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Rare Case of Polymicrobial Sepsis with *Cupravidus Pauculus* in a Sclerodermic Patient

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ABSTRACT

Cupriavidus pauculus (*C. pauculus*), formerly named *Wautersia paucula*, is a Gram negative, aerobic, non-fermentative germ with ubiquitous environmental distribution and can cause severe infections in humans. We present the case of a 41 – years old female patient with scleroderma with recent history of travel in Thailand, who was admitted for sepsis with Streptococcus pneumonia, associating a respiratory infection caused by multi-drug resistant germs, Pseudomonas aeruginosa and Stenotrophomonas *maltophilia*. During hospitalization, respiratory status was aggravated and a non – fermentative germ, namely *Cupriavidus pauculus*, was identified in sputum samples. The evolution of the patient with an underlying immunocompromised condition after empiric treatment with imipenem, followed by antibiotic therapy selected by susceptibility test (levofloxacin and trimethoprim/sulfamethoxazole) was favourable with recovery after one month of hospitalization. *C. pauculus* is characterized by a highly variable profile of resistance, including sometimes extended – spectrum antibiotics. Only few reports of infections produced by this pathogen in humans are available. Further data are needed since *C. pauculus* is responsible for severe infections especially in immunosuppressed patients.

Keywords: Cupriavidus Pauculus; Sepsis, Scleroderma; Imipenem; Immunosuppression

Introduction

Cupriavidus pauculus (C. pauculus), formerly named *Wautersia paucula*, is a Gram-negative, aerobic, non-fermentative bacterium, part of the Cupriavidus species [1]. This germ is commonly found in the environment, such as plants, soil and water, including bottled mineral water [2]. Only few worldwide case reports are currently available in literature [2-6]. We report the case of a polymicrobial severe infection produced by different multi-drug resistant (MDR) microorganisms, including *C. pauculus* in an immunosuppressed patient. A 41-year-old female patient was admitted in January 2019 into our clinic for persistent fever, dry cough, chest pain and progressive dyspnoea, with onset within 6 days before presentation. The patient was non-smoker, with medical history of scleroderma and CREST syndrome (Raynaud phenomenon) and recently returned from Thailand. On examination, she was subfebrile (37.6°C), and pulmonary auscultation revealed bilateral diminished vesicular murmur and inspiratory crackling in both lungs, with high variations in oxygen saturation between 86 - 97% at room air), hypotension (92/70 mmHg) and tachycardia (132 beats per minute). Laboratory tests identified leukocytosis (11040/

mmc) and neutrophilia (92.8%) (Figure 1A), severe inflammation (CRP>324 mg/dL) (Figure 1B), hypochromic anaemia, nitrogen retention syndrome, and significant alteration of arterial gas levels (PaO2/FiO2 = 102.083). Legionella urinary antigen test was negative. The day of the hospital admission, 3 peripheral blood cultures were performed and were positive 72 hours later for penicillin susceptible Streptococcus pneumoniae (Table 1).

Table 1: Susceptibility results.

Bacterium	Sample	Susceptibility
Streptococcus pneumoniae	Blood	PEN, AMP, AMX, AMC, PRL, TPZ, CXM, CTX, CRO, CPD, FEP, SXT, ERY, AZM, CLR, CLI, LEV, MXF, CHL, TIC, TEC, VA
Pseudomonas aeruginosa	Sputum	AK, GEN, TOB, CIP, LEV
Stenotrophomonas maltophilia	Sputum	SXT
Cupriavidus pauculus	Sputum	AK, GEN, TOB, LEV, IPM, MEM, LEV; intermediate sensitive to CIP

Note: AK, amikacin; AMP, ampicillin; AMX, amoxicillin; AMC, amoxicillin-clavulanate; AZM, azithromycin; FEP, cefepime; CTX, cefotaxime; CPD, cefpodoxime; CPT, ceftaroline; CAZ, ceftazidime; CRO, ceftriaxone; CXM, cefuroxime; CHL, chloramphenicol; CIP, ciprofloxacin; CLR, clarithromycin; CLI, clindamycin; ERY, erythromycin; GEN, gentamicin; IPM, imipenem; LEV, levofloxacin; MEM, meropenem; MXF, moxifloxacin; PEN, penicillin; PRL, piperacillin; TPZ, piperacillin/tazobactam; TEC, teicoplanin; TIC, ticarcillin; TOB, tobramycin; SXT, sulphamethoxazole/trimethoprim; VA, vancomycin

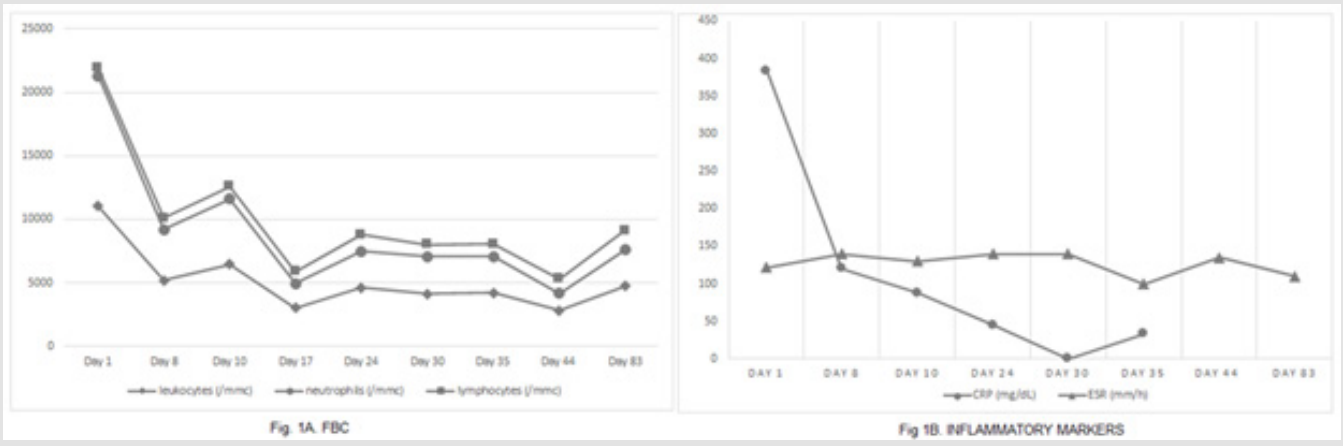

Figure 1: Laboratory markers.

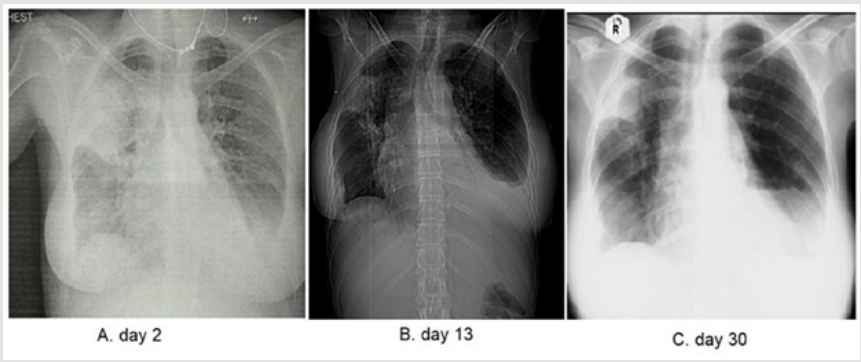

Figure 2: Imagistic results
a) Alveolar condensation and opacification with ascending upper limit.
b) Condensation syndrome with aeric bronchogram and fluid in left pleura.
c) And regression of lesions.

Chest X-ray (Figure 2A) revealed alveolar condensation in the right upper lobe and bilateral pleural effusion. Antibiotic treatment initiated with cefotaxime 6 g/day and doxycycline at admission, was subsequently modified according to susceptibility results to vancomycin 2 g/day, and imipenem 2g/day. Sepsis was improved during the next days of treatment, until a sudden aggravation was manifested by high fever, severe productive cough, and vomica in the sixth day of hospitalization. Sputum examination identified inflammatory reaction and in culture were identified multi-drug resistant (MDR) microorganisms, namely Pseudomonas aeruginosa and Stenotrophomonas maltophilia (Table 1). Pleural ultrasound revealed bilateral pleural fluid and subjacent alveolar condensation. Fluid obtained by left thoracentesis was cloudy, xantochrome, with high cellularity (5.787 cells/mmc, 90% neutrophils), and bacteriologically negative. Antibiotic therapy was deescalated to ampicillin 10 g/day, TMP/SMX 4 tablets/day and levofloxacin 750 mg/day. After 14 days of treatment, thoracic CT (Figure 2B) revealed an aspect of bronchopneumonia with abscess formation and medium left pleural effusion with passive atelectasis. Examination of pleural fluid objectified a significant improvement, with decrease of cellularity to 560 cells/field. On the 27th day of hospitalization, bacteriological sputum examination revealed absence of MDR pathogens. By contrast, the non-fermentative gram-negative bacteria (*C. pauculus*) has been isolated from the patient's sputum on blood agar. The bacterium has been identified using ID32GN strips (bioMérieux, France). Clinical significance of the isolated bacterium was supported by the presence of gram-negative bacilli associated with the inflammatory cells in the sputum Gram-stained smear and the isolation in high amount in culture. Based to susceptibility test (Table 1), patient continued antibiotic treatment with levofloxacin and TMP/SMX. The 7 – day course of therapy was effective, and symptoms were ameliorated, biological markers (Figures 1A & 1B) and chest X-ray image (Figure 2C) regressed. Entire duration of the hospitalization was 36 days. Within 7 days after discharge, patient presented rare episodes of residual cough, a medium-intensity opacity in the right upper lobe on X-ray and inflammatory syndrome. The inflammatory syndrome was also identified at 2 – month follow up and was expected due to systemic immunological disorder.

Discussion

The pathology of scleroderma is complex and is not fully understood yet. Cell-cell and cell-matrix interactions are responsible for the activation of the immune system and hyperproduction of growth factors and cytokines with pathogenic potential (IL-1, IL-4, IL-6, IL-8, IL-13, and IL-17), as well as vascular damage and excessive synthesis of extracellular matrix resulting in a significant increase in the amount and deposition of collagen [7]. Systemic scleroderma is a systemic disease with multiorgan damage, directly affects the lungs where it causes interstitial damage, pulmonary hypertension or pleural involvement (pleurisy has been identified in 7% cases). However, opportunistic respiratory infections remain an important cause of mortality and morbidity in scleroderma, with a mortality rate of up to 33% [8]. Pneumonia can be triggered by pathogens with tropism for the respiratory system, including Enterobacteriaceae, Pseudomonas aeruginosa, and Staphylococcus aureus [8]. Our patient considered herself otherwise healthy and did not investigated her underlying condition appropriately. Although she was aware of her underlying autoimmune disorder, she did not have any vaccine administered (e.g. pneumococcal vaccine), even when travelling to a country with endemic potential [9]. All these factors provided the breeding ground for the severe polymicrobial infection produced by Streptococcus pneumoniae, Pseudomonas aeruginosa, Stenotrophomonas maltophilia and subsequently *C. pauculus*.

Cupriavidus spp. are ubiquitous environmental organisms, mainly in water and plants. C. pauculus is the most important member of this family responsible for opportunistic infections and which can sometimes cause outbreaks [2,4]. The germ was initially classified as CDC group IV c-2 bacteria and later named Ralstonia paucula or Wautersia paucula by different authors. Based on the similarity of the genomic sequence, both were renamed as *C. pauculus* [1,6]. C. pauculus is responsible for different infections, such as community or nosocomial respiratory infections (including ventilation – associated pneumonia), meningitis, tenosynovitis, cellulitis, septic arthritis, peritonitis, sepsis [2,3]. The first cases of nosocomial infections produced by C. pauculus were described in hospitalized children [4]. The infection has been identified in all age groups, but has a high severity in newborns and immunocompromised patients (e.g. neoplasia, transplantation, AIDS or inflammatory bowel disease) [6,8,10]. Respiratory infections affect mainly immunocompromised patients but pre-existing of metastatic foci of infection in lungs could increase the risk of infection with *C. pauculus* even in immunocompetent patients [11]. In our case, pneumococcus and the MDR germs could be predisposing factors for the *C. pauculus* infection. We were unable to identify the source of the *C. pauculus* infection. We do not know if the pathogen was present since admission, but *C. pauculus* was not isolated in samples drawn during early hospitalization. However, the patient underwent many invasive procedures (including thoracentesis) and required prolonged oxygen therapy.

We may even consider this as a nosocomial infection through a possible contamination of water from the bubble humidifier bottles used for oxygen therapy. Contaminated water from hydrotherapy pools, nebulization solution or even thermos-regulator reservoir water in the exracorporeal membrane oxygenation circuit (ECMO) has been identified as the source of infection with this

microorganism in various forms of infection [4]. In addition, the use of catheters, parenteral nutrition or systems for hemodialysis or have also been identified as the source of nosocomial infection caused by *C. pauculus* [12,13], but such devices were not used in our case. However, including a possible contamination of bottled water consumed by the patient [14] or even the recent international travel history could lead to a supposition of a diagnosis of community – acquired infection in our patient. Current clinical experience regarding an optimal antibiotic treatment of *C. pauculus* infection is limited. The sensitivity of this germ is quite variable. Data from the literature have shown that *C. pauculus* is susceptible to broad spectrum beta-lactams, fluoroquinolones and TMP/SMX, most strains are resistant to aminoglycosides and inconstantly sensitive to colistin [3,12,15]. In our case, the susceptibility testing was performed by disk-diffusion method; colistin susceptibility was assessed by broth microdilution (MIC = 0.5 mg/L). Interpretation of the susceptibility tests was done using the EUCAST criteria for Acinetobacter spp. (version 9.0). The strain was susceptible to standard dosing regimen of aminoglycosides, carbapenems, and levofloxacin, and susceptible to ciprofloxacin in increased exposure circumstances. Our results confirm what other authors have mentioned previously, namely that empirical treatment with imipenem followed by TMP/SMX and levofloxacin, offered favourable evolution in *C. pauculus* infection [12,15]. The peculiarity of the case derives from identification of polymicrobial infection produced by MDR germs, including *C. pauculus* which has not been reported previously in our region.

Conclusion

Patient with scleroderma must be aware of their disease and ensure a proper medical monitoring since the autoimmune disorder is a risk factor for infections caused by multidrug-resistant or rare germs, such as *C. pauculus*. This case illustrates the need to address and treat infection produced by *C. pauculus* in immunocompromised individuals as an infection with possible severe evolution. Our results are in line with previous data, namely that empirical treatment with imipenem may offered favourable evolution in *C. pauculus* infection. Informed Consent Statement: Informed Consent Statement: Written informed consent was obtained from the patient for publication of this case report and accompanying images.

References

1. Vandamme P, Coenye T (2004) Taxonomy of the genus Cupriavidus: a tale of lost and found. Int J Syst Evol Microbiol 54(6): 2285-2289.
2. Balada Llasat JM, Elkins C, Swyers L, Bannerman T, Pancholi P (2010) Pseudo-outbreak of Cupriavidus pauculus infection at an outpatient clinic related to rinsing culturette swabs in tap water. J Clin Microbiol 48(7): 2645-2647.
3. Almasy E, Szederjesi J, Rad P, Georgescu A (2016) A Fatal Case of Community Acquired Cupriavidus Pauculus Pneumonia. Crit Care Med (Targu Mures) 2(4): 201-204.
4. Duggal S, Gur R, Nayar R, Rongpharpi SR, Jain D, et al. (2013) Cupriavidus pauculus (Ralstonia paucula) concomitant meningitis and septicemia in a neonate: first case report from India. Indian J Med Microbiol 31(4): 405-409.
5. Valdés Corona LF, Maulen Radovan I, Videgaray Ortega F (2021) Cupriavidus pauculus bacteremia related to parenteral nutrition. Case series report. IDCases 24: 01072.
6. Fiel D, Calça R, Cacheira E, Rombo N, Querido S, et al. (2020) Cupriavius pauculus causing a respiratory tract infection in a post-kidney-transplant patient: A firstly described rare clinical case. Pharm Pharmacol Int J 8(1): 34-36.
7. Denton Christopher P. Pathogenesis of systemic sclerosis (scleroderma).
8. Di Franco M, Lucchino B, Spaziante M, Iannuccelli C, Valesini G, et al. (2017) Infections in Systemic Rheumatic Disease: Focus on Opportunistic Infections. Int J Mol Sci 8(2): 293.
9. Gamil A, Chokephaibulkit K, Phongsamart W, Techasaensiri C, Piralam B, et al. (2021) Pneumococcal disease in Thailand. Int J Infect Dis 102: 429-436.
10. Bianco G, Boattini M, Audisio E, Cavallo R, Costa C (2018) Septic shock due to meropenem- and colistin-resistant Cupriavidus pauculus. J Hosp Infect 99(3): 364-365.
11. Huda SA, Yadava S, Kahlown S, Jilani MH, Sharma B (2020) A Rare Case of Ventilator-Associated Pneumonia Caused by Cupriavidus Pauculus. Cureus 12(6): 8573.
12. Azcona Gutiérrez JM, Buendía Moreno B, Sáez Nieto JA, López Brea Calvo M (2008) Aislamiento de Cupriavidus pauculus en la unidad de cuidados intensivos. Enferm Infecc Microbiol Clin 26(6): 397-398.
13. Valdés-Corona LF, Maulen Radovan I, Videgaray Ortega F (2021) Cupriavidus pauculus bacteremia related to parenteral nutrition. Case series report ID Cases 24: 01072.
14. Manaia CM, Nunes OC, Morias PV, da Costa MS (1990) Heterotrophic plate counts and the isolation of bacteria from mineral waters on selective and enrichment media. J Appl Bacteriol 69(6): 871-876.
15. Massip C, Coullaud Gamel M, Gaudru C, Amoureux L, Doleans Jordheim A, et al. (2020) In vitro activity of 20 antibiotics against Cupriavidus clinical strains. J Antimicrob Chemother75(6): 1654-1658.

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