

Short Report

Malaria and mosquitoes: how often for how long?

D. Stürchler, U. Naef, M. Fernex, M. L. Mittelholzer, R. M. Reber and R. Steffen F. Hoffmann-La Roche AG, CH-4002 Basel, Switzerland and University Institute for Social and Preventive Medicine, Sumatrastrasse 30, CH-8006 Zürich, Switzerland

Conceptually, exposure to *Anopheles* mosquitoes can be divided into an intensity and a duration component. Entomological surveys have characterized the influence of intensity (Hii *et al.*, 1988; BURKOT *et al.*, 1988; TRAPE & ZOULANI, 1987; DEL GIUDICE *et al.*, 1987; DRUILHE *et al.*, 1986): infective bites range from <0.1 to 3/person/day and vary with *Anopheles* species, season, and malaria endemicity. Few studies have addressed the influence of duration of exposure. In Peace Corps volunteers working in Africa, fluctuations of quarterly *Plasmodium falciparum* malaria incidence rates have been observed (BERNARD *et al.*, 1989). In British travellers, the relative risk of malaria was 80 times higher for travels of 27 to 52 weeks' duration compared to travels of 1 week duration (PHILLIPS-HOWARD *et al.*, 1990). In endemic populations, age is usually taken as a surrogate measure of exposure time (DEL GIUDICE *et al.*, 1987; MOLINEAUX, 1988), assuming stable malaria transmission and absence of population movements.

We have attempted to determine the effect of exposure time on travellers from Switzerland to malarious areas in East and West Africa (STEFFEN *et al.*, 1990). In this population, exposure ranged from <1 week to >12 weeks, a time frame which makes confounding by acquired immunity in this non-immune population unlikely. The confirmed malaria attack rate was <1/1000 travellers for exposures of ≤1 week, and 12/1000 travellers for exposures of 4–12 weeks, a significant 16-fold increase of relative risk (Table).

Table. Parasitologically confirmed malaria cases in travellers from Switzerland to East and West Africa, classified by length of stay abroad

	No. of weeks abroad			
	≤1	2–3	4–12	>12
Malaria cases per no. of travellers				
Without prophylaxis	0/183	0/371	5/61	2/6
With any prophylaxis	1/1210	15/13670	5/797	0/12
Overall	1/1393	15/14041	10/858	2/18
Incidence/1000 travellers	0.7	1.1	11.7	111.1
Relative risk	1	1.5	16.0	139
95% confidence limits	–	0.1–5.1	2.1–125	13–1476

Corresponding author: PD Dr D. Stürchler, PKF/TI, F. Hoffmann-La Roche AG, Postfach, CH4002 Basel, Switzerland.

These attack rates are probably confounded by variations in intensity of exposure and protective measures in a study population which includes mainly businessmen and tourists. However, our data confirm the correlation between duration of exposure and malaria risk. This finding is expected and plausible, in fact exposure time is shown to be one of the more relevant malaria risk factors for visitors to endemic areas.

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