Growth of *Mycobacterium tuberculosis* in Conventional BacT/ALERT FA Blood Culture Bottles Allows Reliable Diagnosis of Mycobacteremia

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The conventional BacT/ALERT FA blood cultures supported the ample growth of *Mycobacterium tuberculosis* in seeding experiments and appeared to perform as reliably as the BACTEC Myco/F-Lytic vials in the recovery of *M. tuberculosis* from blood in HIV-infected patients. Overall, blood cultures were positive in 39% of patients with tuberculosis.

In the 1980s, novel automated blood culture (BC) systems were investigated for their potential to diagnose mycobacteremia, especially in late-stage human immunodeficiency virus (HIV) disease. Studies, from mainly industrialized countries, described the frequent isolation of *Mycobacterium avium* complex and rather rare detection of *Mycobacterium tuberculosis* complex (3, 7), which led to the introduction and widespread use of BC based on Middlebrook broth. Recent studies, mainly from developing countries with high tuberculosis incidence rates, reported positive mycobacterial blood cultures from 5 to more than 30% (2, 6, 8). However, little is known about the nature of mycobacteremias, especially those caused by *M. tuberculosis*, and thus little is known of the ideal conditions for the collection of blood. In HIV-infected patients, "conventional" BCs tend to be collected more frequently than mycobacterial BC based on Middlebrook broth. However, *M. tuberculosis* is thought to grow very scantily, if at all, in conventional blood culture broths (7). The aim of this study was to investigate if conventional BacT/ALERT FA (bioMerieux, Marcy-l’Etoile, France) blood cultures (nutrient-rich complex media, supplemented with 6.5% charcoal) support the growth of *M. tuberculosis* and might thus help to determine the optimal timing, number, and yield for the diagnosis of MTC mycobacteremia in patients with HIV infection in Portugal.

The study took place at a large teaching hospital in Lisbon, Portugal. To serve as a baseline for this study, all positive mycobacterial blood cultures (BACTEC Myco/F-Lytic; Becton Dickinson, Sparks, Md.), collected from January 1999 up to February 2004 at the authors’ hospital, were analyzed. A total of 1,779 mycobacterial blood cultures were collected from 476 patients with HIV infection. The overall results per patient are shown in Table 1. Seven patients with one or more positive blood cultures for *M. tuberculosis* had further blood cultures collected within 24 h (BacT/ALERT FA and/or BACTEC Myco/F-Lytic). However, these BCs did not...
yield mycobacterial growth. Patients with positive blood cultures for *M. tuberculosis* in either BC system had blood collected earlier after admission (50.6% of all BCs collected within 48 h) than patients with culture-proven disseminated tuberculosis and negative BCs (18.8% collected within 48 h).

It has been shown that automated blood culture systems, essentially using some kind of Middlebrook-based broth, allow the detection of mycobacteria, including *M. tuberculosis* (2, 4, 6, 8). However, studies concluded that mycobacterial blood cultures added little to the conventional diagnostic work-up (2, 8) or were performed in areas where mycobacteria are endemic (8) and frequently in developing nations (6) where the use of expensive blood cultures is often beyond the already overstretched resources. Contrary to this, the results presented here corroborate a previous observation that blood cultures can be a useful tool for cultural confirmation of tuberculosis in HIV-infected patients in Portugal (4).

A rather surprising finding of this study was that the conventional BacT/ALERT FA culture medium did support the abundant growth of *M. tuberculosis* as shown by the seeding experiments. Furthermore, they seemed to have the potential to perform as well as the BACTEC Myco/F-Lytic bottles in the recovery of *M. tuberculosis* from the blood of HIV-infected patients. It may well be possible that the BacT/ALERT instrument would allow the detection of mycobacterial growth in the BacT/ALERT FA bottles if they were incubated long enough and the detection algorithm could be adjusted accordingly. Interestingly, a recent report announcing “the end of a dogma” (1) reminded us that simple blood agar appears to be as efficient as egg-based media for the recovery of *M. tuberculosis*. Perhaps, the widely held view that liquid media have to be based on some kind of Middlebrook broth with certain supplements (like OADC) may also have to be reexamined.

Concerning the ideal timing and number of blood culture collection (5), it appears that BC for the detection of mycobacteria should be collected as soon as possible after hospital admission, as shown by the fact that patients with culture-proven disseminated tuberculosis (mainly from liver biopsy specimens) had negative mycobacterial BCs when they were collected later during their hospital stay. This interesting observation has to be confirmed with a larger number of patients.

### REFERENCES