Malaria incidence and prevention among European and North American travellers to Kenya

H.O. Lobel,[1] P.A. Phillips-Howard,[2] A.D. Brandling-Bennett,[1,3] R. Steffen,[4] C.C. Campbell,[1] A.Y. Huong,[1] J.B.O. Were,[3] & R. Moser[4]

A longitudinal survey was conducted among travellers departing from Nairobi airport to determine the use of malaria prevention measures and assess the risk for malaria while travelling in Kenya. Among 5489 European and North American travellers, 68 different drug regimens were used for prophylaxis, and 48% of travellers used both regular chemoprophylaxis and more than 1 antimosquito measure during travel; 52% of 3469 travellers who used chemoprophylaxis did so without interruption during their travel and for 4 weeks after departure. Compliance was lowest among travellers who visited friends and relatives, who were young, or who stayed more than 3 weeks. Sixty-seven (1%) travellers experienced symptoms of malaria, but the diagnosis could be verified for only 16 of these. Long-stay travellers appeared to be at higher risk for malaria than short-stay travellers, and health information needs to be targeted especially to the former. Similar investigations are needed among international travellers to other malaria-endemic countries. With comparable data available, consistent and effective malaria prevention guidelines can be developed.

Introduction

The incidence of malaria among European and North American travellers returning from Africa has increased markedly during the past decade (*1, 2*).[a] Especially significant is the rise of malaria incidence among travellers to Kenya, which receives more than 400 000 travellers from Europe and North America each year.[b] The number of *Plasmodium falciparum* infections acquired in Kenya and imported into the United Kingdom and the USA tripled between 1977 and 1986 (*1*).[a] The increased number of travellers to Kenya, and the lack of effective and safe chemoprophylactic regimens, contributed to the increased number of cases. The lack of optimal chemoprophylaxis has led to an increased risk for acquiring malaria during travel (*3*).

The lack of highly safe and effective drugs to prevent infection with chloroquine-resistant *P. falciparum* has created a dilemma for travellers and for those who develop recommendations for malaria prevention. In North America and Europe, at least sixteen different drug regimens are recommended by various authorities for travellers to East Africa (*4–6*). Because many chemoprophylactic regimens do not eliminate the risk for infection, many experts recommend that travellers carry a curative dose of a drug. This dose is to be used to treat a febrile illness, when medical care is not available, in an effort to prevent death from *P. falciparum* infection. In addition to chemoprophylaxis, antimosquito measures, such as repellents and mosquito nets, are frequently recommended because they are considered safe and effective ways of reducing mosquito contact (*7*).

To formulate malaria prevention recommendations for travellers and to evaluate the use and efficacy of these measures, it is necessary to determine which measures are used and to assess the risk for malaria among travellers (*8*). The lack of consistent recommendations is understandable because such information is not available to travellers from most countries. A cohort of travellers departing from Kenya was therefore surveyed, in order to determine the use of and compliance with measures to prevent malaria, to assess the frequency of self-treatment for episodes of presumed malaria during travel, and to determine the occurrence of adverse reactions to antimalarial drugs as well as of episodes of malaria during and after travel in Kenya.

[1] Division of Parasitic Diseases, Center for Infectious Diseases, Centers for Disease Control, Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA, USA. Requests for reprints should be sent to Dr. H.O. Lobel, Malaria Branch, Centers for Disease Control, Atlanta, GA 30333, USA.

[2] London School of Hygiene and Tropical Medicine, London, England.

[3] Clinical Research Centre, Kenya Medical Research Institute, Nairobi, Kenya.

[4] Institute of Preventive Medicine, University of Zurich, Zurich, Switzerland.

[a] *Malaria surveillance annual summary.* Atlanta, GA, Centers for Disease Control, 1986.

[b] *Economic survey.* Nairobi, Ministry of Planning and National Development, 1988.

Reprint No. 5064

Materials and methods

A questionnaire, available in four languages (English, French, German, and Italian), was administered to travellers departing from Nairobi airport for Europe on all scheduled flights between 1 and 21 September 1987. The questionnaire was distributed and collected before boarding. Data collected concerned the duration and purpose of travel, countries and areas visited within Kenya, preventive antimalarial measures used, adverse drug reactions experienced, and episodes of suspected or confirmed malaria. Eight to ten weeks later a follow-up questionnaire was mailed to these travellers. The follow-up questionnaire asked about compliance with prophylaxis and about malaria episodes after leaving Kenya. To determine the non-response bias, a random sample of travellers from North America and the United Kingdom who did not return the second questionnaire were contacted and interviewed by telephone. All cases of malaria diagnosed by a physician and all cases of persons hospitalized because of adverse reactions to malaria drugs were investigated by contacting the physician who had treated the patient. The diagnosis of malaria was considered verified if a record was available of a blood-smear examination that indicated the presence of *Plasmodium* parasites.

Compliance with chemoprophylaxis was defined as the regular, uninterrupted use of prophylactic drugs during travel in Africa and for four or more weeks after leaving. Use of adequate antimosquito measures was defined as the use of two or more such measures (bed nets, insect repellents, protective clothing at night, insecticides, staying indoors at night). Travellers in Africa for less than four weeks were defined as short-stay travellers, and those remaining for four weeks to one year as long-stay. Residents of countries outside North America or Europe, travellers who did not go outside Nairobi (malaria transmission is considered not to occur in Nairobi), and travellers who were in Africa for more than twelve months, were excluded from our analysis because their behaviour and experience differ from that of temporary visitors from North America and Europe to malarious areas of Kenya.

Statistical significance was determined with the χ^2 test. Multiple logistic regression analysis was performed in order to identify the factors that influence compliance with chemoprophylaxis.

Results

Population

Questionnaires were completed at Nairobi airport by 8533 (60%) of 14 228 travellers boarding 93 flights. Not all passengers, particularly those who arrived late at the departure gate, were given questionnaires. When the number of these passengers was excluded from the denominator, the response rate for completed questionnaires was 75%. A follow-up questionnaire was sent to 6205 of the travellers from Europe and North America, 4612 (74%) of whom responded. Samples of non-respondents in the United Kingdom (120) and the USA (115) were contacted. Use of prophylaxis after departure from Nairobi and the occurrence of adverse reactions and of malaria were comparable for respondents and non-respondents.

Respondents at Nairobi airport were from 52 countries, including 3735 residents of European countries, 2707 from North America, 1743 from African countries, and 348 from other countries. To assess the representativeness of the survey population, the country of residence and the purpose of travel of the respondents were compared with that of all European and North American travellers to Kenya in 1987 (Table 1). Those countries whose residents frequently travel on charter flights directly to the coast of Kenya, such as Germany and Switzerland, were under-represented because we did not survey persons using such flights. For the same reason, tourists made up a smaller proportion of respondents than of all travellers to Kenya in 1987.

Of the 6442 European and North American travellers, 953 (15%) stayed within Nairobi or were in Africa for more than twelve months and were therefore excluded from the analysis. The 5489 visitors who travelled outside Nairobi and stayed for twelve months or less included 2418 from North America and 3071 from Europe (for specific countries, see Table 2); 2865 (52%) were female and 2949 (54%) were under 40 years of age. Tourism was the main reason for 76% (4182), business for 6% (325), and visiting friends and relatives for 10% (533). Of all European and North American travellers, 3930 (72%) were in East Africa for less than 4 weeks. American travellers were significantly older than the Europeans (mean age, 44.4 years versus 33.8 years ($P < 0.001$)), stayed a shorter time (1799 (83%) stayed less than 4 weeks versus 1994 (65%, $P < 0.001$)), and were more likely to be tourists (1814 (84%) versus 2184 (71%, $P < 0.001$)). The coast of Kenya was visited by 2010 (65%) European travellers but by only 575 (26%) from the USA. In contrast, 823 (27%) Europeans visited game parks only, compared with 1442 (66%) from the USA. Only 236 (4%) visited Lake Victoria (western Kenya).

Pre-travel medical advice

Of all the European and North American travellers, 5223 (95%) were aware of malaria risk in Africa.

Table 1: **Place of residence and proportion of tourists among all survey respondents and all travellers to Kenya from Europe and North America**[a]

Country/region of residence	Travellers surveyed		All travellers	
	Number	% tourists	Number	% tourists
USA	2433 (37.8)[b]	78.6	60 400 (14.3)	81.3
United Kingdom	1805 (28.0)	68.3	73 100 (17.3)	76.2
Italy	631 (9.8)	75.8	38 100 (9.0)	90.2
France	381 (5.9)	69.2	27 200 (6.4)	86.4
Federal Republic of Germany	302 (4.7)	39.5	111 700 (26.4)	92.2
Canada	274 (4.3)	70.8	8 500 (2.0)	76.5
Scandinavia	175 (2.7)	31.2	15 100 (3.5)	78.1
Switzerland	102 (1.6)	50.3	49 500 (11.7)	93.5
Other	339 (5.2)	71.7	39 800 (9.4)	90.8
Total	6442 (100)	76.7	423 400 (100)	85.9

[a] Based on *Economic Survey*. Nairobi, Ministry of Planning and National Development, 1988.
[b] Figures in parentheses are percentages of the total.

Table 2: **Percentage of people surveyed who used malaria prevention measures during travel, by place of residence**

Country/region of residence	No. of persons	% using prophylaxis regularly with two or more AMM[a]	% using prophylaxis and AMM[a] but one or both inadequate	% using prophylaxis or AMM[a] only	% using no preventive measures
Scandinavia	106	29.2	26.4	36.8	7.5
France	316	32.6	23.7	38.9	4.7
Federal Republic of Germany	219	48.4	30.6	15.1	5.9
Italy	523	36.7	24.3	33.8	5.2
Netherlands	165	32.1	37.0	27.3	3.6
United Kingdom	1559	42.9	33.2	20.3	3.7
USA	2173	58.6	19.8	19.6	2.0
Canada	245	51.8	23.7	22.9	1.6
Other	183	41.8	23.7	30.5	4.0
Total	5489	48.0	25.6	23.1	3.3

[a] AMM = antimosquito measures (e.g., bed nets, insect repellents, insecticides, protective clothing or staying indoors at night).

Most of them (4140 or 75%) obtained advice from medical sources (e.g., physicians, health departments, traveller clinics), prior to departure, about prevention of malaria. Only 623 (11%) relied on their own knowledge of protective measures. This was most frequent as follows: 31 (19%) Dutch travellers, 60 (18%) business travellers, 133 (25%) persons visiting friends or relatives, and 278 (18%) long-stay travellers.

Use of prevention measures

Almost all European and North American travellers (5309 or 97%) used one or more measures to prevent malaria. During travel, chemoprophylaxis was taken by 5216 (95%) travellers, 4407 (84%) of whom used it regularly. Antimosquito measures were used by 4134 (75%), 3096 (75%) of whom used at least two such measures. However, only 2630 (48%) used prophylaxis regularly and used adequate antimosquito measures while in Africa. Those least likely to use regular prophylaxis and adequate antimosquito measures were as follows: 84 (26%) business travellers, 173 (32%) persons visiting friends and relatives, 1279 (43%) travellers under 40 years of age, and 599 (38%) long-stay travellers. Country of residence also influenced the use of regular prophylaxis and adequate antimosquito measures during travel (Table 2). Only 180 (3%) did not use any preventive measures, including 74 (2%) tourists, 38 (12%) business travellers, and 37 (7%) persons visiting friends and relatives. The differences between tourists and business travellers and between tourists

and persons visiting friends and relatives were highly significant ($P < 0.001$).

Sixty-eight drug regimens were reportedly used for prophylaxis, nine of which were used by 79 or more persons (Table 3). The most commonly used drug regimen, chloroquine alone, was used by 2550 (49%) persons who took chemoprophylaxis, ranging from 1672 (77%) American to 3 (2%) Dutch travellers. Chloroquine and proguanil were used by 1184 (23%) persons, ranging from 133 (81%) Dutch to 766 (49%) British and 7 (2%) Italian travellers. Mefloquine was mainly used by French (148 or 47%) and pyrimethamine–sulfalene (Metakelfin)[c] by Italian travellers (132 or 25%).

Compliance with a chemoprophylactic regimen during and after travel was examined in travellers who used prophylaxis during travel and who completed both the original and follow-up questionnaires. Of 3469 travellers who used chemoprophylaxis in Kenya, 1793 (52%) used it regularly during travel and for 4 weeks after leaving Kenya. Of the 1676 (48%) travellers who did not comply fully with their regimen, 27% did not use prophylaxis regularly while in Africa and 73% did not do so after departure. Of the latter group, 8% did not take any prophylaxis after departure, 67% did not take prophylaxis for a full four weeks after departure, and 24% did not take prophylaxis regularly. Logistic regression analysis showed that compliance was especially poor among people who visited friends and relatives (37%), travelled for more than three weeks (39%), experienced adverse reactions (40%), used proguanil (31%), and among young travellers from the United Kingdom (43%) ($P < 0.001$).

[c] Use of trade names is for identification only and does not imply endorsement by the Public Health Service or the U.S. Department of Health and Human Services.

Table 3: **Drugs used for prophylaxis by travellers**

Drug	No. of users	% of users
Chloroquine	2550	48.9
Chloroquine and proguanil	1184	22.7
Proguanil	183	3.5
Mefloquine	177	3.4
Metakelfin	134	2.6
Fansidar	110	4.4
Chloroquine and Maloprim	108	2.1
Chloroquine and Fansidar	94	1.8
Maloprim	79	1.5
Other drugs	578	11.1
Not stated	19	0.4
Total	5216	100.0

Adverse reactions

One or more adverse reactions attributed to the use of chemoprophylaxis was reported by 669 (13%) of the 5216 travellers who used chemoprophylaxis. Gastrointestinal side-effects were most frequent. Although no side-effect caused anyone to be hospitalized, side-effects reduced compliance significantly. Side-effects were most frequent for users of chloroquine and proguanil combined, and least so for pyrimethamine–dapsone (Maloprim) users (Table 4).

Self-treatment for presumed malaria

Of 5489 travellers, 1715 (31%) stated that they carried drugs to treat a malaria attack. The number that did so ranged as follows: 137 (63%) German travellers to 24 (15%) Dutch travellers; 1308 (76%) of these travellers carried pyrimethamine–sulfadoxine (Fansidar), 100 (6%) chloroquine only, 78 (5%) mefloquine, and 71 (4%) Metakelfin. Only 44 (3%) treated themselves for a presumed malaria attack: 8 (0.6%) of 1242 short-stay travellers and 36 (8%) of 473 long-stay travellers ($P < 0.001$).

Malaria

Sixty-seven (1%) of 5489 travellers reported having had symptoms of malaria. Of these, 65 (97%) experienced symptoms while abroad and 2 after returning to their country of residence. Eleven (0.3%) of the short-stay travellers and 54 (4%) of the long-stay travellers had a presumed malaria attack while in Kenya. Few of the 65 cases that occurred in Kenya were documented by microscopic examination; malaria was diagnosed by clinical examination by a physician for 25 (38%) persons, in 22 (34%) cases by travellers themselves, and by a physician reportedly after blood smear examination for only 18 (28%) persons. Subsequent contact with physicians revealed that for 14 (78%) of these 18 cases a blood slide was positive for malaria parasites (all *P. falciparum*); for 4 people the result of microscopic examination was negative. Both cases that occurred after departure from Nairobi were verifiable. Thus, the diagnosis was verified for only 16 (24%) of the travellers who reportedly had malaria. The incidence of these verified episodes of malaria was 3 cases per 1000 travellers per month (Table 5). The relative risk was 14-fold higher for travellers to Lake Victoria than for travellers to game parks ($P < 0.001$). The incidence of all reported episodes of malaria among travellers to Kenya was 12 cases per 1000 travellers per month.

Only 1 of the 16 travellers with a verified episode of *P. falciparum* malaria did not take any chemoprophylaxis. Prophylaxis was used regularly by 13 of them: 6 used chloroquine, 2 used chloroquine and

Table 4: **Percentage of travellers surveyed who reported adverse reactions to chemoprophylaxis, by drug**

Drug	No. of users	Adverse reactions				
		Eye	Cutaneous	N/V/D[a]	Other	Total
Chloroquine and proguanil	1184	1.2	1.0	14.7	1.7	18.6
Chloroquine and Fansidar	94	1.1	4.4	12.0	0	16.4
Chloroquine and Maloprim	108	1.9	0.9	9.3	1.8	13.9
Mefloquine	177	0	1.2	12.1	4.1	16.2
Proguanil	183	0.5	0	10.6	1.2	12.3
Metakelfin	134	0.8	1.5	9.9	0.7	12.2
Chloroquine	2550	1.0	0.8	7.4	3.5	10.9
Fansidar	110	0	1.9	3.8	1.9	7.6
Maloprim	79	0	0	1.3	1.3	2.6

[a] Nausea, vomiting, diarrhoea.

Table 5: **Incidence of malaria[a] among travellers surveyed, by area of Kenya visited**

Destination	Person–months of exposure	No. of cases	Incidence[a]	Relative risk
Coast	3341	11	3.3	4.7
Lake Victoria	301	3	10.0	14.3
Game parks	1523	1	0.7	1
Other	237	1	4.2	6.0
Total	5403	16	3.0	

[a] Number of verified cases of *P. falciparum* infection per month per 1000 travellers.

proguanil, 2 used chloroquine and chlorproguanil, 1 used chlorproguanil only, 1 used proguanil only, and 1 used Metakelfin. Prophylaxis was used irregularly by 2 persons, 1 of whom used chloroquine and 1 chloroquine and proguanil. The incidence of *P. falciparum* malaria was not significantly different among groups by type of prophylactic regimen, but the number of cases was too small to permit inferences about prophylactic efficacy.

Discussion

Information about travellers' knowledge of malaria, the preventive measures they employ, their experience with malaria, and the occurrence of adverse drug reactions can be obtained from questionnaire surveys of travellers. The accuracy of the information about use of prevention measures cannot be verified, but reported episodes of malaria or of adverse reactions that require medical care can be validated by contacting physicians. Traveller surveys have been conducted at airports, among members of tour groups, among clients of a medical advisory service, and aboard charter and scheduled flights (*9–11*).[d] Such surveys are often cross-sectional and focus on select groups. Also, surveys have usually been limited to travellers from the USA and a few European countries. Our investigation, which was conducted among travellers from many countries returning from an African destination frequently visited by European and North American travellers, demonstrates the importance of follow-up procedures to determine compliance with chemoprophylaxis after travel.

Many different drugs and drug combinations were used by travellers for prophylaxis, which reflected the different recommendations in the countries of residence and the availability of the drugs. Inconsistent recommendations may confuse travellers and decrease their compliance. Developing consistent recommendations requires a better understanding of the use of prevention measures among travellers from different countries and of their risk of malaria (*8*).

Less than half the persons surveyed used both regular chemoprophylaxis and more than one antimosquito measure during their travels. Only 52% of those interviewed complied fully with chemoprophylactic regimens during and after travel, and most noncompliance occurred after they had left Kenya. A similar trend was found among travellers interviewed in the United Kingdom (*11*). Health providers, who

[d] **Campbell, H.** *Imported malaria in Britain: a study of British residents travelling to malaria endemic areas.* M.Sc. thesis, University of London, London, 1984.

were consulted by 75% of the travellers, need to emphasize the importance of the correct use of anti-mosquito measures and the need for uninterrupted use of chemoprophylaxis together with several anti-mosquito measures.

Health information needs to be targeted especially to long-stay travellers who are less likely to use adequate prevention measures, and who appear to be at higher risk for malaria. Of the long-stay travellers in our study, more than 60% were missionaries and persons visiting friends or relatives and less than 30% were tourists and business travellers.

The recommendation that travellers treat themselves when they suspect a malaria attack places great responsibility on them. They must interpret the etiology of often vague symptoms and understand the appropriate regimens for self-treatment. This may result in abuse of potentially dangerous drugs or failure to take life-saving action. Recommendations for self-treatment may be more important for long-stay than for short-stay travellers.

Few of the malaria episodes in Kenya reported by the travellers surveyed were diagnosed by blood-slide examination, even when the traveller consulted a physician. Comparable data have been reported previously for expatriates in Africa (*12, 13*). This lack of blood-slide examination may be dangerous for the patient because the symptomatology of malaria is not pathognomonic, especially in the early stages of the disease. Because measures to prevent malaria are not always effective, travellers should be aware of the available medical facilities in their area of travel. When they receive medical care, they should request that a laboratory test be performed to diagnose their illness, and they should obtain written documentation of the diagnosis and treatment.

Estimates of malaria risk for travellers and of the efficacy of prophylaxis are often based on the incidence of malaria after return to the country of residence (*3, 14*). This may result in an underestimation of the real risk, because many malaria episodes occur during travel. In our investigation the incidence of suspected malaria among travellers to Kenya was similar to the incidence of *P. falciparum* infection in Peace Corps volunteers in East Africa (15 cases per 1000 persons per month), which suggests that most suspected episodes of malaria were indeed malaria (*15*).

International cooperation is needed to develop comparable data bases on the use of malaria prevention measures by travellers and their risk for malaria (*8*). Our investigation has initiated this cooperation. We recommend that similar investigations, using comparable methodologies, be carried out among travellers from different countries to other areas with a risk for malaria.

Acknowledgements

We appreciate the generous assistance of the Nairobi station managers and personnel of Air France, Alitalia, British Airways, Kenya Airways, KLM Royal Dutch Airlines, Lufthansa, Pan American Airways, Olympic Airways, Sabena, and Swissair. We also acknowledge the assistance of Dr C.G. Nevill and the staff of the African Medical and Research Foundation (AMREF) in Nairobi in contacting physicians in East Africa.

Résumé

Incidence et prévention du paludisme chez les voyageurs d'Europe et d'Amérique du Nord se rendant au Kenya

En septembre 1987, on a distribué un questionnaire en quatre langues à des voyageurs au départ de Nairobi, afin de déterminer quelles étaient les mesures de prévention employées contre le paludisme et le risque de contracter la maladie chez les voyageurs se rendant au Kenya. Le taux de réponse a été de 75%. Un second questionnaire leur a été adressé huit à dix semaines plus tard, pour lequel le taux de réponse a été de 74%. Les 5489 voyageurs provenant d'Europe et d'Amérique du Nord ayant répondu au questionnaire ont utilisé pour la prophylaxie 68 schémas thérapeutiques différents, qui étaient le reflet des diverses recommandations formulées dans les pays de résidence et des médicaments disponibles. Seuls 48% des voyageurs ont associé une chimioprophylaxie régulière à au moins deux mesures de protection antimoustiques au cours de leur voyage; sur les 3469 personnes soumises à une chimioprophylaxie, 52% l'ont observée sans interruption pendant leur voyage et au cours des 4 semaines qui ont suivi. La plupart des cas de non-observance se sont produits après le départ du Kenya. L'observance la plus faible a été le fait de voyageurs qui avaient rendu visite à des amis ou à de la famille, voyagé plus de trois semaines, eu des effets indésirables, pris du proguanil; ce même phénomène a été retrouvé chez les jeunes du Royaume-Uni. Le corps médical, qui a été consulté par 75% des voyageurs, doit insister sur l'importance d'utiliser correctement les protections antimoustiques et sur la nécessité d'une chimioprophylaxie ininterrompue associée à plusieurs mesures antimoustiques. Un tiers des voyageurs avaient emporté des médicaments destinés à traiter une crise de paludisme et 3% d'entre eux ont eu à s'en servir. Soixante-sept personnes (1%) ont présenté des symptômes de paludisme, mais le diagnostic n'a pu être confirmé que pour 16

d'entre elles. Les voyageurs se déplaçant pour de longues durées semblent avoir présenté un risque plus élevé de contracter la maladie que les voyageurs venus pour peu de temps, et l'information médicale doit donc être ciblée sur les premiers. Des études du même type seraient nécessaires chez les voyageurs internationaux se rendant dans d'autres pays d'endémie du paludisme. On ne pourra mettre au point de directives cohérentes et efficaces que si l'on dispose de données comparables. Cela permettra de diminuer la confusion qui règne chez les voyageurs dans ce domaine et améliorera l'observance des mesures de prévention.

References

1. **Phillips-Howard, P.A. et al.** Malaria in Britain: 1977–86. *Br. med. j.*, **296**: 246–248 (1988).
2. **Raeber, P.A. et al.** Le paludisme en Suisse: 1982 à 186. *Schweiz. Med. Wochenschr.*, **118**: 1261–1266 (1988).
3. **Lobel, H.O. et al.** Efficacy of malaria prophylaxis in American and Swiss travellers to Kenya. *J. infect. dis.*, **155**: 1205–1209 (1987).
4. *Health information for international travel.* Atlanta, Centers for Disease Control, 1987 (Publication No. (CDC) 87–8280).
5. **Bradley, D.J. & Phillips-Howard, P.A.** Recommendations for malaria prevention in European countries. In: Steffen, R. et al., ed. *Proceedings of the First Conference on International Travel Medicine, Zurich, 1988.* New York, Springer-Verlag, 1989, pp. 164–166.
6. **Kendler, D. & Keystone, J.S.** Chemoprophylaxis for chloroquine-resistant *Plasmodium falciparum* malaria. *Canada diseases weekly rep.*, **13**: 55–57 (1987).
7. **Pappaioanou, M. et al.** A quantitative approach to recommendations on malaria prophylaxis. *Bull. Wld Hlth Org.*, **66**: 477–483 (1988).
8. Development of recommendations for the protection of short-stay travellers to malaria endemic areas: Memorandum from two WHO Meetings. *Bull. Wld Hlth Org.*, **66**: 177–196 (1988).
9. **Steffen, R. et al.** Malaria chemoprophylaxis in 28 712 European travellers to Africa: a follow-up study. In: Steffen, R. et al. *Proceedings of the First Conference on International Travel Medicine, Zurich, 1988.* New York, Springer-Verlag, 1989, pp. 141–144.
10. **Lobel, H.O. et al.** Use of prophylaxis for malaria by American travellers to Africa and Haiti. *J. Amer. Med. Assoc.*, **257**: 2626–2627 (1987).
11. **Phillips-Howard, P.A. et al.** Malaria prophylaxis: survey of the response of British travellers to prophylactic advice. *Br. med. j.*, **293**: 932–934 (1986).
12. **Jaatinen, M. et al.** Falciparum malaria resistant to chloroquine and Fansidar. *Br. med. j.*, **288**: 65 (1984).
13. **Harries, A.D. et al.** Malaria prophylaxis amongst British residents of Lilongwe and Kasungu districts, Malawi. *Trans. R. Soc. Trop. Med. Hyg.*, **82**: 690–692 (1988).
14. **Phillips-Howard, P.A. et al.** Short-term travel to malarious areas: malaria risk in British residents. *Trav. med. int.*, **6**: 51–60 (1988).
15. **Bernard, K.** Health risks for temporary residents of developing countries: the U.S. Peace Corps as an epidemiologic model. In: Steffen, R. et al., ed. *Proceedings of the First Conference on International Travel Medicine, Zurich 1988.* New York, Springer-Verlag, 1989, pp. 37–44.