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Misidentification of Unusual *Aeromonas* Species as Members of the Genus *Vibrio*: a Continuing Problem

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Two unusual cases of *Aeromonas* infection are described, one associated with bacteremia (*Aeromonas schubertii*) and another in which the organism was recovered from an infected gall bladder (*Aeromonas veronii* biotype veronii). These strains were initially identified as *Vibrio damsela* and *Vibrio cholerae* by the Vitek and API 20E systems, respectively. Use of appropriate screening tests and familiarity with the newer *Aeromonas* species could prevent initial misidentifications and potential public health consequences.

Over the past two decades the number of recognized species in the genus *Aeromonas* has expanded from 4 (*Aeromonas hydrophila*, *Aeromonas sobria*, *Aeromonas caviae*, and *Aeromonas salmonicida*) to at least 13 legitimate genomospecies (2, 3, 6). At least 9 of these taxa have been recovered from clinical material and therefore could be pathogenic for humans. Despite these taxonomic advances, commercial identification systems have often been unable to accurately identify aeromonads to the species level or as part of a complex. Often, *Aeromonas* species are mistakenly identified as vibrios, with which they share many phenotypic characteristics (9). A common example of this misidentification involves *A. caviae* being misidentified as *Vibrio fluvialis* (6). In this report we describe two cases of infection caused by unusual *Aeromonas* species that were originally mistaken for vibrio infections.

Case 1. A 64-year-old man with a history of liver cirrhosis developed diarrhea of 2 to 3 days' duration subsequent to consuming a seafood meal containing shellfish. Subsequent to his diarrheal episode he developed signs of sepsis, and blood samples were drawn. Two sets of blood cultures were positive for gram-negative bacilli, and two colony types were initially detected. One isolate was identified as *Vibrio* ("*Listonella damsela*," "*Photobacterium damsela*") *damsela*, while the other isolate was identified as *A. sobria* by the Vitek system (bioMérieux Vitek, Inc., Hazelwood, Mo.). The strains were subsequently forwarded by the Monterey County Health Department to the Microbial Diseases Laboratory, where both isolates were identified as *Aeromonas schubertii* (Table 1).

Case 2. A 56-year-old male who was traveling was seen in the emergency room of a local hospital for acute cholecystitis requiring an immediate cholecystectomy. Cultures of the infected gall bladder yielded a gram-negative bacillus. No further medical information on this patient was available. The organism was presumptively identified as *Vibrio cholerae* by the local public health laboratory based upon the API 20E (API bioMérieux, Hazelwood, Mo.) profile number, 5347125. The isolate was then forwarded to the Microbial Diseases Laboratory for definitive identification, which revealed the strain in question to actually be *Aeromonas veronii* biotype veronii (Table 1).

These two cases highlight several important points regarding the accurate identification of aeromonads. First, if key screening reactions that separate members of the *Vibrionaceae* (*Aeromonas*, *Plesiomonas*, and *Vibrio*) had been used (Table 1), the initial misidentification of these organisms could have been avoided (7). Key screening reactions include growth in nutrient

TABLE 1. Relevant properties of unusual *Aeromonas* isolates[a]

Characteristic	Case 1	Case 2
Initial identification (system)	*V. damsela* (Vitek)	*V. cholerae* (API 20E)
Final identification	*A. schubertii*	*A. veronii* biotype veronii
Source	Blood	Gall bladder
Phenotypic properties		
Oxidase	+	+
Catalase	+	+
TSI	K/A$^-$	A/AG$^-$
Growth in the absence of NaCl	+	+
Growth in 3% NaCl	+	+
O/129 susceptibility (10 and 150 μg/ml)	R	R
LDC	+	+
ADH	+	−
ODC	−	+
Voges-Proskauer	+	+
Growth in KCN	+	−
Esculin hydrolysis	−	+
Hemolysis (sheep blood)	+	+
Acid from:		
D-Glucose, acid	+	+
D-Glucose, gas	−	+
L-Arabinose	−	−
Salicin	−	+
D-Mannitol	−	+
Sucrose	−	+
Lactose	−	(+)

[a] Abbreviations: TSI, triple-sugar–iron agar; K, alkaline; A$^-$, acid (no H_2S); AG$^-$, acid with gas (no H_2S); R, resistant; LDC, lysine decarboxylase; ADH, arginine dihydrolase; ODC, ornithine decarboxylase. Symbols: +, positive reaction; −, negative reaction; (+), weak reaction.

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broth in the presence and absence of added salt, resistance to the vibriostatic agent O/129 (2,4-diamino-6,7-diisopropylpteridine), the string test, and growth on thiosulfate-citrate-bile salts-sucrose agar. These can be of particular importance in the case of the ornithine decarboxylase-positive biotype of *A. veronii*, which can be mistakenly identified as *V. cholerae* if a complete battery of screening tests are not performed (1, 5). We have previously received several water isolates of *A. veronii* biotype veronii thought to be *V. cholerae* by municipal water districts which failed to perform sufficient in vitro biochemical testing to clearly separate these two groups. Such misidentifications can immediately raise red flags leading to mobilization of health care personnel because of the public health significance of *V. cholerae*. A second point concerns the failure of commercial systems to satisfactorily identify these microorganisms. This has been a recognized problem for over a decade, and it continues to be a weak area of commercial identification systems. While it has not been determined whether the misidentification of one *Aeromonas* species as another is of any major clinical impact, the identification of aeromonads as vibrios can be an important distinction. In some states, such as California, all cases of *Vibrio* infections are reportable due to the intimate association these illnesses have with the consumption of raw or undercooked shellfish (4). More importantly, the misidentification of an aeromonad as *V. cholerae* triggers a series of epidemiologic responses because of the immense public health significance this organism has. Although *Vibrio* infections are relatively rare in the United States, their public health significance and their clinical significance are well documented, and more accurate and reliable methods to rapidly and accurately identify these organisms need to be developed. Finally, to our knowledge this is the first report linking *A. schubertii* gastroenteritis and bacteremia with the consumption of shellfish. *A. schubertii* is one of only five *Aeromonas* species linked to human cases of septicemia, and all of the documented reports of *A. schubertii* infection have involved extraintestinal disease (wounds and bacteremia). In vitro laboratory investigations suggest that this is one of the more pathogenic species within the genus based upon 50% lethal dose studies with outbred mice (8). The present case 1 report further supports this view.

In summary, then, it is clear that until better and more accurate methods to identify members of the *Vibrionaceae* are developed, it will be extremely difficult to get an accurate picture of the type of illnesses caused by many of the less well-characterized *Aeromonas* species and the roles they play in clinical infections. Furthermore, the identification of aeromonads as vibrios by many different commercial systems needs to be addressed in light of its medical and public health importance.

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