**Pasteurella multocida** subdural empyema

Case report

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The authors report a case of subdural empyema caused by the organism *Pasteurella multocida*. The clinical course is outlined, and the etiology and treatment are discussed.

**Key Words** - subdural empyema • *Pasteurella multocida* • brain abscess

The bacterium *Pasteurella multocida*, a member of the genus Pasteurella, is a saprophyte in the respiratory tract of many domestic animals. Infection in man usually results from canine or feline bites or scratches.

The present case describes a patient who developed a subdural empyema several weeks after ethmoid polypectomy. *Pasteurella multocida* was grown from cultures obtained at craniotomy and from pharyngeal swabs obtained from one of the patient's cats. This organism, which has a pathogenicity of increasing significance, has not previously been described as responsible for subdural empyema.

**Case Report**

This 44-year-old woman was admitted to the Neurological Institute of the Columbia-Presbyterian Medical Center of New York on November 2, 1979, with complaints of nausea, vomiting, and a severe, throbbing, right-sided facial pain which radiated retro-orbitally. Two weeks prior to admission, the patient, who had chronic sinusitis, underwent an uncomplicated right ethmoid polypectomy. *Pasteurella multocida* was grown from cultures obtained at craniotomy and from pharyngeal swabs obtained from one of the patient's cats. This organism, which has a pathogenicity of increasing significance, has not previously been described as responsible for subdural empyema.

**Examination.** She was neurologically intact, with marked tenderness over the maxillary sinuses bilaterally. Her temperature was 100.4°F. There was no neck stiffness or papilledema. Skull and sinus films were consistent with pansinusitis, and a technetium brain scan showed a focal pickup in the right frontal area. The precontrast computerized tomographic (CT) scan revealed a lucency in the same region (Fig. 1 left). After administration of intravenous iodium contrast medium (Fig. 1 center), the scan revealed an elliptical lucent collection along the calvaria with an enhancing rim, and an area of intracerebral right frontal luency. A lower postcontrast section (Fig. 1 right) showed that the lesion extended down to just above the ethmoid sinuses.

Laboratory studies demonstrated a mild peripheral leukocytosis with 12,400/cu mm white blood cells and 91 polymorphonuclear leukocytes, of which five were immature forms. Lumbar puncture disclosed an opening pressure of 110 mm H₂O, cerebrospinal fluid (CSF) analysis showed a glucose level of 62 mg/dl, protein 39 mg/dl, and 21 cells/cu mm (1 neutrophil and 20 lymphocytes). Gram stain showed no organisms, and cultures of the CSF for fungi, tuberculosis, and bacteria were negative. An antibiotic regimen of penicillin, 2 million units intravenously every 4 hours, and chloramphenicol, 1 gm given intravenously every 6 hours, was initiated.

**Operation.** Right frontal craniotomy was performed. After elevation of the bone flap, the tense, bulging dura was opened, and a thick purulent collection of pus exuded from the subdural space. An
adherent membranous exudate was observed extending subfrontally. The pus was aspirated and the membrane excised. The brain, which was erythematous and swollen, was then vigorously irrigated with saline, and the dura was closed. Postoperatively, the patient was neurologically unchanged.

Postoperative Course. Gram stain from the operative specimen revealed small Gram-negative rods, and the initial antibiotic regimen was continued pending culture results. When *P. multocida* was isolated, the chloramphenicol was stopped and the patient was treated with intravenous penicillin alone. Two weeks postoperatively, another CT scan, with and without contrast material, revealed no evidence of a subdural collection, but there was persistent edema of the right frontal area. She continued receiving intravenous antibiotics for another 2 weeks. At this time, the CT scan was normal, and she was discharged on anticonvulsant medication.

A detailed review of the patient's previous activities revealed that she routinely kissed her two pet cats and dog on the mouth. The animals' mouths were cultured, and the identical serogroup *P. multocida* was isolated from the oral secretions of one cat. This cat, although asymptomatic, was treated with oral amoxicillin, and the organism was eliminated.

Discussion

The genus Pasteurella is composed of a group of organisms which originally included *P. tularensis*, *P. pestis* (the Great Plague), and others. The bacteria were identified according to the species of animal infected, as in *P. bovis septica* or shipping fever of cattle, and *P. suis septica* or hog cholera. Ultimately, because the organisms were found to be bacteriologically and antigenically similar, it became customary to regard all nonhemolytic members of the hemorrhagic septicemia group as members of the same species. This has been named "*Pasteurella multocida*" or "killer of many." *P. multocida* is a facultative coccobacillus or filamentous Gram-negative rod that may show bipolar staining. The organisms are nonmotile and nonsporulating, and grow well on blood agar, chocolate agar, and nutrient agar.

*P. multocida* is best known as an animal pathogen, implicated in outbreaks of hemorrhagic septicemia reported in horses, cattle, sheep, reindeer, swine, cats, ducks, chickens, rabbits, and mice, and usually leading to a fatal outcome. In addition, *P. multocida* has been reported as part of the normal flora in the upper respiratory tracts of dogs, rats, lions, panthers, buffalo, mink, and opposums. Other studies have demonstrated the bacterium in 14% to 54% of healthy dogs, and 52% to 70% of healthy cats. *P. multocida* also exists as part of normal human mouth flora. Jones and Smull isolated *P. multocida* from the pharynx of a 5-year-old girl with a history of recurrent colds. At the time of the culture the child was completely asymptomatic, with a normal physical examination. However, 2 months earlier, she had been scratched on the eyelid by her pet cat. These same investigators also discovered two pharyngeal carriers of *P. multocida* among 100 asymptomatic animal handlers. Other authors have isolated the organism from asymptomatic humans with a history of animal contact.

Most investigators currently believe that *P. multocida* may exist as part of the normal flora of the upper

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respiratory tract in man, lying dormant until trauma, infection, or other disruption of the host’s natural resistance provides damaged tissue for invasion and the subsequent manifestation of disease.\(^6\) For example, meningitis\(^8\) may result from access of the organism to the central nervous system (CNS), probably via rich vascular communications from previously saprophytic colonization of the pharynx or sinuses, as may have occurred in our patient. Pneumonia, lung abscesses, and empyema probably arise from organisms as part of the mixed flora of the lower and upper respiratory tracts.\(^9\) Remote sites, such as joint, liver, and appendix, are probably infected hematogenously,\(^6\) a mechanism long recognized as occurring with other common respiratory flora, such as *Streptococcus pneumoniae*, *Haemophilus influenzae*, and Group A streptococci.

Hubbert and Rosen\(^4\) published a study of 136 human infections with *P. multocida* unrelated to animal bites. Of these, 60% were in the respiratory tract. Most of these were accompanied by clinical diagnoses such as bronchiectasis, carcinoma, chronic bronchitis, and chronic obstructive pulmonary disease; 17% involved the abdomen, 12% involved extremities; 7% involved the CNS (two-thirds of these had meningitis, the others, chronic otitis media); and 2.9% had eye infections. Of these patients, 31% reported no history of animal contact. In 72 cases reported previously in the literature, similar percentages and sites of infection were noted.

Infections of the CNS due to *P. multocida* are rare. Eighteen cases of *P. multocida* meningitis and four of brain abscesses have been reported. Three of the cases of brain abscess occurred in patients with chronic otitis media and the fourth occurred in an infant following a perforating cranial dog bite.\(^7\) The three cases of chronic otitis media progressed to form cerebellar abscesses. There have been no reports of *P. multocida* subdural empyema. It is noteworthy that our patient had a history of chronic sinusitis in addition to surgical intervention.

Many investigators believe that the incidence of *P. multocida* infections in man has been underreported because of incorrect identification. Furthermore, *P. multocida* should be considered in the evaluation of infected animal bites or scratches, since it is probably the single most common infecting agent.\(^1\)

*P. multocida* is quite susceptible to penicillin, although plasmid-mediated antibiotic resistance has been demonstrated, and sensitivity testing should be performed. Treatment with high-dose penicillin has been advocated because of the possibility that tissue necrosis may render smaller doses less effective.\(^8\) The organism has also been reported to be susceptible to tetracycline, chloramphenicol, and streptomycin. Treatment failures have been reported with erythromycin.

In summary, *P. multocida*, a well known animal pathogen, is becoming increasingly prominent as a cause of infection in man as culture techniques improve. The relative paucity of reported cases may be a reflection of the organism’s similarity to other more common forms of bacteria, such as *H. influenzae* and *Neisseria*. Current studies indicate that *P. multocida* may be part of the normal human mouth flora, particularly in individuals with a history of animal contact. There is evidence to suggest that *P. multocida* does not cause disease in humans unless factors such as trauma, chronic disease, or even immunosuppression alter host defenses to allow tissue invasion. In view of the organism’s susceptibility to penicillin, it is especially important that it not be overlooked.

**References**


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