Bacteremia due to Bifidobacterium, Eubacterium or Lactobacillus; Twenty-one Cases and Review of the Literature

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Twenty-one cases of bacteremia due to Bifidobacterium, Eubacterium and Lactobacillus are described. Transient bacteremic episodes with these organisms may follow trauma to the mouth, intestine, or vagina. The majority of the patients were female and most had an underlying condition that may have predisposed to bacteremia. Ten of the patients died despite antibiotic treatment.

INTRODUCTION

Bifidobacterium, Eubacterium, and Lactobacillus species are all non-sporeforming gram-positive rods that are classified as anaerobes. Species vary from strictly anaerobic to aerotolerant. These genera are taxonomically unrelated, but they are all non-motile and lack catalase. Their microscopic morphology includes straight or curved rods (Lactobacillus), pleomorphic rods (Eubacterium), and branched or bifurcated forms (Bifidobacterium).

Species of all three genera are found among the commensal flora of man. Since these organisms are usually recovered together with other commensals, little is known of their pathogenic potential.

The present paper describes the recovery of these species, usually in pure culture, from the blood of patients with a variety of clinical problems.

METHODS

Subjects

Blood cultures were obtained from adult patients at the Columbia-Presbyterian Medical Center during the period 1972 to 1977. In every case, the blood was drawn the same day on which the provocative signs or symptoms occurred, usually within a few hours after a temperature rise.

Blood Sampling Procedure

The patient's antecubital fossa was prepared with either 2% tincture of iodine or PVP-Iodine (Betadine solution, Purdue-Frederick Co.) and approximately 17 ml of
blood was collected into Vacutainer tubes containing sodium polyanethol sulfonate (Becton-Dickinson).

Laboratory Procedures

The blood was distributed between two bottles, one of which contained modified Columbia broth [1,2]. This bottle was vented to provide aerobic conditions. The second bottle contained modified Columbia broth made hypertonic with 10% sucrose [3]. This bottle remained unvented to maintain anaerobic conditions. Aerobic bottles were subcultured to chocolate agar at 10 hours and at 5 days; anaerobic bottles were subcultured to anaerobic blood agar at 5 days [3]. Gram stains were performed on all isolates, and gram-positive isolates were tested for catalase production. Anaerobic or microaerophilic non-sporeforming gram-positive rods were identified by fermentation in prerduced media (Scott Labs) or with the Minitek System (Bioquest) and with gas liquid chromatography according to the criteria of the Virginia Polytechnic Institute [4].

Data Analysis

Patients' charts were reviewed to determine the history, presence of underlying disease, and other pertinent clinical information.

RESULTS

During the 6-year period of this study, 91,493 blood cultures were received. More than 9,000 isolates were recovered, 10% of which were anaerobes. Ten Bifidobacterium species, 8 Eubacterium species, and 4 Lactobacillus species were recovered among these approximately 900 anaerobic isolates. Blood cultures became positive 3–5 days after incubation. These organisms were not recovered from any other site or specimen.

Ten Bifidobacterium isolates were obtained from 9 patients. Blood from 2 of the patients (Nos. 5 and 6) grew out a second organism: Bacteroides fragilis and Peptostreptococcus species. The patients ranged in age from 21 to 60 years. Five of these patients had complications associated with pregnancy; 2 patients had gastrointestinal disorders; and 2 patients had systemic lupus erythematosus, one of whom developed peritonitis. Two of the patients died (Table 1).

Nine Eubacterium isolates were obtained from 8 patients. The same blood culture from 2 of the patients (Nos. 10 and 12) grew out a second organism: Klebsiella pneumoniae and Bacteroides species. Other blood cultures from patient No. 10 grew out Arizona, Pseudomonas aeruginosa, Klebsiella pneumoniae, and Bacteroides fragilis. Separate blood cultures from patient No. 13 grew out Proteus vulgaris and Nocardia asteroides. A single blood culture from patient No. 14 grew out E. coli. The patients ranged in age from 19 to 70 years. Seven of these patients had gastrointestinal disorders and 1 patient developed fever following caesarean section. Six of the patients died (Table 2).

Seven Lactobacillus isolates were obtained from 4 patients, all in pure culture. A separate blood culture from patient No. 18 grew out Bacteroides fragilis. The patients ranged in age from 47 to 71 years. Two of the patients had gastrointestinal disease, 1 patient had endocarditis, and the remaining patient developed postoperative fever. Two of the patients recovered (Table 3).

Antimicrobial susceptibility studies were not performed on any of the isolates.
### Table 1

Patients from whom *Bifidobacterium* Isolates Were Obtained

| Patient | Age | Sex | Organism                  | Clinical Problem                                                                 | Signs and Symptoms Prompting Blood Culture | WBC (per cmm) | Treatment                    | Outcome |
|---------|-----|-----|----------------------------|---------------------------------------------------------------------------------|-------------------------------------------|--------------|-------------------------------|---------|
| 1       | 24  | F   | *Bifidobacterium* species  | Delivery                                                                        | Fever to 101°F                           | 17,400       | None                          | Recovered |
| 2       | 58  | M   | *Bifidobacterium* species  | Bowel obstruction due to rectal cancer                                         | Shaking chills                            | 10,000       | Ampicillin kanamycin cephalothin | Died     |
| 3       | 39  | F   | *Bifidobacterium* eriksonii | Fever 1 day post cholecystectomy                                                | Fever to 102°F                           | 15,600       | None                          | Recovered |
| 4       | 35  | F   | *Bifidobacterium* eriksonii | Fever 2 days post c section —uterine fibroids                                  | Fever to 100°F                           | 20,100       | Ampicillin                    | Recovered |
| 5       | 29  | F   | *Bifidobacterium* eriksonii | Septic shock 5 days postpartum                                                  | Chills, fever to 104°F                   | 13,700       | Ampicillin kanamycin          | Recovered |
| 6       | 21  | F   | *Bifidobacterium* eriksonii | Septic pregnancy                                                                 | Chills, fever to 102°F                   | 18,200       | Ampicillin kanamycin          | Recovered |
| 7       | 31  | F   | *Bifidobacterium* species  | Fever 2 days postpartum                                                          | Fever to 101.8°F                         | 16,500       | Ampicillin gentamicin         | Recovered |
| 8       | 34  | F   | *Bifidobacterium* species  | Multiple Staph. abscesses (systemic lupus erythematosis)                         | Rule out Staph. Subacute bacterial endocarditis | 6,800       | Oxacillin                     | Recovered |
| 9       | 60  | F   | *Bifidobacterium* adolescentis × 2 | Peritonitis due to diverticulosis (systemic lupus erythematosis)                  | Fever to 100°F                           | 3,100        | Ampicillin gentamicin cephalothin | Died     |
### TABLE 2
Patients from whom *Eubacterium* Isolates Were Obtained

| Patient | Age | Sex | Organism             | Clinical Problem                                      | Signs and Symptoms Prompting Blood Culture | WBC (per cmm) | Treatment                        | Outcome |
|---------|-----|-----|----------------------|-------------------------------------------------------|------------------------------------------|---------------|----------------------------------|---------|
| 10      | 32  | F   | *Eubacterium nitrogenes* | Rectal fistula (acute lymphocytic leukemia)           | Chills, fever to 102°F                   | 49,000        | Cephalothin tobramycin ticarcillin | Died    |
| 11      | 39  | M   | *Eubacterium* species  | Ileal perforation, Crohn's disease, stage IV Hodgkins | ?                                       | 8,900         | Ampicillin gentamicin oxacillin   | Died    |
| 12      | 70  | F   | *Eubacterium* species  | Bowel perforation due to fecal impaction             | Shock, fever to 102°F                    | 12,900        | Chloramphenicol gentamicin oxacillin | Died    |
| 13      | 61  | F   | *Eubacterium* alactolyticum | Colon diverticulosis, pneumonia                       | Septic shock                             | 11,600        | Ampicillin gentamicin cephalothin | Recovered|
| 14      | 57  | F   | *Eubacterium* species  | Chronic liver disease, diverticulosis                | ?                                       | 17,800        | Ampicillin                       | Died    |
| 15      | 66  | M   | *Eubacterium* species  | Metastatic cancer—stomach, liver, kidney, spleen, pancreas | Chills, fever to 104°F                  | 10,000        | Chloramphenicol cephalothin tetracycline | Died    |
| 16      | 37  | M   | *Eubacterium lentum* × 2 | GI hemorrhage, lung abscess, peritonitis              | Chills, fever to 102.8°F                 | 13,500        | Penicillin gentamicin clindamycin | Died    |
| 17      | 19  | F   | *Eubacterium lentum*    | Fever 1 day post c section                            | Fever to 101.6°F                        | 14,800        | Gentamicin cephalothin clindamycin | Recovered|
### TABLE 3

| Patient | Age | Sex | Organism | Clinical Problem | Signs and Symptoms Prompting Blood Culture | Treatment | WBC (per cmm.) | Outcome |
|---------|-----|-----|----------|------------------|------------------------------------------|-----------|---------------|---------|
| 18      | 47  | F   | *Lactobacillus* species | Colitis, agranulocytosis, pulmonary emboli, thrombosis, diabetes | Fever to 104°F | Gentamicin cephalothin | 1,000 | Died |
| 19      | 71  | F   | *Lactobacillus* species | Peritonitis, vixus perforation, diabetes | Fever to 101°F | Chloramphenicol | 10,400 | Died |
| 20      | 53  | F   | *Lactobacillus* species x 4 | Subacute bacterial endocarditis | Shaking chills, fever to 101°F | Cefazolin | 9,300 | Recovered |
| 21      | 50  | F   | *Lactobacillus* species | Fever 1 day post thyroidectomy | | Penicillin | 12,800 | Recovered |
DISCUSSION

Species of *Bifidobacterium*, *Eubacterium*, and *Lactobacillus* are members of the commensal flora of the mouth, vagina, and gastrointestinal tract [5]. *Eubacterium* species have also been recovered from skin and the upper respiratory tract. Species of *Bifidobacterium* and *Lactobacillus* have been isolated from normal appendices [6] and bifidobacteria have been found in the urine of 2 patients with indwelling catheters [7].

All 3 genera have been implicated in obstetric and gynecologic infections [8–11] and recovered from intraabdominal abscesses [10,12,13]. *Bifidobacterium* and *Eubacterium* species have also been involved in pleuropulmonary infections [5,14–20].

The most common anaerobic gram-positive non-sporeforming rod recovered from blood cultures is *Propionibacterium acnes*. In most cases the presence of this organism represents contamination from the skin flora. A positive catalase reaction serves to differentiate *P. acnes* from *Bifidobacterium*, *Eubacterium*, and *Lactobacillus*.

The recovery of anaerobic gram-positive non-sporeforming rods other than *P. acnes* from blood cultures is rare. Our low rate of recovery—1 per 3,500 blood cultures—is comparable to the infrequent isolations reported by others [21–25]. The explanation for the rarity of these organisms in bacteremia is far from clear. Possible partial explanations include the failure to adequately culture blood for anaerobic organisms, or the misidentification of isolates as *P. acnes*. One cannot relate the infrequent recovery of these genera from blood to their numbers in the gastrointestinal tract or other body sites, since all 3 genera are present in high concentrations. *Bifidobacterium* species are numerically second only to *Bacteroides* in the gastrointestinal tract and are more numerous than *Clostridium* or anaerobic cocci [5] which are recovered with considerably greater frequency. Similarly, *Eubacterium* species are at least as abundant as clostridia or peptostreptococci. It would appear that bifidobacteria, eubacteria, and lactobacilli are low in those virulence factors that permit organisms to invade and multiply at sites other than their normal habitat.

Wilson [25] reported the recovery of a *Bifidobacterium* and a *Eubacterium* from a patient with peritonitis. Lactobacilli [26–36] and eubacteria [37,38] have been shown to be the etiologic agents of subacute bacterial endocarditis. Transient bacteremias have also been reported with all 3 genera; bifidobacteria have been isolated following genitourinary manipulation [39], eubacteria after oral prophylaxis [40], and lactobacilli following a suction abortion [41].

It would appear that transient bacteremias due to these organisms may occur following some disturbance of their ecologic niche; mouth, intestine, vagina. Trauma may be associated with dental procedures; parturition or alteration in the integrity of intestinal mucosa associated with diverticulosis, neoplasia, or perforation. None of the infections was considered to be hospital-acquired.

Seventeen of the 21 patients in our series were female.

Almost all of the patients had some underlying condition that may have predisposed to their bacteremia. Five of the patients with *Bifidobacterium* and 1 patient with *Eubacterium* had complications associated with pregnancy; 12 of the patients had gastrointestinal disease, 2 patients had systemic lupus erythematosus, and 1 patient had pre-existing valvular disease.

*Bifidobacterium*, *Eubacterium*, and *Lactobacillus* species are generally susceptible *in vitro* to clinically achievable levels of antibiotics such as penicillin, clindamycin,
chloramphenicol, and tetracycline which are commonly employed in treating anaerobic infections. All of the patients were treated before the results of the blood culture were reported.

Ten of the 21 patients died despite antibiotic treatment. However, the bacteremia was considered to be the terminal event in only one patient (No. 16) who developed disseminated septic emboli and microabscesses.

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