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Picture of a Microorganism

# *Plasmodium falciparum* and blood cultures: 'rings' a bell?

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The microbiological laboratory received two sets of aerobic/anaerobic blood cultures (Bact/Alert), which were processed in an automated system (Bact/Alert 3D). Aerobic bottles signalled growth after 3.7 and 4.1 hours, so Gram stains were performed, revealing various ring-shaped Gram-negative structures, not compatible with bacterial or fungal elements (Fig. 1). Giemsa-stained preparations of the same material demonstrated ring stages of *Plasmodium falciparum* (Fig. 2). The specimens derived from a 30-year-old Chilean man, who presented with fatigue, fever and jaundice after returning from Cameroon, where he had worked over several months. Severe falciparum malaria (parasitaemia, 19%) had been diagnosed by blood films and PCR the previous day; he was treated with intravenous artesunate and recovered without complications. Positive-flagged blood cultures were re-incubated and subcultured to exclude concomitant bacteraemia.

The phenomenon of 'false' positive growth triggered by malaria parasites in automated blood culture systems has been reported before in falciparum malaria patients with parasitaemias of 1.8%–10% [1–4]. In these reports, aerobic or anaerobic blood cultures were positive after 12–42 hours; in our case, probably because of the higher parasite density, the detection time was significantly shorter. It has been suggested that *P. falciparum* is capable of growth and maturation for at least 3 days in blood culture media [1]. This hypothesis was supported by our observation of mature trophozoites (Fig. 2), which usually do not appear in peripheral blood films. Microbiological laboratories should be familiar with the

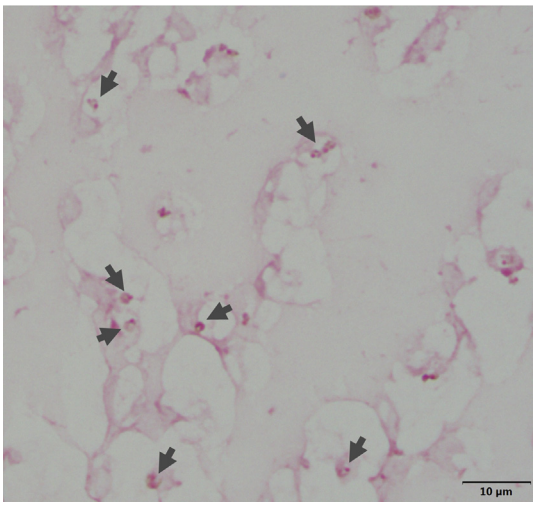


**Fig. 1.** Gram stain of positive blood culture bottle showing multiple round Gram-negative structures with a diameter of 2–3 µm (arrows). The ring-shaped appearance with a denser chromatin dot should arouse suspicion of malaria parasites.

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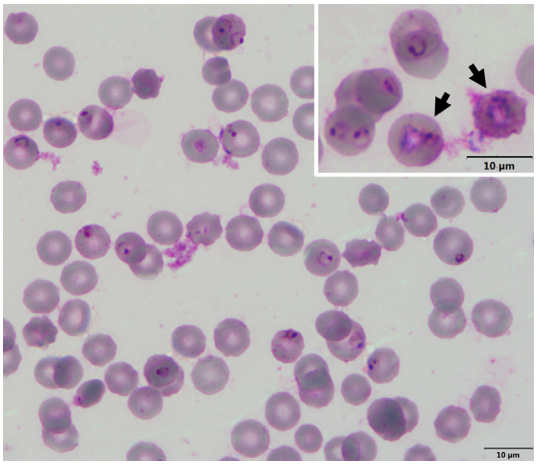


**Fig. 2.** Giemsa stain of the same blood culture confirming *Plasmodium falciparum* parasites with typical morphological criteria such as double trophozoite infection, double chromatin dots and multiple infected cells within high-power field (indicating high parasitaemia); besides the predominant early trophozoites (ring forms), there are also mature trophozoites (arrows), which are characterized by larger, irregular parasites within normal-sized red blood cells.

appearance of *Plasmodium* parasites in Gram-stained blood culture specimens, because they provide important diagnostic hints, especially in patients suffering from life-threatening falciparum malaria.

## Transparency declaration

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## CRediT authorship contribution statement

T. Weitzel: Conceptualization, Validation, Writing – Original, Draft Writing – Review & Editing, Visualization. L. Porte: Resources, Writing – Review & Editing.

## References

[1] McCarthy KM, Frean J, Loakes J, Liebowitz LD. Growth and maturation of *Plasmodium falciparum* in BacT/Alert blood culture system. Trans R Soc Trop Med Hyg 1999;93:272–4.
[2] Richalet G, Brenier-Pinchart MP, Bosseray A, Croizé J, Pelloux H. Bactec 9240 alarm triggered by *Plasmodium falciparum*. Eur J Clin Microbiol Infect Dis 2002;21:244–5.
[3] de Vries JJ, van Assen S, Mulder AB, Kampinga GA. Positive blood culture with *Plasmodium falciparum*: case report. Am J Trop Med Hyg 2007;76:1098–9.
[4] Aesif SW, Swierzbinski MJ, Keiser JF. Positive blood culture results after Plasmodium falciparum diagnosis. Lab Med 2014;45:e89–91.

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