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An Outbreak of Hepatitis A Associated with an Infected Foodhandler

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SYNOPSIS

Objective. The recommended criteria for public notification of a hepatitis A virus (HAV)-infected foodhandler include assessment of the foodhandler's hygiene and symptoms. In October 1994, a Kentucky health department received a report of a catering company foodhandler with hepatitis A. Patrons were not offered immune globulin because the foodhandler's hygiene was assessed to be good and he denied having diarrhea. During early November, 29 cases of hepatitis A were reported among people who had attended an event catered by this company. Two local health departments and the Centers for Disease Control and Prevention, in collaboration with two state health departments, undertook an investigation to determine the extent of the outbreak, to identify the foods and event characteristics associated with illness, and to investigate the apparent failure of the criteria for determining when immune globulin (IG) should be offered to exposed members of the public.

Methods. Cases were IgM anti-HAV-positive people with onset of symptoms during October or November who had eaten foods prepared by the catering company. To determine the outbreak's extent and factors associated with illness, the authors interviewed all case patients and the infected foodhandler and collected information on menus and other event characteristics. To investigate characteristics of events associated with transmission, the authors conducted a retrospective analysis comparing the risk of illness by selected event characteristics. To evaluate what foods were asso-

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ciated with illness, they conducted a retrospective cohort study of attendees of four events with high attack rates.

Results. A total of 91 cases were identified. At least one case was reported from 21 (51%) of the 41 catered events. The overall attack rate was 7% among the 1318 people who attended these events (range 0 to 75% per event). Attending an event at which there was no on-site sink (relative risk [RR] = 2.3, 95% confidence interval [CI] 1.4, 3.8) or no on-site kitchen (RR = 1.9, 95% CI 1.1, 2.9) was associated with illness. For three events with high attack rates, eating at least one of several uncooked foods was associated with illness, with RRs ranging from 8 to undefined.

Conclusion. A large hepatitis A outbreak resulted from an infected foodhandler with apparent good hygiene and no reported diarrhea who prepared many uncooked foods served at catered events. Assessing hygiene and symptoms is subjective, and may be difficult to accomplish. The effectiveness of the recommended criteria for determining when IG should be provided to exposed members of the public needs to be evaluated.

epatitis A occurs at high levels in the United States; in 1996, 31,032 cases were reported.1 Most disease occurs in the context of community-wide outbreaks, during which infection is typically transmitted person-to-person in households and extended family settings.^{2,3} Only approximately 2% to 3% of reported cases are connected with food or waterborne outbreaks. These outbreaks usually arise from food being contaminated during preparation by a foodhandler who is infected with hepatitis A virus (HAV), although some outbreaks have been attributed to foods contaminated prior to reaching the food service establishment.⁴⁻⁶ For example, a recent outbreak involving more than 200 cases of hepatitis A was associated with consumption of frozen strawberries contaminated during harvesting or processing.⁷

In general, good hygiene and handwashing are the cornerstones of prevention of HAV transmission in food service establishments. Foodhandlers should wash their hands after going to the bathroom and when entering food preparation areas. The peak of infectivity of a person infected with HAV occurs during the two weeks before the onset of illness. When a case of hepatitis A is recognized in a foodhandler, immune globulin (IG), which is effective in preventing hepatitis A if given within two weeks of exposure, should be administered to the foodhandler's co-workers to reduce the possibility of transmission. Factors to consider in assessing the risk of transmission to patrons include whether the infected foodhandler handled foods that were not subsequently cooked; whether he or she had diarrhea, which might increase the risk of transmission; and his or her hygienic practices. If a foodhandler with hepatitis A who handles high risk foods (foods that are handled and not subsequently cooked) during the infectious period is judged to have poor hygiene or has diarrhea, the Centers for Disease Control and Prevention (CDC) recommends considering notification of exposed members of the public to offer them IG if IG can be administered within two weeks of exposure.^{3,8}

Intensive public health efforts are required for the control of foodborne hepatitis A outbreaks. When a report is received of a foodhandler with hepatitis A, health department staff must respond quickly. In general, this involves inspecting the facility and interviewing the foodhandler to assess his or her food handling technique, hygienic practices, and symptoms. Sometimes a home visit is made to get a better picture of the foodhandler's hygienic practices. If it is determined that IG should be offered to exposed members of the public, arrangements must be made to notify and administer it to a large number of people within a short period of time.

On October 18, 1994, a foodhandler at a catering company in northern Kentucky (Caterer A) developed gastrointestinal symptoms and left work because of illness. He visited an emergency department on the following day and was clinically diagnosed with hepatitis A. He visited a physician six days later, who serologically confirmed his case of hepatitis A and reported it to the health department.

Over the next several days, officials of the Northern Kentucky Independent Health Department visited the catering company and interviewed the foodhandler to determine what control measures were necessary. No violations of codes or regulations had been identified by health department staff during a routine inspection of Caterer A in June 1994, and no violations were found during the investigation conducted on October 27. All of the other employees of Caterer A were tested for antibodies to HAV (anti-HAV), and all received IG. Although the foodhandler had prepared numerous high risk foods (such as uncooked vegetables and other cold foods), because his hygiene was judged to be good and he reported that he did not have diarrhea, the health department decided not to offer IG to those who had attended events at which the food was provided by Caterer A.

Thirty-two cases of hepatitis A were reported to the Northern Kentucky and Cincinnati Health Departments during the first three weeks of November. Of these, 29 involved people who had attended an event in October catered by Caterer A. Therefore, the two health departments and the CDC, in collaboration with the two state health departments, undertook an investigation to determine the extent of the outbreak, to identify the event characteristics and foods associated with illness, and to investigate the apparent failure of the criteria for determining when IG should be offered to exposed members of the public.

METHODS

Epidemiologic investigation. For this investigation, cases were defined by three criteria: having immunoglobulin M (IgM) antibodies to HAV (being anti-HAV–positive), a marker of acute infection; onset of symptoms during the months of October or November 1994; having eaten foods prepared by Caterer A.

Health department staff collected demographic and clinical information for each of the 91 cases identified. An infectious disease nurse interviewed the infected foodhandler, asking about symptoms and food handling practices. The nurse contacted the diagnosing physician and questioned him regarding the foodhandler's symptoms and hygiene.

The owner of Caterer A supplied a list of all events that took place during the three weeks before the foodhandler became ill for which the infected foodhandler prepared food, menus for each such event, the number of people served, and the telephone number of a contact person. We verified the number of people who attended each event by speaking with an organizer of the event.

Environmental investigation. On December 5, 1994, two of the present authors (MSM and VP) visited Caterer A and assessed food preparation, serving, and storage procedures and examined event menus. The same kitchen was used to prepare foods for a restaurant operated by Caterer A and for catered events.

Event characteristics. To identify characteristics of catered events associated with illness, we conducted a

retrospective analysis comparing the risk of illness by selected event characteristics.

Retrospective cohort study. We selected four events that had the highest attack rates and involved a large number of people for a more detailed study. We conducted telephone interviews with all those who had attended these four events, questioning them about foods eaten at the event, subsequent illness, food preferences, and other risk factors such as international travel.

Data analysis. To assess possible associations between certain characteristics of catered events or eating certain foods and illness, we calculated attack rates (percentage of people reporting symptoms following a specific exposure, rounded to the nearest whole number) and relative risks (RR). The 95% confidence intervals (95% CI) and exact chi-square statistics were calculated using Epi Info, Version 6.⁹ We calculated the lower bound of the 95% CI for undefined relative risks according to the method of Martin and Austin.¹⁰

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Epidemiologic investigation. In total, we identified 91 cases of hepatitis A among residents of northern Kentucky and southern Ohio who reported having eaten food prepared by Caterer A; in every case, onset of symptoms was from October 27 through November 27, 1994 (see Figure). Eighty-four people had attended an event catered by Caterer A from October 2 through October 21, and seven had eaten at the restaurant operated by Caterer A. The earliest event associated with a reported case occurred on October 2.

Of a total of 41 events attended by 1318 people, about half (21) resulted in at least one reported case; The overall attack rate was 7% of people attending catered events (range 0 to 75% per event).

The mean age of case patients was 42.6 years; 55% were male. Most (85%) reported jaundice, 69% reported nausea and vomiting, 63% reported fever, 45% reported anorexia, and 36% reported abdominal pain. The mean incubation period was 30.7 days (range 18 to 48 days). None reported a history of international travel, contact with a person with hepatitis A, or other specific risk factors for hepatitis A.

Environmental investigation. The infected foodhandler, working for Caterer A, was solely responsible for preparing food for 38 of the 41 events during the first

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characteristics. Attending an event at a site that lacked a kitchen (RR = 1.9; 95% CI 1.1, 2.9) or a site that lacked a sink (RR =2.3; 95% CI 1.4, 3.8) were associated with illness (Table 1). The risk of illness was no higher for events at which two or more uncooked foods were served than for events at which only one uncooked food was served. The

three weeks of October. When time permitted, he also delivered food from the caterer's kitchen and served food at the events. He reported that he routinely washed his hands with soap and dried them with paper towels after going to the bathroom and before preparing food.

During very busy periods, estimated by the employer to be 10 days during this time, an assistant was hired, who prepared cold foods, cutting fresh fruit and vegetables, preparing pasta salad, and slicing cheese and deli meats. The specific events for which the assistant prepared foods could not be ascertained; however, he and all other Caterer A employees other than the infected individual were found by health department officials to be IgM anti-HAV negative.

The infected foodhandler described the following food handling practices: Fresh fruit was sliced on clean surfaces and immediately refrigerated in plastic containers. Vegetables were sliced and stored in ice water. Blocks of cheese were used to prepare cheese trays, and the blocks were then rewrapped and placed in the refrigerator. The vegetable dip and the sauce for herb chicken were prepared in bulk, and the remainder was refrigerated for later use. No gloves were used. Fruit, cheese, and lettuce prepared for catered events were sometimes served to patrons in Caterer A's restaurant.

Event characteristics. We compared the risk of illness among people attending events with certain characteristics to the risk among people attending events without these risk was no higher when a vegetable, fruit, or cheese tray was served than when no tray was served. The risk of illness did not differ for luncheons versus other types of events or between events held in the first two weeks of October and those held during the third week of October (the week during which the foodhandler became ill).

Retrospective cohort study results. At three of the four events chosen for further study (Events A, B, C), uncooked foods were associated with illness (Table 2). Thirteen uncooked foods were served at event A, but only eating pineapple was associated with illness (RR = 10.0; 95% CI 1.4, 100). For event B, eating any of the uncooked foods except cucumber was associated with illness, with the highest attack rates among those who ate gouda cheese, the vegetable dip, or celery (RR = undefined for each), 95% CI 2.2, ∞). Eating the only uncooked food served at event C (salad) was associated with illness (RR = 8.3, 95% CI = 1.1, 50.0). Caterer A prepared three meals over three days for Event D; no single food was associated with illness.

$D \hbox{\rm I} s c u s s \hbox{\rm I} o n$

This report documents a large outbreak involving multiple events and many uncooked foods prepared over a three-week period by a single infected foodhandler. The outbreak was unusual in that when it was first evaluated by the health departments, the risk of transmission

	Number of events with this characteristic	Number of people attending	Attack rate		
Characteristic			Percent	Relative risk	95% CI
Number of uncooked foods served					
1	. 32	1149	6	1.92	0.78, 4.69
≥2	. 5	167	3		
Kitchen on-site					
No	. 25	625	7	1.85	1.13, 2.87 ^a
Yes	. 12	691	4		
Sink on-site					
No	. 6	181	11	2.29	1.39, 3.78 ^a
Yes	. 31	1135	5		
Timing of event					
First week in October	. 15	602	8	1.96	0.95, 4.06
Second week in October	. 14	525	3	0.63	0.27, 1.48
Third week in October	. 8	189	4	referent	
^a Association between the selected characteristic	c and becoming ill sig	nificant at the $P < 0.0$)5 level		
CI = confidence interval					

Table 1. Relative risk of illness by selected event characteristics, Kentucky and Ohio outbreak of hepatitis A, October 1994 (N = 37 catered events)

appeared to be low, and the health department determined that an announcement offering IG to exposed patrons was not necessary. In our further epidemiologic analyses, we found that serving uncooked foods and lack of a kitchen or sink at the site of the event were associated with an increased risk of illness.

The situation was initially assessed by the health departments as posing a low risk of transmission primarily because the foodhandler denied having diarrhea and was considered to have good hygienic practices. These practices, especially handwashing, have been shown to limit the spread of enterically transmitted diseases in day care centers, health care facilities, and restaurants.¹¹⁻¹³

It is not clear why transmission of hepatitis A occurred in this situation. The foodhandler may in fact have had diarrhea; one of his physicians subsequently reported that he gave a vague history of intermittent mild diarrhea. In the absence of diarrhea, factors that facilitated transmission may be related to the large number of uncooked, high risk foods that the infected foodhandler prepared, his level of infectivity, or unrecognized poor hygienic practices.

The recommended criteria for determining the risk of HAV transmission when an infected foodhandler is identified were developed by the CDC during the early 1980s, based on a review of the epidemiologic characteristics of 20 reported foodborne outbreaks during 1968–1980.⁸ These criteria are not standardized, and some are subjective (for example, level of hygiene) or self-reported (for example, frequency of handwashing, presence of diarrhea) and therefore difficult to evaluate. Although the relative infrequency of outbreaks associated with infected foodhandlers when these criteria are followed suggests that they are reasonably sound, their effectiveness needs to be evaluated.

Little information is available about how the recommended criteria are applied. State and local governments may have regulations regarding inspection of food service establishments, foodhandler education and training, and practices such as handwashing and glove use. Specific methods used to evaluate the risk of transmission from an infected foodhandler may be included in regulations or local health department policies and procedures; however, the level of detail of these policies and procedures and the stringency and consistency with which they are applied may vary. One of the two local health departments involved in our investigation had a detailed fivepage written policy specifically devoted to evaluating and managing an infected foodhandler, while this issue was covered in one paragraph in the other health department's guidelines. A better understanding of how local health departments assess the risk of transmission from

Table 2. Relative risk of illness, by selected foods, Kentucky and Ohio outbreak of hepatitis A, 1994

Event A: October 4, 1994; n = 21 people attending

Food	People eating/not eating the selected food		Attack rate		
	Number	Percent	Percent	Relative risk	95% Cl
Pineapple					
Yes	6	29	67	10.0	1.4, 100.0 ^a
No	15	71	7		
Strawberries					
Yes	9	43	44	5.26	0.71, 33.3
No	12	57	8		
Vegetable dip					
Yes	10	48	40	4.35	0.58, 33.3
No	H	52	9		
Broccoli					
Yes	10	48	40	4.35	0.58, 33.3
No	11	52	9		
Honeydew					
Yes	7	33	43	3.03	0.64, 14.3
No	14	67	14		

Event B: October 21, 1994; n = 32 people attending

Food	People eating/not eating the selected food		Attack rate		
	Number	Percent	Percent	Relative risk	95% CI
Gouda cheese					
Yes	14	44	43	Undefined	2.22, ∞ ^a
No	18	56	0		
Vegetable dip					
Yes	14	44	43	Undefined	2.22, ∞ ^a
No	18	56	0		
Celery					
Yes	14	44	43	Undefined	2.22, ∞ ^a
No	18	56	0		
Carrots					
Yes	19	56	32	Undefined	I.2, ∞ ^a
No	13	41	0		
Cucumber					
Yes	7	22	43	3.57	0.92, 14.3
Νο	25	78	12		
Quiche					
Yes	14	44	29	2.56	0.55, 12.5
No	18	56	Н		

Table 2 (continued)

Event C: October 4, 1994; n = 28 people attending

Food	People eating/not eating the selected food		Attack rate		
	Number	Percent	Percent	Relative risk	95% CI
Salad					
Yes	13	46	54	8.30	1.14, 50.0 ª
No	15	54	7		
Beans					
Yes	19	68	32	1.43	0.35, 5.56
No	9	32	22		
Chicken					
Yes	12	43	25	0.80	0.24, 2.70
No	16	57	31		
BBQ ribs					
Yes	23	82	26	0.65	0.18, 2.33
No	5	18	40		
Potatoes					
Yes	22	79	23	0.45	0.15, 1.39
No	6	21	50		

Event D: October 4-6, 1994; n = 23 people attending

Food	People eating/not eating the selected food		Attack rate		
	Number	Percent	Percent	Relative risk	95% CI
Chicken salad					
Yes	17	74	47	Undefined	0.74, ∞
No	6	26	0		
Cantaloupe (Oct. 5)					
Yes	19	83	42	Undefined	0.36, ∞
No	4	17	0		
Honeydew (Oct. 5)					
Yes	19	83	42	Undefined	0.36, ∞
No	4	17	0		
Potato salad (Oct. 6)					
Yes	19	83	42	Undefined	0.36, ∞
No	4	17	0		
Strawberries (Oct. 4)					
Yes	16	70	44	3.03	0.46, 20.0
No	7	30	14		

^aAssociation between eating the selected food and becoming ill significant at the P < 0.05 level

CI = confidence interval

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infected foodhandlers and the outcome of these assessments would be helpful in evaluating the effectiveness of the recommended criteria and determining if revisions are needed.

There are two useful lessons from this investigation for health departments investigating cases of hepatitis A in foodhandlers. First, report of this case was delayed by six days because the diagnosing physician did not notify the health department. Health care providers should be educated regarding the importance of prompt reporting of hepatitis A cases, especially if the patient is a foodhandler. Second, uncooked foods prepared by the infected foodhandler, stored, and served at an event after he stopped working, were associated with illness. Health departments and food service establishments should be aware of this possibility.

Our investigation had several limitations. First, we obtained detailed food histories from participants at only four events. Second, when examining possible associations between the characteristics of events and illness, as shown in Table 1, we considered whether uncooked foods were served, not whether people actually ate them. This may have limited our ability to assess any associations between uncooked foods and illness. In addition, we could not determine for which events the assistant helped prepare foods or at which events the infected foodhandler prepared foods but did not serve them, possibly important determinants of attack rates.

Hepatitis A vaccine was first licensed in the United States in 1995, and in 1996 the Advisory Committee on Immunization Practices (ACIP) made recommendations regarding its use.³ The ACIP did not recommend routine hepatitis A vaccination of foodhandlers because few reported hepatitis A cases are associated with transmission from infected foodhandlers. In addition, there are no data to indicate that foodhandlers are at increased risk of infection because of their occupation. Therefore, the determination of whether to vaccinate foodhandlers essentially rests on economic considerations. Although cost-effectiveness has not been evaluated extensively, one study suggested that, from a restaurant owner's perspective, vaccination was not likely to be economical.¹⁴ Additional cost-effectiveness analyses are needed, including analyses from a county health department's and societal perspective.

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