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## CASE REPORT

# *Comamonas testosteroni* infection in Taiwan: Reported two cases and literature review

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*Comamonas testosteroni* is a widely distributed aerobic gram-negative bacillus. Infection by *C. testosteroni* is infrequent, and no such cases have been reported in Taiwan. Here, we would like to present a 54-year-old alcoholic patient from Taiwan, and his left leg was injured during a fishing trip, resulting in left leg cellulitis and *C. testosteroni* bacteremia. The patient's fever subsided after initial treatment with extended-spectrum cephalosporin, whereas his erythematous swelling did not resolve until switched to ciprofloxacin. The second patient is a 73-year-old Taiwanese male with chronic hepatitis B infection, liver cirrhosis, and hepatocellular carcinoma. *Comamonas testosteroni* bacteremia was found after transarterial embolization. Further studies are necessary to determine the best antibiotic(s) for patients infected with *C. testosteroni*.

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## Introduction

*Comamonas testosteroni* is an aerobic gram-negative bacillus that is motile, nonglucose fermenting, nonspore forming, and presents singly or in pairs. This species, known as *Pseudomonas testosteroni* before its reclassification by molecular genetic techniques, metabolizes testosterone.<sup>1</sup> Comamonads have a wide geographic distribution and are commonly found in soil, plants, water saprophytes, and also in humidifier reservoir water.<sup>2</sup> Until 1987, *C. testosteroni* has only rarely been implicated in human infections of the abdomen, bloodstream, central nervous system, and urinary tract. In the late 1980s, researchers reported 18 unrelated cases more than a 3-year period in the state of Texas, suggesting that this species might be missed if not carefully identified by clinical microbiology laboratories.<sup>3</sup> Although the pathogenic potential of *C. testosteroni* has not been well studied, it is usually considered a commensal. *C. testosteroni* has been implicated in bacteremia-related septic shock, endocarditis, and meningitis.<sup>4–6</sup> The following is the presentation of two patients with *C. testosteroni* bacteremia.

## Case report

### Case 1

A 54-year-old Taiwanese male who suffered a traumatic injury on his left leg and subsequently developed progressive painful erythematous swelling and local warmth that were accompanied by fever was admitted. One week before admission, the patient fell down while fishing and injured his left leg by a fish fin. Before this, he was in good health without any systemic disease except mild obstructive lung disease. His only previous hospitalizations were for bilateral hip avascular necrosis followed by replacement of hip joints (2 years before) and herniation of an intervertebral disc followed by instrumentation and fusion (5 years before).

After injury, the patient did not care for his wound, and he developed erythematous painful swelling with local warmth (Fig. 1). The symptoms worsened and were eventually accompanied by fever and chills that were not controlled by oral antipyretics. During his initial hospitalization, no leukocytosis or elevated serum C-reactive protein was observed, although his wound was not healing. Intravenous oxacillin (2 g for every 6 hours) was prescribed as an empirical treatment for cellulitis. Soon after, an initial blood culture report indicated the presence of gram-negative bacilli. Extended-spectrum cephalosporin was administered for the treatment of *Aeromonas hydrophilia*, a common fresh water species in Taiwan with a high mortality rate.<sup>7</sup> The patient's fever subsided, but the erythematous lesion on his left leg did not improve. *C. testosteroni*, which had been reported that possibly associated with exposure to tropical fish,<sup>8</sup> was subsequently identified from a blood culture using the BACTEC 9240 system (Beckson Diagnostic Instrument System, Sparks, MD, USA). Figure 2 showed the species on sheep blood agar, eosin methylene blue agar, and chocolate agar plates. The results of biochemical tests traditionally used to identify *C. testosteroni* are shown in Table 1 and confirm our identification of *C. testosteroni*. Results from the



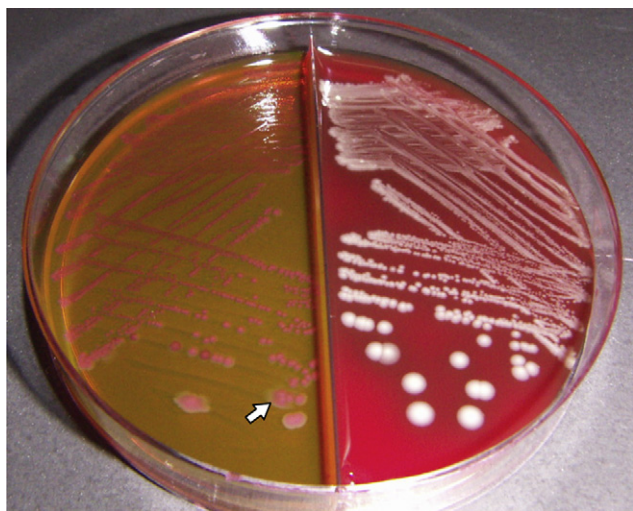
**Figure 1.** Case 1 had erythematous painful swelling with local warmth on his left leg (both arrows indicated the wounds injured by fish fin).

Phoenix100 System (Beckson Diagnostic Instrument System, Sparks, MD, USA) were positive (98%) for *C. testosteroni*. The Clinical and Laboratory Standards Institute does not provide standards for antibiotic susceptibility testing of this species by the disk diffusion method.

Because of the poor progress of the lesion, a computed tomography (CT) scan was performed with contrast enhancement of the left lower extremities to look for possible necrotizing fasciitis. The CT scan revealed swelling of the superficial soft tissue on the left lower leg and foot regions, but there was no visible enhancement of fluid accumulation on serial CT images of the lower extremity (Fig. 3). Antibiotic was changed to intravenous ciprofloxacin (400 mg for every 12 hours). On the fifth hospital day, a painful fluid-contained lesion was found on the left medial ankle and some bloody discharge. The wound was aspirated but found no aerobic or anaerobic bacteria in the aspirate. The patient's leg lesion subsided gradually after 8 days of antibiotic treatment, and he was discharged on the 14th hospital day. A follow-up for visit 2 weeks after discharge demonstrated that the patient was stable and had no evidence of reinfection.

### Case 2

A 73-year-old Taiwanese male with chronic hepatitis B infection, liver cirrhosis, and hepatocellular carcinoma presented with persistent dull abdominal pain over the supraumbilical region (10 cm above umbilicus) 1 month before admission. This patient received four courses of transarterial embolization for hepatocellular carcinoma during May 2006 to May 2007. Eating food exacerbated the pain, but he denied nausea, vomiting, bowel habit change, fever, tea-colored urine, or radiation pain.



**Figure 2.** In Case 2, *Comamonas testosteroni* was detected from blood culture and inoculated on sheep blood agar (left side) and eosin methylene blue agar (right side). Colonies were 0.5–1.5 mm in diameter after 24 hours of incubation in air at 35°C. The colonies were gray, smooth, entire, slightly raised, and nonhemolytic on blood agar (arrows indicated the pink colonies appeared on eosin methylene blue agar).

The patient's abdominal pain became more severe 2 weeks before presentation. At presentation, an abdominal CT scan indicated several residual tumors and admission was arranged. Radiofrequency ablation was performed for recurrent liver tumors. On the following day, the patient experienced fever with chills. Two sets of blood cultures were collected, and intravenous cefmetazon, Daiichi Sankyo Propharma Co., Ltd. Nihonbashi Koamicho, Chuo-Ku, Tokyo, Japan (1 g every 8 hours) and gentamicin (60 mg every 8 hours) were administered. When the blood cultures revealed *Acinetobacter baumannii* and *C. testosteroni*, we changed antibiotic to intravenous levofloxacin (500 mg once a day). The patient's condition improved gradually, with subsidence of fever and abdominal pain. He was discharged with stable vital signs and was given oral levofloxacin (500 mg every day) for 4 days. Three months after discharge, the patient has remained stable and has no evidence of reinfection.

## Discussion

Our first case had cellulitis because of *C. testosteroni* bacteremia. This organism is widespread and occurs in water, soil, plants, and animals. It has also been identified in hospital devices, such as intravenous lines and the humidifier reservoir water in respiratory therapy equipment. *C. testosteroni* (formerly *P. testosteroni*) is usually considered a nonpathogenic microorganism. A literature review indicates that only 27 patients have been infected with *C. testosteroni*,<sup>4</sup> and only one case report was presented after that review until now, so our two patients represent the 29<sup>th</sup> and 30<sup>th</sup> reported cases of *C. testosteroni* infection. Clinical information is available for only 19 of these patients. Eight had intra-abdominal infections, nine had bloodstream infections, two had central nervous system infections, one had a respiratory tract infection,

one had a urinary tract infection, and two had concurrent intra-abdominal and bloodstream infections (Table 2).

Because *C. testosteroni* can be isolated from fresh water, it seems likely that wound infection could occur after contact with contaminated water. However, no such cases have been previously reported. Cellulitis, often because of an acute spreading infection beneath the dermis, is usually caused by group A streptococci or *Staphylococcus aureus* and is usually associated with a wound or penetrating trauma. Cellulitis is less commonly caused by nontuberculous mycobacteria in soil, *Burkholderia pseudomallei* (melioidosis) in tropical areas, *Aeromonas hydrophila* in fresh water, *Pasteurella multocida* in animal bites, *Eikenella corrodens* in human bites, and *Bartonella henselae* in cat scratch disease.<sup>9</sup> *C. testosteroni*-mediated cellulitis has not been reported previously, possibly because of the low pathogenic potential of this species.

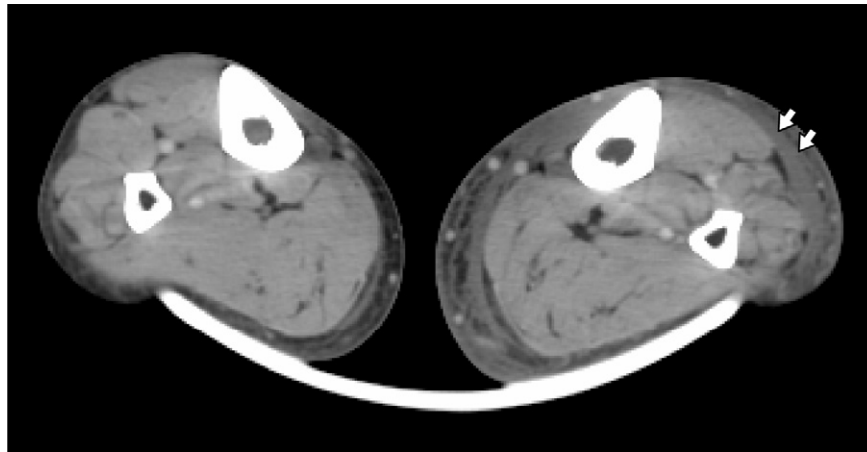
Among the eight patients with *C. testosteroni*-mediated intra-abdominal infection (Table 2), a perforated appendix was the most common predisposing factor (6/8, 75%) and one of them also had *C. testosteroni* bacteremia. All seven of these patients survived. From the list of 19 patients provided in Table 2, only 2 patients died. One was stillborn, and the other was premature. Maternal intravenous drug abuse was noted in both cases. Excluding patients younger than 1 year of age, the mortality rate of *C. testosteroni* infection is zero. This suggests a low pathogenic potential.

Reviewing the antibiotics used to treat *C. testosteroni* infection, a  $\beta$ -lactam was given to every patient (except the stillborn patient) along with other agents, such as an aminoglycoside or a quinolone. Cefoxitin, a second-generation cephalosporin, was the most frequently used antibiotic. The isolate in present two cases was sensitive to a broad range of antibiotics, including all tested cephalosporins and quinolones. As in all but two previous cases, our

**Table 1** Results of traditional biochemical tests used for identification of *Comamonas testosteroni*

Testing items	Results
Oxidase	Positive
Growth on MacConkey	Positive
TSIA slant	Alkaline
TSIA butt	Neutral
Hydrogen sulfide from TSIA	Negative
Urease	Negative
Motility	Positive
Indole production	Negative
Voges-Proskauer	Negative
Citrate utilization	Negative
Lysine decarboxylase	Negative
Arginine dihydrolase	Negative
Ornithine decarboxylase	Negative
OF-Glucose	Alkaline
OF-Fructose	Alkaline
OF-Mannitol	Alkaline
Pigment	Negative
Hemolysis on BAP	Negative

BAP = blood agar plate; OF = oxidative fermentation; TSIA = triple sugar iron agar.



**Figure 3.** In Case 1, a computed tomography scan with contrast enhancement of lower extremities revealed swelling of superficial soft tissue on the left lower leg to foot region. There was no visible enhancing fluid accumulation on serial images. An inflammatory process, such as cellulitis or superficial fasciitis, was considered the most likely diagnosis (the arrows indicated swelling of superficial soft tissue).

patient's infection resolved after antibiotic therapy. Interestingly, our patient's fever subsided after initial treatment with an extended-spectrum cephalosporin, but the erythematous swelling on his left leg did not resolve

until we switched to ciprofloxacin. Although some bloody discharge formation was noted and aspirated then, we found no aerobic or anaerobic bacteria in the aspirate. Thus, we thought that the real cause of resolution of the

**Table 2** Case reports of infection by *Comamonas testosteroni*

Patient no.	Sex/age (yr)	Diagnosis	Specimens isolated	Antibiotic agents	Outcome	Reference
1	F/54	Catheter-related infection	Blood	Cefepime, ciprofloxacin, and drotrecogin alfa	Cured	Abraham and Simmon <sup>4</sup>
2	M/50	Cholesteatoma	CSF	Meropenem	Cured	Arda et al. <sup>6</sup>
3	F/31	Bacteremia	Bone and bone marrow	Kanamycin and tetracycline	Cured	Atkinson et al. <sup>9</sup>
4	M/31	Appendicitis	Abdominal abscess	Cefoxitin	Cured	Barbaro et al. <sup>3</sup>
5	F/24	IVDA	CSF	Moxalactam and nafcillin	Cured	Barbaro et al. <sup>3</sup>
6	F/59	Alcoholic cirrhosis	Peritoneum	Cefoxitin	Cured	Barbaro et al. <sup>3</sup>
7	M/11	Appendicitis	Peritoneum	Ampicillin, clindamycin, and tobramycin	Cured	Barbaro et al. <sup>3</sup>
8	F/12	Appendicitis	Peritoneum	Cefoxitin	Cured	Barbaro et al. <sup>3</sup>
9	F/21	Appendicitis	Peritoneum	Cefoxitin	Cured	Barbaro et al. <sup>3</sup>
10	ND/SB	Maternal IVDA	Cord blood	None	Died	Barbaro et al. <sup>3</sup>
11	F/84	CHF and UTI	Urine	Ampicillin	Cured	Barbaro et al. <sup>3</sup>
12	M/24	Appendicitis	Peritoneum	Cefoxitin	Cured	Barbaro et al. <sup>3</sup>
13	F/NB	Maternal IVDA	Blood	Ampicillin and amikacin	Died	Barbaro et al. <sup>3</sup>
14	M/49	Infective endocarditis	Blood and mitral valve	Cefepime + gentamicin, and then ampicillin	Cured	Cooper et al. <sup>5</sup>
15	ND/ND	AIDS	Respiratory secretions	Ceftazidime	Cured	Franzetti et al. <sup>10</sup>
16	M/22	Appendicitis	Peritoneum and blood	Cefazolin	Cured	Gul et al. <sup>11</sup>
17	F/75	Catheter-related infection	Blood and CVC	Ceftazidime and gentamicin	Cured	Le Moal et al. <sup>12</sup>
18	M/54	Cellulites	Blood	Oxacillin, flomoxef, and then ciprofloxacin	Cured	Present case 1
19	M/73	Intra-abdominal infection and HCC	Blood	Metacin + gentamicin and then levofloxacin	Cured	Present case 2

CSF = cerebrospinal fluid; CVC = central venous catheter; CHF = congestive heart failure; F = female; HCC = hepatocellular carcinoma; IVDA = intravenous drug abusers; M = male; NB = newborn; ND = no data; SB = stillborn.

lesion was antibiotics change, and the bloody discharge was not pus and should be postinflammatory discharge only. We suggested that further studies are needed to guide clinical decision making for patients infected with *C testosteroni*.

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