

Knowing where to look: 'Meningococcal' septicaemia following a dog bite

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Abstract

The patient presentation of septic shock and purpuric rash is commonly attributed to meningococcal septicaemia. We describe a case of similar presentation where initial cultures and antigen testing were negative for meningococcus and the isolation of an unusual organism, *Capnocytophaga canimorsus*, was only made after obtaining a history of a dog bite and liaison with the microbiology laboratory. The epidemiology and clinical features of *Capnocytophaga canimorsus* infection is discussed, together with the antibiotic management of dog bites.

Key words: *Capnocytophaga canimorsus*, *dog bite*, *septicaemia*.

Case report

A 47-year-old woman presented to the emergency department at Geelong Hospital with presumed meningococcal septicaemia. She had become unwell 2 days prior to admission with a febrile illness, complaining of sweating, generalized myalgia and arthralgia, vomiting and a generalized headache. Her daughter had become alarmed at the development over a few hours of drowsiness and a rash and had brought her mother to hospital. The patient had suffered from mild asthma but had not taken oral corticosteroids. She did not have any known immunodeficiency state and only had a modest alcohol intake.

On presentation, she appeared unwell and was vague but orientated. She was hypotensive, tachycardic and peripherally cold and sweaty. A rapidly evolving purpuric rash was noted on her legs and arms. There

were no signs of meningism or any other focus of infection.

The provisional diagnosis of meningococcal septicaemia with disseminated intravascular coagulation was made and she was treated with penicillin G (2.4 g, i.v., q.i.d.) and cefotaxime (2 g, i.v., b.d.). Initial blood analysis reflected these findings with evidence of renal impairment (serum creatinine 210 µmol/L, normal range (NR) 30–120), severe thrombocytopenia (platelet count $33 \times 10^9/L$, NR 15–500) and a coagulopathy (international normalized ratio 2.0, NR < 1.2) with elevated D-dimers (> 1200 ng/mL, NR < 200).

She was transferred to the intensive care unit for monitoring and improved clinically and biochemically over the next 48 h. Rapid antigen testing for *Neisseria meningitidis* types A/C/Y/W135 and type B was negative on serum and no pathogens were recovered from blood cultures initially.

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Once the patient's mental state had improved, further history-taking revealed that she had been bitten by a dog 4 days prior to admission. Indeed, on closer examination, a small puncture wound was visible on a middle finger. Following liaison with a medical microbiologist, the blood cultures were subcultured onto horse-blood agar and sheep-blood agar under both aerobic conditions with 5% carbon dioxide as well as anaerobic conditions.

Six days after admission, a fastidious, slow-growing Gram-negative bacillus was isolated from the aerobic sheep-blood agar and horse-blood agar plates and this was judged, clinically, to be a *Capnocytophaga* sp. in view of the history of dog bite. The organism was identified as *C. canimorsus* and this was later confirmed at a reference laboratory.

Her subsequent course was complicated by the adult respiratory distress syndrome with severe hypoxia and diffuse interstitial infiltrates but she improved without ventilatory support. She was discharged from hospital 8 days after admission and received a total of 14 days of intravenous cefotaxime (2 g b.d.). On discharge she was well and had no neurological or respiratory sequelae.

On review, 6 weeks later, she had made a complete recovery. Her blood film did not reveal any features suggestive of hyposplenism, serum immunoglobulins were normal and there was no other evidence of immune deficiency.

Discussion

This case illustrates the importance of the history in diagnosing unusual diseases, particularly when early laboratory results are at variance with the clinical scenario. In this case, specific subculturing was undertaken to look for organisms associated with dog bites. *Capnocytophaga canimorsus*, previously known as DF-2, is an unusual cause of septicaemia, its incidence in a Danish review estimated at 0.5 cases/million per year.¹

Capnocytophaga canimorsus septicaemia and meningitis was first described in 1976.² Since then, a spectrum of clinical disease has been described, ranging from rash, cellulitis and arthritis to disseminated intravascular coagulation, septic shock, meningitis, endocarditis, confusion, respiratory insufficiency and brain abscess.^{1,3} There is a well-known association of *C. canimorsus* with dog bites and

one series of 39 reported an antecedent dog bite in 56% of cases. A further 26% of cases described an epidemiological association with dogs.¹ There have also been five reports in the literature of septicaemia associated with cats.⁴

Infections with *C. canimorsus* are more common in the immunocompromised patient and a series of 41 patients in 1991 reported asplenia in 33% of cases, alcohol abuse in 22% of cases and that 5% of cases were taking oral glucocorticoids.³ Other series have noted an association with haematological and solid malignancies.⁵ However, a significant proportion of *C. canimorsus* infections occur in an otherwise healthy population. The mortality of *C. canimorsus* sepsis has been reported as between 4% and 30% in immunocompetent hosts but as approximately 30% in the immunocompromised.^{3,5}

Capnocytophaga canimorsus is usually sensitive to a wide range of antibiotics, including beta-lactams, tetracycline and clindamycin but is resistant to vancomycin and the aminoglycosides.⁶

A recent study in Adelaide has estimated that there are approximately 100 000 people bitten by a dog each year in Australia and that most do not seek medical attention.⁷ It has been estimated by retrospective surveys that 20% of children have received an animal bite⁸ with 34% of dog bites occurring in children less than 14 years of age (K. Ashby, personal communication, 1998). In Victoria, it is thought that 35% of households with young children (4 years of age or younger) own a dog, with the injury rate in this age group being 56 per 100 000.⁹

Following a dog bite, the incidence of infection has been reported as between 5% and 15%. Risk factors for infection include: (i) age greater than 50 years; (ii) delay (> 8 h) in treatment; (iii) puncture wounds not amenable to surgical debridement; (iv) wounds to the face or hands; (v) deep wounds involving deep structures; and (vi) an immunocompromised state.^{10,11}

Local infections are usually polymicrobial with a large number of organisms associated with dog bites, *Pasturella multocida* being the most common organism recovered. Septicaemia following a dog bite is less frequent and most often due to *C. canimorsus*, particularly in the immunocompromised.¹² Of note, however, is that five of 39 cases of *C. canimorsus* sepsis in Denmark had received antibiotics prior to their presentation with clinical infection.¹

The question of prophylactic antibiotics for dog bites has been controversial. To date, small randomized

controlled trials have failed to consistently show a significant reduction in infection rates with penicillin,^{13,14} oxacillin¹⁵ and cotrimoxazole,¹⁶ possibly due to the small size of the study population. Despite the heterogeneity of the patient group, a meta-analysis in 1994 suggested a statistically significant benefit with antibiotics with a reduction in infection rate from 16% in controls to 9% in patients treated with antibiotics.¹⁷

Current recommendations are for procaine penicillin and amoxicillin/clavulanate for 5 days for moderate wounds, and metronidazole and ceftriaxone for severe injuries in patients from high-risk groups.¹¹ Other agents that exhibit *in vitro* activity against organisms known to be commensal to dogs include tetracycline, ticarcillin/clavulanate, cefuroxime and ciprofloxacin/metronidazole.¹⁰

Conclusion

Diagnostic sensitivity is greatest when the clinical scenario is used to help guide microbiological investigations and this requires close liaison between treating clinicians and microbiologists. *Capnocytophaga canimorsus* is a fastidious organism that must be specifically sought in the setting of overwhelming sepsis following a dog bite, particularly in the immunocompromised patient. Most infections following dog bites are local and polymicrobial. The efficacy of prophylactic antibiotics is unclear but currently recommended in recognized risk groups.

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