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Case Report: Septic shock due to *Pasteurella multocida* in an immunocompetent elderly from a rural area of the Colombian Caribbean

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Pasteurella multocida is a germ known to present opportunistic pathologies in most cases associated with contact with animals or their secretions. Systemic infections are rare and tend to occur in patients with risk factors or those who have contact with animals. A case of *P. multocida* bacteremia is presented in a 76-year-old male patient from a rural area of the Colombian Caribbean who was admitted due to a neurological condition with no personal history and no relevant epidemiological data. His deterioration was torpid, and he died possibly from *P. multocida*.

KEYWORDS

zoonoses, bacteremia, domestic animals, one health, public health

Introduction

Pasteurella multocida is a gram-negative coccobacillus, nonmotile pleomorphic. It grows well on blood and chocolate agar but does not grow on selective culture media to isolate Gram-negative such as MacConkey agar (1). It is a zoonotic agent in various animals, such as sheep, mice, cattle, birds, dogs, and cats (2–4). *Pasteurella multocida* causes opportunistic infections in humans and is part of the microbiota in domestic and wild animals. It has been found to colonize the trachea and bronchi of pet owners (2). *P.*

multocida is considered the primary source of infection due to the contamination of wounds with animal saliva or aerosolized secretions (3). Different studies show an increase in *P. multocida* infections globally. Although disseminated infection in subjects with a normal immune system is rare, bacteremia can be fatal in up to 30% of cases (2, 3). Respiratory infection by *P. multocida* is rare and almost exclusively reported in immunosuppressed patients with chronic respiratory diseases. However, *P. multocida* causes meningitis and endocarditis, usually occurring in neonates and older immunosuppressed adults (2). This study aims to describe a case of fatal *P. multocida* infection in a 76-year-old individual immunocompetent.

Clinical case

A 76-year-old male patient with no known pathological history lived in a tropical rural region of the department of Bolívar 94 km from Cartagena, Colombia. As an essential epidemiological background, he was an agricultural worker caring for farm animals (cattle, pigs, poultry). In his home, he had domestic animals such as dogs and cats, and no associated comorbidities nor relevant, familiar records. The patient came to the emergency room for a 24-hour clinical picture characterized by loss of postural tone, sphincter relaxation, eyelid ptosis, dysarthria, loss of muscle strength predominantly in the right side of the body 2/5, left side 3/5, without meningeal signs, tachypneic with high blood pressure (200/112 mm/Hg). Due to the high risk of ventilatory failure and increased neurological deterioration, the patient was admitted to the intensive care unit (ICU) and required management with intravenous nitrovasodilators, oxygen by Ventury mask, and FIO₂ 60%. The patient's ventilatory deterioration persisted. Thus, it was necessary to initiate mechanical ventilation and the administration of vasoactive drugs (Figure 1). Laboratory tests were performed during the patient's stay. The leukopenia and thrombocytopenia were remarkable in the shock septic of the patient (Table 1).

Non-contrast brain tomography showed an ischemic lesion with hemorrhagic transformation, left superior ventricular collapse, left basal ganglia brain hematoma, and neurogenic shock (Figure 2). Comprehensive management by neurosurgery was suggested, but it was determined that the surgical procedure would be of little benefit. Neurosurgery's preliminary diagnosis was made as cerebrovascular disease secondary to intracerebral hemorrhage and intracranial hypertension. In addition, to rule out an occlusive origin of the patient's clinical picture. A Doppler of neck vessels was also performed, which showed an atheromatous of the carotid arterial system, and no other crucial vascular alteration was found. Doppler echocardiography showed preserved left ventricular systolic function. Ejection fraction 58%,

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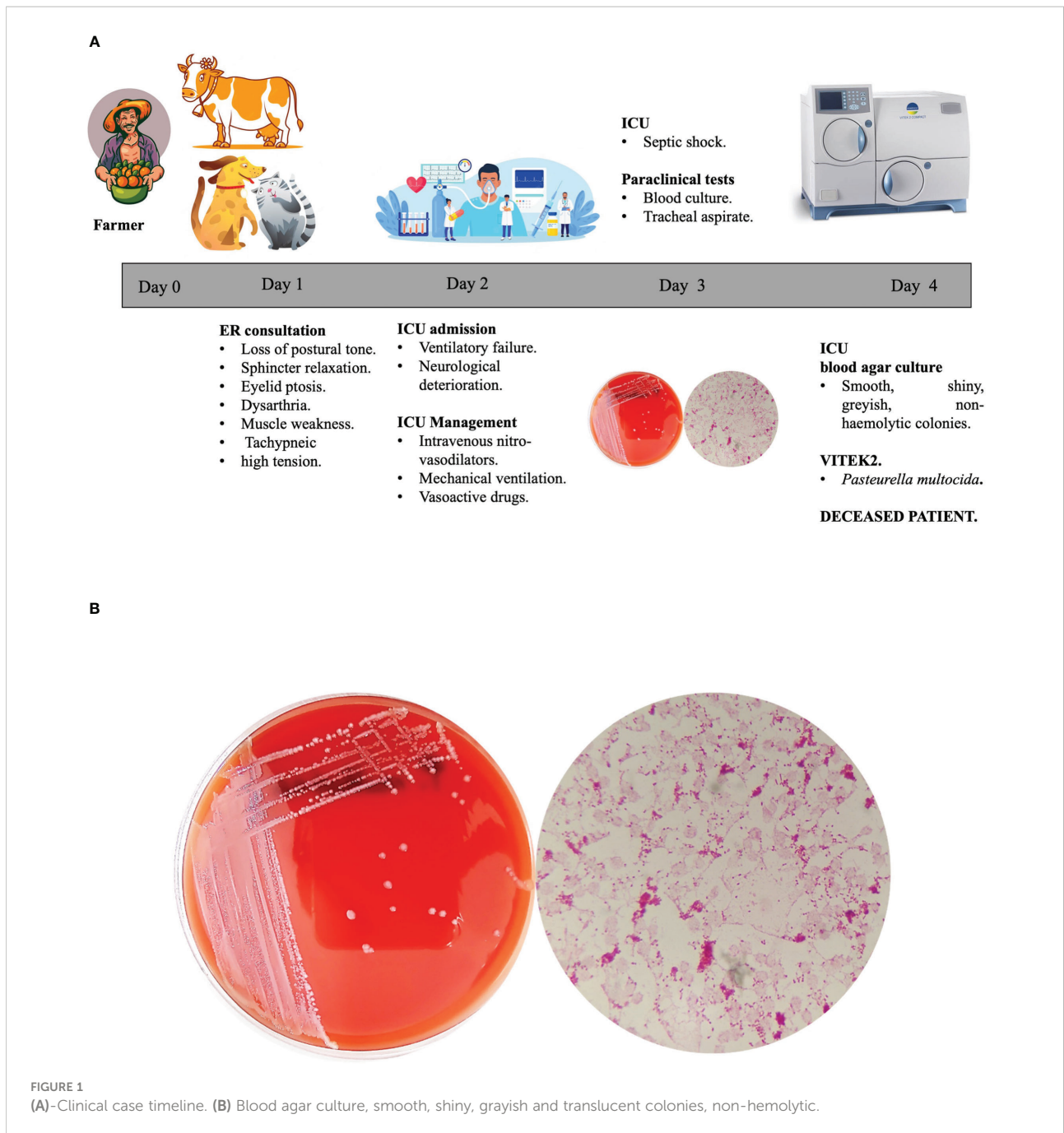
During the three days of hospitalization in the ICU, the patient presented signs of systemic inflammatory response syndrome (SIRS), and septic shock was diagnosed. Three blood cultures and one tracheal aspirate were taken. At 24 hours, the presence of Gram-negative coccobacilli was demonstrated. After 24 hours of incubation at 37°C, the blood agar culture observed smooth, shiny, grayish, and translucent, non-hemolytic colonies of approximately 1 mm diameter (Figure 1). Colonies did not grow on MacConkey agar, the oxidase test was positive, and it was identified as *P. multocida* by VitekTM Compact (Biomérieux) with 99.9% accuracy. Biochemical tests showed the absence of sulfur and urease without fermentation of citrate and lactose, and the culture of bronchial secretion was positive for the bacterium. The processing of the clinical specimens and culture methods are described in the [Supplementary Material](#).

The isolation was confirmed from the three blood culture bottles, the culture and the VITEK2 test were repeated, and *P. multocida* was confirmed. Furthermore, orotracheal secretion yielded *Pasteurella multocida*. Microdilution (VitekTM) performed the antimicrobial susceptibility profile according to CLSI guidelines (Clinical and Laboratory Standards Institute). Results showed that the germ was susceptible to most antibiotics used such as cefepime ≤ 0.12 ug/ml, imipenem ≤ 0.5 ug/ml, meropenem ≤ 0.25 ug/ml, ciprofloxacin ≤ 0.06 ug/ml. ml and piperacillin/tazobactam ≤ 4 ug/ml.

Despite clinical care in the ICU, the patient died 72 hours after admission to the ICU. Antibiotic treatment for *P. multocida* was not administered. On physical examination and clinical history, no skin lesions like bites or scratches from domestic animals were found (Figure 1).

Discussion

The prevalence of *Pasteurella multocida* infection in Colombia and Latin America is unknown. However, in the



United States, some studies of skin infections caused by pet bites have shown that 50% of these infections are caused by dog bites and 75% by cat bites (2, 5). However, severe infections and fatalities caused by *P. multocida* in humans are believed to be rare (6). Because the microorganism usually causes mild and self-limited infections in human hosts, which is why it is classified as Biohazard Level 2.

The present manuscript reports an elderly patient with a severe infection by *P. multocida*. The subject had no physical findings and

no history of a bite by a domestic animal. These findings are consistent with the study by Giordano et al. (6). They reported *P. multocida* infections associated with bacteremia and admission to the ICU in individuals older than 64 years, with no evidence of bites from domestic animals. In the present study, it was impossible to determine the portal of entry of the microorganism. *P. multocida* probably entered the patient through the respiratory tract. The report by López-Cuenca et al. (7) described a case like ours and established the airway as a possible entry point for the

TABLE 1 Paraclinical tests performed on the patient.

Parameters	First day (August 30 th)	Day 3 (September 1 th)
Hemoglobin (g/l)	13.2	11
Hematocrit (%)	41%	34
Leukocytes (mm ³)	1729	2590
Neutrophils (%)	67%	83
Platelet (mm ³)	210000	61520
prothrombin time (Seg)	15.7	13
Thromboplastin Time (Seg)	28.6	38
Sodium	137	139
Chlorine	103	112
potassium	3.90	5.6
Creatinine	1.41	2.2
Urea	61	80
BUN	28	41
PH arterial blood gas	7.27	7.12
Pco ₂	42	54
P0 ₂	116	77
HCO ₃	19	18
EB	7.3	11
SATO	97	90
SAO	96	96
PAFIO ₂	146	0.86
Lactate	4.86	4

microorganism. It is possible since *P. multocida* has been isolated from the respiratory tract of healthy subjects or those with comorbidities who live with domestic animals.

Our case is similar to that of Pak et al. (8), who reported a case of pneumonia due to *P. multocida* in an immunocompetent patient who, on physical examination, did not show any signs of injury caused by the animals he cared for (8). A retrospective study by Giordano et al. (6) found that most immunosuppressed patients infected with *P. multocida* had no history of bites and scratches from domestic animals. Our case and the one reported by Pak et al. (8) show that the immunocompetent are infected by *P. multocida*, and its course can be fatal.

Regarding the neurological compromise evidenced in this patient, it would not be a typical picture related to *P. multocida* since, at the central nervous system level, the primary neurological manifestation reported in humans is meningitis (9). However, in farm animals, the neuropathogenic potential of

this bacterium is believed. *Pasteurella multocida* can induce vascular changes in the brain, such as hemorrhages. Pasteurellosis is related to increasing perineuronal space and severe inflammatory lesions (10). However, it is relevant to mention that the neurological involvement was not initially suspected to be related to an infectious condition. Because the presumptive diagnosis was focused on a hemorrhagic-type cerebrovascular event, this was possible taking into account the high blood pressure figures that the patient presented at the time of admission.

On the other hand, it is essential to mention that among the causes of septic shock in older adults who live with animals, *P. multocida* should be considered among the possible causal agents for this infection (11, 12). For this reason, infants or older adults with comorbidities should avoid contact with salivary secretions or skin lesions due to bites or scratches by these animals. In addition, leukopenia and thrombocytopenia

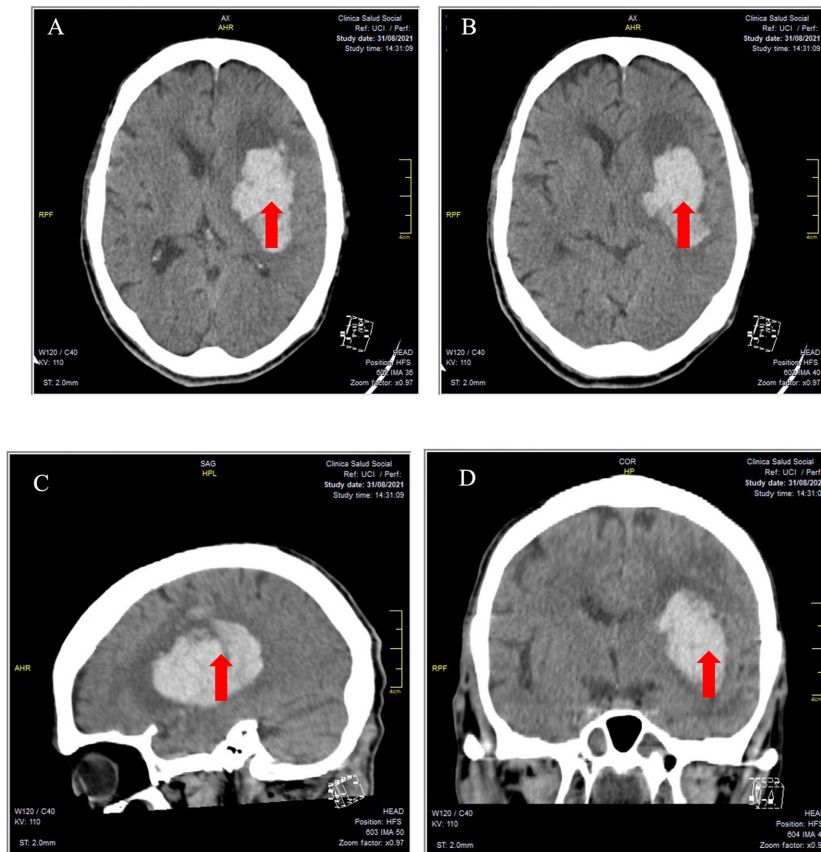


FIGURE 2
(A–D) Cerebral tomography, the red arrows show ischemic lesion with hemorrhagic transformation with left superior ventricular collapse, left basal ganglia cerebral hematoma.

are associated with septic symptoms. Also, it would be related to a worse clinical outcome (13).

Finally, this report demonstrates that within the differential diagnoses of sepsis without no apparent source of infection. *P. multocida* should be considered by health personnel as one of the possible agents causing sepsis, mainly in individuals with close contact with animals, with or without a recent history of bite or scratch. On the other hand, future one-health approaches will be crucial to understanding and knowing the prevalence of these infections of zoonotic origin.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The ethics committee approved the realization of this anonymous case report of the Institute of Biological Research of the Tropics of the University of Córdoba (IIBT). The study was carried out under the principles of the Declaration of Helsinki and resolution number 008430 of 1993 of the Colombian Ministry of Health, which regulates health studies.

Author contributions

The patient in this study were evaluated by ED. Laboratory test was performed by AL. The manuscript was written by HS-C, SM, ED, JM. The critical review and the drafting edit were performed by AM, GA. All authors read and approved the manuscript. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fitd.2022.1047842/full#supplementary-material>

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