**Plasmodium and Borrelia Co-infection**

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Co-infection with *Plasmodium* and *Borrelia* has been reported only once in the English literature—in a man infected with *Plasmodium vivax* and *Borrelia persica*. We describe a 22-year-old Israeli woman who suffered from co-infection with *Plasmodium vivax* and *Borrelia* sp. (most probably *B. recurrentis*) contracted in East Africa. Both patients presented with hemolytic anemia and pancytopenia.

A 22-year-old Israeli woman was admitted to our emergency room on 20 September 2002 after 3 days of spiking fever and malaise. Between January and August 2002, she had traveled in East Africa (chronological order: Kenya, Uganda, Ethiopia, Tanzania, Malawi, Zamb; Botswana, Namibia, South Africa). During the first 6.5 months of her trip (in Kenya–Botswana), she had taken antimalarial prophylaxis consisting of mefloquine 250 mg once a week. Four to six months after leaving Israel, she experienced three febrile episodes lasting 1–5 days each. She denied any trips to caves or contact with wild rodents since her return. Several days before admission, daily episodes of chills and spiking fever reappeared. On admission, the patient was pale, her temperature was 38.2°C, her blood pressure was 100/60, her pulse rate was 100/min, and splenomegaly was noted. The hemoglobin level was 10.9 g/dL, the hematocrit was 22%, the reticulocyte count was 1.6%, the red blood cell count was 3.3 × 10⁶/mm³, the white blood cell count was 3,300/mm³, with 48% lymphocytes, 35% polymorphonuclears and 16% monocytes, the platelet count was 80,000/mm³, the haptoglobin level was 0 mg/dL, and the bilirubin level was 2.1 mg/dL (of which 1.7 mg/dL was indirect). The direct Coombs test was negative. Liver enzymes, creatinine, urea blood levels, glucose-6-phosphate dehydrogenase activity and urinalysis were normal. Examination of blood thick smear revealed *Borrelia* sp. and *Plasmodium vivax* parasites (fig.).

Therapy was started with doxycycline 200 mg/day and chloroquine base 1,000 mg, followed by 500 mg at 12, 24 and 36 h. Subsequent treatment with primaquine (15 mg base) continued daily for 14 days, and doxycycline treatment was continued for 7 days. During hospitalization, the patient’s temperature returned to normal; however, pancytopenia and hemolytic anemia continued for a few days and gradually improved. No blood transfusion was necessary. Repeat examination of blood thick smear on day 7 of the admission revealed no malarial parasites or *Borrelia* spp. The patient was discharged on day 9 after admission and has been well since.

**Discussion**

Our case is unique, first, because of co-infection with relapsing *Plasmodium vivax* and *Borrelia* sp., and second, because of presentation with hemolytic anemia and pancytopenia. Based on the history, it most probable that the two pathogens were contracted by our patient during her trip to East Africa. Louse-borne relapsing fever is caused only by *B. recurrentis*, and is transmitted from...
person to person by the human body louse *Pediculus humanus*. Flatau et al. have recently described a 21-year-old man who presented with severe hemolytic anemia (requiring blood transfusions), and pancytopenia and was found to be suffering from co-infection with *Plasmodium vivax* and *Borrelia*. In this case, the history revealed that he had contracted malaria in East Asia, but he was infected with *Borrelia* in Israel after his return (*B. persica*).

Both patients presented with a combination of jaundice, hemolytic anemia and pancytopenia. Jaundice and pancytopenia have been described in both infections. Hemolytic anemia has been reported in association with *Borrelia*, but rarely in previously healthy patients with *Plasmodium vivax* infection. We believe that it is possible that the synergistic effects of the two infections caused these complications in the two patients.

These two cases should alert physicians who care for febrile patients suffering from hemolytic anemia and/or pancytopenia who are returning from areas endemic for malaria and *Borrelia* infection, and to suspect and search the thick and thin blood smears for both pathogens.

**References**