

# National Enteric Disease Surveillance: COVIS Annual Summary, 2009

## Cholera and Other *Vibrio* Illness (COVIS) Annual Summary, 2009

### *Summary of human Vibrio cases reported to CDC, 2009*

The Cholera and Other *Vibrio* Illness Surveillance (COVIS) system is a national surveillance system for human infections caused by all species of *Vibrio*; the COVIS database is maintained by the Centers for Disease Control and Prevention. Information from COVIS has been used to determine host, food, and environmental risk factors for *Vibrio* infection.

COVIS was initiated by CDC in collaboration with the Food and Drug Administration (FDA), and the Gulf Coast states (Alabama, Florida, Louisiana, Mississippi, and Texas) in 1988. Using the COVIS report form (available at [http://www.cdc.gov/nationalsurveillance/PDFs/CDC5279\\_COVISvibriosis.pdf](http://www.cdc.gov/nationalsurveillance/PDFs/CDC5279_COVISvibriosis.pdf)), participating health officials report clinical data, including information about underlying illness; detailed history of seafood consumption; detailed exposure to a body of water, drippings from raw or live seafood, or other contact with marine life in the 7 days before illness onset; and traceback information on implicated seafood. Before 2007, only cholera, which, by definition, is caused by infection with toxigenic *Vibrio cholerae* serogroup O1 or O139 was nationally reportable; in January 2007, infection with other species from the family *Vibrionaceae* (vibriosis) also became nationally reportable. 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. Although all *Vibrio* infections are nationally notifiable, many cases are likely not recognized because *Vibrios* are not easily identified on routine enteric media.

This report summarizes human *Vibrio* infections during 2009 reported by states to CDC. Results are presented in two categories: 1) toxigenic *Vibrio cholerae* infections (including both cholera, caused by toxigenic *V. cholerae* O1 or O139, and vibriosis, caused by all other toxigenic *V. cholerae* serogroups), and 2) all other *Vibrio* infections. . Additionally, results are presented by clinical specimen type. The *Vibrio* species may have been isolated from more than one specimen type in a single patient. It is important to note that isolation of *Vibrio* from an ill patient does not necessarily indicate that the *Vibrio* infection caused the illness. While many *Vibrio* species are well-recognized human pathogens, the status of some species, including *V. damsela*, *V. furnissii*, *V. metschnikovii*, and *V. cincinnatiensis*, as human enteric or wound pathogens is less clear.

Understanding exposures is essential for control of infections. For toxigenic *V. cholerae*, exposures are summarized first by place of exposure (domestic vs. travel-associated) and then by seafood consumption and water exposure. For all other *Vibrio* infections (*Vibrios* other than toxigenic *V. cholerae* O1, O139, O141, or O75) exposures are categorized as follows: wound, seafood, and travel. Patients are classified as having a wound exposure if they reported sustaining a wound or having a pre-existing wound while exposed to marine or estuarine water or during physical contact with marine wildlife in the 7 days before illness onset. Patients are classified as having a seafood exposure if they did not report a wound but did report consumption of seafood seven days before illness onset. They are classified as having travel exposure if they reported international travel in the seven days before illness onset, regardless of wound or seafood exposure.

## Toxigenic *Vibrio cholerae*

### Serogroup O1 & O139 (reportable as cholera)

In 2009, nine patients with toxigenic *V. cholerae* serogroup O1 infection and one patient with toxigenic *V. cholerae* serogroup O139 infection were reported. Of the ten patients with toxigenic *V. cholerae* serogroup O1 or O139 infection, six were hospitalized and none died. Infection was travel-associated in eight cases (one patient acquired infection while traveling in Pakistan, four while traveling in India, one while traveling in the Philippines, one while traveling in Sri Lanka and India, and one while traveling in Bangladesh). Seafood consumption was reported by four of these patients (from the patients who traveled in the Philippines, Bangladesh, India, and Sri Lanka/India). Two patients reported exposure to recreational water (patients who traveled in India and Sri Lanka/India); both also reported seafood consumption. Four patients (three who traveled in India and one who traveled in Pakistan) reported no exposure to recreational or drinking water and no seafood consumption. One patient with domestically acquired infection reported consumption of shrimp. The other patient with domestically acquired infection reported no recreational water exposure or seafood consumption but did have contact with people who had recently traveled from Pakistan.

### Serogroup O141 & O75 (reportable as vibriosis)

In 2009, one patient with toxigenic *V. cholerae* serogroup O141 infection was reported. This patient reported exposure to a freshwater lake in Michigan. The patient was not hospitalized.

In 2009, one patient with toxigenic *V. cholerae* serogroup O75 infection was reported. This patient was not interviewed, so the exposure history is not available. The patient was hospitalized and survived.

Table 1: Cases of toxigenic *V. cholerae*, 2009

State	Age	Sex	Onset	Exposure	Serogroup
CA	43	M	8/21/2009	Travel to India	O1, Ogawa
CA	38	M	6/26/2009	Travel to India	O1, Ogawa
IN	13	F	7/2/2009	Travel to Sri Lanka and India	O1, Ogawa
MA	3	F	1/7/2009	Travel to India	O1, Ogawa
NY	2	F	7/8/2009	Travel to Bangladesh	O1, Ogawa
PA	66	M	7/20/2009	Travel to India	O1, Inaba
TN	51	F	4/5/2009	Travel to Philippines	O1, Ogawa
TX	2	M	5/5/2009	Travel to Pakistan	O1, Ogawa
TX	2	F	8/10/2009	Domestic-unknown	O1, Ogawa
NY	62	M	6/30/2009	Domestic-seafood (harvest area unknown)	O139
LA	51	F	4/1/2009	Unknown	O75
MI	42	F	7/2/2009	Domestic-recreational water exposure	O141

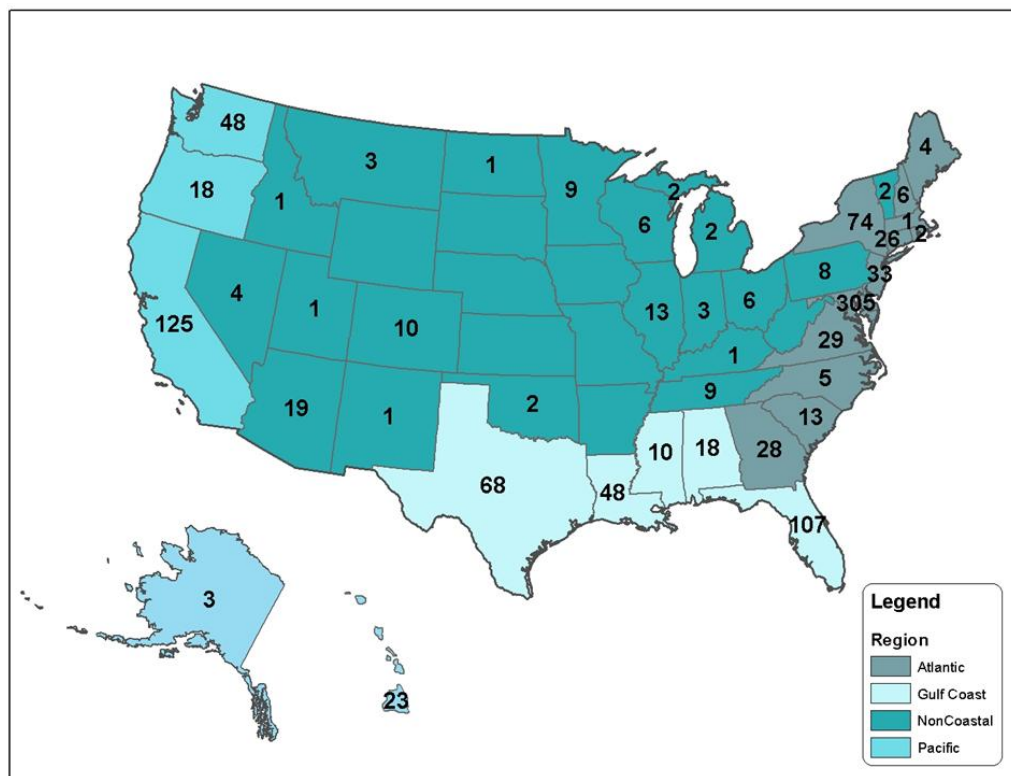
## Vibriosis<sup>1</sup>

In 2009, *Vibrio* isolates (excluding toxigenic *V. cholerae*) from 825 patients were reported to COVIS (Table 2). Among patients for whom information was available, 36% were hospitalized, and 6% died. The most frequently reported species was *V. parahaemolyticus*, which was isolated from 386 of the 825 (46%) patients. Of the patients infected with *V. parahaemolyticus* for whom information was available, 81 of 359 (23%) were hospitalized, and two of 348 (1%) died. *V. alginolyticus* was isolated from 129 of the 825 (16%) patients; of the patients with information available 15 of 116 (16%) were hospitalized, and 2 of 116 (2%) died. *V. vulnificus* was isolated from 107 of the 825 (13%) patients; of the patients with information available, 93 of 103 (90%) were hospitalized, and 32 of 101 (32%) died.

### Geographic Location

Of the 825 cases of vibriosis reported, 251 (30%) were from Gulf Coast states, 217 (26%) from Pacific Coast states, 256 (31%) from Atlantic Coast states, and 101 (12%) from non-coastal states (Figure 1). The *Vibrio* species reported most frequently from Gulf Coast states were *V. vulnificus* (27%), *V. parahaemolyticus* (21%), *V. alginolyticus* (19%), and non-toxicogenic *V. cholerae* (13%). The *Vibrio* species reported most frequently from non-Gulf Coast states were *V. parahaemolyticus* (58%), *V. alginolyticus* (14%), *V. vulnificus* (7%), and non-toxicogenic *V. cholerae* (7%).

Figure 1. Number of cases of *Vibrio* infections (excluding toxigenic *V. cholerae*), by state, 2009 (n=825 in 42 states).



<sup>1</sup> Vibriosis is defined as infection with a species from the family *Vibrionaceae* other than toxigenic *V. cholerae* O1 or O139. For this report, vibriosis caused by other toxigenic serogroups of *V. cholerae* are reported in the section on toxigenic *V. cholerae* infections. Vibriosis caused by all other *Vibrios*, including non-toxicogenic *V. cholerae* and both toxigenic and non-toxicogenic species other than *V. cholerae*, is summarized in this section.

Table 2. Number of vibriosis cases by species, complications, and site of isolation in patients from the United States, 2009.

Vibrio Species	Outcomes*						Specimen Type					
	Patients		Hospitalized		Deaths		Isolates <sup>†</sup>		Stool	Blood	Wound	Other <sup>§</sup>
	N	%	n/N	%	n/N	%	N	%	n	n	n	n
<i>V. alginolyticus</i>	129	16	15/116	13	2/116	2	129	15	3	4	71	51
<i>V. cholerae</i> (non-toxigenic) <sup>¶</sup>	79	10	37/72	51	7/71	10	79	9	39	19	7	14
<i>V. damsela</i>	3	0	0/3	0	0/3	0	3	0	0	1	2	0
<i>V. fluvialis</i>	40	5	15/36	42	0/35	0	40	5	28	1	4	7
<i>V. furnissii</i>	3	0	3/3	100	0/3	0	3	0	0	2	1	0
<i>V. hollisae</i>	10	1	7/10	70	0/10	0	10	1	10	0	0	0
<i>V. metschnikovii</i>	2	0	0/1	0	0/1	0	2	0	0	0	1	1
<i>V. mimicus</i>	20	3	10/20	50	0/19	0	21	3	13	3	2	4
<i>V. parahaemolyticus</i>	386	47	81/359	23	2/348	1	388	46	314	7	41	26
<i>V. vulnificus</i>	107	13	93/103	90	32/100	32	114	14	5	75	31	3
Other**	3	0	1/3	33	0/3	0	3	0	1	0	2	0
Species not identified	33	4	7/29	24	1/30	3	33	4	8	1	7	16
Multiple species <sup>††</sup>	10	1	5/9	56	1/10	10	22	3	8	4	6	4
<b>Total</b>	<b>825</b>	<b>100</b>	<b>274/764</b>	<b>36</b>	<b>45/750</b>	<b>6</b>	<b>847</b>	<b>100</b>	<b>430</b>	<b>116</b>	<b>175</b>	<b>126</b>

\* Denominators indicate the number of patients with information available.

<sup>†</sup> The number of isolates is higher than the total number of patients for two reasons. First, specimens from a single patient may yield isolates of the same *Vibrio* species from more than one specimen source (that is, the isolation of the same *Vibrio* species from two specimen sources in the same person is counted as 2 isolates). Second, more than one *Vibrio* species may be isolated from the same patient; each *Vibrio* species is counted as an isolate.

<sup>§</sup> Includes ear, sputum, urine, other, and missing information.

<sup>¶</sup> Includes non-toxigenic *V. cholerae* O1 (2 isolates), *V. cholerae* O139 (1 isolate) and other non-toxigenic *V. cholerae* non-O1 non-O139 (76 isolates).

\*\* *V. harveyi* and *V. diazotrophicus*

<sup>††</sup> The following combinations of *Vibrio* species were each isolated from one patient: *V. cholerae* non-O1, non-O139, *V. parahaemolyticus*; *V. cholerae* non-O1, non-O139, *V. mimicus*; *V. alginolyticus*, *V. metschnikovii*; *V. fluvialis*, *V. mimicus*; *V. alginolyticus* *V. vulnificus*; *V. fluvialis*, *V. parahaemolyticus*; *V. alginolyticus*, *V. parahaemolyticus*; *V. fluvialis* *V. furnissii*; *V. parahaemolyticus*, *Vibrio* spp - not identified; *V. fluvialis*, *V. parahaemolyticus*

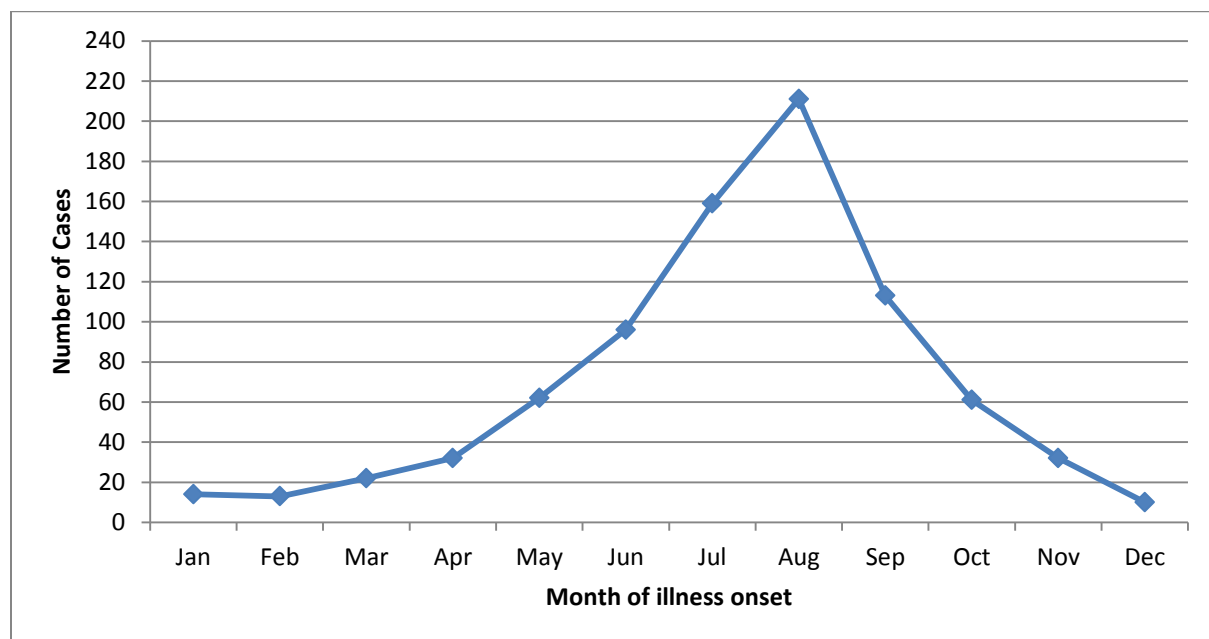
### Specimen Type

Among the 847 *Vibrio* isolates<sup>2</sup> (excluding toxigenic *V. cholerae*) reported in 2009, 430 (52%) were from stool, 116 (14%) from blood, 175 (21%) from wounds, and 126 from 'other' sites. *V. parahaemolyticus* was the species most frequently isolated from stool (314 [73%] of 430 isolates from stool), *V. vulnificus* was the species most frequently isolated from blood (75 [65%] of 116 isolates from blood), and *V. alginolyticus* was the species most frequently isolated from wounds (71 [41%] of 175 isolates from wounds). Of those from 'other sites', 45 (5%) were from the ear, of which 37 (82%) were *V. alginolyticus*.

### Seasonality

Cases of vibriosis had a definite peak during the summer months (Figure 2). Most cases (78%) occurred from May to September, with the greatest number in August.

Figure 2. Number of cases of vibriosis, by month of illness onset or, when onset date not available, specimen collection date, 2009 (n=825).



### Exposures and exposure categories

Among the 825 vibriosis cases, 250 (30%) were wound-associated, 486 were seafood-associated, and 89 could not be classified. Among those with a wound exposure, 175 (70%) reported having skin exposed to a body of water, 55 (22%) reported handling seafood, and 43 (17%) reported contact with marine wildlife. Among the 236 who reported eating a single seafood item (Table 4), 48% ate oysters (94% of whom consumed them raw), 9% ate clams (73% of whom consumed them raw), 10% ate shrimp, and 19% ate finfish. Among the 825 vibriosis patients, 495 provided travel information; 51 (10%) of these patients reported international travel in the seven days before illness onset.

<sup>2</sup> The number of isolates is higher than the total number of patients for two reasons. First, one patient may have the same *Vibrio* species isolated from more than one specimen type (that is, the isolation of the same *Vibrio* species from two specimen types in the same person is counted as 2 isolates). Second, more than one *Vibrio* species may be isolated from the same patient; each *Vibrio* species is counted as an isolate

Table 4. Seafood exposures among patients with foodborne vibriosis who reported eating a single seafood item in the week before illness onset, 2009

	Mollusks			Crustaceans				Other	Finfish <sup>†</sup>	Total
	Oysters	Clams	Mussels	Shrimp	Lobster	Crab	Crayfish	Other Shellfish <sup>*</sup>		
<b>Patients who ate single seafood item (%)</b>	113 (48)	22 (9)	2 (1)	23 (10)	3 (1)	22 (9)	2 (1)	3 (1)	46 (19)	236
<b>Subset that ate the item raw, (%)</b>	103 (94)	16 (73)	0 (0)	2 (10)	0 (0)	4 (20)	0 (0)	1 (33)	12 (32)	138 (59)

<sup>\*</sup> Other shellfish reported: Conch

<sup>†</sup> Finfish reported: Bonefish (ojo), herring, whitefish, lomu, perch, salmon, tuna, sardines, sea cucumber, tilapia, grouper, mullet, red snapper, flounder, and trout

#### Laboratory

In 2009, 149 isolates were confirmed at CDC as *V. parahaemolyticus*; 20 serotypes of *V. parahaemolyticus* were identified: 34 (23%) were O4:Kuk, 32 (21%) were O1:Kuk, and 12 (8%) were O3:Kuk, 6 (4%) were of the pandemic clone serotype O3:K6, and 4 (3%) were O1:K56; the remaining 61 were one of 15 other serotypes, all 41% of total.

#### Recent Publications using data submitted to CDC

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.

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