



## An unusual case of *Pasteurella multocida* bacteremic meningitis

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### ABSTRACT

*Pasteurella multocida* is a rare cause of bacterial meningitis, more frequently affecting humans at the extremes of age. We report a case of meningitis and bacteremia caused by *P. multocida* in a 67-year-old diabetic woman who was living with 10 cats. She didn't have any animal bites or scratches, but she reported kissing the pets in the mouth. The outcome was favorable following antimicrobial treatment. Although rarely encountered, *P. multocida* should be considered as a possible cause of meningitis, particularly when Gram-negative coccobacilli are revealed in the cerebrospinal fluid and a history of recent animal contact is present.

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### Introduction

*Pasteurella multocida* is a small Gram-negative coccobacillus found in the nasopharynx, and the digestive tract of domestic animals, livestock, and many wild animals [1]. Carriage rates are highest among cats (70–90%) and dogs (50–60%) [1]. Asymptomatic carriage has been reported in people with close animal contact, such as veterinarians and in patients with underlying pulmonary disease, such as bronchiectasis and chronic obstructive pulmonary disease (COPD) [2]. The majority of human infections caused by *P. multocida* are soft tissue infections following animal bites or scratches [2,3]. However, other non-traumatic routes of infection should be considered. *P. multocida* meningitis is a rare cause of bacterial meningitis [4,5].

Herein we report a case of *P. multocida* meningitis and bacteremia in a 67-year-old diabetic woman who had close contact with domestic cats.

### Case report

A 67-year-old Norwegian tourist was admitted to the Emergency Department of our hospital with a 24-h history of confusion and disorientation. She had arrived in Crete, one week before. Her

past medical history was significant for diabetes, hyperlipidemia, hypertension, and hearing loss. Physical examination showed high-grade fever (39.4 °C), decreased level of consciousness and marked agitation. Her blood pressure was normal (130/70 mmHg), her respiratory rate was 40/min, her pulse was 120 beats/min and her SatO<sub>2</sub> 89% on room air. Her Glasgow Coma Scale score was 10 (eyes 3, verbal 2, motor 5). The clinical examination revealed cervical stiffness, and positive Brudzinski and Kerning signs. She had no focal neurologic signs and her fundoscopy was normal. The rest of the clinical examination was unremarkable. She had no recent signs of an animal bite or scratch wounds.

Laboratory examination revealed a white blood cell (WBC) count of 18,500/mm<sup>3</sup> (86% neutrophils), hemoglobin concentration of 16 g/dl, platelet count of 150 × 10<sup>3</sup>/mm<sup>3</sup> and C-reactive protein 31 mg/dl (normal < 1 mg/dl). Cerebrospinal fluid (CSF) analysis demonstrated a cloudy liquid with elevated protein level (181 mg/dl) and reduced glucose (38 mg/dl) while the corresponding blood level of glucose was 144 mg/dl. The CSF WBC count was 24,050 cells/mm<sup>3</sup> with 93% neutrophils. Based upon the initial reported Gram stain, the causative agent was thought to be *Neisseria meningitidis*.

Empiric antibiotic therapy was immediately initiated pending culture results with intravenous ampicillin (12 g/day), ceftriaxone (4 g/day), vancomycin (2 g/day), while dexamethasone (40 mg/day) was added as adjunct therapy. The computed tomography of the brain, which was performed one day after admission, revealed mild swelling. Blood and CSF cultures revealed a Gram-negative

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**Table 1**  
Etest MICs for *Pasteurella multocida* isolated from CSF and blood.

Antibiotic	MIC ( $\mu\text{g/ml}$ )	Interpretation
Penicillin	0.094	S
Ampicillin	0.094	S
Amoxicillin/clavulanic acid	0.19	S
Ceftriaxone	<0.016	S
Chloramphenicol	0.38	S
Tetracycline	0.19	S
Doxycycline	0.19	S
Levofloxacin	0.016	S
Moxifloxacin	0.012	S
Trimethoprim/sulfamethoxazole	0.004	S
Erythromycin	2	R
Azithromycin	2	R

CSF, cerebrospinal fluid; MIC, minimum inhibitory concentration; S, susceptible; R, resistant.

coccobacillus that was identified by standard procedures and the automated Vitek 2 system (BioMérieux, Marcy L' Etoile, France), as *P. multocida*. Antimicrobial susceptibility testing was performed by the disk diffusion method and minimal inhibitory concentrations (MICs) were determined by the E-test method (BioMérieux). The organism was susceptible to all beta-lactams tested (penicillin, ampicillin, amoxicillin-clavulanic acid and ceftriaxone), levofloxacin, moxifloxacin, chloramphenicol, tetracycline, doxycycline, trimethoprim/sulfamethoxazole and resistant to erythromycin and azithromycin (Table 1). Upon questioning the patient regarding exposure to animals, she reported living with ten cats. The pets were allowed on her bed, they were licking her face and occasionally she was kissing them in the mouth. Based on the results of antibiotic susceptibility tests, vancomycin, ceftriaxone and dexamethasone were discontinued. Ampicillin treatment was continued for two weeks until the patient was transferred back to her country. During her hospitalization she was gradually improved and no neurological or other complication developed. We recommended to continue antibiotic treatment for a total of 21 days.

## Discussion

*P. multocida* was first isolated from wild hogs by Kitt in 1878, and further characterized by Pasteur [1]. In humans, *P. multocida* is commonly involved in skin and soft tissue infections following animal bites or scratches [1]. Invasive diseases, as pneumonia, endocarditis and intra-abdominal infections have been reported in immunocompromised patients [1,3]. Meningitis and bacteremia due to *P. multocida* are rare infections, more frequently observed in the extreme ages of life [4,5]. To our knowledge 39 cases of infant and 29 cases of adult *P. multocida* meningitis have been reported in the English-language literature after 1950. Half of the paediatric patients with *P. multocida* meningitis were infants less than 1 year old and one third of the infected adults was over 60 years old [4]. Most adult patients were immunocompromised with 67% having a medical history of cancer, cirrhosis, diabetes, and chronic obstructive disease [5]. Our patient had diabetes, which is considered as a condition predisposing for pasteurellosis [6].

In the majority of *P. multocida* meningitis cases (89%) there was a history of animal contact, although a specific history of animal bite was much less common (15%) [5]. *P. multocida* meningitis usually results after direct inoculation of the pathogen by an animal bite penetrating the skull, haematogenous seeding from bacteremia, contamination from colonized sites by skull fracture or cranial surgery and local spread from an adjacent infected site [3]. Non-traumatic route of transmission includes exposure to the animal

oropharyngeal secretions from direct licking or sniffing, or from being handled by someone who did not wash their hands after contact with a pet [7]. Five cases involved vertical transmission from the mother to the neonate during delivery, and some cases have occurred in animal lovers by kissing pets [8,9]. The “kisses” between our patient and her cats probably were the first step in her oropharyngeal colonization with *P. multocida* followed by invasion and hematogenous spread to the meninges.

*P. multocida* isolated from the CSF and blood of these patients was susceptible to penicillin, and ampicillin [4,5,8–10]. However, penicillin-resistant *P. multocida* have been reported in rare cases [11]. All these cases were treated with penicillin G, ampicillin, or 3rd generation cephalosporins. The most frequent treatment duration was between 14 and 21 days [5,10]. A 2-week treatment is suggested in the absence of complications, otherwise it will be extended depending on the type of complication and the clinical response [12].

In conclusion, *P. multocida* is a rare but well recognized cause of bacteremia and meningitis affecting mostly the extreme of ages. In the direct examination of the CSF it can be confused with *Haemophilus influenzae* or *Neisseria meningitidis*. It is reasonable to consider *P. multocida* as a possible cause of meningitis, particularly when Gram-negative coccobacilli are revealed in the CSF and a history of recent animal exposure is present.

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## Competing interests

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## Ethical approval

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