JOURNAL OF CLINICAL MICROBIOLOGY, May 1996, p. 1283–1285 Vol. 34, No. 5
0095-1137/96/$04.00+0

Veillonella Infections in Children

ITZHAK BROOK*

Department of Pediatrics, Navy Hospital, Bethesda, Maryland, and Department of Pediatrics, Georgetown University School of Medicine, Washington, D.C.

Received 11 September 1995/Returned for modification 25 October 1995/Accepted 5 February 1996

From 1974 to 1994, 2,033 specimens from children were submitted for cultures for anaerobic bacteria. Eighty-three *Veillonella* spp. were recovered from 83 children (4%). Most *Veillonella* species were recovered from abscesses, aspiration pneumonias, burns, bites, and sinuses. The infections were polymicrobial in 79 (95%) patients, but in 4 (5%) patients, *Veillonella* species were recovered in pure culture. The predisposing conditions associated with the recovery of these organisms were previous surgery, malignancy, steroid therapy, foreign body, and immunodeficiency. These data illustrate that *Veillonella* spp. are found infrequently in children, mostly in association with mixed infections, and are recovered mixed with mouth and bowel flora.

Awareness about the role of anaerobic bacteria in pediatric infections has increased in recent years. The organisms that were mostly studied were *Bacteroides*, *Prevotella*, *Fusobacterium*, and *Peptostreptococcus* species (6). *Veillonella* species are anaerobic gram-positive cocci that normally inhabit the mouth, upper respiratory tract, intestine, and vagina (16). The importance of *Veillonella* species in human infections is uncertain. These organisms were recovered in pure culture in only a few instances (4, 11) and were usually isolated mixed with other bacteria (6, 10).

This retrospective review summarizes the author's experience in the past 20 years with the recovery of *Veillonella* species from infections in children. Some of the data have been published before in articles describing the role of anaerobic bacteria in various pediatric infections (6), but cases not previously presented are also included, and the spectrum of *Veillonella* infections in children is presented.

The specimens included in this review were studied or reviewed by the author between June 1974 and June 1994. They were collected in the following hospitals: University of California Medical Center, County Medical Center, and Serra Memorial Hospital in Los Angeles, and Fairview State Hospital, Costa Mesa, Calif.; Children's Hospital National Medical Center and Southeast Community Medical Center in Washington, D.C.; and the Naval Hospital in Bethesda, Md.

The clinical microbiology laboratories' records were reviewed to identify patients with *Veillonella* infections. The available case histories of all patients from whom these organisms had been isolated were reviewed to ascertain the presence and site of infection, associated microorganisms, underlying disease process, and possible predisposing or associated conditions. Data for five patients whose charts were not available for review were not included in the final analysis.

Only specimens that were properly collected without contamination by the normal skin or mucous surface flora and submitted in transport medium appropriate for anaerobic bacteria were accepted by the microbiology laboratories. These were generally specimens obtained during or by aseptic needle or biopsy aspiration of abscesses or fluid from body cavities. Pulmonary specimens were obtained by transtracheal aspiration or through the tracheostomy or ventilatory tube or biopsy. When possible, pus and fluids were collected and transported in syringes. Tissues were transported in oxygen-free gassed-out tubes. Swab specimens were submitted in the Port-A-Cul transport swab system (BBL, Cockeysville, Md.). However, precise records of all of the transport media used were not available.

The specimens were inoculated onto reduced medium that included vitamin K_1-enriched brucella blood agar (BBL), blood agar with kanamycin and vancomycin, a blood plate containing colistin-methane-sulfonate and nalidixic acid, and an enriched thioglycolate broth containing hemin and vitamin K_1 (12, 15, 18). The cultures were incubated in GasPak jars (BBL) at 37°C and were examined after 48 and 96 h.

Plates that showed any growth were incubated until the microorganisms had been identified. All cultures that showed no growth were incubated for at least 5 days. Microorganisms were identified by the API anaerobic system (Analytab Products, Plainview, N.Y.) or by the Minitek system (BBL). In addition to these tests, when complete identification was not possible by the methods described above, other carbohydrate tests (Scott Laboratories, Fiskeville, R.I.) and gas-liquid chromatography (6, 7) were performed as needed to identify the organisms. The criteria used for identification were the guidelines published previously (12, 15, 18).

A total of 2,033 specimens were examined for anaerobic bacteria during the study period. *Veillonella* species were not recovered from eye, joint, blood, central nervous system, or urinary tract specimens, totaling 718 specimens. Eighty-three isolates of *Veillonella* species were recovered from the remaining 1,315 specimens representing a variety of sites (Table 1).

The 83 isolates of *Veillonella* were recovered from 83 patients, 65 of whom were males. The ages of the patients ranged from 6 weeks to 17 years (mean, 7 years and 4 months). The infections were polymicrobial in 79 (95%) patients, but in 4 (5%) patients, *Veillonella* organisms were recovered in pure culture. There were 193 other bacterial isolates recovered in mixed infections with *Veillonella* species in 79 specimens; 111 (58%) of these were strict anaerobes, and 82 (42%) were facultative or aerobic species. The number of isolates in mixed culture varied between two and five (average, 2.4 isolates per specimen; 1.4 anaerobes and 1.0 facultative or aerobic organisms).

The four isolates recovered in pure culture were found in one case each of osteomyelitis, cervical lymphadenitis, a cutaneous abscess, and an infected burn site. The patients with cervical lymphadenitis were treated with trimethoprim-sulfamethoxazole at the time of culture, but none of the other patients received any therapy.

* Mailing address: P.O. Box 70412, Chevy Chase, MD 20813-0412. Phone: (202) 363-4253. Fax: (202) 244-6809.

TABLE 1. *Veillonella* isolates in 83 specimens from various clinical specimens from children

Type of infection	Total no. of specimens	Total no. (%) of *Veillonella* spp.
Abscess	428	29 (6.8)
Cervical lymphadenitis	53	2 (3.8)
Chronic mastoiditis	24	1 (4.2)
Serous otitis media	64	1 (1.6)
Pulmonary		
Aspiration pneumonia	74	12 (16.2)
Empyema	72	1 (1.4)
Ventilator pneumonia	10	1 (10)
Pneumonia in cystic fibrosis	6	2 (33.3)
Wounds		
Tracheostomy site	25	3 (12.0)
Paronychia	33	1 (3.0)
Wounds	75	3 (4.0)
Burns	180	7 (3.9)
Bites	39	7 (17.9)
Gastrostomy site	22	2 (9.1)
Omphalitis	23	1 (4.3)
Peritonitis	116	3 (2.6)
Osteomyelitis	26	1 (3.8)
Sinusitis, chronic	45	6 (13.6)
Total	1,315	83 (6.3)

Of the 83 *Veillonella* isolates, 29 (35%) were from abscesses: 12 cutaneous, 4 each peritonsillar and dental, 3 tonsillar, 2 each subdural and perirectal, and 1 each liver and brain. Twelve (14%) of the isolates were from patients with aspiration pneumonia, 7 each (8%) were from patients with burns or bite wounds, and 6 (7%) were from patients with chronic sinusitis.

The anaerobic organisms isolated most commonly with *Veillonella* spp. were *Peptostreptococcus* spp. (37 isolates), pigmented *Prevotella* and *Porphyromonas* spp. (26 isolates), *Fusobacterium* spp. (14 isolates), and *Bacteroides fragilis* group (13 isolates). The most common aerobic and facultative organisms recovered with *Veillonella* spp. were *Staphylococcus aureus* (15 isolates), *Streptococcus* group A (12 isolates), *Escherichia coli* (9 isolates), *Pseudomonas aeruginosa* (7 isolates), nonhemolytic streptococci (7 isolates), and *Klebsiella pneumoniae* (6 isolates).

Most *Prevotella*, *Porphyromonas*, and *Fusobacterium* isolates were recovered from head, neck, and pulmonary sites, while most *B. fragilis* and *E. coli* isolates were found in peritoneal and abdominal sites and skin and soft tissue infections proximal to the rectum. Anaerobic cocci were recovered equally from all sites.

Twenty-eight (34%) of the patients had predisposing or underlying conditions. These were previous surgery (nine patients), malignancy (six patients), foreign body (five patients), steroid therapy (four patients), and immunodeficiency (four patients).

Antimicrobial therapy was given to 29 (35%) patients prior to sample collection. The agents given were amoxicillin or ampicillin in 12 patients, erythromycin in 6 patients, cephalosporins in 5 patients, trimethoprim-sulfamethoxazole in 4 patients, and oxacillin in 2 patients. Antimicrobial therapy was administered to 76 (92%) patients, in conjunction with surgical drainage with or without surgical repair in 45 (54%) patients. The infections resolved in all instances. Single-agent therapy was given in 60 instances, and combination therapy was given in 16 instances. The antimicrobial agents given were clindamycin (23 instances), an aminoglycoside (19 instances), a cephalosporin (16 instances), amoxicillin-clavulanate (11 instances), amoxicillin or ampicillin (8 instances), oxacillin (7 instances), ticarcillin-clavulanate (4 instances), and penicillin (4 instances). Topical therapy with an antibacterial agent was given to four patients with bites and three patients with burns.

This retrospective study demonstrates the prevalence of *Veillonella* spp. in various infections in children. *Veillonella* spp. were isolated from 84 of 2,033 (4%) specimens submitted for anaerobic culture. The highest prevalence of *Veillonella* spp. was in patients with bites, aspiration pneumonia, and chronic sinusitis. The largest numbers of isolates were recovered from patients with abscesses, aspiration pneumonia, burns, bites, chronic sinusitis, peritonitis, and wounds. *Veillonella* spp. were not, however, isolated from patients joint, eye, blood, central nervous system, or urinary tract infections. *Veillonella* spp. were found infrequently in children, were mostly found in association with mixed infection, and were recovered mixed with mouth and bowel flora.

The data presented here illustrate the recovery of *Veillonella* spp. from 83 infections in children. These organisms were especially prevalent in males with infections associated with previous surgery, malignancies, a foreign body, steroid therapy, and immunodeficiency.

Veillonella spp. have been incriminated as causative agents in adults with bacteremia (9, 20, 21), malignancies (especially leukemia) (21), and pleuropulmonary infection (3, 7, 8). *Veillonella* spp. have been isolated from adult patients who developed bacteremia after gastrointestinal endoscopy (2, 8). *Veillonella* spp. have also been recovered from neonates with bacteremia (17).

Several case reports described the recovery of *Veillonella* spp. from adults with clinical infections; *Veillonella* spp. have occasionally been associated with mixed anaerobic pleuropulmonary infections (3, 7), polymicrobial bacteremia after barium enema (13), upper gastrointestinal endoscopy (2), and endocarditis (14). *Veillonella* spp. have been isolated in pure culture from bacteremic patients with osteomyelitis (4, 5) and urologic disorders (1). *Veillonella alcalescens* was isolated from a patient with endocarditis (11). It has been speculated that an alteration in host defenses, as in acute myelomonocytic leukemia, may predispose patients to *Veillonella* infections (5). Fainstein et al. (9) isolated two *Veillonella* spp. as a cause of monobacteremia from the blood of four patients with cancer.

Although *Veillonella* spp. are considered to be of low virulence, they may cause an infection by themselves in certain situations, as well as participate with other bacteria in the polymicrobial infection process.

Veillonella spp. are generally susceptible to most antibiotics used for the treatment of anaerobic infections, including betalactam antibiotics (penicillins and cephalosporins), clindamycin, and metronidazole. However, *Veillonella* spp. are generally resistant to tetracycline and are only intermediately susceptible to erythromycin. It is imperative that whenever infections caused by *Veillonella* spp. are suspected, agents other than these be used (19). Occasional isolates of *Veillonella* spp. may, however, show resistance to penicillin as well as to other agents (9).

Because *Veillonella* spp. may be capable of inducing infections, especially in some high-risk patients, efforts should be made to obtain specimens free of contamination by the normal mucous membrane and skin flora, where *Veillonella* spp. reside. Determination of the clinical significance of each isolate must be made with caution, because that may influence the need to direct therapy against that isolate.

The laboratory assistance of the staff of the microbiology laboratories at the University of California Medical Center, County Medical Center, and Serra Memorial Hospital in Los Angeles, Fairview State Hospital in Costa Mesa, Calif.; Children's Hospital National Medical Center and Southeast Medical Center in Washington, D.C.; and the Naval Hospital in Bethesda, Md., and the secretarial support of Sarah Blaisdell are gratefully acknowledged.

REFERENCES

1. **Arrosagaray, P. M., C. Salas, M. Morales, M. Correas, J. M. Barros, and M. L. Cordon.** 1987. Bilateral abscessed orchiepipididymitits associated with sepsis caused by *Veillonella parvula* and *Clostridium perfringens*. Case report and review of the literature. J. Med. Microbiol. **25:**1579–1580.
2. **Baltch, A. L., I. Buhac, A. Agrawal, P. O'Connor, M. Bram, and E. Malatino.** 1977. Bacteremia after upper gastrointestinal endoscopy. Arch. Intern. Med. **137:**594–597.
3. **Bartlett, J. G., and S. M. Finegold.** 1972. Anaerobic pleuropulmonary infections. Medicine (Baltimore) **51:**413–450.
4. **Borchardt, K., M. Baker, and R. Gelber.** 1977. *Veillonella parvula*, septicemia and osteomyelitis. Ann. Intern. Med. **86:**63–64.
5. **Branhart, R. A., M. R. Weitecamp, and R. C. Aber.** 1983. Osteomyelitis caused by *Veillonella*. Am. J. Med. **74:**902–904.
6. **Brook, I.** 1989. Pediatric anaerobic infection: diagnosis and management. The C. V. Mosby Co., St. Louis.
7. **Brook, I., and S. M. Finegold.** 1980. Bacteriology of aspiration pneumonia in children. Pediatrics **65:**1115–1120.
8. **Brook, I., and E. H. Frazier.** 1992. Infections caused by *Veillonella* species. Infect. Dis. Clin. Pract. **1:**377–381.
9. **Fainstein, V., L. S. Elting, and G. P. Bodey.** 1989. Bacteremia caused by nonsporulating anaerobes in cancer patients. Medicine (Baltimore). **68:**151–162.
10. **Finegold, S. M.** 1977. Anaerobic bacteria in human disease, p. 182–201. Academic Press, Inc., New York.
11. **Greaves, L., and A. B. Kaiser.** 1984. Endocarditis due to *Veillonella alcalescens*. South. Med. J. **77:**1211–1212.
12. **Holdeman, L. V., E. P. Cato, and W. E. C. Moore (ed.).** 1977. Anaerobe laboratory manual. Anaerobic Laboratory, Virginia Polytechnic Institute and State University, Blacksburg.
13. **LeFrock, J., C. A. Ellis, A. S. Klainer, and L. Weinstein.** 1975. Transient bacteremia associated with barium enema. Arch. Intern. Med. **135:**835–837.
14. **Loewe, L., P. Rosenblatt, and W. E. Alture.** 1946. A refractory case of subacute bacterial endocarditis due to *Veillonella gazogenes* clinically arrested by a combination of penicillin, sodium para-aminophippurate and heparin. Am. Heart J. **32:**327–338.
15. **Murray, P. R., E. J. Baron, M. A. Pfaller, F. C. Tenover, and R. H. Yolken (ed.).** 1995. Manual of clinical microbiology, 6th ed. American Society for Microbiology, Washington, D.C.
16. **Smith, L. D. S.** 1977. The pathogenic anaerobic bacteria, p. 93–94. Charles C Thomas, Springfield, Ill.
17. **Spector, S., W. Tickner, and M. Grossman.** 1981. Studies of the usefulness of clinical and hematological findings in the diagnosis of neonatal bacteremia. Clin. Pediatr. **20:**385–391.
18. **Summanen, P., E. J. Baron, D. M. Citron, C. A. Strong, H. M. Wexler, and S. M. Finegold.** 1993. Wadsworth bacteriology manual. 5th ed. Star Publishing Company, Belmont, Calif.
19. **Sutter, W., and S. M. Finegold.** 1976. Susceptibility of anaerobic bacteria to 23 antimicrobial agents. Antimicrob. Agents Chemother. **10:**736–752.
20. **Vazquez, F. V., F. J. Mendez, F. Perez, and M. C. Mendoza.** 1987. Anaerobic bacteremia in a general hospital: a retrospective five-year analysis. Rev. Infect. Dis. **9:**1038–1043.
21. **Wilson, W. R., W. J. Martin, C. J. Wilkowski, and J. A. Washington.** 1972. Anaerobic bacteremia. Mayo Clin. Proc. **47:**639–646.