Summary of human *Vibrio* cases reported to CDC, 2008

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. Historically, only toxigenic *V. cholerae* serogroups O1 and O139 were nationally notifiable; in January 2007, infections caused by any *Vibrio* species (vibriosis) became nationally notifiable. Although all *Vibrio* infections are nationally notifiable, many cases are likely still not recognized because *Vibrios* are not easily identified on routine enteric media. Additionally, CDC serotypes all *V. parahaemolyticus* isolates received from state health departments; for *V. cholerae*, CDC tests for serogroups O1, O75, O139, and O141, and determines whether cholera toxin is produced.

This report summarizes human *Vibrio* infections during 2008 reported by states to CDC. Results are presented in the following 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. 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 2008, five patients with toxigenic *V. cholerae* serogroup O1, two patients with toxigenic *V. cholerae* serogroup O141, one patient with toxigenic *V. cholerae* serogroup O75, and one patient with toxigenic *V. cholerae* serogroup non-O1, non-O139, non-O141, non-O75 were reported (Table 1). Of the five toxigenic *V. cholerae* serogroup O1 cases, three patients were hospitalized and no deaths were reported. Infection was acquired internationally in four cases (one patient acquired infection while traveling in Nepal and Hong Kong, one while traveling in India, one while traveling in the Philippines, and one was a resident of Pakistan visiting the United States). The patient with travel to Nepal and Hong Kong reported consuming shrimp on the flight from Hong Kong to the United States. The patient who traveled to the Philippines reported consuming salmon while abroad. Both the patient who traveled to India and the patient from Pakistan reported no seafood or recreational water exposure. The patient with the domestically-acquired infection reported having eaten self-harvested crab and previously frozen fish.

Both patients with toxigenic *V. cholerae* serogroup O141 infection reported consumption of domestic seafood. The patient from New Jersey consumed raw clams harvested in Great Bay,

NJ while the Louisiana case consumed boiled crab and crawfish from an unknown source. Both were hospitalized and neither died.

The patient infected with toxigenic *V. cholerae* serogroup O75 consumed cooked crab, mussels, and shrimp at a restaurant. Inspection of the restaurant revealed that cooked crabs were placed in boxes previously used to store raw crabs. The patient was hospitalized and survived.

The patient infected with toxigenic *V. cholerae* serogroup non-O1, non-O139, non-O141, non-O75 did not report consumption of seafood, but ingested river water while tubing. She was not hospitalized.

Table 1: Cases of toxigenic *V. cholerae,* 2008

State	Age	Sex	Onset	Exposure	Serogroup
Illinois	46	M	7/25/2008	Resident of Pakistan	*V. cholerae* O1*
Oregon	27	M	7/30/2008	Travel in Nepal and Hong Kong	*V. cholerae* O1*
New Jersey	78	M	8/7/2008	Travel in India	*V. cholerae* O1*
Texas	39	F	11/28/2008	Travel in Philippines	*V. cholerae* O1*
Louisiana	77	F	9/5/2008	Domestic-seafood (LA self-harvest)	*V. cholerae* O1**
Louisiana	86	M	5/20/2008	Domestic-seafood(harvest area unknown)	*V. cholerae* O141
New Jersey	77	M	8/9/2008	Domestic-seafood (NJ harvest)	*V. cholerae* O141
Pennsylvania	20	F	7/15/2008	Domestic- seafood (harvest area unknown)	*V. cholerae* O75
Texas	38	F	6/11/2008	Domestic-recreational water exposure	*V. cholerae* non-O1, non-O139, non-O141, non-O75

*Serotype Ogawa
**Serotype Inaba

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

In 2008, *Vibrio* isolates from 599 patients were reported to COVIS (Table 2). Among patients for whom information was available, 227 (40%) of 566 were hospitalized and 35 (6%) of 561 died. *V. parahaemolyticus* was isolated from 270 (45%) of the 599 patients, and this was the most frequently reported *Vibrio* species. Of the patients infected with *V. parahaemolyticus*, 67 (26%) of 256 with information were hospitalized and four (2%) of 254 with information died. *V. vulnificus* was isolated from 85 (14%) of the 599 patients; 72 (86%) of 84 with information were hospitalized and 24 (30%) of 79 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, 2008.

			Complications[1]						Specimen Type			
***Vibrio* Species**	**Patients**		**Hospitalized**		**Deaths**		**Isolates[2]**		**Stool**	**Blood**	**Wound**	**Other[3]**
	N	**%**	**n/N**	**%**	**n/N**	**%**	**N**	**%**	**n**	**n**	**n**	**n**
Single species												
V. alginolyticus	99	17	23/90	26	1/93	1	99	16	3	5	64	27
V. cholerae (non-toxigenic)[4]	50	8	19/48	40	2/47	4	50	8	28	10	5	7
V. fluvialis	29	5	14/27	52	3/27	11	29	5	19	1	5	4
V. hollisae	4	1	1/4	25	1/4	25	4	1	2	0	1	1
V. metschnikovii	1	0	1/1	100	0/1	0	1	0	0	1	0	0
V. mimicus	32	5	20/29	69	0/30	0	32	5	24	1	2	5
V. parahaemolyticus	270	45	67/256	26	4/254	2	270	44	211	6	37	16
V. vulnificus	85	14	72/84	86	24/79	30	94	15	6	55	29	4
Species not identified	23	4	8/22	36	0/21	0	24	4	8	3	6	7
Multiple species[5]	6	1	2/5	40	0/5	0	13	2	4	3	6	0
Total	**599**	**100**	**227/556**	**40**	**35/561**	**6**	**616**	**100**	**305**	**85**	**155**	**71**

[1] Denominators indicate patients for whom information is known.

[2] The number of isolates is higher than the total number of patients for two reasons: one patient may yield an isolate of the same *Vibrio* species from more than one specimen source (e.g., the isolation of the same *Vibrio* species from 2 specimen sources in the same person is counted as 2 isolates) and more than one *Vibrio* species may be isolated from the same patient and each *Vibrio* species is counted as an isolate.

[3] Includes ear, sputum, urine, and other.

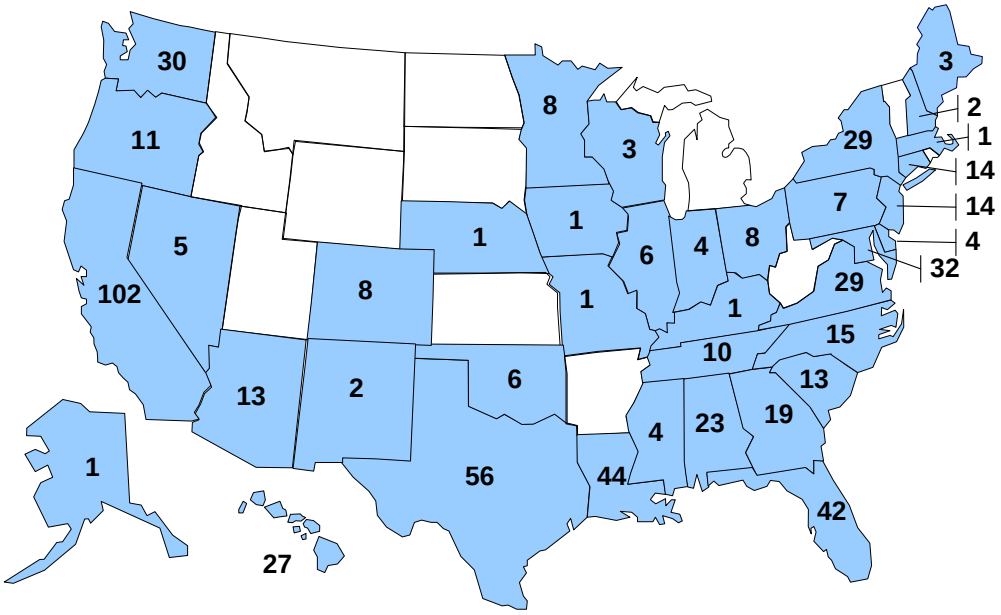
[4] Includes non-toxigenic *V. cholerae* O1 (2 isolates) and other non-toxigenic *V. cholerae* [non-O1 non-O139] (47 isolates).

[5] The following were isolated from one patient: *V. alginolyticus* and *V. metschnikovii*; *V. alginolyticus* and *V. parahaemolyticus*; *V. mimicus* and *V. parahaemolyticus*; *V. parahaemolyticus* and *V. vulnificus*; *V. parahameolyticus* and *V. vulnificus*; *V. fluvialis* and *V. parahaemolyticus*.

Geographic Location

Of the 599 cases, CDC received 169 (28%) reports of *Vibrio* illness from Gulf Coast states, 171 (29%) from Pacific Coast states, 175 (29%) from Atlantic Coast states (excluding Florida, which is included with Gulf Coast states), and 84 (14%) from inland states (Figure 1). The most frequent *Vibrio* species reported from Gulf Coast states were *V. vulnificus* (26%), *V. parahaemolyticus* (24%), *V. alginolyticus* (19%), and *V. mimicus* (12%). The most frequent *Vibrio* species reported from non-Gulf Coast states were *V. parahaemolyticus* (53%), *V. alginolyticus* (19%), *V. vulnificus* (16%), and non-toxigenic *V. cholerae* (9%).

Figure 1. Number of cases of *Vibrio* illnesses (excluding toxigenic *V. cholerae*), by state, 2008 (N=599 in 38 states)



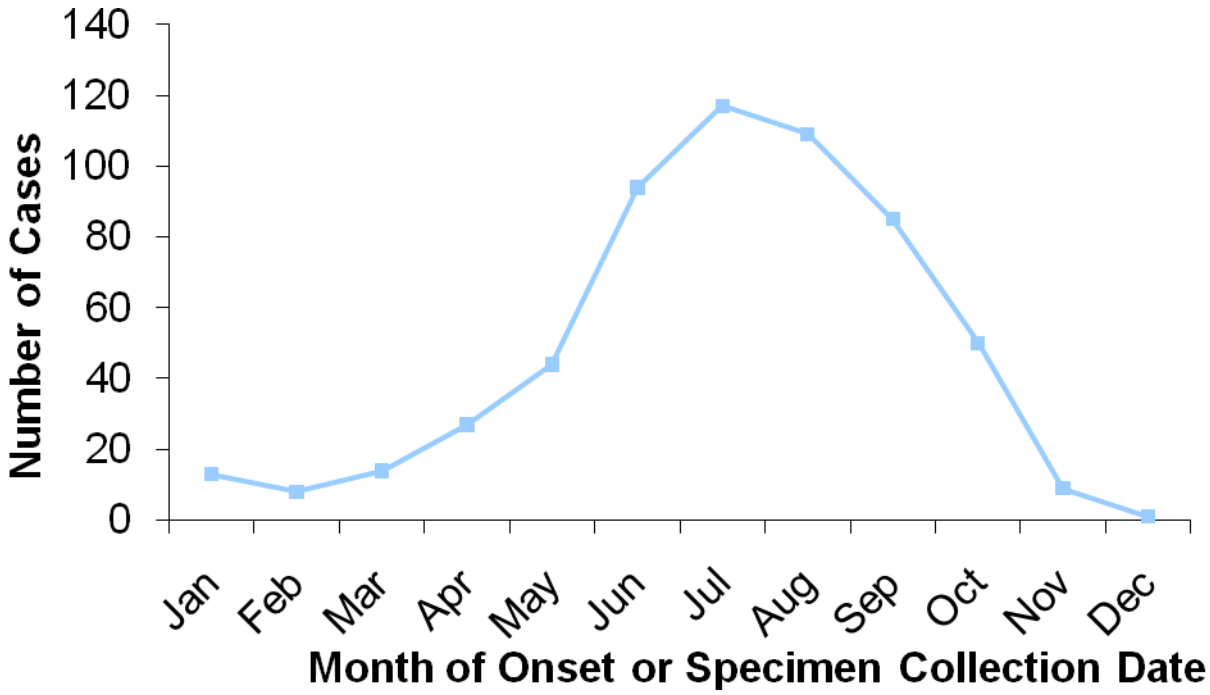
Specimen Type

Among the 616 *Vibrio* isolates (excluding toxigenic *V. cholerae*) in 2008, 305 (50%) were from stool, 85 (14%) from blood, and 155 (25%) from wounds. Twenty-three (4%) isolates were obtained from the ear, of which 17 (74%) were *V. alginolyticus*. An additional 48 isolates (8%) were from sputum, urine, or other sites. *V. parahaemolyticus* was the species most frequently isolated from stool (211 [69%] of 305 isolates from stool); *V. vulnificus* was the species most frequently isolated from blood (55 [65%] of 85 isolates from blood); and *V. alginolyticus* was the species most frequently isolated from wounds (64 [41%] of 155 isolates from wounds).

Seasonality

Cases of *Vibrio* infection had a clear peak during the summer months (Figure 2). Most cases (75%) occurred during May-September, with the greatest frequency during July.

Figure 2. Number of cases of *Vibrio* illnesses (excluding toxigenic *V. cholerae*), by month of illness onset or specimen collection date, 2008 (N=599).



Exposures

One-hundred-twenty-eight (21%) of 599 patients reported having a wound either before or during the likely exposure to *Vibrio*. Of those 128 patients, 121 (95%) reported having skin exposed to a body of water, 34 (27%) reported handling seafood, and 31 (24%) reported contact with marine wildlife. Excluding patients with wound infections, among the 343 for whom a food history was available, 306 (89%) reported eating seafood in the 7 days before illness onset. Among the 137 who reported eating a single seafood item (Table 4), 53% ate oysters (94% of whom consumed them raw), 14% ate shrimp, and 12% ate finfish. International travel in the seven days before illness onset was reported by 34 (7.0%) of 485 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, 2008

	Mollusks			Crustaceans						
	Oysters	**Clams**	**Mussels**	**Shrimp**	**Lobster**	**Crab**	**Crayfish**	**Other Shellfish[1]**	**Finfish[2]**	**Total**
Patients who ate the single item (%)	72 (53)	6 (4)	0	19 (14)	0	15 (11)	5 (4)	4 (3)	16 (12)	137
Subset that ate the item raw, (%)	(94)	(100)	--	(13)	--	(15)	(0)	(100)	(10)	--

[1] Other shellfish reported: seafood salad, octopus, limpets
[2] Finfish reported: flounder, trout, whiting, salmon, yellow tail, cob, tilapia, tuna, red reef fish

Laboratory
Sixty-three isolates were confirmed as *V. parahaemolyticus;* 24 serotypes of *V. parahaemolyticus* were identified. Eight (13%) were of the pandemic clone serotype O3:K6, 7 (11%) were O1:K56, 7 (11%) were O4:Kuk, 5 (7%) were O1:Kuk, and 5 (7%) were O3:Kuk, and 31 were of 19 other serotypes.

Recent Publications

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. Clinical Infectious Diseases 2008; 47: 1035-1040.

Dechet A, Yu PA, Koram N, Painter J. Nonfoodborne *Vibrio* infections: An important cause of morbidity and mortality in the United States, 1997-2006. Clinical Infectious Diseases 2008; 46: 970-6.