Whitehorn, J; Coltart, C; Manser, D; Doherty, T; (2009) A mixed malaria infection: is Plasmodium vivax good for you? Transactions of the Royal Society of Tropical Medicine and Hygiene, 104 (3). pp. 240-241. ISSN 0035-9203 DOI: https://doi.org/10.1016/j.trstmh.2009.08.004

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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; 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/dl and platelets $48 \times 10^9$/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).

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
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. A reduction in the severity of malaria symptoms occurs in individuals pre-exposed to different species, and *Plasmodium vivax* infection may protect against the severe complications of *P. falciparum*. This effect is thought partially to explain the lower mortality rates from *P. falciparum* seen in the Asia–Pacific region compared with Africa. A recent study has shown that sera from a volunteer experimentally infected with *P. vivax* suppressed the growth of *P. falciparum* in vitro. 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.

Funding: None.

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.
References


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