Campylobacter and *Vibrio* infections on Guam

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Introduction

The initiation of routine use of TCBS in Guam medical laboratories resulted in dramatic changes in the epidemiologic profile of enteric diseases on the island. Prior to 1974, no cases of *Vibrio* infection had ever been reported on Guam but *Vibrio* infections have been reported every year since then (see Table 1). The most commonly encountered *Vibrio* species on Guam has been *V. parahaemolyticus* and investigation of both common-source outbreaks and individual infections caused by this organism have shown it to be associated with the ingestion of seafood.[1-3]

Campylobacter was isolated from patients on Guam and first reported in 1995 when a commercially available rapid laboratory test that detected this organism became available. Before then testing for *Campylobacter* was both complicated and labor intensive resulting in tests being run only upon special request.

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This paper discusses the availability of laboratory techniques that facilitate the identification of previously "rare" pathogens in Guam and showed that both *Campylobacter* and *Vibrio* bacteria are important causes of enteric disease. Campylobacteriosis attack rates are similar among the ethnic groups represented on Guam but are much higher among infants than other age-groups. Vibrio infections, in contrast, are apparently rare among infants and may occur most frequently among adults of those ethnic groups that are most likely to consume uncooked seafood. The trends of these infections in Guam demonstrate the importance of surveillance and appropriate laboratory services in the control of emerging infectious diseases in the small islands of the Pacific.

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Vibrio infections

In August of 1974, 6 laborers became ill after sharing locally caught fish fry pickled in a salt solution during their lunch break.[4] One person who had previously had a partial gastrectomy for treatment of ulcers required hospitalization and died after 9 days of treatment, the others had illnesses lasting from 6 hours to 6 days but recovered without being hospitalized. The hospital laboratory was unable to isolate any enteric pathogens from the hospitalized patient but when a specimen submitted to the laboratory of the Guam Department of Public Health and Social Services (DPH&SS) following autopsy was streaked on thiosulfate citrate bile salt sucrose (TCBS) agar, colonies resembling *Vibrio cholerae* were observed. Their identification was subsequently confirmed as *V. cholerae El Tor Ogawa* by the Centers for Disease Control, Atlanta.[4] Following this incident, the DPH&SS recommended that medical laboratories on Guam initiate the routine use of TCBS on all specimens submitted from patients with diarrhea.

Eighteen separate incidents of *V. cholerae El Tor* infection occurring on Guam have been identified; 4 of these incidents involved serotype *Inaba* and 14 were due to serotype *Ogawa*. Serotype *Inaba* infections have been associated with eating oysters in the Philippines, travel to Thailand, travel to Chuuk, and possible local transmission. Serotype *Ogawa* incidents have been associated with eating local fish (4 incidents, the most recent occurring in 1985), eating fish, shellfish, or crab imported from the Philippines to Guam (4 incidents), travel to the Philippines (4 incidents), one incident of local transmission in which tuna sashimi of unknown origin was suspect and one incident of local transmission in which a suspect vehicle was not identified.

Despite frequent introductions of *V. cholerae* to Guam, the island has never experienced an outbreak involving secondary spread from those initially infected. This suggests that

Table 1. Reported enteric infections by year, Guam, 1970 – 1996

Year	Salmonella	Shigella	Campylobacter	V.cholerae	NAG V.cholerae	arahaemolyticus	Other Vibrio*
1970	1	4	0	0	0	0	0
1971	4	0	0	0	0	0	0
1972	8	4	0	0	0	0	0
1973	10	11	0	0	0	0	0
1974	22	4	0	6	0	2	0
1975	75	18	0	0	0	117	0
1976	36	10	0	0	0	2	0
1977	89	24	0	1	0	22	0
1978	70	35	0	0	0	26	0
1979	89	14	0	0	23	0	
1980	126	30	0	0	0	21	0
1981	203	28	0	4	0	22	0
1982	168	49	0	2	0	25	1
1983	143	39	0	1	0	24	0
1984	251	90	0	0	2	32	0
1985	212	77	0	5	1	31	0
1986	213	162	0	2	1	39	1
1987	15	114	0	2	0	35	0
1988	129	72	0	1	1	48	0
1989	139	82	0	0	1	32	3
1990	105	130	0	1	0	26	1
1991	87	76	0	0	0	76	2
1992	64	165	0	0	0	19	0
1993	119	35	0	0	1	27	0
1994	76	33	0	1	2	20	1
1995	40	19	12	0	1	13	1
1996	39	43	23	1	0	11	1

***Identification of "Other" Vibrio •**

1982	V. alginolyticus (1)
1986	V. alginolyticus (1)
1989	V. alginolyticus (1), V. mimicus (1), V. vulnificus (1)
1990	V. alginolyticus (1)
1991	V. alginolyticus (1), Vibrio untypable (1)
1994	Vibrio untypable (1)
1995	V. vulnificus (1)
1996	Vibrio untypable (1)

Table 2. Mean annual age-specific enteric disease incidence rates,* Guam, 1995 – 1996

Age	*Salmonella*	*Shigella*	*Campylobacter*	*V. cholerae*	*NAG V. cholerae*	*V. parahaemolyticus*	Other Vibrio
< 1	427.66	23.76	154.43	0.00	0.00	0.00	0.00
1 – 4	53.09	110.26	32.67	0.00	0.00	0.00	0.00
5 – 14	3.94	25.61	11.82	0.00	0.00	0.00	0.00
15 – 24	13.53	11.84	5.08	0.00	0.00	3.38	0.00
25 – 44	9.34	5.60	3.74	.93	0.00	12.14	0.93
45 – 64	6.92	6.92	2.31	0.00	0.00	13.83	2.31
> 64	13.81	27.62	0.00	0.00	0.00	20.72	0.00
Total	**25.68**	**20.15**	**11.38**	**.33**	**0.00**	**7.80**	**0.65**

* *Cases per 100,000 population.*

Guam's sanitation and drinking water infrastructure are sufficiently developed to render the island resistant to cholera epidemics.

Campylobacter and *Salmonella* are similar in that animals, both wild and domestic, serve to propagate and spread these bacteria and it is generally assumed that *Campylobacter* and *Salmonella* infections most commonly result from the ingestion of contaminated food and drink.[4] While epidemiologic studies of common-source outbreaks support these conclusions, infants, the age-group most affected by both of these infections, are rarely involved in common-source outbreaks and may more commonly be infected by some other means.[5,6]

Although *Campylobacter* surveillance on Guam has a relatively short history, some general conclusions may still be drawn from the available data. As is the case with *Salmonella* infections, *Campylobacter* infections tend to affect infants more than any other age group (Table 2). In contrast, *Shigella* and *Vibrio* infections typically involve older age groups. This is not surprising since *Vibrio* infections have frequently been associated with eating raw or undercooked seafood, items unlikely to be in the diet of infants, and shigellosis is frequently spread person-to-person, a mode of infection which infants are less likely to be exposed to than older, more interactive, age groups.

Discussion

Campylobacter infections might better be termed "newly recognized" rather than "emerging" as they have most likely been present on Guam just as long as have salmonellosis or shigellosis. Continued surveillance of these diseases will not only facilitate the recognition of disease outbreaks in time to take effective action but will also identify distinctive epidemiologic features of each disease which should aid in their routine control.

V. parahaemolyticus surveillance may, indirectly, also serve as a measure of the effectiveness of cholera surveillance. Since this organism occurs in seas worldwide, it will likely be a common enteric disease pathogen wherever seafood is a popular food item. The absence of reports of *V. parahaemolyticus* infections from a country would suggest

Table 3. Mean annual enteric disease incidence rates* by ethnicity, Guam, 1995 – 1996

Ethnicity	*Salmonella*	*Shigella*	*Campylobacter*	*V. cholerae*	*V. parahaemolyticus*
Asian	31.5	13.5	9.0	0.0	22.5
Chamorro	26.2	19.2	11.5	0.0	6.2
Filipino	24.3	9.4	10.8	0.0	10.8
Micronesian**	12.2	89.1	12.2	4.1	0.0
White	24.1	9.6	14.4	0.0	4.8
Total	**25.7**	**20.2**	**11.4**	**0.3**	**7.8**

* *Cases per 100,000 population.*
** *Includes persons from Marshall Islands, Federated States of Micronesia, and Palau.*

Table 4. Outbreaks of Vibrio cholerae El Tor on Guam, 1974 – 1997

Outbreak number	Month Year	Ethnicity of patient	Confirmed/Total	Serotype	Suspected source of infection
1	Jul 1974	Filipino	2/6	Ogawa	Local raw fish
2	Jul 1977	Filipino	1/6	Inaba	Oysters from Philippines
3	Nov 1981	Chamorro	1/4	Inaba	Unknown (no travel)
4	Oct 1982	Filipino	2/2	Ogawa	Local raw fish
5	Aug 1983	Chuukese	1/1	Inaba	Travel to Chuuk
6	Apr 1985	U.S. tourist	1/1	Inaba	Travel to Thailand
7	Aug 1985	Chamorro/Filipino	1/5	Ogawa	Local raw fish
8	Aug 1985	Chamorro	1/1	Ogawa	Local raw fish
9	Oct 1985	Chamorro	1/1	Oawa	Fish from Philippines
10	Nov 1985	Chamorro	1/1	Ogawa	Crab from Philippines
11	Jul 1986	Filipino	1/5	Ogawa	Travel to Philippines
12	Jul 1986	Filipino	1/1	Ogawa	Fish from Philippines
13	Oct 1987	Filipino	1/1	Ogawa	Travel to Philippines
14	Dec 1987	U.S. tourist	1/1	Ogawa	Travel to Philippines
15	Jun 1988	Chamorro	1/1	Ogawa	Travel to Philippines
16	Aug 1990	Filipino	1/1	Ogawa	Crab from Philippines
17	Apr 1994	Filipino	1/1	Ogawa	Unknown (no travel)
18	Jan 1996	Palauan	1/1	Ogawa	Tuna sashimi (local?*)

** Tuna was obtained from friend working on a commercial fishing vessel upon its return to port. The region where the fish was caught is unknown.*

that surveillance for cholera in that country is inadequate since laboratory procedures that facilitate the identification of *V. cholerae* bacteria will also detect the presence of *V. parahaemolyticus*. For this reason disease monitoring agencies may wish to consider making *V. parahaemolyticus* a "reportable" disease.

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