EOSINOPHILIC RESPONSE TO FALCIPARUM MALARIA INFECTIONS

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Abstract. Eosinophilia was a frequently detected incidental finding during a prospective study of malaria seroepidemiology in Thailand. Blood eosinophil counts were performed every 3 months for a year in 823 Thai soldiers on border guard duty in a malaria endemic area. Soldiers developing malaria were admitted to hospital and more frequent eosinophil counts were done. \textit{P. falciparum} parasitemia suppressed preexisting eosinophilia but eosinophilia returned following treatment. \textit{P. vivax} and mixed infections had a similar but less marked effect on the peripheral blood eosinophil count. Eosinophilia in persons from a malaria endemic area may represent a normal late response to malaria infection.

INTRODUCTION

Eosinophilia is a common manifestation of tropical parasitic disease. Increased numbers of circulating eosinophils are well known to be associated with metazoan parasitic infestation (Beeson and Bass, 1977) but an association with malaria and eosinophilia is not generally made. Studies of soldiers with malaria have shown a characteristic pattern of acute eosinopenia followed by eosinophilia after successful treatment (Lowe, 1944; Reiley and Barrett, 1971). Severely ill Thai patients exhibit similar changes in eosinophil count (Davis et al., 1991). We report a study of over 800 Thai soldiers stationed on the Thai-Cambodian border in which changes in blood leukocyte counts during prophylaxis and treatment of malaria were prospectively evaluated.

MATERIALS AND METHODS

Four battalions of Thai Military recruits were enrolled into a prospective malaria seroepidemiology study after giving informed consent. The four separate battalions were sequentially enrolled from 1985 to 1987. 823 men entered the study and 642 (78%) completed one year follow-up. A positive history of previous malaria was given by 26% but only 18% had serologic evidence of previous \textit{P. falciparum} infection on enrolment (HK Webster, personal communication).

Results were obtained routinely on all soldiers on entry and every 3 months for one year. While in the endemic area all had thick blood films examined for malaria every 10 days. One tablet of pyrimethamine 12.5 mg and 100 mg dapsone (Maloprim, Wellcome Foundation PLC, UK) was administered weekly. Soldiers developing malaria were hospitalized and treated with quinine and tetracycline. Daily venous blood samples were taken from all hospitalized soldiers. On each sample, a total leukocyte count was performed using a hemocytometer and a differential count was determined from Giemsa stained blood smears. Total eosinophil counts were derived by multiplying the percent eosinophils by the total leukocyte count.

RESULTS

During the period of study 95 soldiers contracted falciparum malaria and these soldiers had at least three separate leukocyte measurements during their illness. A further 60 soldiers had mixed infections with \textit{P. falciparum} and \textit{P. vivax}, and 23 developed vivax malaria alone. Fig 1 shows the eosinophil response following falciparum malaria in 95 soldiers. A progressive increase to levels above 1,000 eosinophils/mm$^3$ occurred over 13 weeks. One individual soldier's serial results are shown in Fig 2. In this case, falciparum parasitemia repeatedly suppressed eosinophilia but recovery...
Fig 1—Mean eosinophil counts shown as a function of
time since malaria infection in 95 *P. falciparum*
patients. Number above point denotes number of
separate patients contributing data to the
mean.

Fig 2—An individual soldier showing progression of
eosinopenia and eosinophilia during three falciparum malaria infections. PF designates a
positive malaria smear at that point.

Fig 3—Mean white blood cell, neutrophil and lympho­
cyte counts in 95 *P. falciparum* patients identical
to Fig 1.

Fig 4—668 uninfected Thai soldiers were routinely
screened every 3 months to produce this hematologic profile.

but usually to a lesser extent.

Other leukocyte types remained stable during
and after malaria. A mean increase in leukocytes
from 6,000 to 8,000/mm³ during the 10 weeks post
infection was due almost entirely to the increase in
eosinophils (Fig 3). Uninfected soldiers demonstrated
very stable leukocyte and differential counts which did not vary over 12 months (Fig 4).

**DISCUSSION**

Eosinopenia followed by eosinophilia in response
to an acute infection is a general phenomenon
seen in many infectious diseases such as pneu­
monia, meningitis, typhus, typhoid, measles, vari­
cella and dengue (Beeson and Bass, 1977). That
malaria can demonstrate this same pattern was
shown when Australian soldiers were studied
during World War II (Lowe, 1944). Eosinophilia
was a common observation in convalescent soldiers
who contracted malaria in Vietnam (Reiley and Bar­
ett, 1971).

The observations reported here are an extension
of previous studies since eosinophil counts were
available prior to malaria infection and length of
follow up was long. The lower level of eosinophi­
lia seen with mixed infections and vivax malaria
suggests that these infections produce less inflam­
mation. The use of malaria chemoprophylaxis did
not contribute to the eosinophilia since the unin­
fected men demonstrated no change in their eosi­
nophil counts while receiving the same drugs. Previous studies in Thai soldiers have shown a high prevalence of helminth infestation, but this too does not explain the eosinophilia specifically related to malaria.

Eosinophilia is often seen as an incidental finding in a patient returning from the tropics. This can generate concern that a tropical parasitic infection is being suppressed or missed. It is worth remembering that eosinophilia can often be a normal reaction to a previous malaria infection. In this setting, undue attention should not be given to eosinophilia in the absence of other signs of illness.

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REFERENCES


