# Capnocytophaga canimorsus meningitis in a 38-year-old immunocompetent woman from household pet exposure.

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# *Capnocytophaga canimorsus* meningitis in a 38-year-old immunocompetent woman from household pet exposure

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ABSTRACT

A 38-year-old otherwise healthy woman with no history of immunocompromise, recent travel, or concerning exposures presented to the ED with several days of nonspecific cold-like symptoms with associated generalized headache. After the patient was symptomatically treated and discharged, she returned several hours later with worsening of symptoms and new vomiting, confusion, and sensorineural hearing loss. Blood and cerebrospinal fluid cultures eventually returned positive for a *Capnocytophaga canimorsus* infection, a bacterial pathogen found in the saliva of dogs and cats. Only after that, the patient recalled being scratched and licked by her pets, two dogs and a cat. She was treated with a course of systemic steroids, antibiotics and discharged home.



## 1. Introduction

Meningitis involves inflammation of the membrane covering the central nervous system (CNS) due to infections, autoimmune diseases, cancer, or medications.

In the United States, acute bacterial meningitis has an incidence of 5–10 per 100,000 people [1]. *C. canimorsus* meningitis has an annual incidence in the US of 0.03 per one million adults but is believed to be underdiagnosed due to postexposure antibiotic prophylaxis [2,3].

## 2. Case report

A 38-year-old female with a history of hyperthyroidism and microscopic hematuria presented to the emergency department (ED) in mid-October with two days of constant, worsening headache and four days of fever, congestion, cough, myalgias, and fatigue which was not alleviated by naproxen. The patient's spouse stated he had similar symptoms the past few days but was feeling better. The patient had no recent travel, COVID 19 exposure, surgical history or compromised immune status.

On initial presentation to the ED, the patient's vitals included blood pressure of 110/68, pulse of 101 BPM, temporal temperature reading of 99° F in the waiting room with a repeat of 100.5 °F when placed in the exam room. She was in no respiratory distress and had normal oxygen saturation on room air. She had a benign physical examination, including a thorough neurological assessment that evaluated strength, sensation, cranial nerves II-XII, finger-to-nose, and pronator drift.

Laboratory work included a CBC, CMP, urinalysis, urine pregnancy test, chest x-ray, SARS-CoV-2 reverse transcriptase PCR test and head CT. IV fluids and acetaminophen were given. Imaging showed no abnormalities, and laboratory work was grossly normal except for proteinuria of 100–299, glucosuria of 70–149, ketonuria of 10–39, and blood in the urine with >100 RBCs/HPF. WBC count was found to be 9.0 thou/cmm (normal 4.0–10.0 thou/cmm). Even though the patient's urinalysis was abnormal it did not appear to be a source of infection. The patient said she was feeling better after IV fluids and acetaminophen. She was discharged with PCP follow-up and strict return precautions should her symptoms worsen or if she developed any new symptoms. She was also given written instructions on what patients with possible or confirmed COVID-19 cases should do as her COVID-19 test was not yet resulted at the time of discharge. As the patient was seen during the Covid pandemic with a cough and congestion along with a benign work-up, her symptoms seemed to be more consistent with a viral syndrome and a lumbar puncture was not considered.

The patient returned approximately 8 h later complaining of a persistent, worsening headache that began radiating down the back of the head and neck. The patient and her spouse also reported new-onset vomiting, confusion, and distorted hearing. At that time, the patient was afebrile, her vitals were stable, and a physical examination was again grossly normal with mild nuchal rigidity but no neurological deficits.

The patient's CBC showed no leukocytosis but did have a notable left shift, absolute neutrophils 5.2 thou/cmm. A lumbar puncture was performed in the ED which showed a cloudy appearance to the patient's CSF and when analyzed showed a glucose less than one, total protein

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of 348, and leukocytosis of 4612 with 79% neutrophils. Due to this, prophylactic ceftriaxone, vancomycin, and acyclovir were started.

The patient was admitted and transitioned from ceftriaxone to meropenem due to identifying gram-negative rods on the CSF with negative initial blood cultures. Eventually, the blood and CSF cultures grew anaerobic gram-negative rods identified as *C. canimorsus*. Upon further questioning, the patient was found to have two dogs and a cat but denied any recent bites, however, she stated that she was sometimes licked and scratched when playing. An MRI of the brain (Fig. 1) showed lack of fluid-attenuated inversion recovery (FLAIR) suppression on multiple bilateral cerebral sulci, raising the possibility of infection and meningitis. An MRI of the entire spine showed no abnormal findings. Neurology and ENT were consulted for the patient's persistent and worsening bilateral hearing loss with associated dizziness and ataxia. She was subsequently started on a course of systemic steroids and meropenem was switched to ceftriaxone for 14 days. The patient had a PICC line inserted so she was able to finish the antibiotic course at home. After nine days in the hospital, she was discharged on a steroid taper.

The patient had no improvement in hearing loss, with an audiogram showing bilateral mild to profound precipitously sloping hearing loss (meaning mild hearing loss for lower frequencies and worse hearing loss for higher frequencies) [4]. On a subsequent repeat audiogram at the ENT office, the patient showed only minimal improvement. The patient was started on high dose steroids and then intratympanic steroid injections. Repeat audiograms remained unchanged and patient was referred for possible hearing aid options.

## 3. Discussion

*C. canimorsus* is a gram-negative bacillus that is known to be a part of the oral flora in dogs and cats. It has been known to cause illness ranging from mild, and flu-like to deadly sepsis. Over half of all cases are due to bite wounds, but infections are also known to be caused by scratches and licking of human wounds [5]. A history of household pet exposure may not always be considered in the evaluation of fever and headache in the ED, however, it would be prudent and simple to ask a patient if they have recently been bitten or scratched by any animals, whether they are domesticated or not. Those more susceptible to *C.canimorsus* include immunocompromised patients, such as those with a history of splenectomy, alcoholism, live in poor or crowded housing conditions, or have a previous history of meningitis, although up to 40% of infections occur in previously healthy adults [3,6,7].

Our patient had hearing loss associated with her case. It is important to recognize that while the duration of antibiotic therapy has not been established, first-line steroids in the case of *C. canimorsus* meningitis are likely to have a protective effect against subsequent sensorineural hearing loss [3].

A 2015 review of all laboratory confirmed cases of *C. canimorsus* infections found a case fatality rate of 26%. The clinical presentation included sepsis, septic shock, gangrene, high-grade bacteremia, meningitis, endocarditis, and eye infections. About 12% of these patients were asplenic or funcitonally asplenic and 12% were alcoholics. Of the patients within this population, 60% were found to have had a recent history of a dog bite and 27% were found to have scratches, licking, or contact with dogs or cats [8]. A dog in a household may be a sufficient exposure for developing the disease. Our patient had no other notable risk factors for *C. canimorsus* infection. The incubation period from dog bite to systemic symptoms is approximately 5 days, but it may be assumed that our patient was exposed through an unnoticed scratch [5].

While meningitis was not evaluated for during the initial visit, this case highlights the importance of providing patients with return precaution instructions. The patient had quick recurrence of new symptoms prompting her second ED visit where the LP was performed. LP should be considered in a patient with a headache and fever if you don't have any other known source of fever. Additionally, the MRI in our case illustrated lack of FLAIR suppression. Sulcal hyperintensity on FLAIR sequence is a nonspecific but frequently encountered finding and there are many pathologic processes that result in non-suppression of cerebrospinal fluid (CSF) signal on FLAIR sequence, with the most widely known culprits being subarachnoid hemorrhage, meningitis, and CSF dissemination of malignancy [9]. The finding was concordant with the concern for infection in this case.

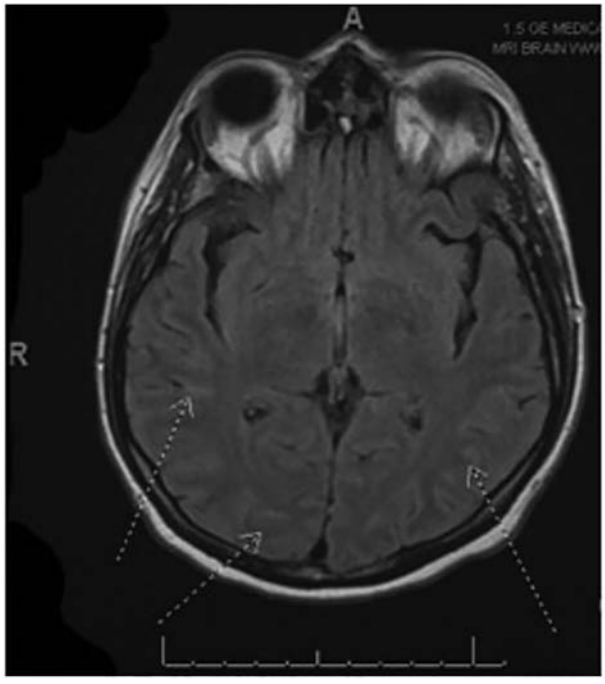


**Fig. 1.** MRI Brain w/wo Contrast: Arrows illustrate lack of FLAIR suppression on multiple bilateral cerebral sulci, raising the possibility of infection/meningitis.

## 4. Conclusion

This case demonstrates the rare but serious effects that *C. canimorsus* meningitis can have while highlighting the significance of taking a detailed history from a patient to best assess the cause of symptoms. Emergency physicians should be aware of this case as it calls attention to the importance of suspecting meningitis at the right time and obtaining a lumbar puncture to help diagnose this uncommon disease.

### Author contributions

All authors provided substantial contributions to manuscript content. All authors gave final approval of the version of the article to be published.

### CRediT authorship contribution statement

**Adam G. Fennell:** Writing – original draft. **Kyle S. Wilson:** Conceptualization, Writing – review & editing. **Kevin R. Caja:** Writing – review & editing. **Pratik M. Parikh:** Writing – review & editing.

### Declaration of Competing Interest

None.

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