risk.

More than one-third of the participants claimed to have paid even more attention to protection after reading the information. Although this did not affect the practical outcome in terms of preventive measures, having received the correct advice is still valuable. It does provide a rationale for the suggested protection. Additionally, this knowledge may help a returning traveler remember to alert a physician to the possibility of an infection. Recently, the appearance of eyelid lesions has been described in Brazil.¹⁹ The point was made that these lesions may be seen more often with the increase in ecotourism and that they may pose diagnostic problems since lesions on eyelids are uncommon in the Americas. Although the leaflet used in the present study does not elaborate on ulcer location, the content would be sufficient to allow a traveler to prompt a health professional.

Much further research is necessary to study the impact of health education on tourists’ preventive behavior in general, and specifically in relation to prevention of arthropod bites. The possible change in insect biting patterns throughout the year should be considered and incorporated in a replication of this study. It may also be time to revisit the issue of the use of currently available repellents and their efficacy, highlighted in the problem of receiving multiple bites despite considering the current advice on prevention.

Conclusion

Supporting previous research,^{2,14} this study suggests that correct and complete information on leishmaniasis

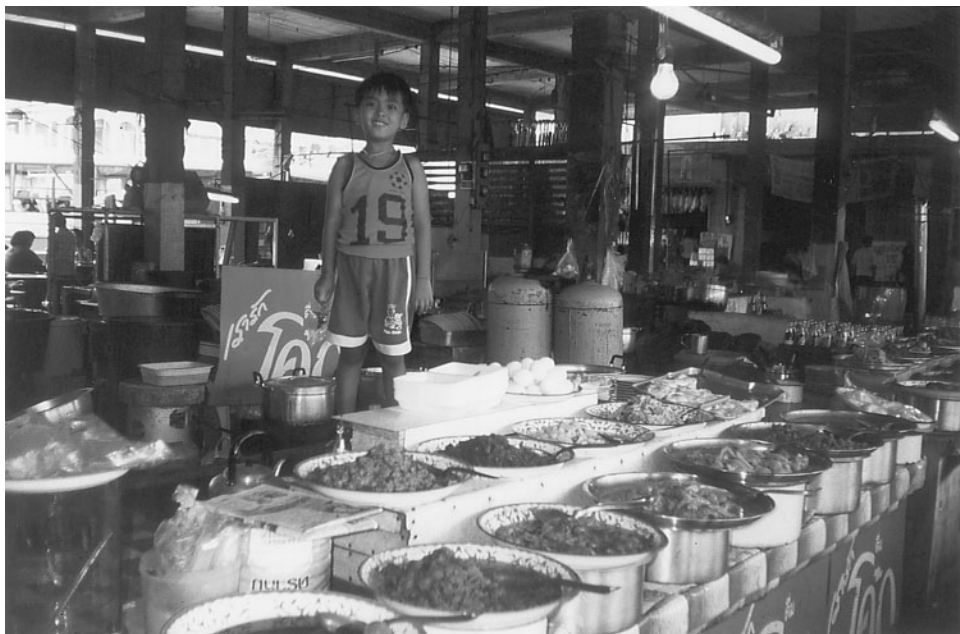
should be included in the travel health advice for travelers to endemic areas to make them aware of the condition and the preventive measures. This will also allow returning travelers to alert their physician to the possibility of an infection.

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Food market at the bus station in Surat Thani, South Thailand. Submitted by Danielle Gyurech, MD, and Julian Schilling, MD.