Illnesses in Travelers Returning from the Tropics: A Prospective Study of 622 Patients

Séverine Ansart, Lucia Perez, Olivier Vergely, Martin Danis, François Bricaire, and Eric Caumes

Background: Although between 8 and 19% of travelers consult a doctor after returning from the tropics, the full spectrum of health complaints is unknown.

Methods: We analyzed the relative frequency of travel-associated health complaints in all travelers (immigrants returning from visiting their home countries, expatriates, business travelers, and tourists) consulting our department between November 2002 and May 2003.

Results: A total of 622 patients were studied (256 women, 366 men; median age 38 yr; 45.3% tourists, 33.8% immigrants, 14.1% expatriates, 6.7% business travelers). The median duration of travel was 36.9 days. The main destinations were Africa (57.6%) and Asia (26.4%). A total of 637 diseases were diagnosed, distributed as follows: skin diseases (23.4%), gastrointestinal infections (19.1%), respiratory tract infections (11.5%), malaria (8.8%), schistosomiasis (7.2%), viral hepatitis (4.1%), urinary tract infections (3.5%), sexually transmitted infections (3.5%), tuberculosis (2.7%), dengue fever (2.5%), and others (13.8%). Malaria and intestinal tract infections accounted for 21% and 23% of diagnoses in the 257 febrile travelers, respectively. Overall, 230 diagnoses (36.1%) corresponded to imported tropical diseases, the main imported diseases being malaria, schistosomiasis, amebiasis, gastrointestinal disorders caused by intestinal nematodes, and dengue fever.

Conclusions: Tropical diseases are not the leading cause of consultation in travelers returning from the tropics. Immigrants are the travelers most at risk of common tropical diseases, with the noteworthy exceptions of dengue fever and invasive schistosomiasis.

Each year about 50 million people travel from industrialized countries to developing countries.[1] Although 8 to 19% of international travelers consult a doctor after returning home,[2–5] the full spectrum of their health complaints is unknown.

Most relevant studies focus on tropical diseases such as malaria,[6] schistosomiasis,[7] and cutaneous leishmaniasis.[8] However, more general studies of health impairments in travelers returning from tropical countries, such as fever,[9,10] skin diseases,[11] respiratory tract infections,[12,13] and urinary tract infections,[14] show that cosmopolitan diseases must also be considered.

Séverine Ansart, MD, Lucia Perez, MD, Olivier Vergely, MD, Martin Danis, MD, François Bricaire, MD, Eric Caumes, MD: Département des maladies infectieuses et tropicales, de Parasitologie-Mycologie, Hôpital Pitié-Salpétrière, Paris, France.

Reprint requests: *Eric Caumes, MD,* Département des maladies infectieuses et tropicales, Hôpital de la Pitié-Salpétrière, 47–83 Boulevard de L'Hôpital, 75013, Paris, France.

In this prospective, descriptive study, we analyzed the reasons why travelers returning from the tropics consulted our tropical diseases unit.

Patients and Methods

All adult patients consulting our tropical diseases unit in Paris, France, from November 1, 2002, to May 31, 2003, were prospectively included in this study if they presented with a disease that had occurred during travel or < 3 months after their return from a tropical country. Children < 15 years old were not included given the absence of pediatricians in our hospital. We studied the following epidemiologic data: age, sex, travel category (immigrants, expatriates, tourists, business travelers), travel history (destination, and duration), vaccination coverage, health advice taken before exposure, and malaria prophylaxis. Travel destinations were classified according to the tropical region visited, as follows: Latin America, the Caribbean (including the French West Indies), Central Asia, the Indian Subcontinent, Southeast Asia, Africa, and Oceania.

Foreign-born residents living in France and returning from their home countries (or a neighboring country) after visits to friends and relatives were defined as

immigrant VFRs. Immigrants who were not living in France and just arrived for immigration were not included. Expatriates were defined as French-born persons living in the same tropical country for more than 6 months. Business travelers were defined as French-born persons working for a short time in a tropical country. Tourists were defined as French-born persons visiting at least one tropical country, whatever the duration of travel.

The intervals between return and presentation to our unit and between return and clinical onset were taken into account in each case. Final diagnoses were made by the two clinical specialists in infectious and tropical diseases (S.A. and E.C.), who examined the patients. Infectious diseases were diagnosed by seroconversion or presence of immunoglobulin M for an infectious agent compatible with the clinical manifestations. If no specific pathogen was identified, the diagnosis was based on epidemiologic, clinical, and biologic grounds and response to an appropriate treatment. Diarrhea was defined by at least three unformed stools daily. Dysentery was defined as acute febrile bloody or mucous diarrhea. Bacterial dysentery was defined as nonamebic dysentery that responded to antibiotics. Chronic diarrhea was defined as diarrhea lasting more than 3 weeks. Viral hepatitis included hepatitis A virus (HAV), hepatitis E virus, hepatitis C virus, and hepatitis B virus infections. Other multisystemic viral infections with hepatic involvement such as Epstein-Barr virus, cytomegalovirus, and parvovirus B 19 were defined as "viral disease." Upper respiratory tract infections included otitis, sinusitis, and sore throat. Bacterial pneumonia was defined as a combination of abnormal chest radiograph findings, respiratory symptoms, and fever that responded to antibiotics. Influenza-like illness was defined as a cough or sore throat associated with fever, chills, or myalgias. Eosinophilic pneumonitis was defined as a combination of interstitial pneumonia and eosinophilia in blood (> 750 eosinophils/mm^3) or in bronchoalveolar lavage. Acute schistosomiasis was defined as a syndrome associating fever, respiratory symptoms, pruritus or urticaria, and eosinophilia occurring in an exposed person. It was confirmed either by seroconversion for schistosomiasis or the appearance of Schistosoma eggs in the stools or urine during follow-up. Regarding tuberculosis (TB), only clinically apparent TB was included. Sexually transmitted diseases were defined as sexually transmitted infections with genital involvement (hepatitis and multisystemic infections excluded).

The relative frequency of the diseases and their associations with demographic (age, sex, traveler's status) and travel characteristics (destination) were analyzed with SPSS software version 9.0 (Statistical Software Inc). The statistical significance of differences in dichoto-

mous variables was determined by using chi-square tests. The statistical significance of differences among continuous variables was determined by using t-test. The α risk was set at 5% (two tailed).

Results

Six hundred eighty-four travelers consulted our department during the 6-month study period. Sixty-two subjects were excluded because they consulted either for medical advice or for fear of contracting a contagious disease such as severe acute respiratory syndrome.

The 622 patients included in the study were composed of 256 women and 366 men (male-to-female ratio: 1.43). They consisted of 282 tourists (45.3%), 210 immigrant VFRs (33.8%), 88 expatriates (14.1%), and 42 business travelers (6.8%). Their median age was 38 years (15–76 yr). The following regions were visited: Africa ($n = 358$, 57.6%), Central Asia/Indian Subcontinent ($n = 92$, 14.8%), Southeast Asia ($n = 72$, 11.6%), Latin America ($n = 46$, 7.4%), the Caribbean ($n = 34$, 5.5%), and Oceania ($n = 20$, 3.2%). The median duration of travel was 36.9 days (1–1,095 d). Of the 473 travelers for whom this information was available, 284 (60%) had received medical advice before travel. It was provided by specialists in travel medicine in 125 cases (44%), general practitioners in 98 cases (34.5%), travel agencies in 37 cases (13.0%), and telephone correspondents in 24 cases (8.5%). Two-thirds of our patients were referred to our unit by their general practitioner.

The median interval between return and presentation to our unit was 26.9 days (1–120 d). Four hundred seventy-nine travelers (77%) consulted within 2 weeks after their return. Symptoms started during travel in 236 patients (38%). In the remaining 386 patients, the median interval between return and clinical onset was 21.7 days (1–92 d).

The 622 patients had a total of 637 diagnoses (15 patients had two diagnoses; Table 1). The main diseases were skin diseases (23.4%), intestinal tract infections (19.1%; Table 2), respiratory tract infections (11.5%; Table 3), malaria (8.8%), schistosomiasis (7.2%), hepatitis (4.1%), urinary tract infections (3.5%), and sexually transmitted diseases (3.5%).

Among the 272 febrile patients, the cause of the fever remained unknown in 15 patients whereas an illness was diagnosed in 257 patients (Table 4). The main diagnoses were intestinal and hepatic infections (23%); malaria (21%); infections of the respiratory tract (15.9%), skin (12%), and urinary tract (8.6%); dengue fever (6.2%); TB (4.7%); acute viral infection (Epstein-Barr virus, cytomegalovirus, parvovirus B 19; 4.3%); acute HAV infection (1.9%); invasive schistosomiasis (1.6%); tick-borne rickettsioses (1.2%); and brucellosis and primary

Table 1 Diseases Diagnosed in 622 Travelers Returning from the Tropics

Diseases	Immigrants (n = 210)	Expatriates (n = 88)	Business (n = 42)	Tourists (n = 282)	Total (N = 622)
Skin diseases	51 (8%)	23 (3.6%)	9 (1.4%)	66 (10.4%)	149 (23.4%)
GI diseases*	16 (2.5%)	24 (3.8%)	14 (2.2%)	68 (10.7%)	122 (19.1%)
Respiratory diseases†	18 (2.8%)	0 (0%)	4 (0.6%)	51 (8.0%)	73 (11.5%)
Malaria	22 (3.5%)	16 (2.5%)	6 (0.9%)	12 (1.9%)	56 (8.8%)
Plasmodium falciparum	16	4	4	12	36
Plasmodium ovale	2	2	0	0	4
Plasmodium vivax	4	8	2	0	14
Subacute	0	2	0	0	2
Schistosomiasis	35 (5.5%)	4 (0.6%)	1 (0.2%)	6 (0.9%)	46 (7.2%)
Intestinal*	17	2	1	1	21
Urinary	18	2	0	0	20
Invasive	0	0	0	4	4
Late cutaneous	0	0	0	1	1
Viral hepatitis	19 (3.0%)	3 (0.5%)	0 (0%)	4 (0.6%)	26 (4.1%)
Urinary tract infections	4 (0.6%)	2 (0.3%)	2 (0.3%)	14 (2.2%)	22 (3.5%)
STDs	12 (1.9%)	2 (0.3%)	1 (0.2%)	7 (1.1%)	22 (3.4%)
Tuberculosis	15 (2.4%)	0 (0%)	0 (0%)	2 (0.3%)	17 (2.7%)
Dengue fever	0 (0%)	4 (0.6%)	4 (0.6%)	8 (1.3%)	16 (2.5%)
Others‡	30 (4.7%)	10 (1.6%)	2 (0.3%)	46 (7.2%)	88 (13.8%)
Total	222	88	43	284	637

GI = gastrointestinal; STDs = sexually transmitted diseases.
*See Table 2.
†See Table 3.
‡Other diseases include rheumatism (n = 13), viral disease (n = 11) including 3 herpes zoster and 3 herpes, psychiatric disorders (n = 9), human immunodeficiency virus infection (n = 8), thrombosis (n = 5), adverse drug reactions (n = 5), ciguatera (n = 5), gnathostomiasis (n = 3), kidney or urinary lithiasis (n = 2), and miscellaneous (n = 27).

Table 2 GI Diseases According to Clinical Presentation in 143 Travelers Returning from the Tropics

Disease	Immigrants (n = 18)	Expatriates (n = 26)	Business (n = 15)	Tourists (n = 69)	Total (n = 143)
Acute diarrhea	4	10	11	53	78
Bacterial dysentery	2	2	8	38	50
Salmonellosis	0	1	1	6	8
Shigellosis	0	0	1	5	6
No pathogen identified	2	1	6	27	36
Amebiasis	2	6	2	10	20
Giardiasis	0	2	1	5	8
Chronic GI problem	29	16	4	16	65
Intestinal nematodiasis	10	4	3	11	28
Intestinal schistosomiasis	17	2	1	1	21
Irritable bowel syndrome	2	10	0	4	16

GI = gastrointestinal.

Table 3 Respiratory Tract Diseases Observed in 73 Travelers Returning from the Tropics

Disease	Immigrants (n = 18)	Business (n = 4)	Tourists (n = 51)	Total (n = 73)
Specific				
Eosinophilic pneumonia	2	0	6	8
Pertussis	0	0	1	1
Undetermined				
URTIs	10	2	14	26
Acute pneumonia	4	0	20	24
Influenza-like illness	2	2	10	14

URTIs = upper respiratory tract infections (ear, nose, and throat infections).

human immunodeficiency virus (HIV) infection (0.8% each). Among febrile patients, malaria was more common in immigrant VFRs and expatriates ($p < .0001$ for each), and respiratory and urinary tract infections were more common in tourists ($p < .0001$ and $p = .02$, respectively). Malaria was associated with travel in Africa ($p = .001$), whereas dengue fever was associated with travel in Asia ($p = .001$). In the 54 patients diagnosed with acute malaria, chemoprophylaxis was taken in 35 cases (64.8%) but was inadequate (in term of compliance, duration after return, or choice of treatment) in 26 cases (74.3%). Regarding the other preventable disease (specifically HAV), data on vaccination coverage was available in 194 patients (31.2%) only. Nonetheless, none of the patients diagnosed with HAV had been vaccinated.

One hundred forty-nine patients presented with skin disease (excluding 4 cases of rash among the 16 patients diagnosed with dengue fever). The main diagnoses were infectious cellulitis ($n = 21$; 14.1% of skin diseases), scabies ($n = 17$; 11.4%), pruritus ($n = 15$; 10.1%), and pyoderma ($n = 14$; 9.4%). The other skin diseases were

myiasis ($n = 12$), dermatophytosis ($n = 10$), filariasis ($n = 9$), cutaneous larva migrans ($n = 8$), urticaria ($n = 8$), tungiasis ($n = 7$), eczema ($n = 6$), leprosy ($n = 4$), herpes zoster ($n = 3$), herpes simplex ($n = 3$), and various noninfectious dermatoses ($n = 12$).

Seventy-eight patients presented with acute diarrhea, including 50 patients (64.1%) with dysentery. The main diagnoses were amebiasis ($n = 20$; 26%), salmonellosis ($n = 8$; 10%), giardiasis ($n = 8$, 10%) and shigellosis ($n = 6$; 8%); no microbial pathogen was identified in the remaining 36 (46%) patients.

Other common diagnoses and presenting symptoms included rheumatic complaints (2%), psychiatric disorders (1.4%), ciguatera (0.8%), and adverse drug reactions (0.8%).

Overall, 230 diagnoses (36.1%) corresponded to imported tropical diseases. The main imported diseases were malaria, schistosomiasis, gastrointestinal infections owing to intestinal nematodes, amebiasis, and dengue fever (Table 5).

Regarding the most common diseases ($n > 16$), significant associations were found between the status of the travelers and some specific diseases (Table 6). There was no significant relation found between these specific diseases and age or sex (data not shown). Immigrant VFRs were more likely to consult for intestinal schistosomiasis (odds ratio [OR] = 8.5), urinary schistosomiasis (OR = 18.2), TB (OR = 14.9), and viral hepatitis (OR = 5.4). In contrast, tourists were more prone to consult for bacterial dysentery (OR = 4.3) and acute pneumonia (OR = 6.6), whereas business travelers consulted more often for bacterial dysentery (OR = 3) and dengue fever (OR = 4.9).

Discussion

To our knowledge, this is the first prospective study specifically designed to evaluate exhaustively the spec-

Table 4 Diseases Diagnosed in 257 Febrile Travelers Returning from the Tropics

Disease	Total
Enteric and liver	59 (23%)
Bacterial dysentery	50
Hepatitis A	5
Amebiasis	4
Malaria	54 (21%)*
Plasmodium falciparum	36
Plasmodium ovale	4
Plasmodium vivax	14
Respiratory tract	41 (15.9%)
URTIs	6
Pneumonia	20
Influenza-like illness	10
Eosinophilic pneumonitis	5
Skin	31 (12%)
Infectious cellulitis	20
Pyoderma	8
Herpes, herpes zoster	3
Urinary tract	22 (8.6%)
Pyelonephritis	13
Prostatis	9
Dengue fever	16 (6.2%)
Tuberculosis	12 (4.7%)
Viral disease†	11 (4.3%)
Invasive schistosomiasis	4 (1.6%)
Rickettsiosis	3 (1.2%)
Primary HIV infection	2 (0.8)
Brucellosis	2 (0.8%)
Total	257

HIV = human immunodeficiency virus; URTIs = upper respiratory tract infections (ear, nose, and throat infections).
*Two patients with subacute forms of malaria were not febrile.
†Viral diseases include infection by Epstein-Barr virus, cytomegalovirus, and parvovirus 19.

Table 5 Tropical Diseases Diagnosed in 622 Travelers

Disease	Total
Malaria	56 (24.3%)
Schistosomiasis	46 (20%)
Intestinal nematodiasis	28 (12.2%)
Amebiasis	20 (8.7%)
Dengue fever	16 (7.0%)
Myiasis	12 (5.2%)
Filariasis	9 (3.9%)
Cutaneous larva migrans	8 (3.5%)
Giardiasis	8 (3.5%)
Eosinophilic pneumonitis	8 (3.5%)
Tungiasis	7 (3%)
Leprosy	4 (1.7%)
Ciguatera	5 (2.2%)
Gnathostomiasis	3 (1.3%)

Table 6 Association between the Most Frequent Diseases and the Traveler's Status*

	Odds Ratio (95% CI)			
Disease (n > 16)	Immigrant vs Other	Expatriate vs Other	Business vs Other	Tourist vs Other
Malaria	1.23 (0.68–2.24)	2.83 (1.43–5.53)	0.31 (0.15–0.62)	1.76 (0.64–4.64)
Bacterial dysentery	0.07 (0.01–0.30)	0.24 (0.04–1.04)	3 (1.20–7.29)	4.39 (2.16–9.08)
Acute pneumonia	0.36 (0.10–1.14)	0 (0–1.26)	0 (0–2.84)	6.6 (2.10–23.12)
Intestinal schistosomiasis	8.52 (2.65–30.34)	0.65 (0.10–2.96)	0.68 (0.03–5.00)	0.06 (0–0.42)
Urinary schistosomiasis	18.22 (4.02–114.75)	0.69 (0.11–3.15)	0 (0–3.46)	0 (0–0.30)
Amebiasis	0.20 (0.03–0.91)	2.80 (0.93–8.06)	1.56 (0–7.36)	1.25 (0.47–3.30)
Tuberculosis	14.96 (3.24–95.61)	0 (0–1.83)	0 (0–4.13)	0.16 (0.03–0.74)
Dengue fever	0 (0–0.58)	2.13 (0.57–7.34)	4.97 (1.29–17.71)	1.25 (0.42–3.71)
STDs	2.31 (0.92–5.88)	0.62 (0.10–2.79)	0.65 (0.03–4.73)	0.57 (0.21–1.51)
Urinary tract	0.40 (0.11–1.29)	0.62 (0.10–2.79)	1.38 (0.33–5.72)	2.24 (0.86–5.91)
Viral hepatitis	5.46 (2.13–14.54)	0.81 (0.19–2.91)	0 (0–2.60)	0.21 (0.06–0.67)

STDs = sexually transmitted diseases.
*As determined by univariate analysis.

trum of health problems in outpatients occurring within 3 months after return from the tropics to an industrialized country. It is noteworthy that previous studies performed in returning travelers were biased by a selective, generally retrospective approach on a specific illness or health problem, usually in hospitalized patients.

Our travelers probably do not reflect the population of all travelers or those of the Parisian population. Indeed 33.8% of our patients are immigrant VFRs. The population consulting in our unit is also biased because we are one of two referral centers for tropical diseases in Paris, especially for skin diseases, which explains the leading place of dermatoses and tropical infections in this cohort. In addition, it is important to note that this study was performed between autumn 2002 and spring 2003, a period marked by the emergence of severe acute respiratory syndrome. The syndrome and the travel warning from the World Health Organization probably led travelers to avoid Asian destinations.[15] Indeed, only 11% of our patients visited Southeast Asia, whereas travel to Africa (57%) was frequent. This choice of destinations may explain some of our results.

A large proportion of travelers consult a doctor after their return (8% of 7,767 Swiss travelers,[2] 11% of 2,109 Italian travelers,[3] 12% of 779 American travelers,[4] and 19% of 200 Israeli travelers[5]), but the spectrum of diseases is largely unknown.[1] We found that skin diseases, gastrointestinal disorders, and respiratory tract infections were the three leading reasons for seeking medical advice in our unit. Similar results were found in another setting: among 779 American travelers who self-reported their health problems, 202 (26%) reported a total of 235 illnesses after their return; diarrhea was the leading health problem (13%), followed by respiratory disorders (10%), and skin problems (3%).[4] In regard to preventable diseases, in the current study only 84 health problems

(13.2%) could have been prevented by vaccination or chemoprophylaxis.

The main causes of fever were malaria, bacterial dysentery, and cutaneous, respiratory tract, and urinary tract infections. Similarly, in an Australian study of 232 consecutive febrile travelers, malaria was the most common diagnosis (27%), followed by respiratory tract infection (24%), gastroenteritis (14%), dengue fever (8%), and pneumonia (6%).[9] Overall, in our study cosmopolitan infections involving the skin and the respiratory, gastrointestinal, and urinary tracts (especially in women) were more frequent than imported tropical diseases. As previously underlined, such infections must not be overlooked when examining a patient returning from the tropics.[14,16]

We found that imported tropical diseases accounted for 36.1% of the diagnoses in our travel cohort: malaria, schistosomiasis, intestinal nematodiasis, amebiasis, and dengue fever were the most frequent. Chronic intestinal and urinary schistosomiases were a more frequent cause of health impairment in immigrant VFRs than in other categories of traveler (see Table 6), but this was more likely to be related to their childhood in their country of origin than to the actual travel. In contrast, invasive schistosomiasis was diagnosed exclusively in tourists. Dengue fever was more often seen in febrile travelers returning from Asia ($p = .001$), as in a previous Australian study (OR = 13.2) and a Swedish study (OR = 4.95 for the Malay Peninsula).[9,17]

Malaria was the most frequent disease in our study and the main diagnosis in febrile immigrants and expatriates. This is surprising as the incidence of malaria was low (3.8 per 1,000 travelers) in a recent American study.[4] However, our cohort included large proportions of immigrants and travelers to Africa, and these characteristics have previously been identified as risk factors for

malaria in travelers.[2,6,9] Most cases of malaria were due to *Plasmodium falciparum* (64.3%), predominantly involving immigrant VFRs (55.5%) and travelers to Africa (79%). This is in keeping with the results of a previous French study in which 83% of 8,056 cases of imported malaria reported in 2000 were due to *P. falciparum*, and 63% of cases involved immigrants from Africa.[18]

The main causes of diarrhea were amebiasis (26%), salmonellosis (10%), and shigellosis (8%); no pathogen was identified in 46% of cases. This study was not designed to assess the causes of diarrhea in travelers returning from the tropics, and this explains why enterotoxigenic *Escherichia coli* was not identified. Otherwise, our results are in keeping with those of studies evaluating the causes of diarrhea among travelers. In one such study, analyzing 1,079 enteric pathogens identified in international travelers to Jamaica, India, and Kenya, the three leading pathogens were enterotoxigenic *Escherichia coli* (25%), *Shigella* (7%), and *Salmonella* (6%); no pathogen was identified in 53% of cases.[19] The high frequency of amebiasis may be explained by the fact that we were unable to distinguish *Entamoeba histolytica histolytica* from *E. histolytica dispar* during the period of our study (polymerase chain reaction testing was not available at that time). No other protozoa have been associated with diarrhea in our study.

Respiratory tract infections were the third most frequent diagnosis in our study. They were more common in febrile tourists ($p < .0001$) than in other categories of febrile traveler. They mainly consisted of influenza-like illness, pulmonary infections, and ear, nose, and throat infections, as was the case in a previous cohort of 1,719 travelers (64% of whom had visited Nepal) with respiratory tract infections.[12] The causes of pneumonia are multiple and varied in this setting and include not only bacterial and viral infections but also fungal infections and eosinophilic pneumonitis (related to the invasive stage of various helminthic infections).[9,13]

We diagnosed 17 cases of TB. This high frequency is explained by the large proportion of immigrants, who accounted for 15 cases of TB. Interestingly, the other two cases were diagnosed in long-term expatriates. This is in keeping with the results of a Dutch study, in which the estimated incidence rate of TB among travelers was 2.8 cases per 1,000 person-months among tourists and 9.8 cases per 1,000 person-months among expatriate healthcare workers.[20] Among immigrants, TB was diagnosed < 3 months after their last return from their country of origin. It is thus difficult to correlate TB and travel particularities (prior exposure in their country of origin or acquisition on the trip in question). Although the risk of acquiring TB while traveling in a developing country is high,[20] TB was more likely acquired during a prior exposure since it has the potential for a long incubation period. In addition, we were unable to distinguish between new infections and reactivations in immigrants. Some cases of TB were certainly reactivation because they occurred in immigrants, but a relapse was only diagnosed in two cases.

We observed eight cases (1.3%) of HIV infection. Two patients were diagnosed with a primary HIV infection secondary to unprotected sexual intercourse with locals. This result shows that travelers in endemic countries are at risk of HIV infection if they engaged in unprotected sex abroad. Similarly, in a cohort of Belgian expatriates between 1985 and 1987, the risk factors associated with HIV seroconversion were sexual contact with local women (OR = 14.7, 95% CI 2.81–76.9) or sexual contact with prostitutes (OR = 10.8, 95% CI 1.6–71.9) as well as injections by unqualified staff (OR = 13.5, 95% CI 3.7–49.8).[21] The other six patients were expatriates (*n* = 4) and immigrants (*n* = 2) who consulted in our unit for health problems and were diagnosed with chronic HIV infection. As already pointed out with chronic schistosomiasis and TB, the relationship between chronic HIV infection and the recent trip is difficult to correlate except regarding expatriates (all having lived out of France for 4 years).

Finally, we observed several emerging health impairments in travelers abroad, such as psychiatric disorders, adverse drug reactions, venous thrombosis, ciguatera, and gnathostomiasis.

In conclusion, our results suggest that tropical diseases are not the leading cause of health impairment among travelers returning from the tropics and that immigrants returning from visiting friends and relatives in their home countries are the travelers most at risk of contracting TB and common tropical diseases, with the noteworthy exceptions of dengue fever and invasive schistosomiasis.

Acknowledgments

Declaration of Interests

The authors state they have no conflicts of interest.

References

1. Ryan ET, Wilson ME, Kain CK. Illness after international travel. N Engl J Med 2002; 347:505–516.
2. Steffen R, Rickenbach M, Wilhelm U, et al. Health problems after travel to developing countries. J Infect Dis 1987; 156:84–91.
3. Bruni M, Steffen R. Impact of travel related health impairments. J Travel Med 1997; 4:61–64.

4. Hill DR. Health problems in a large cohort of Americans traveling to developing countries. J Travel Med 2000; 7:259–266.

5. Winer L, Alkan M. Incidence and precipitating factors of morbidity among Israeli travelers abroad. J Travel Med 2002; 9:227–232.

6. Schlagenhauf P, Steffen R, Loutan L. Migrants as a major risk group for imported malaria in European countries. J Travel Med 2003; 10:106–107.

7. Visser LG, Polderman AM, Stuiver PC. Outbreak of Schistosomiasis among travelers returning from Malawi, West Africa. Clin Infect Dis 1995; 20:280–285.

8. Melby PC, Kreutzer RD, McMahon-Pratt D, et al. Cutaneous leishmaniasis: review of 59 cases seen at the National Institutes of Health. Clin Infect Dis 1992; 15:924–937.

9. O'Brien D, Tobin S, Brown GV, Torresi J. Fever in returned travelers: review of hospital admissions for a 3-year period. Clin Infect Dis 2001; 33:603–609.

10. Doherty JF, Grant AD, Bryceson ADM. Fever as the presenting complaint of travellers returning from the tropics. Q J Med 1995; 88:277–281.

11. Caumes E, Carriere J, Guermonprez G, et al. Dermatoses associated with travel to tropical countries. A prospective study of diagnosis and management of 269 patients presenting to a tropical disease unit. Clin Infect Dis 1995; 20:542–548.

12. Leder K, Sundararajan V, Weld L, et al. Respiratory tract infections in travelers: a review of the Geosentinel Surveillance Network. Clin Infect Dis 2003; 36:399–406.

13. Ansart S, Pajot O, Grivois JP, et al. Pneumonias among travellers returning home. J Travel Med 2004; 11:87–91.

14. Zeller V, Didier B, Dos Santos G, et al. Upper urinary tract infection as a leading cause of fever among female travelers returning from the tropics. J Travel Med 2003; 10:139–140.

15. Centers for Disease Control and Prevention. Update: outbreak of severe acute respiratory syndrome—worldwide, 2003. MMWR Morb Mortal Wkly Rep 2003; 52:241–248.

16. Caumes E, Bricaire F. Illness after international travel. N Engl J Med 2002; 347:1984.

17. Lindback H, Lindback J, Tegnell A, et al. Dengue fever in travelers to the tropics, 1998 and 1999. Emerg Infect Dis 2003; 9:438–442.

18. Danis M, Legros F, Thellier M, Caumes E et les correspondants du réseau CNRMI. Données actuelles sur le paludisme en France métropolitaine. Med Trop 2002; 62:214–218.

19. Jiang ZD, Lowe B, Verenkar MP, et al. Prevalence of enteric pathogens among international travellers with diarrhea acquired in Kenya (Mombasa), India (Goa), or Jamaica (Montego Bay). J Infect Dis 2002; 185:497–502.

20. Cobelens FGJ, Van Deutekom H, Draayer-Jansen IWE, et al. Risk of infection with *Mycobacterium tuberculosis* in travellers to areas of high tuberculosis endemicity. Lancet 2000; 356:461–465.

21. Bonneux L, Van der Stuyft P, Taelman H, et al. Risk factors for infection with immunodeficiency virus among European expatriates in Africa. BMJ 1988; 297:581–584.