Short communication

First documented *Capnocytophaga canimorsus* infection in a species other than humans

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Abstract

*Capnocytophaga canimorsus* was cultured from an infected, dog-inflicted bite wound in a pet rabbit. The wound was treated successfully and the rabbit recovered. To our knowledge, this is the first report of a *C. canimorsus* infection in a species other than humans.

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1. Introduction

*Capnocytophaga canimorsus* (*C. canimorsus*), formerly known as ‘dysgonic fermenter 2’ (DF-2), is a fastidious, capnophilic, slow-growing gram-negative bacterium that appears to belong to the oral flora of dogs and cats. In 1976, it was first reported to cause septicemia, endocarditis and meningitis in man (Bobo and Newton, 1979). Mortality rates of *C. canimorsus* infections in man are as high as 30% regardless of medical intervention. Wound infections appear to relatively rapidly lead to local intravascular coagulation with tissue necrosis as a result. Local infections have the potential to turn into life threatening septicemia’s. Pers et al. (1996) reviewed 39 cases of *C. canimorsus* septicemias in order to describe its clinical course. Common initial symptoms were fever, malaise, myalgia, vomiting, diarrhea, abdominal pain, dyspnea, confusion, headache and dogs licking pre-existing wounds or other contact with dogs (Brenner et al., 1989). However, a few cases have occurred following cat bites and scratches (McLean et al., 2004; Valtonen et al., 1995). Mortality rates of *C. canimorsus* infections in man are as high as 30% regardless of medical intervention. Wound infections appear to relatively rapidly lead to local intravascular coagulation with tissue necrosis as a result. Local infections have the potential to turn into life threatening septicemia’s. Pers et al. (1996) reviewed 39 cases of *C. canimorsus* septicemias in order to describe its clinical course. Common initial symptoms were fever, malaise, myalgia, vomiting, diarrhea, abdominal pain, dyspnea, confusion, headache and
skin manifestations. Disseminated intravascular coagulation developed in 14 patients, meningitis in 5, and endocarditis in 1. Although C. canimorsus is of considerable zoonotic importance, its clinical relevance for animals has not been established. Frey et al. (2003) reported the isolation of Capnocytophaga spp. from a cat with chronic sinusitis and rhinitis. Forman et al. (2005) described a cat with pulmonary carcinoma with a lower respiratory tract infection due to Capnocytophaga cynodegni. However, C. canimorsus infection in a species other than humans has not yet been described.

2. Results and discussion

In 2004, a 2-year-old previously healthy male pet rabbit was bitten on the head by a dog. The rabbit incurred relatively deep wounds, but no veterinary care was applied until 2 days later, when swelling in the wounded area had developed. The rabbit was presented to one of us, clinically examined and trimethoprim/sulfonamide (15 mg/kg BID per os) was prescribed. Because there was no clinical improvement, the patient was presented again 2 weeks later and a swab sample was taken deep from the abscess now present and sent to the Veterinary Microbiological Diagnostic Centre of Utrecht University. A pure culture of slow growing bacteria was found on sheep blood agar under anaerobic conditions after 48 h incubation at 37 °C. No growth occurred on MacConkey agar and on sheep blood agar incubated under aerobic conditions. Gram-staining of the colonies showed that they were slender fusiform gram-negative rods. Upon sub-culturing on chocolate agar the strain grew well under microaerophilic conditions after 24 h. Rapid Ana (276771) identified the organism as a Capnocytophaga species.

By this time the abscesses were open and the wounds were abraded with a curette and flushed with betadine solution. Amoxicillin and clavulanic acid (Avuloxyl®, Pfizer Animal Health) soaked tampons (Sugi Steri) were inserted into the cavities. The rabbit was also treated with doxycycline (5 mg/kg BID per os) for 10 days. A collar was fixed around the neck of the rabbit to prevent it from ingesting amoxicillin/clavulanic acid. The general condition of the patient improved significantly and the wounds healed completely.

For further identification, the isolate was subjected to a real time PCR with the C. canimorsus specific forward primer (Conrads et al., 1997); 5′-GCATCAGT-GAATAATTAAAG-3′ (nucleotides 187–207) and the reverse primer 5′-CTACCAGGGTATCTAACCCTG-3′ (nucleotides 793–772) derived from the C. canimorsus 16S rRNA sequence (accession nr. L14637). The reaction mix consisted of 2.0 μl of LightCycler FastStart DNA Master SYBR Green I (Roche, Penzberg, Germany), 0.5 μl of each primer (100 mM), 2.4 μl of 25 mM MgCl₂, 12.6 μl aqua dest. and 2.0 μl template, which was the supernatant of the colony in 1 ml of aqua dest. heated at 95 °C for 5 min. The LightCycler 1.5 instrument (Roche Diagnostics, Mannheim, Germany) was set to make a hot start at 95 °C for 10 min, followed by 35 cycles of annealing at 45 °C for 10 s, elongation at 72 °C for 25 s and denaturation at 95 °C for 10 s, followed by melting curve analysis. C. canimorsus (ATCC 86848) served as control strain. Our isolate gave a clear signal with a melting point of 87 °C similar to that of the ATCC strain and on ethidium bromide gel electrophoresis the PCR product of both strains gave a clear band with the expected size of 576 bp. Subsequently, the nucleotide sequence of the PCR-product of our isolate was determined (BaseClear, Leiden, The Netherlands) and BLAST analysis showed the highest identity with C. canimorsus.

Many cases of C. canimorsus infections have been reported in human medicine (Hovenga et al., 1997; Le Moal et al., 2003; Lion et al., 1996; van de Ven et al., 2004) and most of these infections have occurred following dog bites. In the present case, the C. canimorsus infection was also associated with a dog-bite wound. To what extent C. canimorsus occurs in the oral flora of dogs is not yet exactly clear. We previously applied the PCR described above on buccal swabs from 46 healthy dogs and found a positive signal in 19 samples, indicating a prevalence of 41% (unpublished results). Interestingly, although dog-bite wounds are common in many animal species, especially in dogs and cats, these C. canimorsus bite wound infections have not been reported to occur in animals. There are several possible explanations for this. First of all C. canimorsus may be overlooked by routine culturing because of it is fastidious behaviour and slow growth. Dog bite related infections are often polymicrobial and C. canimorsus may be overgrown in the presence of other micro-organisms or may not be recognized. Therefore, it is possible that C. canimorsus infections are under
diagnosed and are in fact more common in animals with
dog- or cat-bite wounds. On the other hand, humans
may be better hosts for *C. canimorsus* infections. In the
present case a pure culture of *C. canimorsus* was found,
which made it easier to identify the organism.
Recognizing the potential presence of these infections
in bite wounds is extremely important for applying the
right antimicrobial therapy. Although *C. canimorsus* is
susceptible to a wide range of antimicrobials including
amoxicillin with clavulanic acid and tetracyclines, they
are resistant to trimethoprim/sulphonamide combina-
tions and aminoglycosides (Rummens et al., 1986).
Trimethoprim/sulphonamide combinations are used
frequently to treat (bite) wound infection in veterinary
medicine. In the present case trimethoprim was used
initially because it is safe for rabbits. Many anti-
microbials, including beta-lactam antibiotics, can cause
severe side effects in rabbits, often with fatal outcome.
In humans, however, amoxicillin is generally consid-
ered to be the first choice for the treatment of infected-
dog-bite wounds. In view of the potential presence of *C.
canimorsus* and the fact that some strains have been
shown to produce beta-lactamase, amoxicillin should
always be combined with clavulanic acid. The rabbit
was treated with amoxicillin with clavulanic acid
locally and tetracycline orally and it recovered. In
conclusion, this study describes the first *C. canimorsus*
infection in a species other than humans.

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