POSITIVE BLOOD CULTURE WITH \textit{PLASMODIUM FALCIPARUM}: CASE REPORT

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Abstract. An adult traveler presented with fever and malaise after returning from Sierra Leone. Young trophozoites of \textit{Plasmodium falciparum} were seen in a blood smear, with parasitemia being 10%. Moreover, blood cultures drawn on admission signaled as “positive” after 1 day of incubation, but no bacteria were seen in the Gram stain or were subcultured. A Giemsa-stained smear from the positive bottle contents yielded numerous pigmented, mature trophozoites of \textit{P. falciparum}. This case indicates that, in patients with malaria, the growth of \textit{P. falciparum} in blood cultures can result in “false”-positive blood cultures.

INTRODUCTION

Malaria is among the most prevalent tropical diseases worldwide. Approximately 30,000 travelers from industrialized countries contract malaria each year.\textsuperscript{1} In travelers returning from malaria-endemic areas with fever, malaria is an important differential diagnostic consideration to be ruled out. Therefore, initial work-up should include blood smears. Moreover, to exclude bacterial (co)infection, initial work-up of febrile travelers should include blood cultures as well.\textsuperscript{2}

We describe herein the case of a patient with malaria in which high parasitemia resulted in a “false”-positive blood culture.

CASE REPORT

A 53-year-old male presented with fever, malaise, and headache after traveling to Sierra Leone without taking malaria prophylaxis. Laboratory results showed slight anemia (hemoglobin, 8.0 mmol/L), leukopenia (white blood cell count, 3.2 \times 10^{9}/L with 2% atypical lymphocytes), severe thrombocytopenia (platelet count, 23 \times 10^{9}/L), and unconjugated hyperbilirubinemia. Furthermore, lactate dehydrogenase, aspartate aminotransferase, and alanine aminotransferase were mildly elevated (348, 41, and 50 units/L, respectively). One blood culture set was drawn on admission, and blood smears were Giemsa stained for detection of malaria. The latter showed many young trophozoites of \textit{Plasmodium falciparum}, with parasitemia being 10% (Figure 1A). Malaria was diagnosed, and antimalarial therapy with intravenous quinine (10 mg/kg thrice daily) and oral doxycycline (100 mg twice daily) was initiated. After 24 hr of incubation, the BacT/Alert blood culture system (BD Diagnostics, 7 Loveton Circle, Sparks, MD) signaled the anaerobic blood culture to be positive. A Gram-stained smear of the anaerobic bottle contents showed no bacteria, but round intra-erythrocytic structures were seen, some with yellow-brown pigment (Figure 1B). A Giemsa-stained smear of the anaerobic bottle contents demonstrated numerous pigmented, mature trophozoites and few young trophozoites of \textit{P. falciparum} (Figure 1C). Aerobic and anaerobic subcultures of the anaerobic bottle showed no growth after 48 hr. After 3 days of quinine and

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\begin{figure}[h]
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\includegraphics[width=\textwidth]{figure1}
\caption{(A) Giemsa-stained thin blood smear on admission of the patient, showing many young trophozoites of \textit{P. falciparum}. (B) Gram-stained smear of the positive-signaled anaerobic blood culture, showing round intra-erythrocytic structures, some with yellow-brown pigment. (C) Giemsa-stained smear of the positive-signaled anaerobic blood culture, demonstrating numerous pigmented mature trophozoites and a few young trophozoites of \textit{P. falciparum}. This figure appears in color at www.ajtmh.org.}
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doxycycline therapy, treatment was continued with atovaquone/proguanil orally (1000/400 mg once daily) for 3 days. No complications occurred, and the patient was discharged in good clinical condition 7 days after admission.

**DISCUSSION**

We describe an unusual case of a patient with malaria in which high parasitemia resulted in a “false”-positive blood culture. Only two other reports have been published in the English literature about the triggering of a blood culture system by *Plasmodium* species. The parasitological and technical features of these published cases, including our case, are summarized in Table 1. All three previously published cases and our case concerned *P. falciparum*, with parasitemia being 1.8% to 10%. Both aerobic and anaerobic bottles from different blood culture systems were positive. McCarthy and others and Richalet and others described the *P. falciparum* trophozoites detected in the blood cultures as “late,” “dysmorphic,” or “altered,” respectively. We clearly document the difference between the young trophozoites seen in the thin smear on admission versus the numerous late trophozoites seen in the thin smear after 24 hr of incubation in the blood culture system.

Continuously monitored automated blood culture systems are used to detect bacteremia and fungemia. The BacT/Alert blood culture system monitors the elaboration of CO₂ by means of a colorimetric sensor at the base of the bottle. False-positive signaling of the system may be caused by a high patient leukocyte count (leukocyte count > 10.5 × 10⁹/L). In our patient, elevated leukocyte count was excluded as a cause of the signaling of the blood culture system. It has been described that *P. falciparum* produces CO₂ by means of anaerobic glycolysis within erythrocytes. In conclusion, our findings, supported by the literature, indicate that the growth of *P. falciparum* in our patients’ blood culture was the cause of the triggering of the blood culture system.

In travelers returning from the tropics with fever, the differential diagnosis should include malaria. Blood smears for malaria should be performed. Moreover, bacterial (co)infection should be excluded by means of blood cultures. Community-acquired bacterial coinfection in travelers with malaria occurs frequently and may contribute to death. Concurrent malaria and enteric fever have been described in adult and child inhabitants of malaria endemic areas. Therefore, blood cultures should be drawn even if malaria has been diagnosed. However, in patients with malaria, high parasitemia may result in “false”-positive blood cultures, as this case illustrates.

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**REFERENCES**