

Summary of human *Vibrio* cases reported to CDC, 2007

The Cholera and Other *Vibrio* Illness Surveillance (COVIS) system is a national database of reported human illnesses caused by all species of *Vibrio*; the COVIS database is maintained by CDC. 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.

COVIS was initiated by CDC, the Food and Drug Administration (FDA), and the Gulf Coast states (Alabama, Florida, Louisiana, Mississippi, and Texas) in 1988. Using the Cholera and Other *Vibrio* Illness Surveillance Report (available at http://www.cdc.gov/nationalsurveillance/PDFs/CDC5279_COVISvibriosis.pdf), participating health officials collect clinical data, information about underlying illness, history of seafood consumption and exposure to seawater in the 7 days before illness. Participants also conduct tracebacks of implicated seafood. Surveillance has expanded nationally, with most states reporting cases since 1997.

Historically, only toxigenic *V. cholerae* serogroups O1 and O139 were nationally notifiable; therefore, the numbers of non-toxigenic *Vibrio* isolates were likely underreported. However, in January 2007, infections caused by any *Vibrio* species (vibriosis) became nationally notifiable, although many cases of vibriosis are undetected by clinical laboratories because vibrios are not easily identified on routine enteric media. Additionally, CDC serotypes all *V. parahaemolyticus* isolates received from state health departments, tests for serogroups O1, O75, O139, and O141, and determines cholera toxin production for all *V. cholera* isolates.

This report summarizes human *Vibrio* infections during 2007 reported by states to CDC. 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 do not produce cholera toxin. This report differs from previous reports, in that results for the entire country are presented together rather than including a separate section for Gulf Coast states. Additionally, results are presented by specimen type. It is important to note that isolation of some *Vibrio* species from a patient with illness does not necessarily indicate causation. While many *Vibrio* species are well-recognized pathogens, the status of *V. damsela*, *V. furnissii*, *V. metschnikovii*, and *V. cincinnatiensis* as enteric or wound pathogens is less clear.

Toxigenic *Vibrio cholerae*

In 2007, seven patients with toxigenic *V. cholerae* serogroup O1 (cholera), one patient with toxigenic *V. cholerae* serogroup O141, and one patient with toxigenic *V. cholerae* serogroup O75 were reported (Table 1). Of the seven toxigenic *V. cholerae* serogroup O1 cases, five patients were hospitalized and no deaths were reported. Infection was acquired through international travel in four cases (two patients acquired infection while traveling in India, one while traveling in Bangladesh, and one while traveling in Pakistan). Of the two patients who acquired infection in India, one was a vegetarian who reported no recreational water exposure and the other reported no seafood consumption but reported recreational water exposure. The patient who traveled to Bangladesh reported consuming fish while abroad. The patient who traveled to Pakistan reported no seafood or recreational water exposure. All patients with domestically-acquired infection reported having eaten seafood. Two of the patients reported eating raw oysters that traced back to the Louisiana Gulf Coast. The third patient reported eating fried shrimp and catfish; no traceback was undertaken.

No travel or seafood consumption was reported by the patient with toxigenic *V. cholerae* serogroup O141 infection. He did consume queso fresco that was brought from Mexicali, Mexico. Four members

of the patient's family who also consumed the queso fresco reported diarrhea and cramping that began on October 15 and 16, but cultures were not performed on the family members. The source of the cheese in Mexico is unknown. No hospitalization was required.

The patient infected with *V. cholerae* serogroup O75 had traveled domestically to Florida where he ate at an oyster bar. Health officials were unable to reach the patient to get a more detailed food history, and no traceback was undertaken. No hospitalization was required.

Table 1: Cases of toxigenic *V. cholerae*, 2007

State	Age	Sex	Onset	Exposure	Serogroup	Serotype
Arizona	39	M	9/20/2007	Domestic-seafood (Gulf Coast)	<i>V. cholerae</i> O1	Inaba
California	55	F	9/2/2007	Travel in India	<i>V. cholerae</i> O1	Ogawa
Kentucky	46	M	9/28/2007	Domestic-seafood (Gulf Coast)	<i>V. cholerae</i> O1	Inaba
Michigan	24	F	6/27/2007	Travel in India, Thailand, and Cambodia	<i>V. cholerae</i> O1	Ogawa
New York	23	M	8/28/2007	Travel in Bangladesh	<i>V. cholerae</i> O1	Ogawa
Ohio	10	F	8/28/2007	Travel in Pakistan	<i>V. cholerae</i> O1	Ogawa
Texas	65	F	8/9/2007	Domestic-seafood(harvest area unknown)	<i>V. cholerae</i> O1	Inaba
California	15	M	10/12/2007	Domestic- imported queso fresco suspected	<i>V. cholerae</i> O141	
Alabama	43	M	10/20/2007	Domestic-seafood(harvest area unknown)	<i>V. cholerae</i> O75	

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

In 2007, *Vibrio* isolates from 549 patients were reported to COVIS (Table 2). Among patients for whom information was available, 199 (39%) of 512 were hospitalized and 36 (7%) of 488 died. *V.*

parahaemolyticus was isolated from 232 (42%) of the 549 patients, and this was the most frequently

reported *Vibrio* species. Of the patients infected with *V. parahaemolyticus*, 52 (24%) of 221 with

information were hospitalized and none died. *V. vulnificus* was isolated from 95 (17%) of the 549

patients; 87 (93%) of 94 with information were hospitalized and 30 (36%) of 83 with information died.

Table 2. Number of *Vibrio* illnesses (excluding toxigenic *V. cholerae*) by species, complications, and site of isolation in patients from the United States, 2007.

<i>Vibrio</i> Species	Patients		Complications ¹				Specimen Type					
			Hospitalized		Deaths		Isolates ²		Stool	Blood	Wound	Other ³
	N	%	n/N	%	n/N	%	N	%	n	N	n	n
<i>V. alginolyticus</i>	100	18	15/90	17	0/88	0	101	18	7	9	56	29
<i>V. cholerae</i> (non-toxigenic) ⁴	49	9	21/43	49	3/37	8	49	9	22	15	5	7
<i>V. damsela</i>	2	<1	0/2	0	0/2	0	2	<1	0	0	2	0
<i>V. fluvialis</i>	19	3	3/17	18	1/17	6	19	3	14	0	3	2
<i>V. hollisae</i>	6	1	4/6	67	0/6	0	6	1	4	0	1	1
<i>V. mimicus</i>	10	2	4/9	44	0/9	0	10	2	8	0	1	1
<i>V. parahaemolyticus</i>	232	42	52/221	24	0/218	0	233	41	164	5	46	18
<i>V. vulnificus</i>	95	17	87/94	93	30/83	36	107	19	2	69	31	5
Species not identified	23	4	7/18	39	1/16	6	23	4	7	1	7	8
Other	4	1	2/3	67	0/3	0	4	1	0	1	0	3
Multiple species ⁵	9	2	4/9	44	1/9	11	19	3	8	1	8	2
Total	549	100	199/512	39	36/488	7	573	100	236	101	160	76

¹ Denominators indicate patients for whom information is known.

² Isolation of the same *Vibrio* species can occur from more than one specimen per patient; therefore, the number of isolates can be higher than the total number of patients.

³ Includes ear, urine, bile, and other.

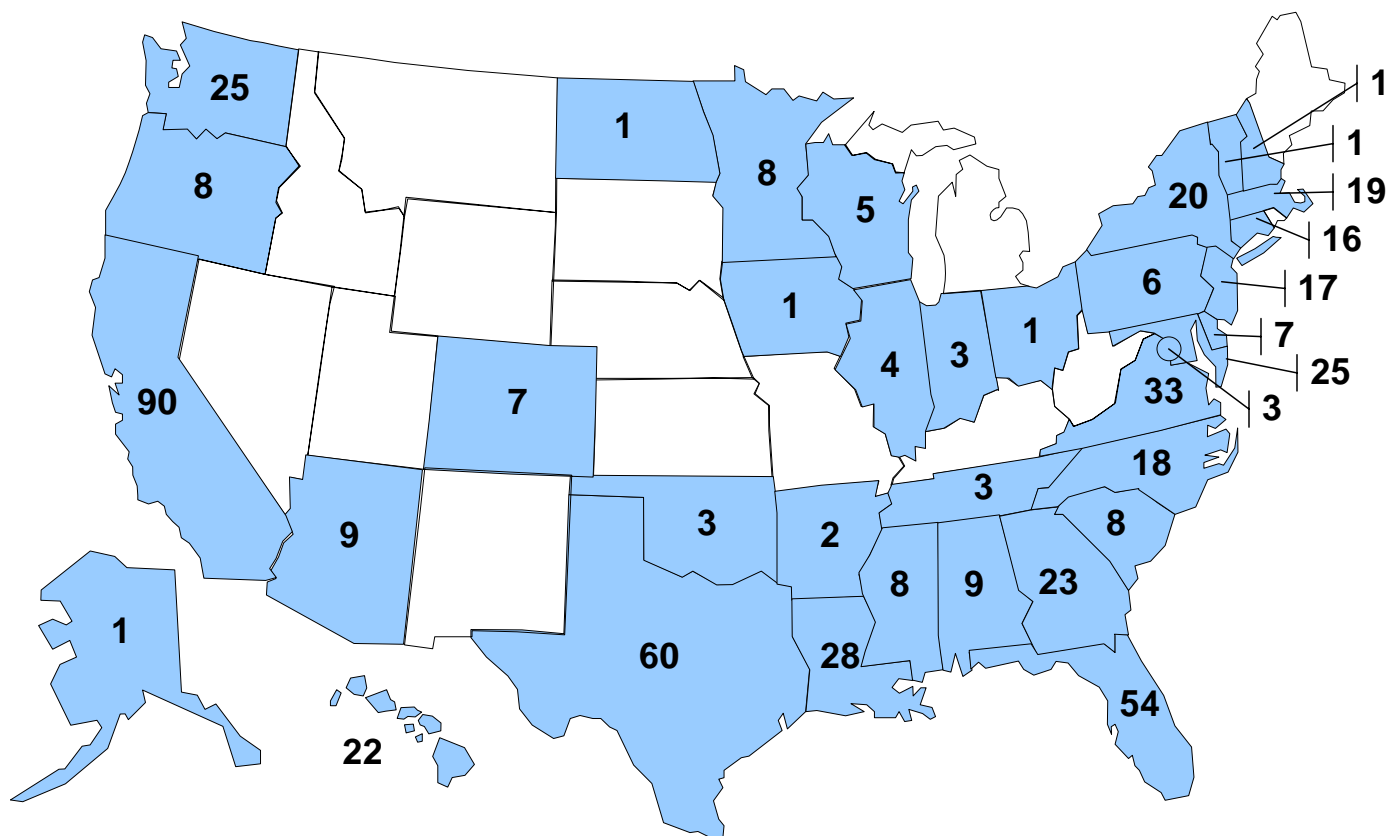
⁴ Includes non-toxigenic *V. cholerae* O1 (5 isolates) and other non-toxigenic *V. cholerae* [non-O1 non-O139] (46 isolates).

⁵ The following were isolated from one patient: *V. alginolyticus* and *V. parahaemolyticus*; *V. cholerae* (non-toxigenic) and *V. hollisae*; *V. damsela* and *V. parahaemolyticus*; *V. fluvialis* and *V. mimicus*; *V. fluvialis* and *V. parahaemolyticus*; *V. alginolyticus* and an unidentified *Vibrio* species; *V. parahaemolyticus* and an unidentified *Vibrio* species; *V. vulnificus* and an unidentified *Vibrio* species; *V. cholerae* (non-toxigenic), *V. parahaemolyticus*, and *V. vulnificus*.

Geographic Location

Of the 549 cases in 2007, CDC received 159 (29%) reports of *Vibrio* illness from Gulf Coast states, 146 (27%) from Pacific Coast states, 187 (34%) from Atlantic Coast states (excluding Florida, which is included with Gulf Coast states), and 57 (10%) from inland states (Figure 1). The most frequent *Vibrio* species reported from Gulf Coast states were *V. vulnificus* (34%), *V. parahaemolyticus* (27%), *V. alginolyticus* (15%), and non-toxicogenic *V. cholerae* (9%). The most frequent *Vibrio* species reported from non-Gulf Coast states were *V. parahaemolyticus* (48%), *V. alginolyticus* (19%), *V. vulnificus* (11%), and non-toxicogenic *V. cholerae* (8%).

Figure 1. Number of cases of *Vibrio* illnesses (excluding toxigenic *V. cholerae*), by state, 2007 (N=549 in 35 states and the District of Columbia)



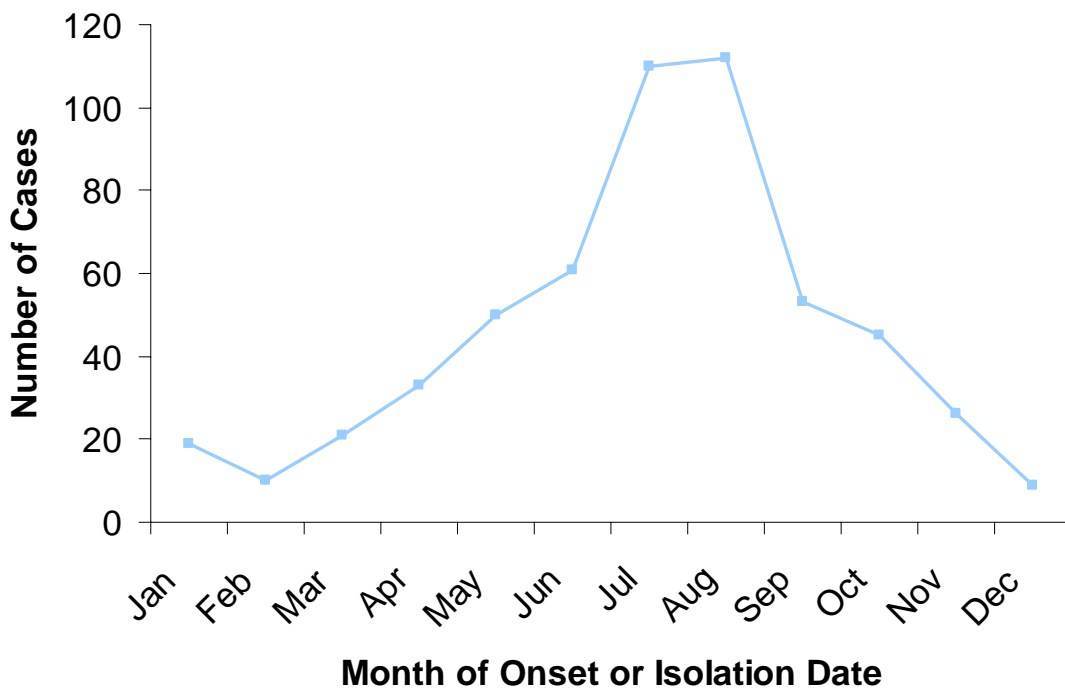
Specimen Type

Among the 573 *Vibrio* isolates (excluding toxigenic *V. cholera*) in 2007, 236 (41%) were from stool, 101 (18%) from blood, and 160 (28%) from wounds. Fifty-six (10%) isolates were obtained from the ear, of which 30 (54%) were *V. alginolyticus*. An additional 20 isolates (3%) were from urine, bile, or other site. *V. parahaemolyticus* was the species most frequently isolated from stool (164 [69%] of 236 isolates from stool); *V. vulnificus* was the species most frequently isolated from blood (69 [68%] of 101 isolates from blood); and *V. alginolyticus* was the species most frequently isolated from wounds (56 [35%] of 160 isolates from wounds).

Seasonality

Cases of *Vibrio* infection had a clear seasonal peak during the summer months (Figure 2). Most cases (70%) occurred during May-September, with the greatest frequency during August.

Figure 2. Number of cases of *Vibrio* illnesses (excluding toxigenic *V. cholerae*), by month of illness onset or specimen isolation, 2007 (N=549).



Exposures

One-hundred-thirty (24%) of 549 patients reported having a wound either before or during exposure to *Vibrio*. Of those 130 patients, 121 (93%) reported having skin exposed to a body of water, 38 (29%) reported contact with marine wildlife, and 33 (25%) reported handling seafood. Excluding patients with wound infections, among the 276 for whom a food history was available, 245 (89%) reported eating seafood in the 7 days before illness onset. Among the 119 who reported eating a single seafood item (Table 4), 58% ate oysters (97% of whom consumed them raw), 13% ate finfish, and 11% ate clams (83% of whom consumed them raw). International travel in the seven days before illness onset was reported by 38 (7.9%) of 476 patients for whom travel information was available.

Table 4. Seafood exposure among patients with foodborne *Vibrio* infection (excluding toxigenic *V. cholerae*) who reported eating a single seafood item in the week before illness onset, 2007

	Mollusks			Crustaceans				Other Shellfish ¹	Finfish ²	Total
	Oysters	Clams	Mussels	Shrimp	Lobster	Crab	Crayfish			
Patients who ate the single item (%)	69 (58)	13 (11)	1 (1)	11 (9)	0	9 (8)	0	1 (1)	15 (13)	119
Subset that ate the item raw, %	97	83	0	11	--	0	--	0	40	--

¹ Other shellfish reported: scallop.

² Finfish reported: grouper, poke, salmon, tilapia, tuna

Laboratory

CDC received 76 isolates of *V. parahaemolyticus*, of which 69 were serotyped. Of these, 10 (14%) were serotype O4:K12, 10 (14%) isolates were O4:Kuk, 9 (13%) isolates were O1:Kuk, 7 (10%) were O5:Kuk, 4 (6%) were O10:Kuk, 3 (4%) isolates were of the pandemic clone serotype O3:K6, and the remaining 26 isolates (38%) were 18 different serotypes.

Recent Publications

1. Tobin-D'Angelo M, Smith AR, Bulens SN, Thomas S, Hodel M, Izumiya H, Arakawa E, Morita M, Watanabe H, Marin C, Parsons MB, Greene K, Cooper K, Haydel D, Bopp C, Yu P, Mintz ED. Severe Diarrhea Caused by Cholera Toxin–Producing *Vibrio cholerae* Serogroup O75 Infections Acquired in the Southeastern United States. *Clin Infect Dis* 2008; 47: 1035-1040.
2. Dechet A, Yu PA, Koram N, Painter J. Nonfoodborne *Vibrio* Infections: An Important Cause of Morbidity and Mortality in the United States, 1997-2006. *Clin Infect Dis* 2008; 46: 970-6.