Chronic Otitis Media Due to EF-4 Bacteria

E-4 bacteria have been established as human pathogens following animal bites. This pathogen is thought to become pathogenic during deep puncture inoculations or in the immunocompromised host. We report a case of chronic ear infection as a result of canine contact from dogs licking the ears of their healthy owner.

A 36-year-old man was referred from a community hospital in Idaho to the Otolaryngology Service at Madigan Army Medical Center, Tacoma, Washington, for evaluation and treatment of chronic right ear drainage. At the time of presentation, the patient described a 9-month history of purulent drainage from a right ear extending through the perforated membrane. A presumptive diagnosis of an attic retraction pocket with cholesteatoma formation was made. Specimens of the purulent exudate were obtained for culture.

Following computed tomography, which confirmed soft-tissue opacification of the mastoid air cells on the right side with extension into the middle ear, he underwent complete mastoid-
ectomy with tympanoplasty. Pathological examination of the mastoid sinus confirmed cholesteatoma formation.

Culture of a specimen from his right ear demonstrated heavy growth of a gram-negative coccobacillus classified as Centers for Disease Control and Prevention (CDC) group EF-4. Further history obtained from the patient later revealed that he frequently wrestled with his two dalmatians, who would often lick his ears.

EF-4 was first described by Tatum et al. [1] in 1974. There are now ~100 strains of this fastidious gram-negative coccobacillus currently recognized by the CDC. Although Pasteurella species are more notorious as pathogens involved in dog and cat bites, many studies have been performed that have demonstrated that EF-4 bacteria are more prevalent than Pasteurella species in the natural canine oral flora.

In 1977, Bailie et al. [2] examined the oral and nasal mucosa of 50 dogs. The most frequently isolated aerobic organisms in order of prevalence were IIj, EF-4, Pasteurella species, and Staphylococcus aureus. EF-4 strains were isolated from 41 (82%) of 50 dogs. These findings were supported by a study from Michigan State University’s College of Veterinary Medicine [3]. In this investigation, EF-4 bacteria were isolated from 30% of canine gingival scrapings. Nares were not tested. Culture and identification procedures were similar but not identical in both studies, which may explain the different recovery rates.

In 1995, Ganiere et al. [4] studied gingival scrapings from canines, specifically looking for EF-4 bacteria. By using isolation plates containing 5% sheep blood agar supplemented with thiostrepton and trimethoprim, they were able to isolate 59 strains of EF-4 bacteria from 45 (92%) of 49 dogs tested. Further noted was classification of EF-4 bacteria into two main groups, or biovars, based on biochemical properties and protein diffusion patterns found by gel electrophoresis. There is evidence to suggest that these biovars may represent different species altogether.

Allen and Hanner [5] described separation of the strains of EF-4 bacteria into two biovars: EF-4a and EF-4b. EF-4a is characterized by the ability to ferment glucose, and about 80% of strains have arginine dihydrolase activity. In contrast, EF-4b strains do not ferment glucose and have no arginine dihydrolase activity; gel electrophoresis reveals that patterns for EF-4b strains are distinct from those for EF-4a strains. The importance of making the distinction between these biovars and possibly two distinct species is their apparent difference in pathogenic potential.

In all documented human studies to date, EF-4a was demonstrated to be the implicated biovar. As far as we are aware, EF-4b has been implicated only as a colonizer or opportunistic pathogen in superficial wounds. Likewise, in all cases of necrotizing pneumonia in cats, EF-4a has been the biovar implicated.

Escande and Lion [6] retrospectively reviewed 958 cases of culture-proven human infection with Pasteurella species and related species in Paris between 1985 and 1991. Roughly two-thirds of infections were cutaneous in nature. Respiratory infections, septicemia, urogenital infections, and abdominal infections comprised most of the remaining one-third of infections. EF-4 has been the implicated pathogen in cutaneous, septicemic, abdominal, and respiratory infections in humans, lending strong evidence to the clinical relevance of EF-4 as a human pathogen.

Otitis media is a common problem. Empirical therapy targeting the usual culprit organisms is likely to be efficacious. However, when standard therapies fail, reevaluation for an “unusual” pathogen should be considered. When a history of a dog bite or salivary contact is elicited, EF-4 bacteria should be added to the list of pathogens that can cause significant infection from canine bites or exposure to canine secretions.

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References