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Letters to the Editor

Sir,

Polymicrobial pseudobacteraemias associated with non-sterile sodium citrate blood collection tubes

Contamination of blood cultures with skin microorganisms such as coagulase-negative staphylococci, propionibacteria and corynebacteria has been well described[1] and is usually due to poor skin preparation prior to venepuncture or poor handling and preparation of blood culture vials. Pseudobacteraemias associated with a wide variety of environmental Gram-negative bacilli have also been reported, usually involving single species such as *Pseudomonas pickettii*,[2] *Pseudomonas cepacia*,[3,4] *Serratia marcescens*[5,6] and *Serratia liquefaciens*[7,8] but also multiple isolates for example *Enterobacter cloacae, Alcaligenes faecalis, Pseudomonas aeruginosa* and *Acinetobacter calcoaceticus*.[9] An association between pseudobacteraemia and the use of non-sterile sodium citrate and EDTA blood collection tubes,[4–9] contaminated skin disinfectants,[3] sterile fluids for injection[2] and poor blood culture collection techniques has been previously documented.

We report another outbreak of pseudobacteraemia arising from non-sterile sodium citrate blood collection tubes involving several species of Gram-negative bacilli. Over a five-month period (August–December 1992) *Alcaligenes xylosoxidans* subsp. *xylosoxidans* was isolated from the blood cultures of eight patients at the Royal Melbourne Hospital. In addition to this organism, two blood culture bottles also yielded *Xanthomonas maltophilia* and one bottle yielded *Klebsiella oxytoca*. Over the same time '*Corynebacterium aquaticum*' was isolated from the blood cultures of five additional patients. This organism does not appear in the Approved Lists of Bacterial Names and is awaiting reclassification to a different genus.[10]

'*Corynebacterium aquaticum*' is an uncommon human pathogen, but has been reported as causing urinary tract infection and meningitis in a neonate, peritonitis in two patients undergoing continuous ambulatory peritoneal dialysis and bacteraemia in a child with chronic granulomatous disease.[10]

The isolation of a non-spore forming, motile, Gram-positive bacillus in blood cultures is usually clinically significant. The microscopic morphology and tumbling motility associated with '*Corynebacterium aquaticum*' may lead to confusion with *Listeria monocytogenes* when blood culture broth is examined directly by phase contrast microscopy. Similarities also exist in the biochemical profiles of these two organisms with both producing catalase and hydrolysing aesculin. Unlike *L. monocytogenes*, '*C. aquaticum*'

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is not beta-haemolytic on horse blood agar and produces only pinpoint colonies after 24 h incubation at 35°C in 5% CO_2 in air. A characteristic yellow pigment may be seen after 48 to 72 h incubation.

Gram-negative bacilli isolated from blood cultures are rarely dismissed as contaminants and in view of the variety of organisms implicated in cases of pseudobacteraemia, it may be difficult to recognize these organisms as contaminants in the early stages of an outbreak, resulting in a delay in correct diagnosis, inappropriate antimicrobial therapy and possibly prolonged hospitalization.[1] It may not be until the number of isolates exceeds the institution's norm that the possibility of an outbreak being in progress is raised and a source sought.

In our cases the organisms isolated were considered to be contaminants on clinical grounds, although antimicrobial therapy was initiated in one case. A review of medical records and discussions with ward staff revealed that at the time of each blood culture collection, a single sample of blood had been taken and inoculated firstly into a sodium citrate tube for coagulation profiles, and secondly into blood culture vials. Samples of unused tubes were collected from various hospital wards and the aspirated anticoagulant fluid cultured. *Alcaligenes xylosoxidans* subsp. *xylosoxidans, X. maltophilia, Klebsiella oxytoca* and '*C. aquaticum*' were isolated from a number of tubes. The Gram-negative bacilli had identical API 20NE profile numbers, biochemical patterns (determined by our in-house replicator system) and antibiograms to those isolates from the blood culture vials. The '*C. aquaticum*' isolates were identified by conventional biochemical techniques[10] and two isolates were confirmed by the Microbiological Diagnostic Unit, University of Melbourne.

There is no requirement under the Australian Therapeutic Goods Act (1989) for non-evacuated blood collection tubes to be sterile, yet many hospital staff are under the impression that these tubes are invariably sterile when in fact they may not be. A study of the microbiology of evacuated blood collection tubes showed that 14% contained a range of both Gram-positive and Gram-negative bacteria, together with some fungi.[11] The authors also found that 9% of supposedly sterile blood collection tubes were contaminated with bacteria including *P. aeruginosa, Enterococcus* sp., *S. marcescens* and *A. calcoaceticus*.

Hoffman and colleagues in 1976[6] showed that both needle and syringe could become contaminated by bacteria already present in evacuated collection tubes as a result of reflux. When blood is introduced under pressure into these tubes and filled above the level of the needle tip, both fluid and air bubbles can reflux into the syringe. This phenomenon could also occur with non evacuated blood collection tubes by means of splashing. When this same sample is subsequently introduced into blood culture vials the contamination can be carried over.

In order to reduce the possibility of a recurrence of pseudobacteraemia in our hospital, gamma-irradiated sodium citrate tubes have now replaced the

previous tubes, blood culture collection protocols have been modified and staff re-educated. No further isolates of *Alcaligenes xylosoxidans* subsp. *xylosoxidans* or '*C. aquaticum*' have been encountered to date.

We write to highlight the necessity of maintaining scrupulous blood culture collection protocols. The failure to do so may result in inappropriate changes to patient management and waste laboratory and clinical resources.

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Sir,

Acremonium infection in two compromized patients

Recent reviews of newly recognized fungal pathogens,[1–3] cite only two cases of pulmonary infection with *Acremonium* spp. but no disseminated or cerebral infections were reported.[4] *Acremonium* spp. were not present