

Summary of human *Vibrio* isolates reported to CDC, 2001

Infection with toxigenic *Vibrio cholerae* O1 and O139, the causative agent of cholera, has been a reportable disease in the United States for many years. In addition, since 1988, CDC has maintained a database of reported *Vibrio* isolates from humans in order to obtain reliable information on illnesses associated with *Vibrio spp.* This information has been used to educate consumers about the health risks of seafood, as well as to help determine host, food, and environmental risk factors.

This reporting system was initiated by the Gulf Coast states (Alabama, Florida, Louisiana, Mississippi, and Texas), CDC and the Food and Drug Administration (FDA). In recent years, many other states have also reported *Vibrio* isolates (Figure 1). However, only the cholera agent is nationally notifiable; thus the true number of *Vibrio* isolates may be greater than reported. Participating health officials collect clinical data, information about underlying illness, history of seafood consumption and exposure to seawater in the seven days before illness, and conduct tracebacks of implicated oysters. CDC serotypes all *V. parahaemolyticus* and *V. cholerae* isolates received from state health departments and confirms toxin production in *V. cholerae*.

This report summarizes human *Vibrio* isolates reported to CDC in 2001 using the “Reporting Form for Cholera and Other Vibrio Illnesses” form. Results are presented in two categories: *V. cholerae* isolates that produce cholera toxin (referred to as toxigenic *Vibrio cholerae*), and all other *Vibrio* isolates, including those *V. cholerae* isolates that did not produce cholera toxin. Results are presented separately for Gulf Coast states versus other states to be consistent with previous reports. Additionally, results are presented by anatomic site of isolation. It is important to note that isolation of some *Vibrio spp.* from a patient with illness does not necessarily indicate causation. While many *Vibrio* spp. are well-recognized pathogens, the status of *V. damsela*, *V. furnissii*, *V. metschnikovii*, and *V. cincinnatiensis* as enteric pathogens is less clear.

Isolates of toxigenic *Vibrio cholerae*

In 2001, toxigenic *V. cholerae* O1 was identified from three patients in two states (Table 1). One patient acquired the infection in India, while the other two acquired the infection in Pakistan. Two of the patients were hospitalized, and none died.

Other *Vibrio* isolates (excluding toxigenic *V. cholerae*)

In 2001, 395 other *Vibrio* isolates, and reports of associated illnesses from 373 patients were reported to the *Vibrio* Surveillance System. In patients with multiple isolates, 18 had two *Vibrio spp.* isolates, and two patients had three. Among patients for whom information was available, 151 (46%) of 329 were hospitalized and 33 (9%) of 362 died. *V. parahaemolyticus* was the most frequently reported *Vibrio* species (n=153), while *V. vulnificus* was isolated from 76 (50%) of the 151 persons who were hospitalized and 31 (94%) of the 33 persons who died.

Geographic Location

In 2001, we received 132 (35%) reports of *Vibrio* illness from Gulf Coast states, 97 (26%) from Pacific Coast states, 105 (28%) from Atlantic Coast states (excluding Florida), and 39 (10%) from inland states (Figure 1). *V. parahaemolyticus* was more frequently isolated from persons from non-Gulf Coast states than Gulf Coast states (127^{*} [53%] of 241 versus 30[†] [22%] of 132,

^{*} Includes three persons from whom multiple species were isolated.

[†] Includes one person from whom multiple species was isolated.

odds ratio [OR] =3.8, p-value<.0001). Among the persons for whom hospitalization was reported, a greater proportion of patients with *V. parahaemolyticus* were hospitalized in the Gulf Coast states than in the Pacific Coastal states (14[‡] [56%] of 25 versus 5 [10%] of 52, OR=12.0, p-value<.0001). *V. vulnificus* was the most frequently isolated species from persons in the Gulf Coast states, accounting for 43% of all isolates.

Anatomic Site of Isolation

Among the 395 *Vibrio* isolates from all states, 183 (46%) were from stool, 82 (21%) from blood, and 66 (17%) from wounds. In addition, 17 (4%) isolates were obtained from the ear, and 47 (12%) were from the eye, gallbladder, urine, or other site. *V. parahaemolyticus* was the species most frequently isolated from stool (121 [66%] of 183 samples); *V. vulnificus* was the species most frequently isolated from blood (66 [80%] of 82 samples) and from wounds (29 [44%] of 66 samples).

Seasonality

The number of patients from whom *Vibrio* species was isolated had a clear seasonal peak during the summer months (Figure 2). The greatest numbers occurred in July for both the Gulf Coast and non-Gulf Coast states.

Exposures

Among 212 persons with *Vibrio* isolated from stool or blood (excluding nine persons with isolates from wounds as well as stool or blood) for whom food history was available, 187 (88%) consumed seafood in the 7 days before illness onset. Among the 98 who reported eating a single seafood item (Table 4), 59 (60%) ate oysters, including 55 (56%) who ate raw oysters, while 8 (8%) ate shrimp, 6 (6%) ate fish, and 24 (24%) ate clams, crab, or lobster. An additional 14 (7%) persons reported international travel, swimming with a wound in salt or brackish water, or handling seafood.

Laboratory

The state public health laboratory confirmed the submitting laboratory's identification for 126 (57%) of the 213 *Vibrio* isolates for which laboratory confirmation information is known. Sixty-six isolates of *V. parahaemolyticus* from 63 patients were submitted to CDC for serotyping. Of the 66 isolates, 20 (30%) from seven states were serotype O4:K12 (Colorado, Connecticut, Georgia, Hawaii, Indiana, New York, Oregon), 13 (20%) from five states were serotype O3:K6 (California, Connecticut, Hawaii, Maryland, New York), and the remaining 33 isolates from nine states were one of 20 other serotypes (California, Colorado, Georgia, Maryland, Minnesota, New York, Oregon, Tennessee, and Virginia).

[‡] Includes three persons from whom multiple species were isolated.

Table 1: Isolates of toxigenic *V. cholerae* 2001

State	Age	Sex	Onset	Suspected Exposure	Isolate	Serotype
NH	53	M	04/01	Exposure in India	<i>V. cholerae</i> O1 ¹ CT ⁺	Ogawa
NY	1	F	04/01	Exposure in Pakistan	<i>V. cholerae</i> O1 ¹ CT ⁺	Ogawa
NY	68	F	06/00	Exposure in Pakistan	<i>V. cholerae</i> O1 ¹ CT ⁺	Ogawa

¹ Resistant to furazolidone, sulfisoxazole, and streptomycin, trimethoprim-sulfamethoxazole, and nalidixic acid.

Table 2. Number of *Vibrio* isolates (excluding toxigenic *V. cholerae*) by species and isolation site, and complications of infection, in patients from Gulf Coast states, 2001

<i>Vibrio</i> Species	Patients n (%)	Site of Isolation				Complications			
		Stool	Blood	Wound	Other ¹	Hospitalized ² n/N (%)	Deaths ² n/N (%)		
<i>V. alginolyticus</i>	15 (11)	2	1	7	5	5/13 (38)	0/15 (0)		
<i>V. cholerae-CT</i> ⁻³	10 (8)	9	1	0	0	5/9 (56)	0/9 (0)		
<i>V. damsela</i>	1 (1)	0	0	1	0	0/1 (0)	0/1 (0)		
<i>V. fluvialis</i>	9 (7)	8	0	0	1	2/8 (25)	0/9 (0)		
<i>V. hollisae</i>	4 (3)	2	0	0	2	1/2 (50)	0/4 (0)		
<i>V. mimicus</i>	3 (2)	1	0	0	2	0/2 (0)	0/3 (0)		
<i>V. parahaemolyticus</i> ⁴	29 (22)	19	1	8	1	13/24 (54)	0/26 (0)		
<i>V. vulnificus</i> ^{4,5}	56 (43) ⁴	1	38	21	3	47/54 (87)	18/54 (33)		
Species not identified	4 (3)	1	0	3	0	2/3 (66)	0/4 (0)		
Multiple species ⁴	1 (1)	0	0	2	0	1/1 (100)	0/1 (0)		
Total	132 (100)	43	41	42	14	76/117	(65)	18/126	(14)

¹ Includes ear, peritoneal fluid, urine, and unknown source.

² Denominators indicate patients for whom information is known.

³ Non-toxigenic *V. cholerae*. Includes non-toxigenic *V. cholerae* non-O1 non-O139 (9 isolates) and non-toxigenic *V. cholerae* O1 (0 isolates).

⁴ Both *V. parahaemolyticus* and *V. vulnificus* were isolated from the wound of one patient.

⁵ *V. vulnificus* was isolated from both blood and wound for six patients, and from both blood and another site from one patient.

Table 3. Number of *Vibrio* isolates (excluding toxigenic *V. cholerae*) by species and isolation site, and complications of infection in patients from non-Gulf Coast states, 2001

Vibrio Species	Site of Isolation						Complications		
	Patients		Stool	Blood	Wound	Other ¹	Hospitalized ²		Deaths ²
	n	(%)					n/N	(%)	n/N (%)
<i>V. alginolyticus</i> ^{3,7}	22	(9)	2	2	5	14	2/21	(10)	0/22 (0)
<i>V. cholerae-CT</i> ⁴	26	(11)	15	4	1	6	10/23	(43)	1/26 (4)
<i>V. cincinnatensis</i>	1	(0)	0	0	0	1	1/1	(100)	0/1 (0)
<i>V. damsela</i> ⁷	1	(1)	1	0	0	0	0/2	(0)	0/2 (0)
<i>V. fluvialis</i> ⁷	17	(7)	12	0	1	4	5/15	(33)	1/17 (6)
<i>V. furnisii</i>	1	(0)	0	1	0	0	1/1	(100)	0/1 (0)
<i>V. hollisae</i>	5	(2)	5	0	0	0	3/5	(60)	0/5 (0)
<i>V. metchnikovii</i>	1	(0)	0	0	1	0	0/1	(0)	0/1 (0)
<i>V. mimicus</i>	1	(0)	0	1	0	0	1/1	(100)	0/1 (0)
<i>V. parahaemolyticus</i> ^{5,7}	124	(51)	101	4	4	17	20/105	(19)	0/121 (0)
<i>V. vulnificus</i> ^{6,7}	33	(13)	1	27	6	6	29/30	(97)	13/32 (41)
Species not identified	6	(2)	1	1	2	2	2/5	(40)	0/5 (0)
Multiple species ⁷	3	(1)	2	1	4	0	1/3	(33)	0/3 (0)
Total	241	(100)	140	41	24	50	75/213	(35)	15/236 (6)

¹ Includes ear, peritoneal fluid, urine, and unknown source.

² Denominators indicate patients for whom information is known.

³ *V. alginolyticus* was isolated from blood and other site from one patient.

⁴ Non-toxigenic *V. cholerae*. Includes non-toxigenic *V. cholerae* non-O1 non-O139 (3 isolates) and non-toxigenic *V. cholerae* O1 (12 isolates).

⁵ *V. parahaemolyticus* was isolated from stool and blood from two patients.

⁶ *V. vulnificus* was isolated from blood and wound for three patients, blood and another site from two patients, and stool, blood and wound from one patient.

⁷ *V. alginolyticus*, *V. damsela*, and *V. parahaemolyticus* were isolated from the wound of one patient; *V. fluvialis* and *V. parahaemolyticus* were isolated from the stool of one patient; and *V. vulnificus* was isolated from the blood and *V. parahaemolyticus* from the wound of one patient.

Table 4. Seafood exposure among patients with *Vibrio* infection who reported eating a single seafood item in the seven days before illness onset, 2001

	Oysters	Clams	Mussels	Shrimp	Lobster	Crab	Crayfish	Other	Finfish ²	Total
Shellfish¹										
Raw	55	4	0	1	2	2	0	0	0	64 (65%)
Cooked	1	0	0	6	1	7	3	1	5	24 (24%)
Unknown	3	0	0	2	0	4	0	0	1	10 (10%)
Total	59	4	0	9	3	13	3	1	6	98 (100%)

¹ Other shellfish reported: scallops.

² Other fish reported: salmon, trout, aku-ahi, and white fish.

Figure 1. Number of reported cases of *Vibrio* illness by state, 2001 (N=376 patients)

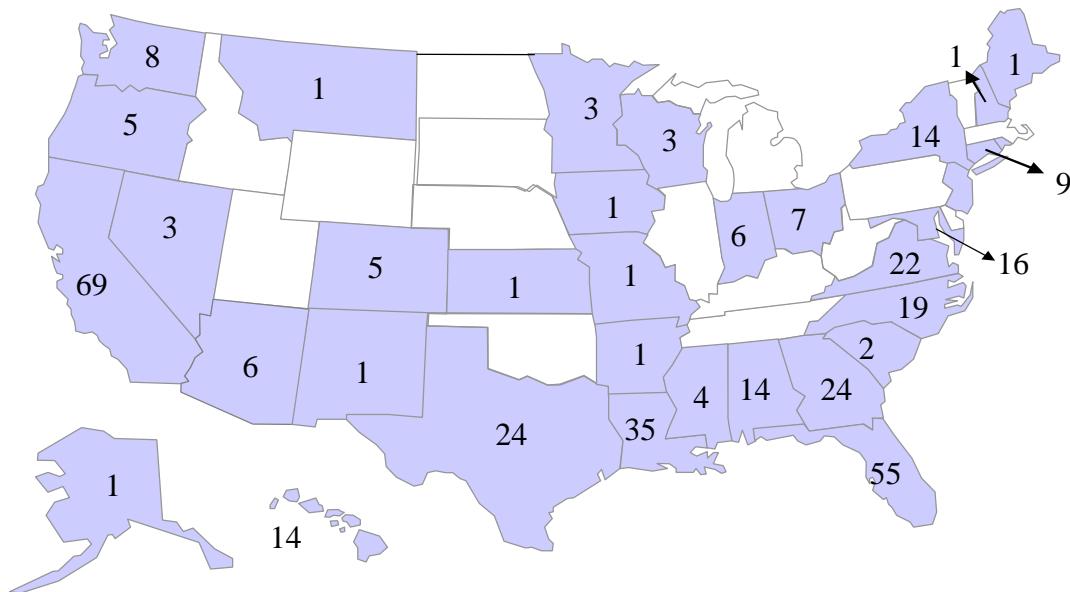


Figure 2. Number of patients with *Vibrio* isolates (excluding toxigenic *V. cholerae*) by month, Gulf Coast states vs. other states, 2001

