

Vibrio alginolyticus Infections in Hawaii

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Clinical and bacteriological features of eight cases of *Vibrio alginolyticus* infections in Hawaii are presented. These isolates occurred in superficial sites, primarily related to infections caused by swimming.

Vibrio parahaemolyticus initially attracted attention as a cause of gastroenteritis associated with inadequately cooked seafoods in such areas as Southeast Asia, England, Japan, the Atlantic seaboard, the Gulf of Mexico, and the Pacific Northwest (1, 3). Recently, halophilic *Vibrio* species have been described from extraintestinal sources, including wounds (7, 10-12, 14), spinal fluid (5), and blood (7, 14, 15).

Hawaii experienced a large outbreak of *Vibrio* gastroenteritis in 1972, from raw crab ingestion (1). We reviewed *Vibrio* isolations of three Honolulu hospitals (Straub Clinic, Kaiser Foundation, and Kauaikeolani Children's Hospital) from 1973 to 1976. During this period, no *V. parahaemolyticus* was isolated from stool specimens in these hospitals or elsewhere in the State of Hawaii (D. Oblon, Hawaii State Department of Health, personal communication). However, we discovered eight cases of *V. alginolyticus* isolated from extraintestinal sites (Table 1). These bacteria were from superficial infections, often after coral or surfboard accidents. Three isolates were recovered from otitis externa cases related to swimming. These su-

perficial septic lesions were somewhat similar to three previously described English coastal cases (12) and two leg infections from Connecticut (11). *V. alginolyticus* was the only bacterium isolated from the majority of our infections and was, therefore, considered to be the probable pathogen. All these infections responded to drainage and wound care. The relationship of clinical cure to antibiotic therapy was unclear, since 37% of the patients received antibiotics to which the bacteria demonstrated in vitro resistance. No instances of gangrene, endotoxin shock, sepsis, or death were identified, although these cases have been described in reports of other *Vibrio* infections (7, 10, 14, 15).

The species *V. parahaemolyticus* is currently divided into two biotypes (6, 13). Biotype 1 primarily causes gastroenteritis. This biotype does not ferment sucrose, has a negative Voges-Proskauer reaction, and does not grow in 10% NaCl. Biotype 2 has been called *V. alginolyticus* and is isolated from extraintestinal sites. Biotype 2 ferments sucrose, has a positive Voges-Proskauer reaction, and can grow in

TABLE 1. Clinical features of *Vibrio alginolyticus* infections

Case	Age (yrs)/sex	Source of isolate and type of infection	Associated bacteria	Treatment
1	20/M	Big toe; surfing laceration	<i>Staphylococcus aureus</i>	Debridement; ampicillin
2	29/M	Foot; coral laceration	None	Drainage; cloxacillin
3	16/F	Shin; surfing laceration	None	Drainage; penicillin, tetracycline
4	8/M	Draining ear; swimming infection	None	Penicillin
5	44/M	Draining ear; swimming infection	<i>Staphylococcus epidermidis</i>	Polymyxin B-neomycin-hydrocortisone otic drops, erythromycin, tetracycline
6	9/M	Draining ear; swimming infection	None	Colistin otic drops, cephalixin
7	17/M	Big toe; auto accident infection	Group A <i>Streptococcus</i>	Debridement; cephalothin
8	33/M	Scalp; coral laceration	<i>Staphylococcus epidermidis</i>	Debridement; cephalothin

high concentrations of NaCl. A third halophilic *Vibrio* species has been defined by Hollis et al. (8). This unnamed species is similar to the *V. parahaemolyticus* biotypes except that it has a lower tolerance to NaCl and is able to ferment lactose. It is this species which has been predominantly responsible for serious cases of halophilic *Vibrio* sepsis and endotoxin shock (7, 10, 14, 15).

Table 2 shows the biochemical reactions of our *Vibrio* isolates tested by previously described methods (4, 9). By biochemical criteria (6), all our isolates were *V. parahaemolyticus*, biotype 2 (*alginolyticus*). After overnight incubation, these bacteria produced 1- to 2-mm,

TABLE 2. Reactions of *Vibrio alginolyticus* isolates

Test	No. of strains tested	Percentage of organisms with positive reaction
Growth on 5% sheep blood agar	7	100
Growth on MacConkey agar	7	85
Motility	8	100
Indole	8	62
Sodium acetate	5	20
Sodium malonate	5	0
Christensen urea	8	0
Simmons citrate	8	100
Nitrate reduction	7	100
Voges-Proskauer	8	88
KCN	4	50
Jordan tartrate	5	80
Phenylalanine deaminase	4	0
Lysine decarboxylase	8	100
Arginine dihydrolase	8	0
Ornithine decarboxylase	8	38
Gelatin liquefaction	6	100
Growth in broth		
0% NaCl	8	0
3% NaCl	8	100
7% NaCl	8	100
10% NaCl	8	100
Carbohydrate fermentation		
Glucose	8	100
Maltose	8	100
Mannitol	8	100
Sucrose	8	100
Lactose	8	0
Salicin	5	20
Xylose	8	0
Adonitol	5	0
Inositol	5	0
Sorbitol	5	0
Arabinose	8	0
Raffinose	5	0
Rhamnose	5	0
Dulcitol	5	0
Trehalose	5	100
Glycerol	5	100

TABLE 3. Disk susceptibilities of *Vibrio alginolyticus*

Antibiotic	No. of isolates tested	Percent sensitive to antibiotic
Ampicillin	6	0
Carbenicillin	3	0
Penicillin	3	0
Cephalothin	6	50 (plus 33% intermediate)
Colistin	5	60 (plus 20% intermediate)
Chloramphenicol	6	100
Tetracycline	6	100
Sulfa	4	100
Gentamicin	3	100
Trimethoprim/sulfa	3	100

greyish, smooth colonies on 5% sheep blood and MacConkey agar. The gram stain revealed short, pleomorphic gram-negative rods. Triple sugar iron reaction was acid/acid, with no production of hydrogen sulfide or gas. These bacteria were motile and oxidase positive, fermented many sugars, and most characteristically demonstrated growth in 10% NaCl.

Antibiotic susceptibility studies were performed by the standardized disk diffusion technique (2) (Table 3). These isolates were susceptible to most antibiotics except the penicillins. These data were consistent with the agar dilution susceptibility studies of *V. alginolyticus* reported by Hollis et al. (8).

In conclusion, *V. parahaemolyticus*, biotype 2 (*alginolyticus*), is ubiquitous in coastal waters and marine products (1). These organisms have been shown in this study and in others (11, 12) to be associated with ocean water infections in many areas, including the State of Hawaii.

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