

**CASE OF THE MONTH**

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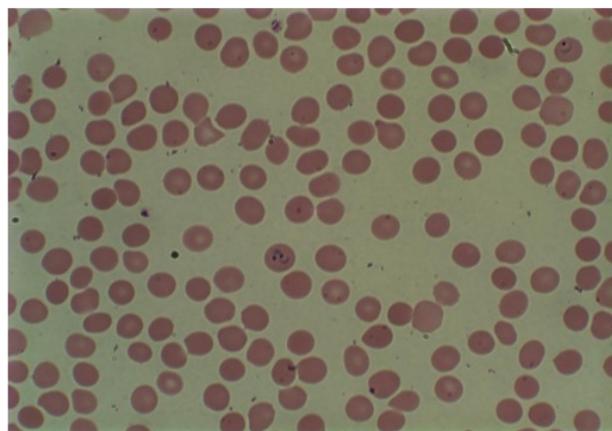
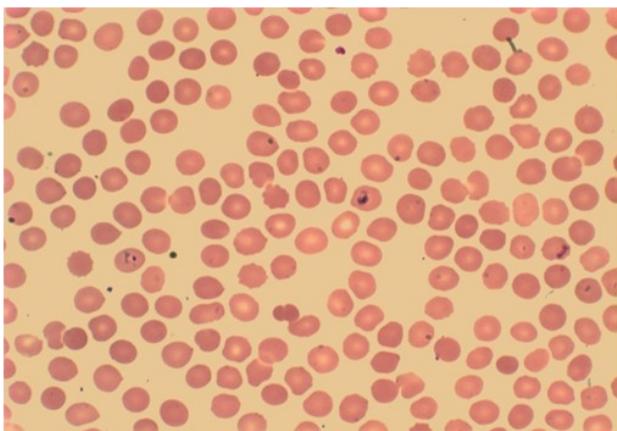
A 23 year old Caucasian male, with no significant past medical history, was admitted to University Hospital for evaluation of fever, chills and back pain. The patient reported that, five days prior to admission, he developed intermittent fever and chills with no specific pattern. He started taking ibuprofen and OTC medications for influenza with only partial relief. Two days prior to admission, he noticed back pain and, on the following day, he developed discomfort in his RUQ. He also reported fatigue and headaches. The patient denied neck stiffness, skin rash, arthralgias, dyspnea, cough, diarrhea, constipation, nausea or vomiting.

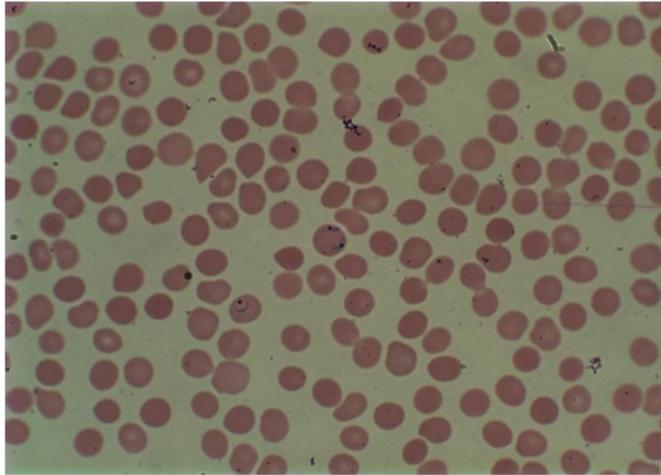
The patient works on a dairy farm in Missouri, milking, vaccinating and feeding the cattle. He has had occasional tick bites in the past. He has smoked half a pack per day for the past five years but denies alcohol abuse, illicit drug use or a history of STDs. He is sexually active with one partner.

Nine months prior to his presentation, the patient took a trip to India (Mumbai, Chennai) and Sri Lanka; he was traveling for three weeks and visited markets, beaches and an elephant sanctuary. He reports having had multiple mosquito bites during the trip but had taken malaria prophylaxis with doxycycline starting 10 days prior to the trip and continuing until two weeks after his return; he admits that he may have missed some doses. He ate vegetarian and non-vegetarian food during his vacation. He denied any symptoms of illness while traveling or upon arriving back in the U.S. After his return, he visited Wyoming, where he worked on a cattle breeding ranch and spent a few days in Colorado, where he went rafting and hiking.

On examination, his temperature was 41.2 C and his other vital signs were stable. Cardiovascular and lung auscultation were unremarkable. There was some tenderness to palpation of the RUQ and LUQ, his liver was palpable 2-3 cm below the right costal margin and splenomegaly was present. No lymphadenopathy, edema, urethral discharge, rash or neurologic deficits were found.

Admission labs revealed WBC 4.2, Hgb 13.2, platelets 41, normal liver enzymes, normal renal function and a total bilirubin of 2.5. A CXR was normal and an ultrasound of the abdomen revealed hepatosplenomegaly. G6PD levels were normal. A peripheral blood smear showed ring forms within RBCs, consistent with *Plasmodium vivax* (below):





The patient was diagnosed with *Plasmodium vivax* malaria and was treated with both chloroquine and primaquine (the latter to eradicate hypnozoites).

**Discussion:**

Malaria is a mosquito-borne disease caused by four species of malarial parasites that can infect humans: *Plasmodium falciparum*, *P. vivax*, *P. ovale* and *P. malariae*. Patients with malaria often experience fever, chills and a flu-like illness; if untreated, they may develop severe complications and die. Each year, 350-500 million cases of malaria occur worldwide, leading to 1 million deaths (most occurring in children in sub-Saharan Africa). About 1300 cases of malaria are diagnosed in the U.S. each year; the vast majority of these cases are in travelers or immigrants, arriving from sub-Saharan Africa or southern Asia.

In most cases, symptoms begin 10 days to 4 weeks after infection, although illness may develop as early as 1 week and as late as 1 year after inoculation. Two types of malaria, *P. vivax* and *P. ovale*, may have a relapsing course; in these infections, some parasites (hypnozoites) remain dormant in the liver for several months (or up to four years) after the person is infected. Once these parasites become active, they invade RBCs and the patient develops acute symptoms (a relapse of the initial illness).

In our case, the patient took doxycycline for prophylaxis, an acceptable option when traveling to India and Sri Lanka; chloroquine is not indicated for prophylaxis when traveling to those countries. However, as this case illustrates, prophylaxis is not always effective and malarial symptoms may develop up to 1 year after returning from a high risk area. Although there have been rare reports of chloroquine-resistant *P. vivax* in India, the CDC still recommends that chloroquine be used as initial treatment, with a switch to a chloroquine-resistant *P. vivax* regimen if clinical response is not documented. Primaquine is used to eradicate hypnozoites, thereby preventing relapse; since primaquine can cause hemolytic anemia in G6PD-deficient persons, G6PD screening is essential prior to starting treatment with this drug.

**References:**

<http://www.cdc.gov/Malaria>

Baird JK, Effectiveness of antimalarial drugs, *NEJM* 2005; 352:1565-1577