Summary of human *Vibrio* isolates reported to CDC, 2004

Infection with toxigenic *Vibrio cholerae* 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 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 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 are nationally notifiable; thus the true 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 seven 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 2004 using the reporting form for "Cholera and Other *Vibrio* Illnesses". 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 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 or wound pathogens is less clear.

Isolates of toxigenic *Vibrio cholerae*

In 2004, eight patients with toxigenic *V. cholerae* were reported (Table 1). Five patients were infected with toxigenic *V. cholera* serogroup O1. One patient acquired the infection in Thailand, two while traveling in India, one in the Philippines, and one in Hawaii. The two patients who acquired infection during traveling in India were unrelated cases and traveled to India 4 months apart from each other. Three patients were hospitalized and one died. No isolates of toxigenic *V. cholerae* O139 were identified. Toxigenic *V. cholerae* O141 was isolated from three patients. One patient was a male, Georgia resident who consumed oysters 3 days before onset of his symptoms. The oysters were traced back to a harvest site in Florida. The second patient was a female, Georgia resident who reported no known exposure to seafood in the 10 days preceding illness. The third patient was a male, Alabama resident who consumed oysters 10 days before onset of his symptoms. The oysters could not be traced back to their harvest site.

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

In 2004, 501 *Vibrio* isolates from 479 patients were reported to the Cholera and Other *Vibrio* Illness Surveillance System. Among patients for whom information was available, 173 (38%) of 460 were hospitalized and 39 (9%) of 443 died. *V. parahaemolyticus* was isolated from 240 (51%) patients, and was the most frequently reported *Vibrio* species. Of the patients infected with *V. parahaemolyticus*, 20% were hospitalized and 1% died. *V. vulnificus* was isolated from 92 (19%) patients; 88% were hospitalized and 39% died.

Geographic Location

In 2004, we received 130 (27%) reports of *Vibrio* illness from Gulf Coast states, 211 (44%) from Pacific Coast states, 100 (21%) from Atlantic Coast states (excluding Florida), and 38 (8%) from inland states (Figure 1). The most frequent *Vibrio* species reported from Gulf Coast states were *V. vulnificus* (47%), *V. parahaemolyticus* (21%), and non-toxigenic *V. cholerae* (9%). The most frequent *Vibrio* species reported from non-Gulf Coast states were *V. parahaemolyticus* (61%), *V. alginolyticus* (11%), *V. vulnificus* (9%), and non-toxigenic *V. cholerae* (7%).

Anatomic Site of Isolation

Among the 501 *Vibrio* isolates from all states, 265 (53%) were from stool, 87 (17%) from blood, and 72 (14%) from wounds. In addition, 23 (5%) isolates were obtained from the ear, and 20 (4%) were from the gallbladder, urine, or other site. *V. parahaemolyticus* was the species most frequently isolated from stool (199 [75%] of 265 isolates from stool); *V. vulnificus* was the species most frequently isolated from blood (64 [74%] of 87 isolates from blood) and from wounds (28 [39%] of 72 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 occurred in July for Gulf Coast states and in August for non-Gulf Coast states.

Exposures

114 (24%) patients reported having a wound either before or during exposure to *Vibrio*. Of those, 43 (38%) reported water activities such as swimming and boating, 19 (17%) reported handling seafood, and 18 (16%) reported contact with marine wildlife. Excluding patients from whom *Vibrio* was isolated from a wound, and among the 365 for whom a food history was available, 317(87%) reported eating seafood in the 7 days before illness onset. Among the 118 who reported eating a single seafood item (Table 4), 69% ate oysters (88% of whom consumed them raw), 10% ate shrimp, and 7% ate finfish. International travel in the 7 days before illness onset was reported by 11 (12%) of patients.

Laboratory

For reports where laboratory confirmation was available, the state public health laboratory confirmed the identification of 165 (95%) of 173 human *Vibrio* isolates. CDC received 81 isolates of *V. parahaemolyticus* from 80 patients. Of these, 76 were viable *V. parahaemolyticus* isolates, four were not viable, and one was not *Vibrio*. Of the viable *V. parahaemolyticus* isolates, 14 (17%) from eight states were serotype O4:K12 (Illinois, Indiana, Louisiana, Massachusetts, Montana, Nevada, New York, and Oregon); 12 (15%) isolates from ten states were serotype O3:K6 (Arizona, Colorado, Connecticut, Georgia,

Hawaii, Illinois, Louisiana, New Hampshire, Texas, and Utah); 10 (12%) isolates from four states were serotype O6:K18 (Alaska, Nevada, Oregon, Washington); and the remaining 40 isolates were one of 20 serotypes.

Outbreaks

One outbreak of *Vibrio parahaemolyticus* serotype O6:K18 was reported from Alaska in which 62 persons were ill (10 culture-confirmed) due to consumption of raw oysters harvested from Alaskan waters[1]. Individual case-reports from this outbreak were not submitted to COVIS and are not included in this summary.

References

1. McLaughlin JB, DePaola A, Bopp CA, Martinek KA, Napolilli NP, Allison CG, Murray SL, Thompson EC, Bird MM, Middaugh JP. Outbreak of Vibrio parahaemolyticus gastroenteritis associated with Alaskan oysters. N Engl J Med. 2005 Oct 6;353(14):1463-70.

Table 1: Isolates of toxigenic *V. cholerae,* 2004

State	Age	Sex	Onset	Suspected Exposure	Serogroup	Serotype
HI	44	F	1/9/2004	Exposure in the Philippines	*V. cholerae* O1	Ogawa
IL	65	M	2/10/2004	Exposure to raw seafood in Thailand	*V. cholerae* O1	Inaba
CA	48	F	4/7/2004	Exposure in India	*V. cholerae* O1	Inaba
HI	60	F	5/16/2004	Exposure to raw, imported seafood	*V. cholerae* O1	Ogawa
GA	50	M	7/27/2004	Exposure to oysters in Georgia	*V. cholerae* O141	--
GA	58	F	7/28/2004	Unknown	*V. cholerae* O141	--
AL	63	M	10/18/2004	Exposure to oysters in Florida	*V. cholerae* O141	--
NY	51	M	12/16/2004	Exposure in India	*V. cholerae* O1	Inaba

Table 2. Number of *Vibrio* isolates (excluding toxigenic *V. cholerae*) by species, complications and site of isolation in patients from Gulf Coast states, 2004

Vibrio Species	Patients		Complications[1]				Isolates		Site of Isolation			
			Hospitalized		Deaths				Stool	Blood	Wound	Other[2]
	N	(%)	n/N	(%)	n/N	(%)	N	(%)				
V. alginolyticus	7	(5)	3/6	(50)	0/6	(0)	7	(4)	0	0	4	3
V. cholerae (non-toxigenic)[3]	12	(9)	6/11	(55)	1/11	(9)	13	(9)	6	6	1	0
V. damsela	1	(1)	1/1	(100)	0/1	(0)	1	(1)	0	0	1	0
V. fluvialis	7	(5)	3/7	(43)	0/7	(0)	7	(5)	5	0	1	1
V. hollisae	1	(1)	0/1	(0)	0/1	(0)	1	(1)	1	0	0	0
V. mimicus	5	(4)	2/5	(40)	0/5	(0)	5	(4)	5	0	0	0
V. parahaemolyticus	27	(21)	13/26	(50)	1/24	(4)	28	(20)	19	1	6	2
V. vulnificus	60	(47)	52/59	(88)	19/53	(36)	66	(47)	1	40	20	5
Other	2	(2)	1/2	(50)	0/1	(0)	2	(1)	0	0	1	1
Species not identified	7	(5)	2/5	(40)	1/6	(17)	7	(5)	2	1	2	2
Multiple species[4]	1	(1)	1/1	(100)	0/2	(0)	4	(3)	0	2	2	0
Total	**130**	**(100)**	**84/124**	**(68)**	**22/117**	**(19)**	**141**	**(100)**	**39**	**50**	**36**	**16**

[1] Denominators indicate patients for whom information is known.
[2] Includes ear, eye, gall bladder, peritoneal fluid, sputum, leg tissue and unknown source.
[3] Non-toxigenic *V. cholerae*. Includes non-toxigenic *V. cholerae* O1 (1 isolates) and other non-toxigenic *V. cholerae* [non-O1 non-O139] (11 isolates).
[4] *V. parahaemolyticus* and *V. vulnificus* were isolated from the wound and blood of one patient

Table 3. Number of *Vibrio* isolates (excluding toxigenic *V. cholerae*) by species, complications and site of isolation in patients from non-Gulf Coast states, 2004

Vibrio Species	Patients		Complications[1]				Isolates		Site of Isolation			
			Hospitalized		Deaths				Stool	Blood	Wound	Other[2]
	N	(%)	n/N	(%)	n/N	(%)	N	(%)				
V. alginolyticus	37	(11)	7/35	(20)	1/33	(3)	37	(10)	2	2	17	16
V. cholerae (non-toxigenic)[3]	28	(7)	6/27	(22)	0/27	(0)	28	(8)	19	3	1	5
V. damsela	2	(1)	2/2	(100)	0/2	(0)	2	(1)	0	0	1	1
V. fluvialis	10	(3)	4/9	(44)	0/10	(0)	10	(3)	6	1	1	2
V. furnissi	2	(1)	1/2	(50)	0/2	(0)	2	(1)	1	0	1	0
V. hollisae	1	(0)	1/1	(100)	0/1	(0)	1	(0)	1	0	0	0
V. mimicus	4	(1)	0/4	(0)	0/4	(0)	4	(1)	3	0	0	1
V. parahaemolyticus	213	(61)	33/204	(16)	2/197	(1)	215	(60)	180	4	6	25
V. vulnificus	32	(9)	28/32	(88)	13/30	(43)	37	(10)	4	24	8	1
Other	1	(0)	0/1	(0)	0/1	(0)	1	(0)	1	0	0	0
Species not identified	15	(4)	5/15	(33)	0/15	(0)	15	(4)	5	1	1	8
Multiple species[4]	4	(1)	2/4	(50)	1/4	(25)	8	(2)	4	2	2	0
Total	**349**	**(100)**	**89/336**	**(26)**	**17/326**	**(5)**	**360**	**(100)**	**226**	**37**	**36**	**61**

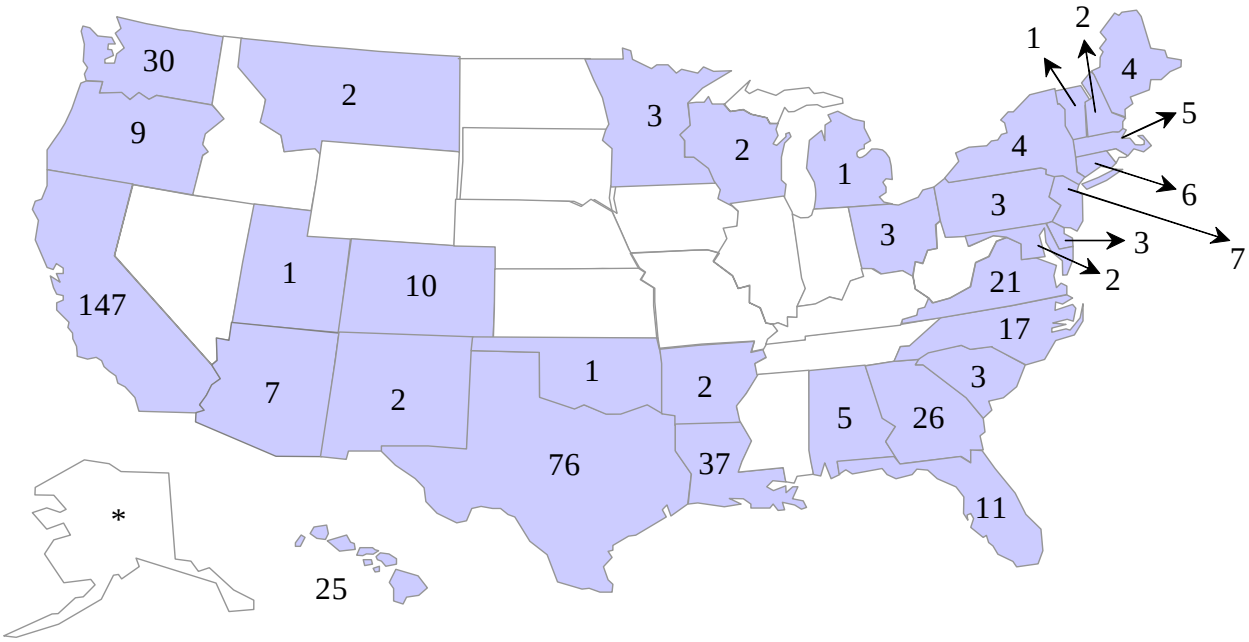
[1] Denominators indicate patients for whom information is known.
[2] Includes ear, urine, sputum, foot tissue, thigh tissue, endotracheal intubation, incision and unknown source.
[3] Non-toxigenic *V. cholerae*. Includes non-toxigenic *V. cholerae* O1 (2 isolates) and other non-toxigenic *V. cholerae* [non-O1 non-O139] (26 isolates).
[4] *V. cholerae* non-01, non-0139 and *V. parahaemolyticus* were isolated from the stool of one patient; *V. damsela* and *V. vulnificus* were isolated from the thigh wound of another patient; *V. cholerae* non-01, non-0139 and *V. mimicus* were isolated from the stool of a third patient; *V. fluvialis* and *V. furnissi* were isolated from blood of a fourth 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, 2004

	Mollusks			Crustaceans						
	Oysters	Clams	Mussels	Shrimp	Lobster	Crab	Crayfish	Other Shellfish[1]	Finfish[2]	Total
Ate (%)	81 (69)	3 (3)	0 (0)	12 (10)	0 (0)	6 (5)	2 (2)	6 (5)	8 (7)	118
% Ate raw	88	67	0	8	0	33	0	33	50	82

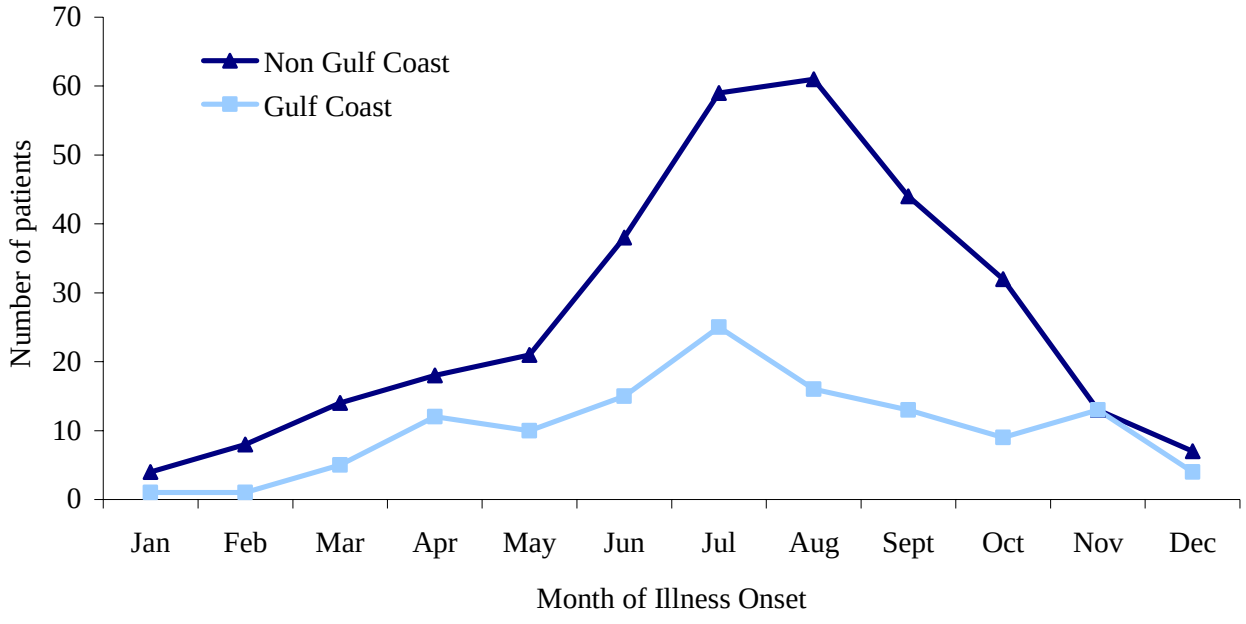
[1] Other shellfish reported: calamari, squid and scallops.
[2] Finfish reported: salmon, trout, catfish, tilapia, sushi, tuna, and eel.

Figure 1. Number of patients with *Vibrio* isolates (excluding toxigenic *V. cholerae*) of *Vibrio* illness by state, 2004 (N=479 patients)



* 62 cases of *Vibrio parahaemolyticus* from an outbreak during summer 2004

Figure 2. Number of patients with *Vibrio* isolates (excluding toxigenic *V. cholerae*), by month*, Gulf Coast states vs. other states, 2004 (N=475*)



*Onset date missing or unknown for 4 patients