A mixed malaria infection: is *Plasmodium vivax* good for you?

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Summary We describe a case of mixed malaria infection in a returning traveller. We suggest that our patient had a chronic infection with *Plasmodium vivax* and that this reduced the severity of an acute infection with *P. falciparum* – an example of cross-species immunity.

KEYWORDS Malaria; Immunity; *Plasmodium falciparum*; *Plasmodium vivax*

1. Introduction

Malaria is a common diagnosis in returning travellers;[1] mixed malaria infections are seen less frequently. We report a case of a mixed malaria infection, and suggest that infection with one species may reduce the severity of the other infection.

2. Case report

A 25-year-old white man presented to the emergency clinic of the Hospital for Tropical Diseases, London, UK on 8 September 2008, shortly after returning from leading a 5 month expedition in Papua New Guinea. His symptoms began with a single episode of diarrhoea, which was followed by a 6 day history of dry cough, fever and sweats. While in Papua New Guinea he trekked in the jungle, and slept in hammocks under a mosquito net. He was not fully compliant with his malaria chemoprophylaxis, and took doxycycline only intermittently. Of note, before this expedition, he had lived in rural Tanzania for 2 years working on conservation projects, but was well during this period.

On examination, he was pyrexial at 40.8 °C, but appeared well. Physical examination was unremarkable apart from pallor. Blood tests showed haemoglobin 7.7 g and platelets 48 × 10^9/l; renal function was normal. A thin film demonstrated trophozoites and schizonts of *Plasmodium falciparum*, with 0.2% parasitaemia. In addition, all stages of *P. vivax* were seen (Figure 1).

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He was initially treated with oral quinine, 700 mg three times daily, followed by a stat dose of Fansidar (sulfadoxine–pyrimethamine; three 500 mg/25 mg tablets). His glucose-6-phosphate dehydrogenase levels were normal, and thus a 2 week course of primaquine 15 mg twice daily was prescribed. His parasitaemia cleared during his

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admission, and by the fourth day only gametocytes of each species could be seen. On discharge, he was given a 1 month course of ferrous sulphate and folic acid in view of his anaemia. He made a full recovery.

3. Discussion

Immunity to malaria in humans is poorly understood, but is thought to be both species- and genotype- (within a species subclass) specific. It has been reported that in mixed infections in humans, cross-species or cross-genome interaction exists between malaria parasites.[2] A reduction in the severity of malaria symptoms occurs in individuals pre-exposed to different species,[3] and *Plasmodium vivax* infection may protect against the severe complications of *P. falciparum*.[2,4] This effect is thought partially to explain the lower mortality rates from *P. falciparum* seen in the Asia–Pacific region compared with Africa.[5] A recent study has shown that sera from a volunteer experimentally infected with *P. vivax* suppressed the growth of *P. falciparum* in vitro.[6] This effect was mediated via IgM antibodies, and could be the means by which *P. vivax* infection protects against *P. falciparum*.

We propose that this case represents an example of cross-species protection. Patients with *P. falciparum* schizonts in their peripheral blood film are often extremely unwell, but this was not the case in our patient. In addition, his marked anaemia suggests that he had a chronic malaria infection, most likely with *P. vivax*, and an acute secondary infection, probably with *P. falciparum*, that precipitated the symptoms leading to admission. Although his intermittent chemoprophylaxis may have played a role, it is probable that a chronic dual infection was responsible for the suppression of the severe manifestations of disease in this case.

Authors' contributions: All the authors were involved in the management of the case; JW, CC and TD prepared the manuscript; DM processed the blood film and produced the picture. All authors read and approved the final manuscript. JW and TD are guarantors of the paper.

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Conflicts of interest: None declared.

Ethical approval: Not required. The patient gave informed consent for this case report to be written. The patient's assessment and treatment were in accordance with standard UK clinical practice.

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[Figure legend]

Figure 1 Giemsa-stained blood film showing an early trophozoite of *Plasmodium falciparum* (A) and a late trophozoite of *P. vivax* (B).