AEROMONAS hydrophila is a Gram-negative bacillus, member of the family Vibrionaceae, which is a common inhabitant of freshwater lakes and streams. It is not commonly identified as an agent of human infection. Most reports have described gastroenteritis, septicemia, meningitis, pneumonia, or surgical wound infections, primarily in immunocompromised patients.

Infections of immunologically competent persons have been rare. We report a well-documented case of severe cellulitis in a previously healthy young man that developed from a laceration acquired during swimming. AEROMONAS hydrophila was recovered in large numbers from the wound and was subsequently shown to be the major bacterial contaminant of the freshwater lake where the injury occurred. The clinical features of AEROMONAS infections of freshwater traumatic wounds suggest a characteristic syndrome, indistinguishable from cellulitis caused by group A Streptococcus.

Report of a Case

A 22-year-old man sustained a full-thickness scalp laceration while diving in shallow water in Lake Mendota, Wis, during early September 1976. Unconsciousness did not occur. The wound was a 12-cm, semicircular avulsion with the apex at the mid sagittal hairline. Physical examination was otherwise unremarkable, and roentgenograms of the skull showed no fracture. The wound was irrigated and closed with 16 nylon sutures. Tetanus toxoid, 0.5 ml, was administered.

Within 24 hours, the wound became increasingly swollen and painful, and the patient began to have fever and chills. On examination 36 hours following the injury, he was in considerable discomfort, but he did not appear ill. The temperature was 37.4°C; blood pressure, 138/84 mm Hg; pulse rate, 100 beats per minute; and respirations, 20/min.

The wound was swollen and exquisitely tender; the flap was fluctuant, and inflammation extended inferiorly to involve both orbits and posteriorly to the brachyoma (Fig 1). There was no meningismus or proptosis, and examination results of the cranial nerves, optic fundi, and vision were normal. Findings from the remainder of the physical examination were unremarkable.

The WBC count was 20,000/μm, with 73% segmented neutrophils, 15% band forms, 10% lymphocytes, and 2% monocytes, and the hematocrit level was 43%.

The sutures were removed, releasing a large volume of sanguineous pus. Gram-stained smear showed sheets of polymorphonuclear neutrophils and many filamentous Gram-negative rods; no Gram-positive organisms were seen.

Initial antibiotic therapy consisted of aqueous penicillin G, 20 million units per day in divided dosage; methicillin sodium, 2 g every four hours by intravenous injection, and gentamycin sulfate, 120 mg every eight hours, intramuscularly.

Cultures of the wound material showed moderate growth of a motile Gram-negative organism that produced β-hemolysis on sheep-blood agar. It fermented glucose and mannitol aerobically; lactose, sucrose, and mannose, but not inositol, sorbitol, rhamnose, or melibiose. The organism was oxidase- and catalase-positive, indole- and Voges-Proskauer-positive, and citrate-negative. It elaborated arginine dihydrolase and lysine decarboxylase, but not ornithine decarboxylase or urease. Nitrate was not attacked. Susceptibility testing by the standardized Kirby-Bauer disk method showed the organism to be sensitive to cephaloridine, gentamicin, kanamycin, chloramphenicol and tetracycline, and resistant to penicillin and ampicillin. Stain numbers of CLOSTRIDIUM sp and an α-STREPTOCOCCUS were also recovered from the wound. Blood cultures were negative.

The patient responded rapidly to treatment, becoming afebrile within 48 hours. The wound was closed secondarily on the sixth hospital day, and the patient was discharged three days later. Follow-up examinations have shown no residual effects from the infection.

Epidemiologic Studies

Bacteriologic studies were undertaken of water in the lake's bay where the injury had occurred. Additional samples were taken from a large ditch that drains an agriculture and livestock

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Aeromonas hydrophila, Colonies Per Deciliter Water

Fecal Coliforms, Colonies Per Deciliter Water

Fig 2.—Results of bacteriologic sampling of lake in vicinity where diving injury occurred.

holding area and enters the bay along this shoreline.

Concentrations of aeromonads in water were determined by a membrane-filtration technique and fecal coliform counts by standard methods. Mannitol-fermenting colonies were examined by the in situ oxidase test. Oxidase-positive, mannitol-fermenting organisms were identified biochemically and shown to be A hydrophila.

Results of sampling are shown in Fig 2. Fecal coliform counts along the shoreline were in a range of 120 to 280/dl, which is marginally acceptable for water-purity standards. Concentrations of aeromonads were highest (10,000 to 100,000/dl) where the drainage ditch enters the lake. Progressive dilution occurred along the shore, with an average concentration of 500 organisms per deciliter in the vicinity where the accident occurred.

Comment

Wound infection with A hydrophila has previously been reported in swimmers who sustained lacerations while diving. Our patient's infection and these reports suggest a characteristic syndrome: an explosive onset of local inflammation with suppuration (24 to 30 hours), accompanied by moderate fever (38 to 40°C) and leukocytosis (20,000 to 25,000/cu mm). Bilateral periorbital cellulitis was also observed in one previous case.

Clinically, this picture strongly resembles soft tissue infection caused by group A streptococci. Secondary extension of A hydrophila infection to the cavernous sinus and leptomeninges has not been described, perhaps because its rapidity prompts seeking early medical treatment.

Surgical drainage combined with appropriate antimicrobial therapy has proved effective. Aeromonas is most consistently sensitive to gentamicin, kanamycin, chloramphenicol, and tetracycline, and is usually resistant to penicillin, ampicillin, and cephalosporins. Aeromonas hydrophila may be a more frequent human pathogen than the literature would suggest. The organism can easily be misidentified with the routine microbiological tests employed in many hospital laboratories because of its many morphological and biochemical similarities to the Enterobacteriaceae, especially Serratia and Escherichia coli. Showing capacity to use glucose oxidatively by use of oxidative-fermentation media or the simple in situ oxidase test is helpful in distinguishing members of the Aeromonas group from other Gram-negative motile organisms isolated on routine enteric media.

The concentration of A hydrophila in freshwater lakes and streams is reported to vary with the degree of organic pollution. Counts of 1,000 to 1 million organisms per deciliter have been recovered from Lake Ontario and the Ottawa River. The gradient of contamination that we demonstrated along the lakeshore implicates the drainage ditch as the major pollutant of the bay where our patient's injury occurred. Our observations suggest that considerable contamination of traumatic freshwater wounds by A hydrophila may occur at comparatively low concentrations and in water with acceptable reference pollution (fecal coliform) counts. Rapidly evolving cellulitis of freshwater soft tissue injuries should raise consideration of A hydrophila infection, especially when the initial examination of suppurative exudate shows a preponderance of Gram-negative bacilli. Initial antimicrobial therapy should include an aminoglycoside, preferably gentamicin. Although Aeromonas spp are usually sensitive to tetracycline, this drug is not recommended in the initial regimen in place of the aminoglycoside, because pseudomonads or Serratia can occasionally be primary pathogens of infected traumatic wounds.

Nonproprietary Name and Trademark of Drug

Gentamicin sulfate—Garamycin.

References


Freshwater Wound Infection—Hanson et al