Aerobic Bacteria Cultured from the Mouth of the American Opossum (Didelphis virginiana) with Reference to Bacteria Associated with Bite Infections

JOHN M. HOWELL†* and WILLIAM C. DALSEY

Department of Emergency Medicine and Joint Military Medical Command Emergency Medicine Residency Program and Clinical Investigation Directorate, Wilford Hall USAF Medical Center, Lackland Air Force Base, Texas 78236-5300

Received 12 June 1990/Accepted 23 July 1990

The American opossum inflicts bite injuries both when hunted for food and when accidentally provoked when handled in captivity. This study involved aerobically culturing organisms from the mouths of seven wild opossums (Didelphis virginiana). Isolates included streptococci, coagulase-positive and -negative staphylococci, Aeromonas spp., Citrobacter freundii, Eikenella corrodens, and Escherichia coli.

Didelphis virginiana, the American opossum, is a ubiquitous marsupial which is trapped and handled frequently, for a wide variety of purposes (1, 5–8). The anterior teeth of D. virginiana are long, slender, and similar to those of a cat. In bite injuries, this similarity might facilitate the delivery of microbes deep into injured tissue, thereby enhancing the likelihood of soft tissue infection. Bacteria cultured from dog bite cellulitis and uninfected wounds approximate the microbes isolated from canine mouths (3, 10, 13, 17). Knowing the microbial organisms which might infect bite injuries aids clinicians in choosing appropriate antimicrobial agents. However, we are unaware of any studies to date which identify bacteria carried in the oral cavity of D. virginiana.

Seven adult opossums (D. virginiana) weighing between 3 and 6 kg were used as subjects. All animals were caught in the wild (in Florida) and transported to the Clinical Investigation Directorate, Lackland Air Force Base, Tex. Subjects did not receive antibiotics prior to study, and none evidenced clinical periodontal cellulitis or abscess. Although opossums generally scavenge for food, subjects were fed a liquid diet (Critical Care Feline Liquid Diet; PetAg, Inc., Hamphire, Ill.) during the 1 to 2 months prior to study. Saliva from gingiva overlying the anterior maxillary and mandibular teeth in all animals was cultured by using a single ray-tipped swab (Precision Culture C.A.T.S.: Precision Dynamic Corp., San Francisco, Calif.). Saliva specimens were transported directly to 5% sheep blood, chocolate, and MacConkey agar plates. Dental plaque cultures were obtained for four animals. Plaque specimens were acquired by scraping anterior maxillary and mandibular teeth in each animal with a no. 11 scalpel and depositing specimens directly onto the same three types of agar media. Bacteria were identified in the usual manner. Gram-negative bacilli were identified by differential growth on MacConkey agar, with the API 20E system (Analytab Products, Plainview, N.Y.), and with a flagellar stain. Anaerobes, fungi, and dysgonically fermenting organisms were not selectively cultured.

Gram-positive cocci recovered were alpha streptococci (not group D), gamma streptococci, and coagulase-positive and -negative staphylococci, including Staphylococcus sciuri. Other isolates included Neisseria spp., Acinetobacter calcoaceticus subsp. lwoffi, Aeromonas hydrophila, Citrobacter freundii, Escherichia coli, Eikenella corrodens, Flavobacterium spp., Haemophilus spp., Oerskovia spp., Pseudomonas spp. (not Pseudomonas aeruginosa), Bacillus spp., and Corynebacterium spp. Alpha streptococci were abundant in cultures from all animals. Bacillus spp. from six opossums exhibited moderate growth. Little growth of E. coli was detected in five of seven subjects. The remaining bacteria were each present in only one or two animals exhibiting little growth. Eikenella corrodens (two animals) and A. calcoaceticus subsp. lwoffi (one animal) were the only bacteria isolated from plaque specimens alone. The following microorganisms were isolated only from saliva: Aeromonas hydrophila, C. freundii, Corynebacterium spp., Flavobacterium spp., gamma streptococci, Haemophilus spp., Oerskovia spp., and Pseudomonas spp.

Bite wounds accounted for approximately 1% of all emergency department visits (9). In this regard, knowledge of potentially pathogenic microbes is useful in directing antimicrobial therapy. Aerobic bacteria which we isolated and which have been cultured by other investigators from infected animals and human bites include Acinetobacter spp. (2, 4, 16), Aeromonas spp. (19), alpha streptococci (4), gamma streptococci (4, 17), coagulase-positive and -negative staphylococci (4, 17), Bacillus spp. (17), Corynebacterium spp. (4), Eikenella spp. (4), Haemophilus spp. (4, 12), Pseudomonas spp. (4, 17), and members of the family Enterobacteriaceae (4, 17). Of these, alpha streptococci, Bacillus spp., and E. coli were most frequently cultured from opossum mouths in this study, and alpha streptococci showed the greatest propensity for agar plate overgrowth.

Up to 75% of cellulitis due to human and animal bites are polymicrobial, involving both aerobes and anaerobes (4, 15, 17). This may be the result of a microaerophilic environment established after tissue puncture. Ordug (17) detected among dog bite infections with multiple organisms a correlation coefficient of 0.9 between Pseudomonas spp. and members of the Enterobacteriaceae. Two opossums in this study harbored both Pseudomonas spp. and a member of the Enterobacteriaceae (C. freundii and E. coli).

Although a small sample was used, our results are consistent with those of Goldstein et al. (11) who cultured Eikenella corrodens from 58.9% of human plaque cultures...
and from only 0.3% of saliva specimens. Conversely, Pasteurella multiocida has been isolated from 47 of 67 cat saliva cultures (18) but was not detected in this study. Komiyama et al. (14) found P. aeruginosa just as likely to be present in human plaque as in saliva; however, we cultured Pseudomonas spp. only from saliva specimens.

Antimicrobial susceptibility testing was not performed. Therefore, firm recommendations concerning antimicrobial therapy for opossum bites may not be derived from this study. It is noteworthy, however, that Pseudomonas spp. and Eikenella corrodens were recovered in addition to streptococci, staphyloccoci, and assorted gram-negative bacteria.

LITERATURE CITED