

# *Tsukamurella tyrosinosolvens* intravascular catheter-related bacteremia in a haematology patient: a case report

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**Abstract.** – *Tsukamurella* spp. are a rare but important cause of intravascular catheter-related bacteremia in immunocompromised patients. The organism is an aerobic, Gram-positive, weakly acid-fast bacillus that is difficult to differentiate using standard laboratory methods from other aerobic actinomycetales such as *Nocardia* spp., *Rhododoccus* spp., *Gordonia* spp., and the rapid growing *Mycobacterium* spp. We report a case of *Tsukamurella tyrosinosolvens* catheter-related bacteremia in a 51-year-old haematology patient who responded to treatment with imipenem and subsequent line removal. 16srRNA sequencing allowed for the prompt identification of this organism.

*Key Words:*

*Tsukamurella tyrosinosolvens*, Catheter-related, Bacteremia.

## Introduction

*Tsukamurella* spp. are a rare but important cause of serious infection in immunocompromised patients, especially those with indwelling intravascular catheters<sup>1-3</sup>. Other reported infections include bacteremia in haemodialysis patients with catheters<sup>4,5</sup>, lung infection<sup>6</sup>, meningitis in a leukemic patient<sup>7</sup>, subcutaneous abscesses and necrotizing tenosynovitis<sup>8</sup>, conjunctivitis<sup>9</sup>, and others.

The organism is an aerobic, Gram-positive, weakly acid-fast bacillus that is difficult to differentiate using standard laboratory methods from some of the other aerobic actinomycetales such as *Nocardia* spp., *Rhododoccus* spp., *Gordonia*

spp. (previously known as *Gordonia* spp.) and the rapid growing *Mycobacterium* spp.<sup>1,3</sup>. It is important to correctly identify these organisms, as treatment guidelines are available for *Nocardia* spp., *Rhodococcus equi* and some of the rapid-growing *Mycobacterium* spp., while treatment guidelines for infection with *Gordonia* spp. and *Tsukamurella* spp. are presently insufficient and management of these infections are guided mainly by case reports and reviews in the literature.

We describe here a case of bacteremia with *Tsukamurella tyrosinosolvens* in a 51-year-old haematology patient.

## Case Report

A 51-year-old lady with acute myeloid leukemia was admitted for chemotherapy. Two days later a peripherally inserted central venous catheter (PICC) was inserted. Granulocyte stimulating factor (GCSF rescue) was given on completion of chemotherapy. On day 13 post chemotherapy, she became febrile. Physical examination and chest X-ray were unremarkable. Blood cultures were taken from the periphery and through the central line, after which she was given intravenous cefepime 2 g (8 hourly) and gentamicin 240 mg daily. Blood counts on day 14 post chemotherapy revealed she was neutropenic and the neutropenia persisted until day 23 post chemotherapy. As she was still febrile on day 18 post chemotherapy, repeat blood cultures were taken from a peripheral vein and via the PICC, and antibiotic therapy was switched to imipenem 500 mg (6 hourly). She responded within 12 hours with defervescence of fever. Gram positive, partially acid-fast bacilli were isolated from blood cultures taken from a peripheral vein and via the PICC catheter on day 13

and day 18 respectively. The microbiology laboratory informed that the partially acid-fast bacilli were possibly a *Rhodococcus* spp., *Nocardia* spp., *Gordona* spp. or a rapid growing *Mycobacterium* spp. After six days of intravenous imipenem, she remained well, and pending full identification of these rods, the patient was discharged and planned for review in the clinic a week later.

When seen at the review, she was well apart from pus discharge from the PICC insertion site. A swab was taken for culture from this site. She was given oral cloxacillin and sent home. A week later, at the second review (by which time the identification of the Gram-positive rods from the earlier blood cultures were known to be *Tsukamurella tyrosinosolvens* by 16s sequencing) the patient was still found to have pus discharge from the PICC site and in addition, had tenderness at the insertion site. The earlier swab from the PICC site had grown coagulase negative *Staphylococcus* which was methicillin resistant. Another pus swab and blood drawn via the PICC line were taken for culture. The line was then removed. Another weeks' course of oral cloxacillin was given empirically. At the third review a week later, the patient was found to be well with no pus discharge or abscess at the previous PICC insertion site. The blood culture taken via the line at the second review had grown *Bacillus* spp., but clinically the patient did not appear septicaemic, and it was not thought to be clinically relevant. The pus swab grew a mixture of coagulase negative *Staphylococcus* which was methicillin resistant and also "diphtheroids". The PICC line tip grew >15 CFU (colony forming units) (using the Maki roll technique) of partially acid-fast Gram-positive rods again, identified as *T. tyrosinosolvens* based on its identical characteristics to the earlier isolates from the blood cultures. The patient was well and no further antibiotics were given.

### Microbiology Investigations

Blood culture from a peripheral vein taken on day 13 post chemotherapy and from the PICC line on Day 18 post chemotherapy grew Gram-positive bacilli from the BD BACTEC™ Plus Aerobic/F Medium bottles (Becton, Dickinson Diagnostic Inc, Sparks, MD, USA). It grew after overnight incubation when subcultured onto blood agar, chocolate agar and Mac Conkey agar. Gram stain of the colonies revealed non-branching rods. After 48 hours, the colonies were larger and distinctly dry with a wrinkled appearance,

and the colour was yellow on blood and chocolate agar, and pale pink on Mac Conkey agar without crystal violet. The organism was a strict aerobe, catalase positive and weakly acid-fast. The API Coryne (BioMérieux sa, Marcy l'Etoile, Craponne, France) profile was 2150004, which identified with low discrimination as *Rhodococcus* spp. (82.9%) followed by *Aureobacterium* spp./*Corynebacterium aquaticum* (12.2%). The possibility of genus *Gordona* or *Dietzia* or *Nocardia* was also mentioned.

There are no interpretation criteria for disk diffusion sensitivity testing of Gram positive rods using the Clinical and Laboratory Standards Institute (CLSI) disk diffusion method. Based on the criteria available for Staphylococci<sup>10</sup>, the organism appeared sensitive to imipenem, vancomycin, cefepime and trimethoprim-sulfamethoxazole and resistant to piperacillin/tazobactam (however, when repeated at a later date, was found to be sensitive to it). The minimum inhibitory concentration by E test (AB Biodisk, Solna, Sweden) performed later was 0.19 µg/ml for imipenem and 1.0 µg/ml for cefepime. As the API identification of the organism was not conclusive, molecular identification by PCR amplification and sequencing of the 16S rRNA gene was performed as previously described<sup>11</sup>. The resulting sequences were aligned and assembled into contig using Sequencher™ ver 4.9 (Gene Codes Corporation, Ann Arbor, MI, USA). The complete 16s rRNA consensus sequence containing 1385 nucleotides was compared with those available in the GenBank Data System. A 99% sequence similarity to *Tsukamurella tyrosinosolvens* (Gen Bank Accession Number: AY254699) was obtained.

### Discussion

Tsukamura and Mizuno first described *Gordona aurantiaca* from sputum of patients with chronic pulmonary disease in 1971<sup>12</sup>. This organism was later also known as *Rhodococcus aurantiacus*<sup>3,13</sup> until 1988, when Collins et al<sup>14</sup> found 99% sequence homology of the organism with *Corynebacterium paurometabolum* (which had earlier been described by Steinhaus in 1941)<sup>15</sup>, and proposed reclassifying and merging these organisms, naming it *Tsukamurella paurometabolum* (now known as *Tsukamurella paurometabola*)<sup>14,3</sup>. This organism has been

found in soil, sludge and arthropods<sup>3,16</sup>. Various species have been described in the genus *Tsukamurella*<sup>2</sup>, and intravascular catheter-related infections have been previously reported among the infections caused by *Tsukamurella tyrosinosolvens*<sup>2,3,5</sup>.

In the present case, the initial tests by API Coryne could not ascertain the identity of the organism. The possibility of it being a *Rhodococcus* spp. was doubtful as the Gram stain did not reveal cocco-bacilli, nor was there any rod/coccus cyclic variation which may be seen in some *Rhodococcus* spp.<sup>1</sup> "Unlike *Nocardia* spp.<sup>1</sup>, this organism did not have a branching appearance on Gram stain". Elshibly et al<sup>2</sup>, also reported an API identification profile of 2150004 (similar to ours) for an isolate subsequently confirmed as *Tsukamurella tyrosinosolvens*. *Tsukamurella* cells are described as long rods that fragment and grow independently<sup>1</sup>. They do not form spores, capsules or aerial hyphae<sup>1</sup>, and colonies have been described as being "flat and spreading with a suedelike surface"<sup>3</sup>, and having a "cerebri-form" appearance after prolonged incubation<sup>1</sup>. The colonies of *Tsukamurella tyrosinosolvens* have been described as "yellowish, dry and rough" on BHI agar<sup>17</sup>. Susceptibility testing to antimicrobials by a minimum inhibitory concentration method should be performed<sup>3</sup> and the Clinical and Laboratory Standards Institute (CLSI) has a document with the broth microdilution method for susceptibility testing of aerobic actinomycetes<sup>18</sup>."

In the present case, treatment outcome was successful with antibiotics and also catheter removal, as reported by other authors<sup>2,3,5</sup> for management of *Tsukamurella* infection. The subsequent swabs taken from the discharge and pus from the PICC insertion site grew organisms which are frequently found on the skin as normal flora (coagulase negative *Staphylococcus* and diphtheroids) which can also be associated with intravenous catheter-associated infection. The 'diphtheroids' did not look like the *Tsukamurella* identified from the blood cultures or catheter tip and were not identified further. Culture of the PICC tip however, grew a significant growth of the same partially acid-fast bacteria, *Tsukamurella tyrosinosolvens*, which could have potentially led to further episodes of bacteremia in this patient if not removed.

In summary, the present case describes septicaemia in a haematology patient due to intravenous catheter-associated infection with *Tsuka-*

*murella tyrosinosolvens*. It is important to document infection with this organism as it is rarely encountered. It also underlines the importance of correctly identifying partially acid-fast Gram-positive rods as management of their respective infections is different. 16srRNA sequencing proved a useful tool in the identification of this organism.

#### Acknowledgements

The 16srRNA gene sequencing was funded by a University of Malaya F vote grant (FS243/2008B).

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