



## Case report

# Cupriavidus pauculus bacteremia related to parenteral nutrition. Case series report

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## ARTICLE INFO

## Article history:

Received 8 September 2020

Received in revised form 16 February 2021

Accepted 9 March 2021

## In memory of Dr. Fernando Videgaray

## Keywords:

Cupriavidus pauculus

Outbreak

## ABSTRACT

Cupriavidus pauculus is a Gram negative rod that is usually isolated in water and has been extraordinarily isolated in patients with vascular access and / or immunosuppression. In this work we present a series of cases of patients with positive blood cultures for cupriavidus pauculus, during a short period of time in our hospital center. The only characteristic related to all cases was the use of parenteral nutrition. It highlights the rareness of the microorganism and the susceptibility identified in the antibiogram, which may be useful for future cases.

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## Introduction

*Cupriavidus pauculus* is a microorganism that is usually isolated in water [1]. There are reports from immunocompromised patients, neonates and in those with extracorporeal membrane oxygenation or in intensive care areas [1–4]. We describe three pediatric patients hospitalized for different reasons who became bacteremic over a period of two days. Blood cultures revealed *Cupriavidus pauculus*. The only common condition of the patients was the use of total parenteral nutrition (TPN) and in that week, there were no other patients at the hospital receiving TPN.

## Case reports

Case 1 (day 1): a preterm male newborn was admitted to the Neonatal Intensive Care Unit (NICU) because of hydrocephalus and hyaline membrane disease. He required invasive mechanical ventilation (IMV), surfactant, nasogastric tube, umbilical and percutaneous catheter. Extubate was achieved in the first 72 h. TPN started and presented a bacteremia event characterized by chills and fever. The isolation in blood cultures was *Cupriavidus pauculus*. The patient was treated with piperacillin and tazobactam and amikacin and evolved favorably. He was discharged 3 weeks later.

Case 2 (day 1): a newborn preterm of female sex was admitted to the NICU due to respiratory failure and patent ductus arteriosus. She required invasive mechanical ventilation, a nasogastric tube and an umbilical catheter. TPN was started and the patient developed fever and chills within the next 24 h. Blood culture showed isolation of *Cupriavidus pauculus*. The patient was treated with piperacillin and tazobactam, but she died 48 h later.

Case 3 (day 2): a 2 year and 9-month-old male was admitted for empyema. He required pleural decortication with placement of a chest tube and central venous catheter (CVC). TPN was started and in the first 24 h he presented fever. Blood cultures revealed *Cupriavidus pauculus*. The patient was initially treated with piperacillin and tazobactam and vancomycin and evolved favorably. The patient was discharged with oral treatment with levofloxacin.

The characteristics of the patients, treatments received and antimicrobial sensitivity are summarized in Table 1.

## Bacterial isolation

All blood cultures were detected on the Bactec 9050 equipment within the first 24 h of incubation. The Gram stain showed Gram negative rods. They were inoculated onto blood agar, chocolate agar, and MacConkey agar plates. After 24 h of incubation, colonies with regular borders, smooth consistency and dry appearance were observed. There was no hemolysis in blood agar, non-lactose fermenting and without oxidase and catalase positive pigmentation. Identification of BD Phoenix 100 equipment was performed using NMIC / ID 121 Negative Combos, producing the result of

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**Table 1**  
Characteristics of patients with bacteremia associated with TPN.

	Case 1	Case 2	Case 3
<b>Age</b>	0 years	0 years	2 years, 9 months
<b>Gender</b>	Male	Female	Male
<b>Diagnosis</b>	Preterm birth (33.3 weeks) Hydrocephalus Hyaline membrane	Preterm birth (31.1 weeks) Patent ductus arteriosus	Pneumonia Empyema
<b>Service</b>	NICU-1	NICU-4	ICU-4
<b>Outcome</b>	Cured	Death not related to infection	Cured
<b>Risk factors</b>			
<b>Surgery</b>	No	No	Left pleural decortication
<b>Venous access</b>	Umbilical and Percutaneous	Umbilical	Central line
<b>Nasogastric tube</b>	Yes	Yes	No
<b>Pleural tube</b>	No	No	Yes
<b>Antibiogram</b>	<i>Cupriavidus pauculus</i>  <ul style="list-style-type: none"> <li>• <b>Sensitivity:</b> cefepime, ceftazidime, imipenem, piperacillin with tazobactam, trimethoprim / sulfamethoxazol levofloxacin and meropenem.</li> <li>• <b>Resistance:</b> aztreonam.</li> </ul>	<i>Cupriavidus pauculus</i> <ul style="list-style-type: none"> <li>• <b>Sensitivity:</b> cefepime, ceftazidime, imipenem, piperacillin with tazobactam, trimethoprim / sulfamethoxazol levofloxacin and meropenem.</li> <li>• <b>Resistance:</b> aztreonam.</li> </ul>	<i>Cupriavidus pauculus</i> <ul style="list-style-type: none"> <li>• <b>Sensitivity:</b> cefepime, ceftazidime, imipenem, piperacillin with tazobactam, trimethoprim / sulfamethoxazol levofloxacin and meropenem.</li> <li>• <b>Resistance:</b> aztreonam.</li> </ul>
<b>Treatment</b>	Amikacin and piperacillin / tazobactam	Piperacillin / tazobactam	Levofloxacin, Vacomycin, piperacillin / tazobactam

*Cupriavidus pauculus*. Another isolate was made to verify the purity of the strain and the negative combo was processed again, finding *Cupriavidus pauculus* with 99 % confidence [5].

All the TPN were dismissed in the hospital, it has been communicated with the provider and an intern audit of handling were done.

## Discussion

We report an outbreak within a three days period, where three patients from different services admitted for different reasons developed bacteremia. Blood cultures showed development of *Cupriavidus pauculus* in all the cases. The personnel responsible for its administration was a different person in each case. During this period, there were no other patients in the NICU or the rest of the hospital with TPN except those with bacteremia. Cultures of the rest of the TPN were performed and they were negative, clarifying that they were different batches, since those probably associated with bacteremia were discarded before culturing.

*Cupriavidus pauculus* is a Gram-negative bacillus with peritric flagella with catalase and oxidase activity; its main source is contaminated water. Outbreaks in hospital setting are extremely rare because handling of the water and medicines have a strict control [6].

To our knowledge, this is the first report of bacteremia due to *C. pauculus* associated with the use of TPN. This work shows the characteristics of a bacterium that is rarely isolated as a causative agent of infection in humans.

Adequate isolation has allowed antimicrobial susceptibility tests to be carried out, finding results like those published in other series and case reports. Treatment with the suggested antibiotics may result in better outcomes in future patients that could get this infection. This report has clinical and epidemiological relevance

due to the ability of this microorganism to contaminate parenteral nutrition. It allows to guide future research and clinical decisions regarding this bacterium.

## Author statement

The authors declare that we have read and reviewed the established comments.

Attached you will find the revised version of the manuscript.

## Declaration of Competing Interest

The authors declare no conflicts of interest.

No financial resources were requested for the preparation of this paper.

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