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Mycobacterium mucogenicum from the Hickman line of an immunocompromised patient

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ABSTRACT

Gram stain of a positive blood culture is the clinician's first indication of a possible causative infective organism and a guide to suitable antimicrobial therapy prior to cultural and phenotypic identification with susceptibility test results. Occasionally interpretation of a Gram stain can be difficult; if there is a low bacterial load, no organisms may be seen. Such a case is reported, where a positive blood culture taken from the Hickman line of an immunocompromised patient flagged as positive at 5 days' incubation, but no organisms were seen on Gram film. On subculture, a slow growing Gram-positive bacillus was isolated which was initially misidentified and reported as a "diphtheroid" species. The actual identity of this organism and further isolates was later elucidated as Mycobacterium mucogenicum, a rapidly growing non-tuberculous mycobacterium.

A 16-year-old boy was admitted to the paediatric oncology unit with lethargy, sore throat and shortness of breath. His presenting blood results were as follows: Hb 47 g/l, platelets 84 × 10^9/l, white blood cells 1.7 × 10^9/l, and neutrophils 0.53 × 10^9/l. A bone marrow biopsy confirmed a diagnosis of acute lymphoblastic leukaemia and a double lumen Hickman line was inserted for commencement of a four-drug chemotherapy regimen. A 5-day course of intravenous meropenem (1 g three times daily) was started empirically to cover Acinetobacter lwoffii. During this period he was clinically stable with occasional temperature spikes and negative blood cultures after 5 days' incubation. Thereafter he was reviewed weekly as an outpatient. Approximately one month after line insertion he was readmitted with febrile neutropenia (neutrophils 0.7 × 10^9/l); intravenous meropenem (1 g three times daily) was restarted. Blood cultures taken on admission from the red and white lumens of the Hickman line became positive (BacT/ALERT 3D system, Biomerieux (UK) Ltd, Basingstoke, UK). Acinetobacter lwoffii was isolated from the red lumen after 24 hours' incubation. No organisms were seen in blood from the white lumen at 5 days' incubation. This bottle was reloaded and flagged as positive at 5 days' incubation, but no organisms were initially seen on Gram stain, were again isolated on the fifth day of incubation; the site of sampling was not stated. After three days' incubation of the culture plates the isolate had a distinct earthy aroma, synonymous with the rapidly growing non-tuberculous mycobacterium (NTM). Ultraviolet microscopy with phenol auramine fluorescent stain using 1% acid alcohol was negative for acid-fast bacilli; however, auramine phenol using 1% sulphuric acid showed strongly staining acid-fast bacilli. This isolate was forwarded to the Regional Centre for Mycobacteriology at Newcastle Health Protection Agency Laboratory for confirmation and identification using basic cultural and biochemical procedures (see table 1); acid fastness of the organism was consistent with our findings (positive with 1% sulphuric acid, negative with 1% acid alcohol). Basic tests revealed that this isolate’s profile was inconsistent with the commonly isolated rapid growing mycobacteria belonging to the Mycobacterium fortuitum–chelonae complex. The isolate showed susceptibility to ethambutol, ciprofloxacin, gentamicin, amikacin, meropenem and linezolid, and resistance to streptomycin. A formal identification could not be established based on these findings. As the organism had been isolated from a blood culture and was deemed clinically significant, the MRU referred the isolate to the Molecular Microbiology Department at Leeds General Infirmary for 16S rRNA typing. Nucleotide sequence analysis and comparison using the BLAST facility at the National Institutes of Health established that the isolate shared a 99.8% similarity to Mycobacterium mucogenicum.

Retesting of the blood culture that grew the isolate initially reported as a diphtheroid species showed that this organism was also acid fast and identical to the subsequent isolate. During this period and following administration of meropenem, the patient had five negative blood cultures prior to hospital discharge 4 days later. However, he was again readmitted 1 week later with vague symptoms and started on meropenem (1 g three times daily), teicoplanin (400 mg once daily) and oral acyclovir. Gentamicin locks (10 mg/ml) were installed for 3 days and 3 days’ systemic gentamicin (300 mg once daily) was also given. A further two positive blood cultures taken on admission grew the same organism from both the red and white lumens, one after 3 days’ incubation
and one at 5 days’ incubation. The patient’s Hickman line was removed in accordance with published guidelines, culture of the catheter tip was negative despite prolonged incubation.

**DISCUSSION**

Catheter related infections due to NTM are relatively uncommon in comparison to other causes such as coagulase negative staphylococci. However, the reported incidence of such infections is considerably higher in patients with an immunodeficiency condition and long term indwelling catheters. The source of infection is usually considered to be the environment, and water borne NTM have frequently been implicated as contaminants of equipment associated with hospital water systems. Kline et al. discuss an outbreak of *M. mucogenicum* catheter related bacteraemia in a group of patients who had recently undergone bone marrow transplantation. Investigations to determine the source of infection revealed that *M. mucogenicum* was the most frequent NTM isolated from the many different water samples tested within the hospital setting. Molecular typing analysis of the *M. mucogenicum* isolates showed that one of the patient’s blood culture isolates matched an isolate from the shower in the patient’s room, suggesting water contamination of the catheter during bathing.

Covert et al. established that NTM were present in many different water systems, including samples from both hospital and residential sources. Their study revealed *M. mucogenicum* as the most common occurring NTM in surface drinking water.

The patient discussed in this report had four positive blood cultures where *M. mucogenicum* was isolated. The isolates were thought to be colonising the lumens of the Hickman line, as there was no evidence of septicemia. It was observed that all blood culture isolates occurred approximately one month after hospital discharge. While at home the patient was given cytarabine boluses via the Hickman line by his parents who had been appropriately instructed regarding maintaining asepsis during line care. It is difficult to ascertain the route by which the patient’s line became colonised with *M. mucogenicum*; however, one of the possibilities to consider is exposure of the line to tap water during regular activities such as bathing. Only one *M. mucogenicum* isolate was detected within five days (three days), with the remaining three isolates detected on the fifth day of incubation. This department, in line with published guidelines, incubates blood cultures in the BacT/Alert continuous monitoring system for 5 days; after 5 days’ incubation bottles are assumed to be negative and are manually removed from the system. This case study raises the issue of extending the incubation period beyond 5 days for blood cultures from immunocompromised patients.

**REFERENCES**