

Knowledge, Attitudes and Practices in Travel-related Infectious Diseases: The European Airport Survey

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Background: The European Travel Health Advisory Board conducted a cross-sectional pilot survey to evaluate current travel health knowledge, attitudes and practices (KAP) and to determine where travelers going to developing countries obtain travel health information, what information they receive, and what preventive travel health measures they employ. Subsequently, the questionnaire used was improved and a cross-sectional, multicenter study was undertaken in airports in Europe, Asia, South Africa and the United States. This paper describes the methods used everywhere, and results from the European airports.

Method: Between September 2002 and September 2003, 5,465 passengers residing in Europe and boarding an inter-continental flight to a developing country were surveyed at the departure gates of nine major airports in Europe. Questionnaires were self-administered, and checked for completeness and validated by trained interviewers.

Results: Although the majority of travelers (73.3%) had sought general information about their destination prior to departure, only just over half of the responders (52.1%) had sought travel health advice. Tourists and people traveling for religious reasons had sought travel health advice more often, whereas travelers visiting friends and relatives were less likely to do so. Hepatitis A was perceived as the most probable among the infectious diseases investigated, followed by HIV and hepatitis B. In spite of a generally positive attitude towards vaccines, 58.4% and 68.7% of travelers could not report any protection against hepatitis A or hepatitis B, respectively. Only one in three travelers to a destination country with at least some malaria endemicity were carrying antimalarial drugs. Almost one in four travelers visiting a high-risk area had an inaccurate risk perception and even one in two going to a no-risk destination were unnecessarily concerned about malaria.

Conclusions: The large variation in destinations, age of the travelers and reasons for traveling illustrates that traveling to a developing country has become common practice. The results of this large-scale airport survey clearly demonstrate an important educational need among those traveling to risk destinations. Initiatives to improve such education should target all groups of travelers, including business travelers, those visiting friends and relatives, and the elderly. Additionally, travel health advice providers should continue their efforts to make travelers comply with the recommended travel health advice. Our common objective is to help travelers stay healthy while abroad, and consequently to also reduce the potential importation of infectious diseases and the consequent public health and other implications.

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Introduction

Returning from abroad with an infectious disease can cause more than individual health concerns: it might also affect relatives, people with whom they have close contact, or the larger community. Prophylactic travel health measures thus do not only benefit individuals, but occasionally the public health as well. Guidance exists on which precautions are recommended for which kind of trip,¹ not only for the medical community, but also for travel agents, travelers and the general public, through travel health-related websites and guidebooks of variable quality. However, many previous (smaller) studies and field experience have shown that travelers do not always take on board the advice that is available.²⁻⁹

To determine the travelers' knowledge, attitudes and practices (KAP) on prevention of infectious diseases, in 2002 the European Travel Health Advisory Board (ETHAB)¹⁰ conducted a pilot study.⁹ This allowed us to improve the questionnaire used. Subsequently, a cross-sectional, multicenter study using this improved questionnaire was undertaken in airports in Europe, Asia, South Africa and the United States. In this contribution, we report on the methods used everywhere, and on the European results.

Methods

The study was conducted in Belgium (Zaventem, Brussels), Germany (Franz Joseph Strauss, Munich), Greece (Hellinikon, Athens), Italy (Malpensa, Milan), the Netherlands (Schiphol, Amsterdam), Spain (Barajas, Madrid), Sweden (Arlanda, Stockholm), Switzerland (Zurich), and the UK (Heathrow, London). Questionnaires were distributed within a period of 2 to 3 weeks per airport, between September 2002 and September 2003.

The method has essentially been described in the report on the pilot study.⁹ In brief, self-administered, anonymous questionnaires were distributed at the departure gate while passengers were waiting to board. Only intercontinental flights to developing countries were selected. Travelers participated on a voluntary basis; no incentive was provided, except for a leaflet with information on hepatitis A, hepatitis B and malaria. In all participating airports, trained interviewers were present to distribute the questionnaires, to answer questions if necessary, and to check the completeness of the responses collected. Where possible, these interviewers copied the information from the travelers' vaccination records.

Travelers were allowed to participate if they were 18 years of age or older, and able to fully understand the language of the questionnaires. They also had to be resident in a European country; thus, nationals of a developing country were only asked to participate if they were actually living in an industrialized country. These crite-

ria were checked by the interviewers when distributing the forms. Afterwards, completed questionnaires from travelers who did not meet all the inclusion criteria were either excluded by the interviewers or rejected from the final analysis.

Since the pilot study showed the questionnaire to be too lengthy, it was decided to split it in two. Both questionnaires had a common part on personal characteristics (age, gender, nationality, residence, profession), on information regarding the travel (destination, duration, purpose, travel companions) and its preparation, and on the travelers' perception of the risk of infectious diseases at their destination. Then, one questionnaire focused on malaria and its prevention and treatment (Q-Mal), and the other targeted vaccine-preventable travel-related diseases (Q-Vac). Q-Mal questionnaires were distributed only to travelers with destinations in or close to malaria-endemic areas. Questionnaires were available in all frequently used languages in the respective countries.

All completed questionnaires were centralized per continent, for data input and analysis. European forms were handled by the Centre for the Evaluation of Vaccination, University of Antwerp, Belgium. A Microsoft Access 2000 database was used for data entry; data were tabulated and analyzed using Microsoft Excel 2000 and SPSS 11.5 for Windows. Pearson's chi-square was used to compare proportions, and all tests were interpreted at the $p = .05$ significance level.

All destinations were rated as high risk for hepatitis A and hepatitis B, based on maps published by the World Health Organization (WHO). For hepatitis A, travelers were considered to be protected if they were either vaccinated for this trip, or fully vaccinated in the past (at least two doses of hepatitis A vaccine, or three doses of combined hepatitis A and B vaccine), or naturally immune. Travelers who reported receiving at least one dose in the past were considered to be possibly protected, and the others were considered to be unprotected. With respect to hepatitis B, travelers with either natural immunity, or reporting vaccination for this trip, or fully vaccinated in the past (at least three doses), were considered to be protected. Responders who had received at least one dose of hepatitis B vaccine were considered to be possibly protected, and the others were considered to be unprotected. Other vaccine-preventable diseases were investigated primarily to assess whether some logical priorities had been used and whether travelers were immunized despite there being no risk of that particular infection at their destination.

Based on the travelers' destination (countries and regions) and their length of stay, the actual risk of contracting malaria was scored as high, low, nil or indefinable by a travel medicine specialist who was blinded for all other variables from the questionnaires, using the

WHO malaria map.¹ As such, “high-risk” destinations were essentially tropical Africa, Papua New Guinea and the Solomon Islands, with regional (e.g., Nairobi City) and seasonal (e.g., southern Africa from July to October) exceptions. “Low-risk” destinations were the endemic regions in Latin America, Asia and also southern Africa during their winter months as listed above. Destinations that are listed on the WHO malaria map as “no risk” were rated accordingly. Travelers who had not indicated their routing through countries where areas with different risks exist were rated “not definable”.

To help travelers identify their antimalarial drugs in the best possible way, questionnaire forms listed generic names together with all available brand names in the destination country.

Results

Study Population

In total, 5,465 questionnaires (2,498 Q-Mal and 2,779 Q-Vac) were received, of which 5,067 (92.7%) fulfilled the entry criteria and were included in the analysis. Stockholm, Zurich, and Madrid had a greater share, while recruitment in London was less successful (Table 1).

Overall, 49.6% of responders were female and 50.4% were male; gender ratios per airport were not statistically different ($\chi^2 = 13.2$; $p = .10$). The 18- to 25-year age group accounted for 18.8% of responses; 30.6% of responders were between 26 and 35 years of age, 21.0% between 36 and 45 years of age, 20.9% between 46 and 60 years of age, and 8.8% over 60 years of age. London (11.8%), Brussels (12.7%) and Stockholm airports (22.3%) had higher proportions of travelers aged 60 years or older.

In general, responders were residents of the country from which they started their trip, varying from 78.4% in Athens to 99.1% in Milan. The only exceptions were Zurich, with 47.1% of non-Swiss responders, and Brussels, with 63.1% non-Belgians. With regard to nationality, 7% came from a non-participating country within the European continent, 2.2% were North American, 8.5% were Central or Latin Americans, 1.5% were nationals of an African country, and 1.4% were from a country in the Middle East or Asia.

Travel Profile

For 19.8% of travelers, this was their first trip to a developing country; passengers leaving from Zurich, Amsterdam and Stockholm were more experienced, while about one-third of respondents leaving from Milan, Munich and, especially, Athens were inexperienced.

A large variety of reasons for traveling were noted. Overall, 70.9% indicated tourism as their purpose for travel, ranging from only 25.0% in Madrid to 93.0% in Stockholm and 97.2% in Milan. One in four responders (25.4%) were visiting friends and relatives on their trip; this was more common in Madrid (73.3%), but much less so in Stockholm (8.5%), Athens (5.7%) or Milan (2.5%). Business travelers accounted on average for 9.5%, with a maximum of 31.8% in London. Few responders traveled for religious reasons (2.3%) or for purposes of research or education (2.8%). One in four participants (25.9%) planned to go backpacking on their trip. This proportion was markedly higher in Amsterdam, Munich, and Milan.

Almost half of the travelers (47.8%) were accompanied by their partner or spouse; 25.8% were traveling alone, 17.5% with friends, 9.6% with children, and 4.7% with colleagues.

Table 1 Number of Questionnaires by Type and by Airport

Airport	Malaria			Vaccines			Total		
	<i>n</i> (received)	<i>n</i> (analyzed)	% of received	<i>n</i> (received)	<i>n</i> (analyzed)	% of received	<i>n</i> (received)	<i>n</i> (analyzed)	% of received
Amsterdam, Schiphol	242	225	93.0	255	243	95.3	497 (9.1%)	468 (9.2%)	94.2
Athens, Hellinikon	200	187	93.5	200	165	82.5	400 (7.3%)	352 (6.9%)	88.0
Brussels, Zaventem	185	159	85.9	186	164	88.2	371 (6.8%)	323 (6.4%)	87.1
London, Heathrow	126	86	68.3	129	84	65.1	255 (4.7%)	170 (3.4%)	66.7
Madrid, Barajas	464	444	95.7	460	452	98.3	924 (16.9%)	896 (17.7%)	97.0
Milan, Malpensa	314	287	91.4	287	275	95.8	601 (11.0%)	562 (11.1%)	93.5
Munich, Franz Josef Strauss	201	194	96.5	202	199	98.5	403 (7.4%)	393 (7.8%)	97.5
Stockholm, Arlanda International	411	369	89.8	617	588	95.3	1,028 (18.8%)	957 (18.9%)	93.1
Zurich, Unique	355	337	94.9	631	609	96.5	986 (18.0%)	946 (18.7%)	95.9
Total	2,498	2,288	91.6	2,967	2,779	93.7	5,465	5,067	92.7

Overall, 22.4% went abroad for 1 to 7 days, 39.6% for 8 to 14 days, 23.0% for 15 to 28 days, and 15.0% for more than 28 days. Travelers leaving from Athens and Milan had predominantly shorter trips, while larger proportions of travelers in London and Madrid had longer stays.

Thailand was the most common destination (11.5%), followed by Egypt (9.8%), Dominican Republic (8.2%), Morocco (6.1%) and India (6.0%). Central and South America accounted for 29.7% of all destinations, Asia for 26.2%, Africa for 17.9%, the North African–Mediterranean region for 13.1%, and the Middle East for 11.9%.

Travel Health Preparations

Preparations for travel were started more than 1 month before leaving in 58.3% of responders, with 39.1% preparing more than 2 months in advance; 17.4% started preparing 2 weeks to 1 month before departure, 12.8% did so 1 to 2 weeks in advance, and 10.2% did so less than 1 week before leaving.

Although the majority of travelers (73.3%) had sought general information about their destination prior to departure, only just over half of the responders (52.1%) had sought travel health advice. Of those who did not, 40.9% stated that they knew what to do, 20.2% were not aware that they should, 18.7% stated that there was no risk to their health, and 6.3% were too busy to seek travel health advice. Only 31.4% of travelers visiting friends and relatives had sought travel health advice, compared to 60.9% of tourists and 82.5% of responders traveling for reasons of religion.

When travel health advice was sought, 43.8% did so more than 4 weeks before leaving, 21.4% between 2 and 4 weeks before leaving, 18.6% between 1 and 2 weeks before leaving, and 16.1% during the last week prior to visiting a destination in the tropics. The most common sources for travel health advice were the general practitioner (GP) or family doctor (57.4%), a travel clinic (35.3%), the travel agent (30.0%), family and friends (27.8%), the Internet (24.0%), books, brochures and newspapers (22.5%), and the pharmacist (20.1%). This clearly indicates the variety of sources consulted, and the fact that travelers are aware of the need to obtain information from several sources. Travelers perceived this information as quite reliable. However, advice from medical professionals (travel clinic > GP > company doctor) was perceived to be more reliable than that obtained from other sources (Internet > family and friends > pharmacist > travel agent > books).

Vaccine-preventable Diseases

All participants (Q-Mal and Q-Vac) were asked to score the risk for a number of vaccine-preventable diseases, from the point of view of the general traveler visiting their destination. Between one-quarter and one-

third of responders stated that they did not know the risk for the respective diseases; an additional 10% to 15% did not answer this question, adding to some 40% who could not assess the risk at all. Ignorance was highest for rabies, typhoid fever and cholera, somewhat lower for hepatitis A and B, and lowest for HIV/AIDS. On average, hepatitis A was scored as having the highest risk. Nevertheless, this risk was considered to be high by only 28.7%, and to be low by another 28.0%. Interestingly, the risk for HIV/AIDS was on average scored as slightly higher compared to the risk for hepatitis B, with average scores between low and high risk. The average scores for typical travel-related infectious diseases such as yellow fever, typhoid fever and cholera equaled the score for “low risk”.

Of the travelers who received the Q-Vac questionnaire ($n = 2,779$), a large majority (83.4%) considered vaccines in general to provide essential protection, and 34.7% considered them to be safe. However, 18.4% thought that they may cause side effects, 16.6% considered them to be expensive, 6.4% said that they were painful, 4.4% thought that they were not necessary, and 3.5% considered them to confer only minimal or no protection. Overall, 38.4% had at least one negative attitude towards vaccines; this proportion was markedly lower in travelers leaving from Athens or Madrid, whereas passengers at the London and Munich airports were much more critical.

We applied quite strict criteria to evaluate travelers' protection status according to the number of vaccines that they reported. For hepatitis A, 22.0% could be considered to be protected, 9.6% might be protected, and 44.4% were not protected at all. Those visiting friends and relatives (10.9%) were markedly less protected against hepatitis A compared to business travelers (18.5%) or tourists (25.6%), as shown in Table 2. For hepatitis B, 18.1% were protected, 13.3% might be protected, and 68.7% were not protected.

Participants were asked for their plans to consume a number of possibly contaminated food items: tap water, ice cubes, raw shellfish, ice-cream, and salads. Restrictions on all items were planned by 26.1% of responders; 10.4% planned to consume four or five of the listed items while abroad. Those visiting friends and relatives planned significantly fewer food restrictions than tourists or business travelers. Travelers leaving from Brussels, Amsterdam or Zurich were clearly more careful, while passengers boarding at Athens and, especially, Madrid planned significantly fewer food restrictions.

KAP on Malaria (Q-Mal only, $n = 2,498$)

Of the travelers who received the Q-Mal questionnaire, 28.1% perceived the risk of malaria at their destination as low, and 31.7% considered it to be high, 14.5% said that there was no risk, and 25.6% could not

Table 2 Estimated Protection Against Hepatitis A Related to the Type of Traveler

Type of traveler	Hepatitis A				Total
	Not Protected	Maybe	Protected	No Answer	
Tourist	768 (42.1%)	162 (8.9%)	467 (25.6%)	428 (23.5%)	1,825
Business	105 (42.3%)	41 (16.5%)	46 (18.5%)	56 (22.6%)	248
VFR	316 (51.6%)	59 (9.6%)	67 (10.9%)	170 (27.8%)	612
Religion	13 (46.4%)	2 (7.1%)	11 (39.3%)	2 (7.1%)	28
Other	33 (50.0%)	3 (4.5%)	20 (30.3%)	10 (15.2%)	66
Total	1,235 (44.4%)	267 (9.6%)	611 (22.0%)	666 (24.0%)	2,779

VFR, visiting friends and relatives.

classify the risk. In those travelers who were going to visit a rural area, 84.6% perceived the risk as at least low. When comparing the perceived to the actual risk of malaria, 76.1% correctly identified their risk as high. Nevertheless, 3.0% of travelers going to a high-risk destination and 18.5% of those going to a low-risk destination thought that there was no risk for malaria (Table 3). Additionally, Table 3 shows that among travelers going to a no-risk malaria area, 20.4% perceived the risk as high and 24.8% gave the risk as unknown.

Overall, 83.8% of those going to a high-risk destination, 21.7% of those with a low risk of malaria, but also 12.2% of those without malaria risk were carrying anti-malarial drugs. Among those who did carry drugs, these were taken mostly for prevention (67.3%); 16.8% took them as standby treatment, and 12.3% for both reasons. Mefloquine was by far the most commonly reported drug (39.5%), followed by atovaquone-proguanil (24.0%), chloroquine (18.7%), and proguanil (10.7%). Doxycycline (2.6%), quinine (2.0%), halofantrine and artemether-lumefantrine (both 1.7%) were much less common. Advice as to which tablets to use was provided by medical professionals: the GP or family doctor (45.0%) or a travel clinic (42.4%). At much lower levels, information also came from family and friends (8.9%), the pharmacist (8.7%), or the occupational health physician (6.9%). Interestingly, the Internet (4.9%), books, brochures and newspapers (2.9%) or travel agents (2.3%) were not frequently consulted. The reasons why travelers did not take malaria prevention were

quite vague: 26.7% of passengers not carrying antimalarial drugs did not know why; 19.7% did not like taking tablets while they were healthy; allergy, cost, considering malaria as not dangerous or antimalarial drugs as not being effective, and the presence of side-effects, each contributed less than 5%.

With regard to behavior outdoors, in the evening, 78.2% of travelers intended to apply mosquito repellent and 71.6% to cover their arms and legs, while use of deodorant (26.4%) or perfume or aftershave (18.6%) was restricted. Half of the responders intended to use the airconditioner at night, one in two to sleep under a mosquito net, 58.2% to use an insecticide every night, and 67.2% to keep their windows, doors and tents closed.

In the travel kit, aspirin (for in-flight deep venous thrombosis), mosquito repellents and antidiarrheal tablets were most frequently carried, at 54.7%, 49.1%, and 47.7%, respectively; 30.2% carried insecticide room spray, 12.0% had a mosquito net; 6.9% of responders took syringes and needles; 8.7% had oral hydration salts; and 25.4% had packed antibiotics specifically for their trip.

Discussion

When discussing the design for this survey, we realized that getting an overview of representative European travelers to developing countries would be utopian. The selection of destinations and flights, and the assumption that unprepared travelers

Table 3 Actual Risk for Malaria (Based on Maps by the WHO) Compared to the Travelers' Perceived Risk of Malaria at their Destination

Actual Risk for Malaria	Perceived Risk for Malaria				Total
	High	Low	Nil	Don't know	
High	385 (76.5%)	91 (18.1%)	15 (3.0%)	12 (2.4%)	503
Low	143 (19.9%)	285 (39.6%)	133 (18.5%)	158 (22.0%)	719
Nil	139 (20.4%)	215 (31.5%)	159 (23.3%)	169 (24.8%)	682
Indefinable	55 (33.5%)	48 (29.3%)	24 (14.6%)	37 (22.6%)	164
Total	722 (34.9%)	639 (30.9%)	331 (16.0%)	376 (18.2%)	2,068

might be less likely to participate, are all possible factors causing bias. However, the proportion of business travelers and those visiting friends and relatives, the age distribution of responders and the wide variety of travel destinations proved the eventual bias to be minimal. We are convinced that the size of this study and the number of travel medicine experts involved in its design and implementation demonstrate its value.

These results clearly indicate a need to provide education for travel professionals and the general public. Although three in four travelers had sought general information on their destination, and less than one in four had begun preparing for the trip less than 2 weeks before leaving, nearly half of them did not seek any travel health advice. For those who did, the requirement for a yellow fever vaccination certificate for some destinations was probably an important incentive.

Those who sought travel health advice often consulted multiple sources, often including physicians, with their advice being perceived as being of high quality. The fact that advice from the GP/family doctor was scored as high as that obtained from specialized travel clinics stresses the need to have high-quality information available to the whole medical community.

The subgroup analysis comparing travelers visiting friends and relatives with tourists and business travelers showed that tourists had more often sought travel health advice, were more often carrying antimalarial drugs, and were slightly better protected against hepatitis A. This stresses the need for any educational initiatives to target all groups of travelers, including business travelers, those visiting friends and relatives, and elderly travelers.

Another striking result is that, whereas hepatitis A is perceived as the most important of the infectious diseases listed in the questionnaire, and in spite of the availability of very clear recommendations, nearly 60% of travelers had no protection against hepatitis A. Moreover, the responders mistakenly perceived the risk of HIV/AIDS to be higher than that of hepatitis B and other vaccine-preventable, travel-related diseases. Once more, this both identifies and stresses the need for education of travelers.

The actual risk of malaria was estimated using destination countries and regions and the length of stay. Because of missing data, this was not possible for 7.9% of the responders. It is of some concern that more than one-quarter of travelers visiting a country with at least some malaria risk were not able to classify this risk at all. Almost one in four travelers visiting a high-risk area had an inaccurate risk perception and even one in two going to a no-risk destination were unnecessarily concerned about malaria.

Finally, convincing the traveling community to see a doctor before visiting a developing country is insufficient in itself. Best practice in travel medicine would indicate that communicating the risk of exposure to travel-related infectious diseases is essential. Travelers should be made aware of the necessity to comply with the recommended travel health advice. After all, we do not aim to increase the workload of those practicing travel medicine. Our common objective is to help travelers stay healthy while abroad and fully enjoy the country that they are visiting, and consequently to also reduce the potential importation of infectious diseases and the resulting public health and other implications.

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References

1. World Health Organization. International travel and health. Geneva: WHO, 2003.
2. Laver SM, Wetzels J, Behrens RH. Knowledge of malaria, risk perception, and compliance with prophylaxis and personal and environmental preventive measures in travelers exiting Zimbabwe from Harare and Victoria Falls International Airport. *J Travel Med* 2001; 8:298–303.
3. Leggat PA. Sources of health advice given to travelers. *J Travel Med* 2000; 7:85–88.
4. Prazuck T, Semaille C, Defayolle M, et al. Vaccination status of French and European travelers. *Rev Epidemiol Sante Publique* 1998; 46:64–72.
5. Schlagenhauf P, Steffen R, Tschopp A, et al. Behavioural aspects of travelers in their use of malaria presumptive treatment. *Bull World Health Organ* 1995; 73:215–221.
6. Schunk M, Wachinger W, Nothdurft HD. Vaccination status and prophylactic measures of travelers from Germany to subtropical and tropical areas: results of an airport survey. *J Travel Med* 2001; 8:260–262.
7. Steffen R, Fuchs E, Schildknecht J, et al. Mefloquine compared with other malaria chemoprophylactic regimens in tourists visiting East Africa. *Lancet* 1993; 341:1299–1303.
8. Steffen R, Collard F, Tornieporth N, et al. Epidemiology, etiology, and impact of traveler's diarrhea in Jamaica. *JAMA* 1999; 281:811–817.
9. Van Herck K, Zuckerman J, Castelli F, et al. Travelers' knowledge, attitudes, and practices on prevention of infectious diseases: results from a pilot study. *J Travel Med* 2003; 10(2): 75–78.
10. Zuckerman J. Shaping travel health and medicine for the future. *Lancet Infect Dis* 2001; 1(5):296–297.