

## Summary of human *Vibrio* isolates reported to CDC, 2005

Infection with toxigenic *Vibrio cholerae* serogroups O1 and O139, the causative agents 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 infection with any species of *Vibrio* from humans in order to obtain reliable information on illnesses associated with the range of *Vibrio* species. 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 Food and Drug Administration (FDA), CDC, and the Gulf Coast states (Alabama, Florida, Louisiana, Mississippi, and Texas) in 1988. Since 1997, many other states have also reported *Vibrio* isolates (Figure 1). However, only toxigenic *V. cholerae* O1 and O139 were nationally notifiable; thus the number of *Vibrio* isolates is greater than reported. Participating health officials collect clinical data, information about underlying illness, history of seafood consumption and exposure to seawater in the 7 days before illness, and conduct tracebacks of implicated oysters. CDC serotypes all *V. parahaemolyticus* isolates received from state health departments, and screens for cholera toxin production and the O1, O139, and O141 serogroups in *V. cholerae* isolates.

This report summarizes human *Vibrio* infections reported to CDC in 2005 using the reporting form for “Cholera and Other *Vibrio* Illness”. 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. 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* 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.

*Vibrio* illnesses associated with Hurricane Katrina were reported to COVIS from eight states (Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, and Texas). The species reported were 26 *V. vulnificus* (72%), 6 nontoxigenic *V. cholerae* (17%), 3 *V. parahaemolyticus* (8%), and 1 (3%) unidentified *Vibrio* species. For patients with available information, 20 (91%) of 22 were considered wound infections because they reported having a wound either before or during exposure to *Vibrio*.

In June 2006, the Council of State and Territorial Epidemiologists adopted a resolution to add all *Vibrio* species infections (vibriosis) to the list of nationally notifiable diseases reported to the National Notifiable Diseases Surveillance System (NNDSS). Reporting of vibriosis is in addition to and distinct from reporting of cholera currently conducted through NNDSS. The position statement, “National Reporting for non-cholera *Vibrio* Infections (Vibriosis),” can be found at <http://www.cste.org/PS/2006pdfs/PSFINAL2006/06-ID-05FINAL.pdf>. In addition to reporting through NNDSS, CDC requests that states collect information using the standard surveillance form for COVIS available at <http://www.cdc.gov/foodborneoutbreaks/>.

### **Isolates of toxigenic *Vibrio cholerae***

In 2005, 12 patients with toxigenic *V. cholerae* were reported (Table 1). Five patients were hospitalized and no deaths were reported. All 12 patients were infected with toxigenic *V. cholerae* serogroup O1. Infection was acquired through international travel for five sporadic cases (three cases acquired infection while traveling in Pakistan and two cases while traveling in the Philippines). Exposure to domestic seafood was the source of infection for four patients, two of whom were a husband and wife in Louisiana who ate crab and shrimp harvested from the Gulf Coast. The other two cases associated with domestic seafood ate seafood at two different locations in Hawaii. Source of infection was unknown for three cases in Guam, of which two cases were related but had brief contact with each other and did not share any meals in the 2 weeks before illness onset. These cases, however, did receive drinking water from the same municipal aquifer supply and ate finfish in the week before illness. The third case in Guam reported eating tuna fish and shrimp in the week before illness.

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

In 2005, 578 *Vibrio* isolates from 546 patients were reported to the Cholera and Other *Vibrio* Illness Surveillance System. Among patients for whom information was available, 232 (46%) of 506 were hospitalized and 40 (8%) of 485 died. *V. parahaemolyticus* was isolated from 218 (40%) patients, and was the most frequently reported *Vibrio* species. Of the patients infected with *V. parahaemolyticus*, 23% were hospitalized and 1% died. *V. vulnificus* was isolated from 121 (22%) patients; 90% were hospitalized and 26% died.

### *Geographic Location*

In 2005, CDC received 219 (40%) reports of *Vibrio* illness from Gulf Coast states, 143 (26%) from Pacific Coast states, 151 (28%) from Atlantic Coast states (excluding Florida, which is included with Gulf Coast states), and 33 (6%) from inland states (Figure 1). The most frequent *Vibrio* species reported from Gulf Coast states were *V. vulnificus* (39%), *V. parahaemolyticus* (23%), *V. alginolyticus* (11%), and non-toxigenic *V. cholerae* (11%). The most frequent *Vibrio* species reported from non-Gulf Coast states were *V. parahaemolyticus* (51%), *V. alginolyticus* (12%), *V. vulnificus* (11%), and non-toxigenic *V. cholerae* (10%).

### *Anatomic Site of Isolation*

Among the 578 *Vibrio* isolates from all states, 243 (42%) were from stool, 105 (18%) from blood, and 164 (28%) from wounds. In addition, 18 (3%) isolates were obtained from the ear, and 48 (8%) were from urine, sputum, or other site. *V. parahaemolyticus* was the species most frequently isolated from stool (150 [62%] of 243 isolates from stool); *V. vulnificus* was the species most frequently isolated from blood (68 [65%] of 105 isolates from blood) and from wounds (51 [31%] of 164 isolates from wounds).

### *Seasonality*

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

### *Exposures*

One hundred fifty-three (28%) patients reported having a wound either before or during exposure to *Vibrio*. Of those, 100 (65%) reported water activities such as swimming and boating, 34 (22%) reported handling seafood, and 40 (26%) reported contact with marine wildlife. Excluding patients with wound infections, among the 255 for whom a food history was available, 223(87%) reported eating seafood in the 7 days before illness onset. Among the 86 who reported eating a single seafood item (Table 4), 49% ate oysters (91% of whom consumed them raw), 10% ate shrimp, and 15% ate finfish. International travel in the 7 days before illness onset was reported by 41 (9%) of 449 patients for whom information was available.

### *Laboratory*

For reports where laboratory confirmation was available, the state public health laboratory identified 239 (97%) of 247 human *Vibrio* isolates, excluding *V. cholerae*. CDC received 129 isolates of *V. parahaemolyticus* from 121 patients. Of these, 117 were viable *V. parahaemolyticus* isolates that were serotyped and four were not viable. Of the viable *V. parahaemolyticus* isolates, 29 (25%) from 12 health jurisdictions were serotype O4:K12 (Colorado, Hawaii, Louisiana, Maryland, Maine, Montana, North Carolina, New York State, New York City, Oregon, Texas, and Washington); 17(15%) isolates from seven states were serotype O3:K6 (Arizona, Colorado, Georgia, Louisiana, Maryland, New Mexico, and Washington); 13 (11%) isolates from eight states were serotype O1:K56 (Hawaii, Louisiana, Maine, Montana, Oregon, Texas, Virginia, and Washington); and the remaining 57 isolates were one of 27 serotypes.

### **Recent Publications**

Two cases of toxigenic *Vibrio cholerae* O1 infection after Hurricanes Katrina and Rita--Louisiana, October 2005. MMWR Morb Mortal Wkly Rep. Jan 20 2006;55(2):31-32.

*Vibrio* illnesses after Hurricane Katrina--multiple states, August-September 2005. MMWR Morb Mortal Wkly Rep. Sep 23 2005;54(37):928-931.

*Vibrio parahaemolyticus* infections associated with consumption of raw shellfish--three states, 2006. MMWR Morb Mortal Wkly Rep. Aug 11 2006;55(31):854-856.

**Table 1: Isolates of toxigenic *V. cholerae*, 2005**

<b>State</b>	<b>Age</b>	<b>Sex</b>	<b>Onset</b>	<b>Exposure</b>	<b>Serogroup</b>	<b>Serotype</b>
Hawaii	85	F	4/8/2005	Domestic (seafood)	<i>V. cholerae</i> O1	Ogawa
Hawaii	34	M	5/10/2005	Domestic (seafood)	<i>V. cholerae</i> O1	Ogawa
Missouri	44	F	8/2/2005	Travel in Pakistan	<i>V. cholerae</i> O1	Inaba
New York	44	F	7/26/2005	Travel in Pakistan	<i>V. cholerae</i> O1	Inaba
Louisiana	43	M	10/15/2005	Domestic (crab and shrimp) - Gulf Coast	<i>V. cholerae</i> O1	Inaba
Louisiana	46	F	10/15/2005	Domestic (crab and shrimp) - Gulf Coast	<i>V. cholerae</i> O1	Inaba
Guam	32	M	10/26/2005	Unknown	<i>V. cholerae</i> O1	Ogawa
Guam	29	M	10/19/2005	Unknown	<i>V. cholerae</i> O1	Ogawa
Michigan	53	M	11/3/2005	Travel in Pakistan	<i>V. cholerae</i> O1	Inaba
Michigan	34	M	11/26/2005	Travel in the Philippines	<i>V. cholerae</i> O1	Ogawa
California	46	M	12/22/2005	Travel in the Philippines	<i>V. cholerae</i> O1	Ogawa
Guam	26	F	12/26/2005	Unknown	<i>V. cholerae</i> O1	Ogawa

**Table 2. Number of *Vibrio* illnesses (excluding toxigenic *V. cholerae*) by species, complications, and site of isolation in patients from Gulf Coast states, 2005**

<i>Vibrio</i> Species	Complications <sup>1</sup>						Site of Isolation					
	Patients		Hospitalized		Deaths		Isolates		Stool	Blood	Wound	Other <sup>2</sup>
	N	(%)	n/N	(%)	n/N	(%)	N	(%)				
<i>V. alginolyticus</i>	23	(11)	5/21	(24)	0/21	(0)	23	(10)	1	1	15	6
<i>V. cholerae</i> (non-toxigenic) <sup>3</sup>	23	(11)	12/20	(60)	3/19	(16)	23	(10)	12	5	1	4
<i>V. damsela</i>	3	(1)	0/2	(0)	0/2	(0)	3	(1)	0	0	3	0
<i>V. fluvialis</i>	11	(5)	7/11	(64)	2/11	(18)	12	(5)	5	2	4	1
<i>V. hollisae</i>	3	(1)	2/3	(67)	0/3	(0)	3	(1)	1	0	1	1
<i>V. mimicus</i>	4	(2)	2/4	(50)	1/4	(25)	4	(2)	3	0	0	1
<i>V. parahaemolyticus</i>	50	(23)	17/44	(39)	2/46	(4)	52	(22)	20	4	21	7
<i>V. vulnificus</i>	85	(39)	70/77	(91)	15/65	(23)	93	(39)	3	45	40	5
Species not identified	9	(4)	4/9	(44)	0/8	(0)	9	(4)	5	0	1	3
Multiple species <sup>4</sup>	8	(4)	4/8	(50)	1/6	(17)	18	(8)	6	4	8	0
<b>Total</b>	<b>219</b>	<b>(100)</b>	<b>123/199</b>	<b>(62)</b>	<b>24/185</b>	<b>(13)</b>	<b>240</b>	<b>(100)</b>	<b>56</b>	<b>61</b>	<b>94</b>	<b>29</b>

<sup>1</sup> Denominators indicate patients for whom information is known.

<sup>2</sup> Includes ear, endotracheal secretion, sputum, and urine.

<sup>3</sup> Includes non-toxigenic *V. cholerae* O1 (1 isolate) and other non-toxigenic *V. cholerae* [non-O1 non-O139] (22 isolates).

<sup>4</sup> *V. parahaemolyticus* and *V. alginolyticus* were isolated from two patients, *V. parahaemolyticus* and *V. mimicus* were isolated from one patient, *V. parahaemolyticus* and *V. fluvialis* were isolated from one patient, *V. parahaemolyticus* and an unidentified *Vibrio* species were isolated from one patient, *V. parahaemolyticus* and *V. vulnificus* were isolated from one patient, *V. vulnificus* and *V. alginolyticus* were isolated from one patient, and *V. vulnificus* and an unidentified *Vibrio* species were isolated from one patient.

**Table 3. Number of *Vibrio* illnesses (excluding toxigenic *V. cholerae*) by species, complications, and site of isolation in patients from non-Gulf Coast states, 2005**

<i>Vibrio</i> Species	Complications <sup>1</sup>						Site of Isolation					
	Patients		Hospitalized		Deaths		Isolates		Stool	Blood	Wound	Other <sup>2</sup>
	N	(%)	n/N	(%)	n/N	(%)	N	(%)				
<i>V. alginolyticus</i>	40	(12)	9/37	(24)	0/37	(0)	40	(12)	2	1	25	12
<i>V. cholerae</i> (non-toxigenic) <sup>3</sup>	33	(10)	14/31	(45)	2/28	(7)	35	(10)	19	10	4	2
<i>V. damsela</i>	4	(1)	3/4	(75)	0/4	(0)	4	(1)	0	0	3	1
<i>V. fluvialis</i>	17	(5)	8/17	(47)	1/17	(6)	17	(5)	12	2	2	1
<i>V. furnissi</i>	2	(0.6)	2/2	(100)	1/2	(50)	2	(0.6)	1	1	0	0
<i>V. hollisae</i>	4	(1)	3/4	(75)	0/3	(0)	4	(1)	4	0	0	0
<i>V. mimicus</i>	6	(2)	3/6	(50)	1/6	(17)	6	(2)	3	0	2	1
<i>V. parahaemolyticus</i>	168	(51)	29/155	(19)	0/155	(0)	168	(50)	130	3	22	13
<i>V. vulnificus</i>	36	(11)	31/35	(89)	10/32	(31)	37	(11)	1	23	11	2
Species not identified	10	(3)	3/9	(33)	0/9	(0)	10	(3)	6	1	1	2
Other	1	(0.3)	0/1	(0)	0/1	(0)	2	(1)	1	0	0	1
Multiple species <sup>4</sup>	6	(2)	4/6	(67)	1/6	(17)	13	(4)	8	3	0	2
<b>Total</b>	<b>327</b>	<b>(100)</b>	<b>109/307</b>	<b>(36)</b>	<b>16/300</b>	<b>(5)</b>	<b>338</b>	<b>(100)</b>	<b>187</b>	<b>44</b>	<b>70</b>	<b>37</b>

<sup>1</sup> Denominators indicate patients for whom information is known.

<sup>2</sup> Includes ear, peritoneal fluid, sinus, sputum, and urine.

<sup>3</sup> Includes non-toxigenic *V. cholerae* O1 (3 isolates), non-toxigenic *V. cholerae*

O139 (1 isolate), and other non-toxigenic *V. cholerae* [non-O1 non-O139] (29 isolates).

<sup>4</sup> *V. parahaemolyticus* and *V. alginolyticus* were isolated from one patient; *V. parahaemolyticus* and *V. fluvialis* were isolated from two patients; *V. parahaemolyticus* and an unidentified *Vibrio* species were isolated from one patient; *V. alginolyticus* and *V. fluvialis* were isolated from one patient; and *V. cholerae* non-O1, non-O139, *V. fluvialis*, and *V. vulnificus* were isolated from one patient.

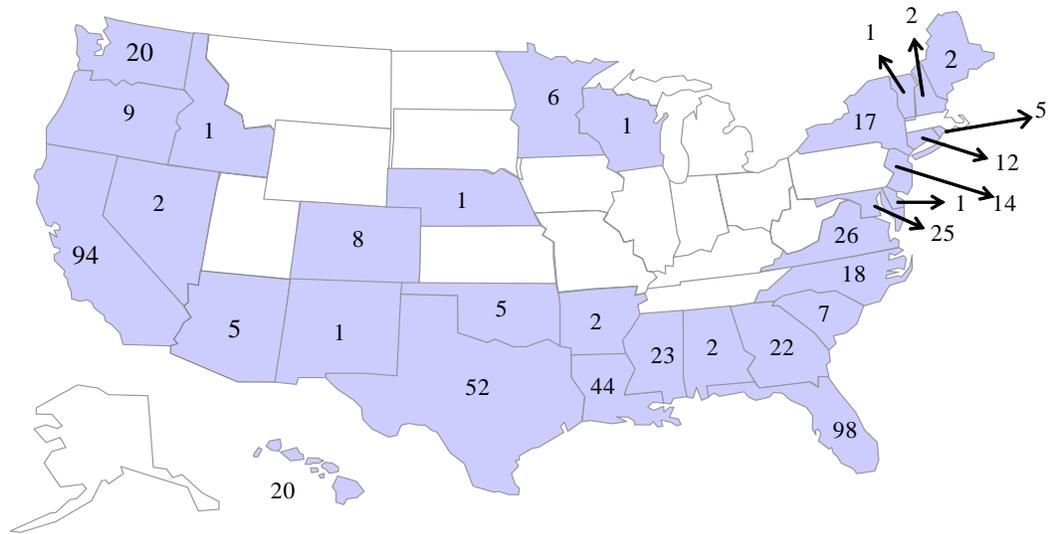
**Table 4. Seafood exposure among patients with foodborne *Vibrio* infection (excluding toxigenic *V. cholerae*) who reported eating a single seafood item in the week before illness onset, 2005 (N=86)**

	Mollusks			Crustaceans				Other Shellfish <sup>1</sup>	Finfish <sup>2</sup>	Total
	Oysters	Clams	Mussels	Shrimp	Lobster	Crab	Crayfish			
<b>Ate (%)</b>	42 (49)	3 (3)	1 (1)	9 (10)	1 (1%)	13 (15%)	2 (2%)	2 (2%)	13 (15%)	86
<b>% Ate raw</b>	91	67	100	44	0	0	0	0	27	49

<sup>1</sup> Other shellfish reported: scallops

<sup>2</sup> Finfish reported: ahi poke, catfish, flounder, perch, red snapper, rockfish, salmon, sunfish, sushi, tuna, yellow fin, and whiting.

**Figure 1. Number of patients with *Vibrio* isolates (excluding toxigenic *V. cholerae*), by state, 2005 (N=546 patients)**



**Figure 2. Number of patients with *Vibrio* isolates (excluding toxigenic *V. cholerae*), by month of illness onset or specimen isolation, Gulf Coast states vs. other states, 2005 (N=546)**

