ACUTE COMMUNICABLE DISEASE CONTROL

SPECIAL STUDIES REPORT
1998

County of Los Angeles
Department of Health Services

Public Health Programs
Disease Control Programs

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AN INTERNATIONAL OUTBREAK OF SHIGELLOSIS ASSOCIATED WITH PARSLEY

During the first week of August 1998, the Acute Communicable Disease Control Unit (ACD) was informed of two restaurant-associated outbreaks of *Shigella sonnei* (*S. sonnei*) in Los Angeles County (LAC). After the initial investigation, no single food item or foodhandler was implicated at either restaurant. On August 26, 1998, ACD learned of two restaurant-associated outbreaks of *S. sonnei* being investigated in Minnesota with exposure dates similar to those in the LAC outbreaks. The suspected vehicle of transmission was fresh parsley. ACD worked with Minnesota (MN) and the Centers for Disease Control and Prevention (CDC) to determine if parsley might be associated with the LAC outbreaks. By early September, similar restaurant-associated outbreaks of *S. sonnei* in late July and early August were reported in Massachusetts, Florida and Canada. Isolates from five of these outbreaks had pulsed-field gel electrophoresis (PFGE) patterns indistinguishable from those identified in the MN outbreaks.

OUTBREAK A

The first LAC outbreak investigation was initiated following a report of illness in two persons who ate at a party held at Restaurant A. Among the eight persons who attended the party, five became ill afterward.

A confirmed case was defined as a patron of Restaurant A during the incubation period with a stool specimen positive for *S. sonnei*. A suspect case was defined as a patron with three or more loose stools in a 24-hour period, or diarrhea and fever. A control was defined as an asymptomatic patron.

Interviews were conducted using a standardized questionnaire, and additional case-finding methods were initiated. Stool specimens or isolates from symptomatic persons with exposure to Restaurant A were requested for submission to the Public Health Laboratory (PHL). All isolates were confirmed as *S. sonnei* and subtypes were identified by PFGE. The Food and Milk Program (F&M) of Environmental Health inspected the restaurant on August 6 and September 4, 1998. All foodhandlers were interviewed and stool specimens were collected. Data was analyzed using Excel and EpiInfo version 6.

Of the 8 individuals in the group who ate at Restaurant A, three were confirmed cases and two were suspect cases. Onset of illness in all five occurred approximately 1.5 days after eating at the restaurant. Reported symptoms included diarrhea (100%), fever (100%), headache (80%), cramps (60%) and vomiting (20%). Individuals had ordered their own entrees and shared appetizers consisting of vegetables and dip (100%), crab cakes (80%), and mussels (60%). After the initial investigation, no single food item was significantly

associated with illness.

Active case finding revealed four additional patients with *S. sonnei* who reported eating at Restaurant A on July 31. Three were confirmed and one was a suspect case. Onset of illness was August 1-2, 1998. There were no common menu items eaten by the four individuals. No new cases were reported after August 16, 1998.

Inspection by F&M found no major violations at Restaurant A. All 27 foodhandlers denied illness and had stool specimens negative for *S. sonnei*. In an unmatched comparison with 10 asymptomatic dining companions, the 10 ill patrons were 32 times more likely to have eaten foods containing chopped, uncooked parsley (OR=32.0, 95% CI=1.8, 1381.4).

Four case isolates submitted to the PHL were confirmed as *S. sonnei*. PFGE results indicated that the subtypes of the four isolates were indistinguishable from each other, from the second LAC outbreak (Outbreak B), and the Minnesota, Massachusetts and Canadian *S. sonnei* outbreaks.

The data analysis for Outbreak A implicated fresh parsley as the source of transmission for this outbreak. The association between illness and consumption of a food item containing fresh parsley was statistically significant. The parsley used by the restaurant was not able to be traced to the same farm as the other outbreaks, possibly due to missing records or poor recall by restaurant staff (who were interviewed six weeks after the outbreak). PFGE results also indicated that this outbreak was part of an international shigellosis outbreak.

OUTBREAK B

The second outbreak investigation was initiated following a report of foodborne illness involving nine persons who had attended a birthday party at Restaurant B on July 30, 1998. One person had been diagnosed with shigellosis, group D.

Case definitions were established as in Outbreak A, a standardized questionnaire was developed and a list of party attendees was requested from one of the organizers. Ill party attendees were asked to submit stool specimens to the PHL. Data was analyzed using EpiInfo version 6.

F&M conducted an initial inspection of Restaurant B on August 19, and a joint inspection with ACD on September 17, 1998. All employees were asked about diarrheal illness and foodhandlers were required to submit stool specimens.
Active surveillance for additional cases was initiated. PFGE was performed on all *S.*

sonnei isolates received by the PHL. Cases with isolates indistinguishable from the outbreak strain, or geographic proximity to Restaurant B, were interviewed by ACD. Interviews were obtained from all 16 persons who attended the party. There were 4 confirmed and 5 suspect cases. Onset of illness ranged from 22 to 78 hours after eating. The median age was 30 years (range 22-39) and 56% of cases were female. Reported symptoms included diarrhea in 9 (100%), bloody diarrhea in 3 (33%), fever in 8 (89%), cramps in 8 (89%), myalgia in 8 (89%), nausea in 7 (78%), headache in 6 (67%) and vomiting in 3 (33%). There were no other common meals or exposures for those ill.

All persons at the party shared appetizers served on large platters. Food items shared by a majority of ill persons were fried pita bread (100%), humus (100)%, stuffed grape leaves (100%), baba ghannouj (89%), tabbouleh (89%) and falafel (89%). Two persons were excluded from the analysis because they did not meet the case definition. Analysis showed that no one food item was significantly associated with illness. This may have been due to the small number of subjects, the limited food items eaten by almost all persons and the fact that parsley was used on many food items.

Of the four confirmed cases, isolates from two were available for PFGE testing by the PHL. When compared with isolates from LAC Outbreak A as well as isolates from the Minnesota outbreaks, the patterns were found to be indistinguishable, whereas non-outbreak isolates showed variable patterns.

The inspection of Restaurant B conducted on August 19 found numerous violations, including improper food storage/holding temperatures, storage of raw chicken above processed foods, lack of handwashing between tasks, use of food preparation sinks for handwashing, and flies in the food preparation area. None of the nine foodhandlers had reported any illness or had been on sick leave. All foodhandlers submitted stool specimens and were negative for *Shigella* spp. There were no common foodhandlers or suppliers for the two outbreak restaurants.

A second visit was made to Restaurant B on September 17 to examine the use of parsley and to check invoices for a traceback. Only curly parsley had been used. Because of better cold storage facilities, the parsley was delivered to a nearby restaurant (belonging to the same owner), and brought to Restaurant B daily. There it was washed with cold water and then returned to the original box rather than a clean container. The parsley was then refrigerated until being chopped by hand for use in, or to be sprinkled over, other foods.

In conjunction with a traceback of parsley supplied to Restaurant B to its point of entry into LAC conducted by F&M, ACD contacted the Minnesota Department of Health and the

CDC to compare details of the outbreaks and coordinate investigative efforts. A nationwide traceback to the growers of all outbreak-associated parsley was conducted through the cooperation of local health departments, the California Department of Health Services' Food and Drug Branch and the FDA.

Although analysis of the data from Outbreak B did not implicate a particular food item, PFGE laboratory evidence, timing of the outbreak with other similar shigellosis outbreaks, and the prodigious use of parsley similar to the other outbreaks all lend strength to the argument that parsley was the source of the *S. sonnei* infections.

OTHER LAC *S. SONNEI* CASES WITH PARSLEY EXPOSURE

Review of *S. sonnei* reports during August and September 1998 revealed one additional case associated with a meal at Restaurant B in the week prior to onset. The isolate was indistinguishable by PFGE from the outbreak pattern. Two other *S. sonnei* cases with isolates indistinguishable from the outbreak pattern were interviewed and reported eating parsley from different sources in the week prior to onset.

Restaurant outbreaks due to shigellosis are rare in Los Angeles County**.** Shigellosis is usually spread by person-to-person contact, although ill foodhandlers may be a source. In this outbreak, there was no evidence of ill foodhandlers prior to the outbreak, and all foodhandlers from the restaurant tested negative for *Shigella spp*.

OTHER INVESTIGATIONS

In addition to these two LAC outbreaks, six additional restaurant-associated outbreaks of *S. sonnei* were identified (two in Minnesota, two in Canada, one each in Massachusetts and Florida). Isolates from the outbreaks in LAC, Massachusetts and Canada matched the Minnesota outbreak PFGE pattern. In the Florida outbreak, there was one culture-confirmed case, but the isolate was not available for PFGE testing.

TRACEBACK AND ENVIRONMENTAL INVESTIGATIONS

To determine the source of parsley for the seven outbreaks that were linked by PFGE, state and provincial health departments, the CDC, the FDA and the Canadian Food Inspection Agency conducted traceback investigations. Farm A in Baja California, Mexico, was a possible source of parsley in six of the seven outbreaks. Field investigations of Farm A found that the water that supplied the packing shed was unchlorinated and vulnerable to contamination. This water was used to chill the parsley in a hydrocooler immediately after harvest and to make ice for packing the parsley for transport. Because

the water in the hydrocooler was recirculated and unchlorinated, bacterial contaminants could have survived in the water or on the parsley. Farm workers and village residents served by the water system reported using bottled water or water from other sources. Workers had limited hygiene education and limited sanitary facilities available on the farm at the time of the outbreak.

Foodhandlers at six of the eight implicated restaurants reported washing the parsley before chopping it. Usually parsley was chopped in the morning and left at room temperature, sometimes until the end of the day, before being served to customers.

LABORATORY INVESTIGATION

The Minnesota Department of Health laboratory, which has tested isolates of *S. sonnei* routinely since 1985, identified a previously unrecognized PFGE pattern of *S. sonnei* and a closely related pattern that differed from the two outbreaks in Minnesota by a single band. The pattern was distributed to other laboratories through PulseNet, the national molecular subtyping network for foodborne disease. In Minnesota, and at CDC, isolates available for testing from all seven outbreaks were indistinguishable from the previously unrecognized PFGE pattern. Isolates from the seven outbreaks were resistant to ampicillin, trimethoprim-sulfamethoxazole, tetracycline, sulfasoxazole and streptomycin.

Investigators at the University of Georgia Center for Food Safety and Quality Enhancement conducted studies to determine the effects of temperature and handling on the growth and survival of *S. sonnei* on parsley. Colony-forming units of *S. sonnei* per gram (cfu/g) decreased by approximately 1 log per week on parsley, whether chopped or whole, under refrigeration (39° F[4° C]). In contrast, *S. sonnei* counts increased on parsley kept at room temperature (70° F [21°C]). On whole parsley, the increase was limited to 1 log cfu/g during the first 1-2 days, but on chopped parsley a 3 log cfu/g increase was observed within 24 hours.

In conclusion, two apparently sporadic LAC shigellosis outbreaks were determined to be part of a large nationwide outbreak of *Shigella sonnei* associated with fresh parsley. New information-sharing systems, Promed and PulseNet, allowed communication and coordination of public health departments from several states and Canada to investigate and uncover the source of this outbreak.

AN OUTBREAK OF ENDOTOXIN-LIKE REACTIONS ASSOCIATED WITH SINGLE DAILY DOSED INTRAVENOUS GENTAMICIN--LOS ANGELES, 1998

On July 30, 1998, the hospital epidemiology department at a large, private acute care hospital in Los Angeles notified the Los Angeles County (LAC) Department of Health Service's, Acute Communicable Disease Control unit (ACDC) about several patients who had severe chills following the receipt of intravenous (IV) gentamicin. Chills developed within three hours after IV gentamicin infusion and were variably accompanied by fever, tachycardia, and/or a decrease of $\geq$20 mm Hg systolic blood pressure (BP). This type of reaction has been previously reported from outbreaks as a complication of hemodialysis, or in experimental studies, and has been attributed to the effect of endotoxins.

When a preliminary investigation identified 20 patients with reactions between April 30 and July 26, 1998, the Hospital Infections Program, Centers for Disease Control and Prevention (CDC), was invited to assist in the investigation. The investigation was initiated to describe the demographic and clinical characteristics of patients with gentamicin-associated reactions, to assess the risk factors for gentamicin-associated reactions, and to determine the cause of these reactions.

A case-patient was defined as any patient at this hospital aged $\geq$28 days who had documented chills, rigors or shivering within three hours after the start of intravenous gentamicin from December 1, 1997 through August 25, 1998. Three retrospective cohort studies, and assays of gentamicin vials for bacterial growth and endotoxin levels were conducted.

Our analysis included 220 gentamicin-treated patients: 152 in the epidemic period, 20 in the post-epidemic period, and 48 in the pre-epidemic period. Gentamicin administered in the pre-epidemic and epidemic period was manufactured by Fujisawa Pharmaceuticals, Inc., and in the post-epidemic period by Schein Pharmaceuticals, Inc. Patients received gentamicin in a multiple daily dosed (MDD; N=79) or single daily dosed (SDD; N=141) regimen. Twenty-four (11%) of the 220 patients met the case definition: 22 in the epidemic period, none in the post-epidemic period, and 2 in the pre-epidemic period. The median age of case-patients was 37 years (range: 18-69), and 17 (71%) were women. From April 30 until June 15, 1998 (i.e., epidemic period), reactions among SDD patients (20/73 [27%]) were more likely than among MDD patients (2/79 [3%]; relative risk =10.8; 95% confidence interval=2.6-44.7). Furthermore, attack rates (AR) among SDD-treated patients (20/73 [27%]) in the epidemic period (when Fujisawa-manufactured gentamicin was used) were significantly higher ($p<0.01$) compared to SDD patients in the post-epidemic period (0/20 [0%]; i.e., when Schein-manufactured gentamicin was used) and the pre-epidemic period (2/48 [4%]; i.e., when Fujisawa-manufactured gentamicin used was from different lots than

in the epidemic period). Case-patients treated with SDD gentamicin received a median dosage of 6.2 mg gentamicin/kg body weight (BW). Eighteen Fujisawa-manufactured gentamicin vials from lots used during the epidemic period were tested and contained a median of 0.49 endotoxin units (EU)/mg gentamicin (range 0.1-1.01 EU/mg). We estimated that patients receiving 6.2 mg gentamicin/kg BW would receive between 0.6 and 6.3 EU/kg BW. Doses above 5 EU/kg BW would exceed the experimentally derived human threshold for endotoxin.

We concluded that this outbreak of endotoxin-like reactions was caused by the lots of Fujisawa-manufactured gentamicin administered during the epidemic period. The calculated endotoxin load of SDD case-patients is consistent with endotoxin-mediated reactions. Use of SDD medications may place patients at greater risk of receiving doses of endotoxin above the threshold for humans. While endotoxin levels in the vials did not exceed U.S. Pharmacopeia limits (1.7 EU/mg gentamicin based on MDD dosing), this limit may need to be reassessed since use of SDD gentamicin is likely to become increasingly popular.

AN OUTBREAK OF *ENTEROBACTER CLOACAE* BLOODSTREAM INFECTIONS DUE TO INTRINSICALLY CONTAMINATED SALINE SOLUTION

BACKGROUND

Intrinsic contamination of parenteral solutions is an uncommon cause of nosocomial bloodstream infections. Between November 2 and November 5, 1998, 11 children developed clinical sepsis within 24 hours after receiving care at a hematology-oncology outpatient clinic/day hospital at a local hospital (Hospital A).

METHODS

A case-patient was defined as any child who developed fever and/or chills within 24 hours after receiving care at the Hospital A hematology-oncology clinic/day hospital between November 2 and November 5, 1998. Medical records of all patients seen in the clinic/day hospital during that time were reviewed to look for common exposures; parents of all children receiving hematology/oncology care at Hospital A were contacted to look for additional cases. We observed procedures in the clinic and collected samples of opened and unopened parenteral solutions and medications and swabs of environmental surfaces in the clinic and day hospital treatment rooms. *E. cloacae* isolates were genotyped in the Public Health Laboratory (PHL), using pulsed-field gel electrophoresis (PFGE).

RESULTS

Of the 57 patients reviewed, 11 (19.3%) met the case definition. The median age was 5 years (range 1-15 years). All had underlying hematologic or solid tumor malignancies. Seven (64%) were female. All affected children recovered without sequelae related to the infection. All case-patients had central intravascular catheter access lines that were used during their clinic visit for blood draws (n=11), receipt of chemotherapy or other medications (n=6), or transfusion of blood products (n=3). After access, intravascular catheters were flushed per protocol with 10 ml of sterile 0.9% sodium chloride packaged in pre-filled flush syringes distributed by CAPS (Braun-McGaw, Detroit, Michigan). The entire supply of heparin and normal saline products was removed from the clinic/day hospital on the morning of November 5, pending results of the investigation. *E. cloacae* was isolated from the blood of 10 of 11 case patients and from two unopened 10 ml. pre-filled saline flush syringes. *E. cloacae* isolates from case-patients were indistinguishable by PFGE from *E. cloacae* isolated from the unopened saline syringes. No additional cases were identified at Hospital A after the implicated product was removed from circulation.

EPIDEMIOLOGY OF SPORADIC NONPERINATAL LISTERIOSIS: WHAT IS THE ROLE OF CANCER?

Listeriosis occurs more frequently in persons with impaired cell-mediated immunity. Persons with cancer are known to be at increased risk for listeriosis. This study investigated the role of cancer in the epidemiology of sporadic nonperinatal listeriosis reported to the Los Angeles between 1986 and 1997.

A case of sporadic nonperinatal listeriosis was defined as a clinically compatible and culture-confirmed case of listeriosis that was not associated with pregnancy or an outbreak. Surveillance staff contacted hospitals and laboratories in LAC semi-monthly to identify all cases. Cases were interviewed for risk data such as food history, underlying medical conditions, and medications. Steroid usage was defined as any steroid preparation mentioned one month prior to the onset of listeriosis. Cases with a history of cancer were matched with the Southern California Cancer Registry, and information on cancer type and onset date was verified. Cases were geocoded by address and aggregated into census tracts.

During the 11-year study period, a total of 394 nonperinatal listeriosis patients were identified. Twenty-five percent of the patients had a history of cancer. The most frequent types of cancers were lymphomas (18%) and myelomas or leukemias (16%). One third of cancer patients developed listeriosis within one year of cancer diagnosis. Cancer patients were not different from non-cancer patients in age (63 vs. 59 years old), gender ratio (male vs. female: 1 to 0.6), or history of Mexican-style cheese or soft cheese ingestion. However, cancer patients with Listeria were more likely than non-cancer patients to be White (74% vs. 53%, p=0.001), and to have a higher case-fatality ratio (45% vs. 27%, p=0.001). Chemotherapy or radiation treatment in the month preceding the onset of listeriosis (63% vs.1.7%, p=0.001), or steroid usage (51% vs. 41%, p=0.018) was significantly more prevalent among cancer patients. No significant difference between the geographic distribution of cancer and non-cancer patients was noted.

This study provides strong supportive evidence for the important role of cancer in the epidemiology of sporadic nonperinatal listeriosis. Although data on specific cancer treatments was incomplete, the high concomitant use of steroids among cancer patients may play as much a role as the underlying malignancy itself. Future studies are needed to evaluate the differential role of cancer itself versus its treatment in developing listeriosis. Preventive efforts should especially target newly diagnosed cancer patients following therapeutic interventions. Reasons for the increased risk for listeriosis among White cancer patients remain unclear.

The manufacturer, in collaboration with State and Federal Public Health and Food and Drug authorities, issued a nationwide recall of its saline products on November 9, 1998. On November 13, 1998, the Centers for Disease Control and Prevention announced the recall of the contaminated product based on the results of this investigation in the *Morbidity and Mortality Weekly Report (MMWR*;47[44]:959-60). To our knowledge, no cases in other jurisdictions were identified.

CONCLUSIONS

Intrinsic contamination of a "sterile" saline product with *E. cloacae* at some point in the manufacturing or distribution process resulted in this nosocomial outbreak. Prompt recognition by Hospital A clinical and infection control staff, collaboration between local, state and federal Public Health and Food and Drug authorities, along with the manufacturer's cooperation in implementing a timely product recall, were factors that likely limited the scope of this outbreak. This outbreak is a reminder that intrinsic contamination of parenteral products, while uncommon, continues to occur and highlights the need for continued attention to quality control, particularly as emphasis on cost containment intensifies.

EPIDEMIOLOGY OF SPORADIC NONPERINATAL LISTERIOSIS: WHAT IS THE ROLE OF CANCER?

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INVASIVE GROUP A STREPTOCOCCAL DISEASE, 1998

BACKGROUND

Since recognition of the streptococcal toxic shock syndrome in 1987, reports of severe invasive disease due to *Streptococcus pyogenes*, also known as Lancefield group A streptococcus (GAS), have appeared with increasing frequency in the medical literature. Changes in virulence of circulating strains or changes in susceptibility of the population are theories that have been offered to account for the apparent increase and severity of streptococcal infections in recent years. Following a cluster of cases of severe invasive GAS disease in 1993, the Acute Communicable Disease Control Unit requested reporting of invasive GAS disease by hospitals and health-care providers in Los Angeles County (LAC). Invasive GAS disease is not a mandated reportable disease in California.

METHODS

Invasive GAS disease is defined as infection associated with the isolation of GAS from a normally sterile site and includes three overlapping clinical syndromes: (1) streptococcal toxic shock syndrome (STSS), characterized by early shock and multiorgan system failure; (2) necrotizing fasciitis (NF), characterized by necrosis of subcutaneous soft tissue and skin with signs of severe systemic disease; and (3) a group of infections that do not meet the criteria for STSS or NF, including bacteremia without a focus of infection and focal infections (e.g., meningitis, pneumonia, peritonitis, osteomyelitis, septic arthritis, cellulitis, and surgical wound infection) with or without bacteremia.

During 1994 and most of 1995, surveillance for invasive GAS disease relied mainly on passive reporting from hospitals and health care providers. From September 1995 to July 1996, the Communicable Disease Active Surveillance Project (CDAS) conducted active surveillance for invasive GAS disease, along with several other infectious diseases of public health importance, in virtually all acute care hospitals and laboratories in LAC. Since July 1996, surveillance for invasive GAS disease has consisted of a combination of passive reporting by health care providers and active surveillance, principally laboratory-based through the CDAS Project, in approximately 60% of laboratories and hospitals in LAC.

RESULTS

In 1998, 128 cases of invasive GAS disease were reported, for a crude incidence rate of 1.5 cases per 100,000 population. This compares with 83 cases in 1994, 103 cases in 1995, 175 cases in 1996, and 205 in 1997 (Table 1). Of 52 cases for which outcome was known, there were 14 deaths, for an estimated case-fatality rate of 27%. The frequency of total invasive GAS cases, STSS and NF for 1994-1998 are shown in Table 1.

Table 1. Frequency of Invasive GAS, NF and STSS Los Angeles County, 1994-1998

Year	Total Invasive GAS Cases	STSS		NF	
		N	(%)	N	(%)
1994	83	29	(35)	18	(22)
1995	103	16	(16)	17	(17)
1996	175	9	(5)	13	(7)
1997	205	7	(3)	9	(4)
1998	128	8	(6)	13	(10)

Focus of Infection: The majority (61%) of invasive GAS cases involved bacteremia without an identified focus of infection (Table 2).

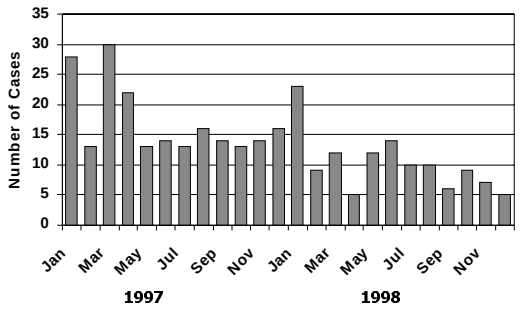
Table 2. Focus of Infection of Invasive GAS Disease Cases Los Angeles County, 1998 (N = 128)

Focus of Infection	No.	Percent
Bacteremia without other focus	78	61.0
Skin/soft tissue infection	31	24.1
Pneumonia	8	6.3
Meningitis	2	1.6
Bone/joint	3	2.3
Other	6	4.7

Seasonality: Cases occurred throughout the year but were more frequent during the late winter and early spring months (Figure 1). However, the pronounced winter/spring seasonality associated with noninvasive GAS infections was not observed.

Age, Gender: The mean age of invasive GAS cases for which age data were available (n=116) was 47 years (median 50 years, range 2 months to 98 years). The highest incidence rate (6.0 cases per 100,000 population) occurred in adults 65 years and older. The male:female rate ratio was 1.2:1. Race/ethnicity data were available for only 56 cases. Of these, 20 (36%) were Hispanic, 24 (43%) were non-Hispanic White, 6 (11%) were Asian, and 6 (11%) were Black.

Figure 1.



Necrotizing Fasciitis: NF was reported in 13 (10%) cases; 92% (12/13) were male. The mean age of NF cases was 46 years (median 47 years, range 23-78 years). Outcome was reported for 9 of the 13 NF cases. The NF case-fatality rate was 49% (4/9). Four patients with NF were also diagnosed with streptococcal toxic shock syndrome.

COMMENTS

These data are subject to several limitations. First, changes in surveillance methods over the study period make meaningful year-to-year comparisons difficult. Completeness of invasive GAS reporting in LAC has not been assessed. The national incidence rate of invasive GAS disease is estimated at 4-5 cases per 100,000 population, compared to the LAC rate of 1.2 cases per 100,000 in 1998. Second, invasive GAS surveillance is mainly laboratory-based and detailed demographic and clinical data is rarely included on the initial report. Hospital record review of reported invasive GAS cases would have provided more complete data but was done for only a small number of cases. It is likely that the number of deaths and the occurrence of additional foci of infections in bacteremic cases are substantially underestimated.

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KINDERGARTEN AND PRESCHOOL IMMUNIZATION ASSESSMENT, 1998

BACKGROUND

California School Immunization Law requires that children receive a series of immunizations before entering any public or private school or preschool. Kindergarten entrants are required to show proof of having received (1) five doses of diphtheria and tetanus toxoids and pertussis vaccine (DTP/DTaP),* (2) four doses of poliovirus vaccine,[1] (3) two doses of measles-containing vaccine, one of which must be measles-mumps-rubella vaccine (MMR), and (4) three doses of hepatitis B vaccine (Hep B) (Table 1). Between 18 and 48 months of age, preschool enrollees are required to show proof of having received (1) four doses of DTP/DTaP, (2) three doses of poliovirus vaccine, (3) one dose of MMR, (4) three doses of Hep B, and (5) one dose of Haemophilus influenzae type b vaccine (Hib).** Before 18 months of age, preschool immunization requirements change depending on the age of the child.

Table 1. Vaccine Doses Required in California for Public or Private Kindergarten Entry and Preschool Enrollment for Children Aged 18-48 Months

	Vaccine				
School Type	DTP/ DTaP	Polio	MMR	Hep B	Hib
Kindergarten	5*	4*	2	3	Not req.
Preschool	4	3	1	3	1**

Each fall, all public and private schools with kindergartens are required to report the immunization status of their kindergarten students to the Los Angeles County Immunization Program. Similarly, all public and private preschools are required to report the immunization status of their enrollees aged 24-59 months (2 years to 4 years, 11 months) to the Immunization Program.

The purpose of the annual immunization assessment of kindergarten students and preschool enrollees is to monitor compliance with California School Immunization Law, and to prevent illness and death from vaccine-preventable diseases.

* One less dose is required if the last dose was given after the second birthday

** Hib is only required for children up to age 54 months (4 years, 6 months). Only one dose of Hib is required but it must have been given on or after the first birthday

METHODS

At the time of kindergarten or preschool entry, school and preschool personnel review each child's vaccination record to ensure that the child has received all the required vaccinations. The school or preschool must follow up on all children needing future vaccinations. This includes children who have not completed a series of vaccine doses but who are not due for another dose because of the interval required between vaccine doses and, in the case of preschools, children who enrolled in the preschool at an age before a particular vaccine dose was due. Children who have not received all of the required vaccinations may be excluded from school or preschool until they are in compliance with the requirements. Children may be exempt from vaccination for medical or philosophical reasons.

Each fall, schools and preschools are required to report to the Immunization Program the number of children who met all the immunization requirements, the number of students who did not meet the immunization requirements, and the number who were exempt from immunizations.

RESULTS

Kindergarten. Information was collected for 155,585 kindergarten entrants attending 2,225 schools: 131,452 (85%) students at 1,187 (53%) public schools and 24,133 (15%) students at 1,038 (47%) private schools. In 1998, 88.2% of kindergarten students had received all of the required immunizations compared with 67.4% for 1997 (Table 2). Coverage levels were similar for public and private schools. The proportion of students who had received three doses of Hep B increased from 72.5% in 1997 to 93.8% in 1998. By school district, the proportion of children who had received all of the required immunizations ranged from a low of 38% to a high of 98%.

Preschool. Information was collected for 113,431 children aged 24-59 months attending 2,177 preschools: 12,589 (11%) enrollees at 194 (9%) public preschools, 76,022 (67%) enrollees at 1,527 (70%) private preschools, and 24,820 (22%) enrollees at 456 (21%) Head Start centers. In 1998, 89.6% of the enrollees had received all of the required immunizations compared with 82.6% in 1997 (Table 3). For public, private, and Head Start enrollees, the proportion who had received all of the required immunizations were 90.9%, 88.9%, and 91.1%, respectively.

DISCUSSION

The number of kindergarten and preschool children who received all the required vaccinations improved significantly from 1997 to 1998. Hepatitis B vaccination requirements were added to the California School Immunization Law in 1997. As a result of the new hepatitis B vaccination requirement, the proportion of kindergarten entrants and preschool enrollees in 1997 who had received all the required vaccinations decreased substantially from previous years. In the year since the hepatitis B kindergarten and preschool vaccination requirement was implemented, considerable progress has been made. In 1998, the proportion of children who received three doses of Hep B was nearly equal to that of the other required vaccinations.

For kindergarten students, this annual assessment provides a population-based measure of vaccination coverage. For preschool children, this assessment provides an estimate of vaccination coverage that cannot be generalized to all preschool-aged children because not all children attend preschool. The 113,431 preschool enrollees included in this assessment represent approximately one-quarter of all children aged 24-59 months in Los Angeles County.

Coverage levels among kindergarten and preschool children in Los Angeles County are slightly lower than the rest of California. Throughout the remainder of the State, 89.8% of kindergarten entrants and 91.8% of preschool enrollees had all the required vaccinations. In spite of the progress during the past year in Los Angeles County, nearly 18,000 kindergarten students and 12,000 preschool children needed one or more immunizations in fall 1998. The Immunization Program will continue to disseminate information to parents and health care providers about the need for timely vaccinations. The Immunization Program also will continue to monitor compliance with California School Immunization Law through its annual assessment of kindergarten students and preschool enrollees.

Table 2. Proportion of Kindergarten Students Who Received the Required Immunizations, 1994-1998, Los Angeles County

	Assessment Year				
	1994	**1995**	**1996**	**1997**	**1998**
No. of schools	2,211	2,230	2,193	2,230	2,225
No. of students	152,177	161,638	160,237	157,850	155,585
DTP/DTaP 4+	92.5%	93.5%	94.2%	95.5%	95.9%
Polio 3+	93.6%	94.0%	94.6%	95.9%	96.0%
MMR 1	98.1%	98.0%	98.5%	98.8%	99.1%
MMR 2	Not applicable	Not applicable	Not applicable	94.0%	94.9%
Hep B 3	Not applicable	Not applicable	Not applicable	72.5%	93.8%
All requirements met	90.9%	92.0%	92.5%	67.4%	88.2%

Table 3. Proportion of Preschool Enrollees Aged 24-59 Months Who Received the Required Immunizations, 1994-1998, Los Angeles County

	Assessment Year				
	1994	**1995**	**1996**	**1997**	**1998**
No. of preschools	2,250	2,255	2,199	2,163	2,177
No. of enrollees	110,426	112,741	110,639	110,768	113,431
DTP/DTaP 4	96.2%	94.3%	94.4%	94.9%	95.3%
Polio 3	93.7%	96.5%	96.8%	97.1%	97.1%
MMR 1	97.3%	97.4%	97.4%	97.4%	97.5%
Hep B 3	Not available	18.1%	39.0%	80.8%	92.5%
Hib 1	89.2%	90.9%	95.3%	96.2%	96.7%
All requirements met*	92.6%	93.8%	91.6%	82.6%	89.6%

*The requirements for 1997 and 1998 were 4 DTP/DTaP, 3 polio, 1 MMR, 1 Hib, and 3 Hep B. In 1996, Hep B was not required. In 1994 and 1995, Hep B and Hib were not required.

NOSOCOMIAL RALSTONIA PICKETTII COLONIZATION ASSOCIATED WITH INTRINSICALLY CONTAMINATED SALINE SOLUTION

BACKGROUND

Ralstonia pickettii (formerly *Pseudomonas pickettii* or *Burkholderia pickettii)* is a gram-negative, non-lactose-fermenting bacillus that is uncommonly isolated from clinical specimens. This microorganism survives well in aqueous environments and has been associated with numerous outbreaks of nosocomial infection due to contamination of patient care solutions and pseudooutbreaks due to contamination in the laboratory.

During February 1 through April 30, 1998, *Ralstonia pickettii* was cultured from respiratory tract secretions of 19 infants and children in a pediatric hospital in Los Angeles County (Hospital A). Acute Communicable Disease Control and hospital infection control staff collaborated to identify the cause of the outbreak as intrinsically contaminated “sterile” 0.9% sodium chloride solution used for respiratory therapy.

METHODS

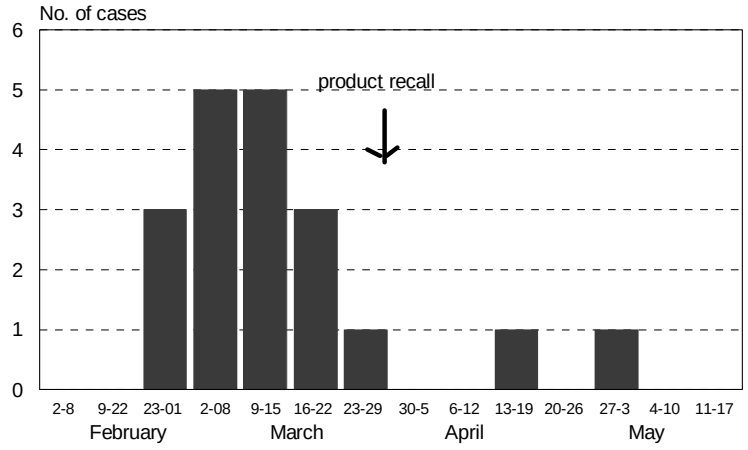
A case was defined as any Hospital A patient from whom *R. pickettii* was isolated from any site from February 1 through April 30, 1998 (epidemic period). Cases were identified by a review of microbiology reports. Clinical information was collected by medical record review; respiratory therapy and microbiology specimen processing policies and procedures were reviewed. Opened and unopened samples of selected solutions used for respiratory therapy and laboratory specimen processing were collected for microbiologic analysis. Unopened vials of saline solution used for respiratory therapy also were collected by Food and Drug Administration (FDA) staff for microbiologic analysis in their laboratory. Available case-isolates were identified and typed by conventional methods and by pulsed-field gel electrophoresis (PFGE) in the Los Angeles County Public Health Laboratory (PHL). The plant where the implicated saline solution was manufactured was evaluated by the FDA.

RESULTS

During February 1 through April 30, 1998 (the epidemic period), 46 respiratory specimens from 19 patients in Hospital A were culture positive for *R. pickettii* (Figure 1). During the previous year (pre-epidemic period), only three respiratory specimens from two patients with cystic fibrosis were culture positive for *R. pickettii.* Case-patients ranged in age from 4 days to 17 years (median, 2 months); 9 of 19 (47%) were male. All were hospitalized in an intensive care unit: neonatal ICU (n=9), cardiothoracic ICU (n=5), or pediatric ICU (n=5). All had serious underlying diseases and 18 were intubated and mechanically ventilated; the case-patient who was not mechanically ventilated had a tracheostomy. All

patients, except one, had endotracheal suctioning using 0.9% sterile sodium chloride solution (Modudose: Kendall, Mansfield, MA) (Hospital A protocol recommends instillation of saline before tracheal suctioning). All case-patients were considered to be colonized since the isolation of *R. pickettii* was not associated with a change in clinical status. Only one case-patient received antimicrobial therapy specifically for *R. pickettii.* Three case-patients died as a result of their underlying diseases. Of 46 cultures positive for *R. pickettii* during the epidemic period, 20 (43%) were collected between March 1 and March 16, 1998. During these two weeks, 28% (20/71) of all respiratory cultures submitted from ICU patients in Hospital A were positive for *R. pickettii.*

Figure 1. *Ralstonia pickettii* Respiratory Colonization
Hospital A, 1998



R. pickettii was isolated from one of four lots of unopened 3-ml vials of 0.9% sterile sodium chloride solution (Modudose) in the Public Health and the FDA laboratories. Cultures from an opened bottle of sterile distilled water collected from the bedside of one of the case-patients grew *R. pickettii* as well as *Stenotrophomonas maltophilia.* Available case-isolates (n=9), isolates recovered from unopened vials of Modudose 0.9% sodium chloride, and the isolate from the opened bottle of sterile distilled water were indistinguishable by PFGE. The use of Modudose saline solution was discontinued at the hospital on March 30, 1998. Two additional cases occurred after that date.

DISCUSSION

On confirmation of Modudose contamination, the distributor voluntarily issued a nationwide product recall. Notification of the recall and a summary of the outbreak in Hospital A was published in the *Morbidity and Mortality Weekly Report (MMWR)* on August 17, 1999.[1] Subsequently, three additional hospitals, one each in California, Minnesota, and Louisiana reported clusters of *R. pickettii* associated with the implicated product to the Centers for Disease Control and Prevention (CDC); isolates from these clusters were indistinguishable from the Hospital A outbreak isolates by PFGE performed by CDC.[2]

The plant where the contaminated saline was manufactured was discovered to be the same plant associated with an outbreak of *R. pickettii* colonization traced to an intrinsically contaminated saline solution in 1983.[3] Genomic comparison of isolates from the 1983 and 1998 outbreaks, performed by CDC, showed different banding patterns, suggesting that the outbreaks were not caused by the same strain.

In summary, when an outbreak of *R. pickettii* occurs, contamination of solutions should be suspected. Despite FDA regulations and manufacturers' quality control programs, intrinsic contamination of "sterile" solutions continues to occur. Timely detection by routine hospital-based surveillance, prompt reporting to local public health authorities, and the resulting timely product recall very likely contributed to the limited national scope of this outbreak.
The outbreak strain of *R. pickettii* was also recovered from an open bottle of distilled water at a patient's bedside in Hospital A, but not from an unopened bottle of the same lot from the same manufacturer, suggesting extrinsic contamination. Extrinsic contamination of other products, or failure to remove all of the contaminated product could explain the two additional cases that occurred in Hospital A after the product recall.

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PEDIATRIC HIV DISEASE
PEDIATRIC SPECTRUM OF DISEASE (PSD)

Since March 1988, the Los Angeles County (LAC) Department of Health Services has been conducting active surveillance for human immunodeficiency virus (HIV) infection in children under the age of 13 years as part of the Centers for Disease Control and Prevention's national Pediatric Spectrum of Disease (PSD) research project. As of December 31, 1998, with active case ascertainment at the 10 major LAC pediatric referral centers, a total of 1,428 HIV exposed and infected children had been reported to PSD. This number includes 1,240 LAC resident children and 188 nonresident children receiving care in LAC (including those who had died). PSD collects information at baseline, when the child is initially evaluated for HIV, and then every 6 months for the life of the child.

CDC CLASSIFICATION

Of the total 1,428 children reported to PSD, 557 were infected, 813 were exposed but uninfected, and 58 were exposed and of indeterminate HIV status due to the persistence of maternal HIV antibody. Of the 557 infected children, 52% were classified as AIDS,[1] 223 (40%) were symptomatic but not AIDS-defined, and 42 (8%) were asymptomatic. In 1998, 136 HIV-exposed and infected children were reported to PSD of whom 5% had an AIDS diagnosis at last medical contact, an additional 15% were infected but without AIDS, 24% were of indeterminate status, and 57% were uninfected.

MODE OF TRANSMISSION

Among the 615 HIV-infected and indeterminate children, 443 (72%) had a perinatally acquired (PA) infection from an HIV-infected mother, 123 children (20%) were infected from a contaminated blood transfusion, 39 (6%) were children with hemophilia or a coagulation disorder, and 10 (2%) had an other or unknown mode of transmission. Two children were infected due to breastfeeding. Among the PA group, 24% had a mother who was an intravenous drug user (IDU), 12% had a mother who had sex with an IDU, an additional 24% had a mother who had sex with an HIV+ or high-risk male, 5% had a mother infected through a blood transfusion, and 35% had a mother whose risk factor for HIV infection could not be identified. Sexual abuse is suspected as a risk factor for 4 children and confirmed for 1 child.

The proportion of perinatally exposed children whose mother’s risk for HIV was IDU has decreased from 42% in 1988-89 to 13% in 1998 (Figure 1). Correspondingly, the number of children infected due to an HIV-infected mother with unknown risk has increased each year from 17% in 1988-89 to 54% in 1998.

DEMOGRAPHICS

Cumulatively, 33% of the HIV infected and indeterminate children were Black, 41% Hispanic, 22% White, 2% Asian, and 1% other/unknown. Of the 136 HIV-exposed and infected children reported in 1998, 40% were Black, 45% Hispanic, and 11% White.

The distribution of HIV-infected and indeterminate children by gender shows slightly more males than females (53% vs. 47%) due to the disproportionate number of transfusion-associated and hemophiliac cases among males.

Most children (72%) had a biologic parent as their primary caretaker at the latest medical contact, 22% lived with another relative or were in foster care, 3% with adoptive parents, and 3% were in other or unknown living arrangements. The PA group was more likely to be living in foster care or with another relative than the transfused and hemophiliacs (27% vs. 5%, respectively). Within the PA group, the Hispanics were the least likely to be in foster care or living with another relative (15% vs. 39% for Blacks and 32% for Whites).

CASE FATALITY AND SURVIVAL

The cumulative fatality rate for AIDS cases was 64% (187/292). Only 3% (9/323) of the children not meeting the AIDS case definition have died. The mean age at AIDS diagnosis for the PA cases was 28 months (median 14.0 months) compared to the mean age at AIDS diagnosis of 87 months for the transfused cases (median 87 months), and 153 months for the hemophiliacs (median 142 months). Estimated median survival from AIDS diagnosis to death or date of last medical contact was 34 months for PA cases and 23 months for the transfused cases (Kaplan-Meier product-limit estimates). Numbers for the hemophiliacs were too limited to make estimates.

Among the 320 HIV-infected and indeterminate children still alive and not lost to follow-up, 14% were less than 2 years of age, 41% were between 2-7 years, 23% were 8-12 years, and 22% were 13 years or greater. Twenty-seven of the 71 children aged 13+ years met the pediatric criteria for AIDS and an additional 18 met the new adult criteria for AIDS with a CD4 count of<200.

PRENATAL ZDV AND PERINATAL TRANSMISSION

Beginning in 1994, zidovudine (ZDV) use during pregnancy, labor and delivery became a recognized means to prevent perinatal HIV transmission. Of the 422 infants born in 1995-1998 to HIV-infected women and reported to PSD, 310 (73%) of their mothers received ZDV during pregnancy. Similarly, 293 (69%) received ZDV during labor and

delivery. Rates of vertical transmission for LAC resident children followed from birth have decreased from a high of 29% in 1990 to 5% in '95, 3% in '97 and 0% thus far for '98. At the same time, receipt of ZDV during pregnancy and/or labor and delivery increased from 59% in 1994 to 92% of the reported infected mothers in 1998 (Figure 2). Overall, however, the rate of HIV transmission is higher because some children are still not being identified at birth. The overall rate of transmission for all children born in 1995-98 and reported to PSD was 10%.

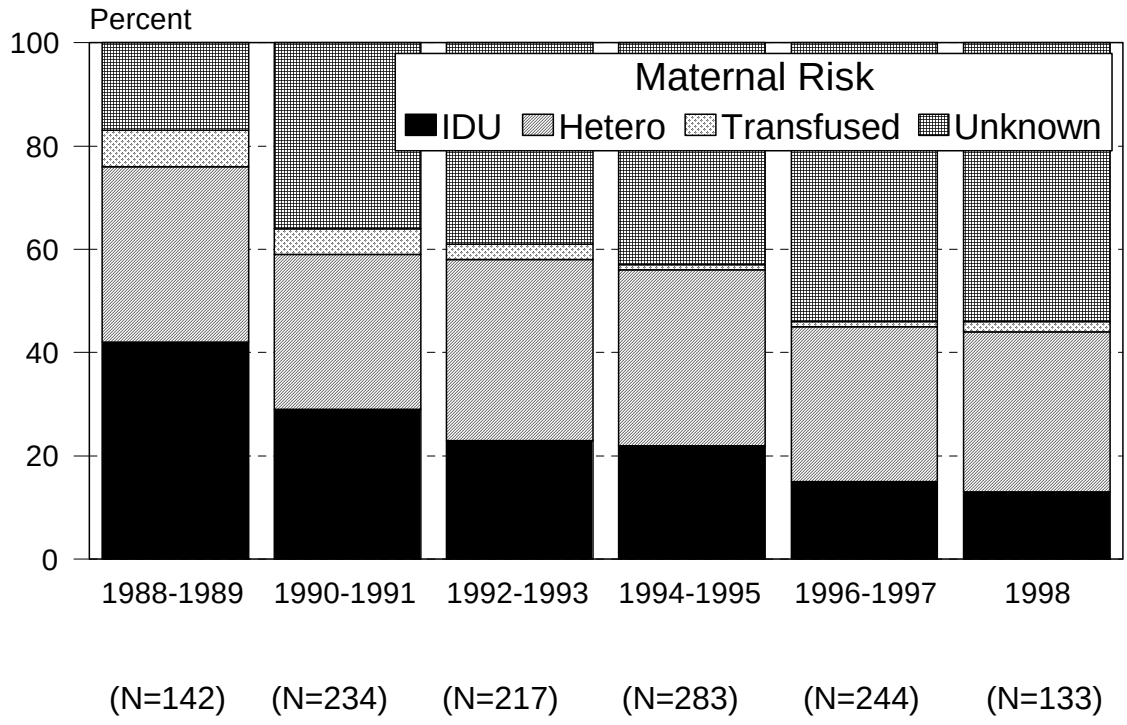
UNIVERSAL OFFERING OF PRENATAL HIV TESTING AND COUNSELING

As of January 1, 1996, all prenatal providers are legally required to offer HIV testing and counseling and document the offering in the patient's medical record. Statistics from 6 health centers who directly report to Acute Communicable Disease Control (ACDC) showed an 81% acceptance rate for 1998. No HIV-positive woman was identified in 1998. ACDC continues to evaluate risk assessment data on pregnant women who test HIV positive. Seventy-eight women since 1989 have been identified in LAC clinics; 56 (71%) reported risk assessment information to ACDC. Twenty-eight (50%) of these women could not identify any known risk factor for HIV infection. Women identified as HIV positive are referred to tertiary care centers to receive specialized care for themselves and their unborn infants.

REFERENCE

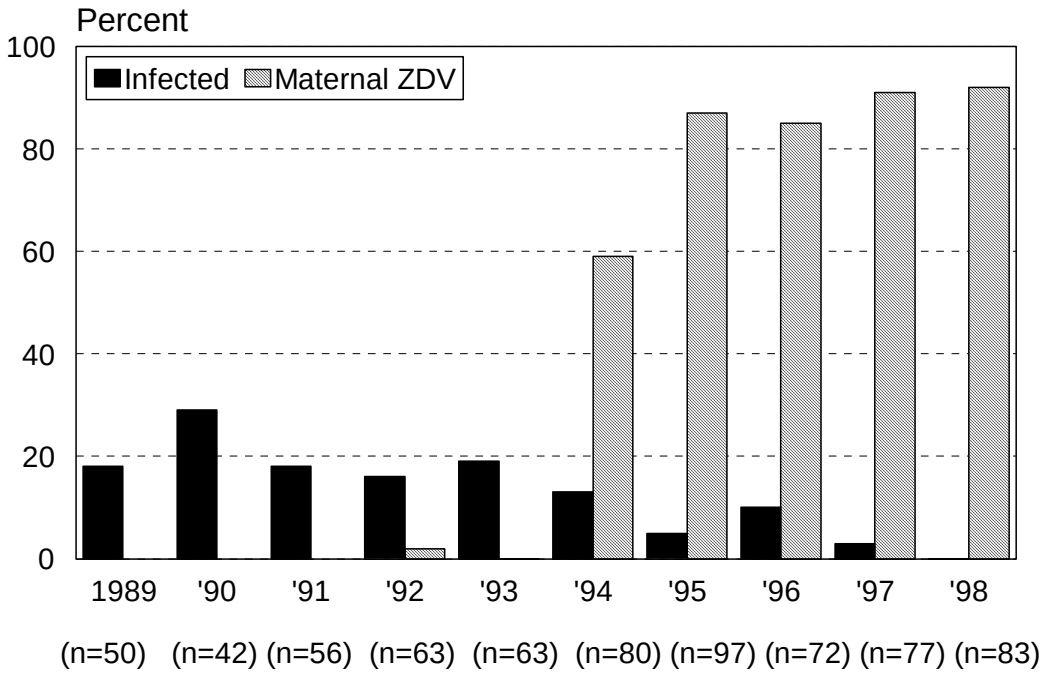
1. Centers for Disease Control and Prevention 1994 revised classification system for human immunodeficiency virus infection in children less than 13 years of age. *MMWR*1994;43:RR-12:1-10.

Figure 1. Maternal Risk for HIV in Children with Perinatally Acquired HIV Exposure by Year of Child's Enrollment Los Angeles County, 3/1988 - 12/1998



Source: DHS, Pediatric Spectrum of HIV Disease Study

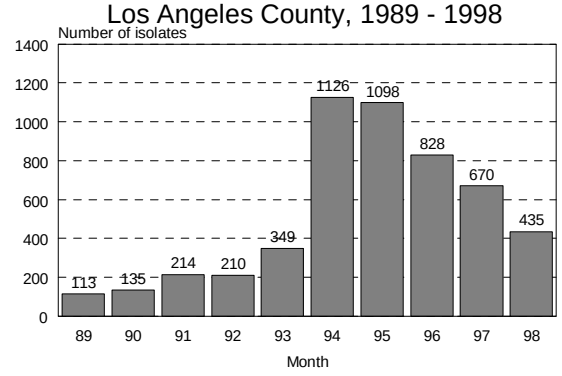
Figure 2. Rates of Perinatal HIV Transmission and Use of Maternal Zidovudine for HIV-Exposed and Infected Children Identified at Birth by Birth Year



SALMONELLA ENTERITIDIS, LOS ANGELES COUNTY, 1998

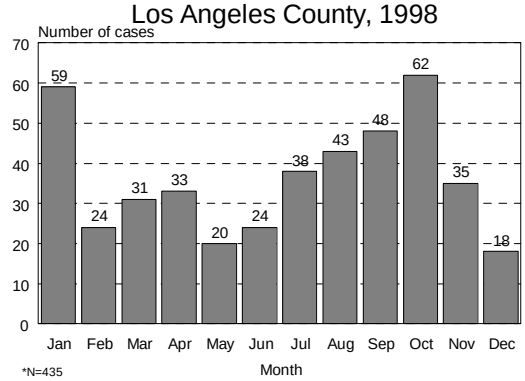
Following a marked increase and peak in 1994, human cases of *Salmonella* serotype *enteritidis* (SE) gradually decreased in Los Angeles County (LAC) and in the rest of Southern California. In 1994, a case-control study of sporadic cases was conducted by the Acute Communicable Disease Control Unit and the California Department of Health Services.[1] The study showed a strong association between SE infection and consumption of eggs, especially raw or undercooked eggs. Eating in restaurants also was associated with increased risk of SE infection. The majority of cases occurred in young adults. Since 1994, an increasing proportion of SE cases have occurred in children under five years and the elderly. Almost all of these are phage type 4, indicating that this phage type has become endemic in Los Angeles County.

Figure 1
SE Isolates by Year*
Los Angeles County, 1989 - 1998



*Includes total isolates identified by the LAC Public Health Laboratory

Figure 2
SE Isolates by Collection Date*
Los Angeles County, 1998



*N=435

SE continues to be the major *Salmonella* serotype identified from isolates submitted to the Public Health Laboratory. In 1998, SE comprised 31.9% (439/1377) *of Salmonella* isolates serotyped for LAC cases, an 18% decrease from 1997 when 39% of isolates were SE (Figure 1). The overall rate of SE was 4.3 cases/100,000 population compared to 13.6/100,000 for all *Salmonella*.

The highest frequency of SE cases occurred during the summer and early fall, similar to other *Salmonella* serotypes (Figure 2), and peaked in October when four outbreaks occurred. The majority (88%) of SE isolates were from feces, followed by blood (8%), urine (2%), and other (1.6%). There were 81 hospitalizations, with an average length of hospitalization of 5.2 days. SE infection was a contributing factor in the deaths of three persons with underlying disease.

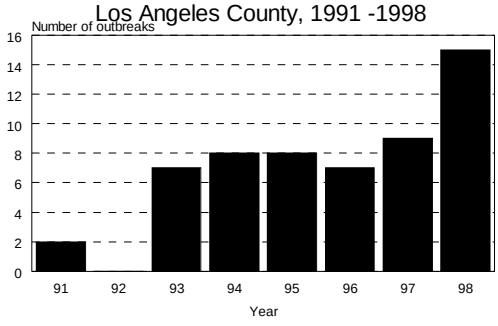
In 1998, 15 (68%) of 22 salmonellosis outbreaks were due to SE phage type 4, which is now the most common SE phage type in Southern California (Figure 3). Five of the outbreaks occurred during the hot late summer/early fall, when layer chickens were stressed by the heat and may have shed more *Salmonella* via the ovary into the eggs. Eggs were the suspected source for seven outbreaks, chicken or turkey for four outbreaks, and the source was unknown for four outbreaks (Table 1). Two of the outbreaks occurred in skilled nursing facilities which served undercooked shell eggs, despite recommendations that pasteurized eggs be used in facilities with populations susceptible to invasive infections. There were 22 hospitalizations associated with 1998 SE outbreaks, and one death in a resident of a skilled nursing facility.

Table 1. *Salmonella enteritidis* Outbreaks in Los Angeles County, 1998

Onset Month	Outbreak Setting	Number Ill	Culture Positive	Phage type	Suspect Vehicle	Suspect Source
January	Home	7	3	4	Macaroni & cheese Turkey	Eggs Turkey
January	Restaurant	5	4	4	Stuffing	Eggs
January	Home	26	9	4	Lasagne	Eggs
February	Restaurant	14	7	4	Chicken enchiladas	Chicken
March	Restaurant	8	6	4	Various dishes	Foodhandlers
March	Home	6	2	4	Ice cream	Eggs
July	Fast food	6	5	4	Hamburgers	Unknown
July	Home	4	2	4	Boiled chicken	Chicken
August	Restaurant	4	2	4	Unknown	Unknown
August	Restaurant	4	1	4	Chicken salad	Chicken
September	Restaurant	6	5	4	Unknown	Unknown
October	Restaurant	13	2	6a	Turkey salad	Turkey
October	SNF	17	8	4	Scrambled eggs	Eggs
October	SNF	4	4	4	Undercooked eggs	Eggs
October	Church	19	3	4	Chile rellenos	Eggs
	15	143	63			

The Acute Communicable Disease Control Unit continues to monitor sporadic cases and outbreaks of SE and works with private industry groups, and the state and federal government to improve egg production, distribution processes and consumer education that will decrease risk of SE infection.

Figure 3
Salmonella Enteriditis Outbreaks
Los Angeles County, 1991 -1998



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SALMONELLA HEIDELBERG ASSOCIATED WITH A BAKERY

BACKGROUND

Within a 24-hour period in August 1998, the Acute Communicable Disease Control Unit (ACD) received two foodborne illness reports involving persons who became ill after attending unrelated parties. Within a few days, a total of six foodborne illness reports had been received. All those involved had become ill after attending unrelated parties held on the first weekend in August; most of the parties had been held on August 1. The only food item common to all the parties was Tres Leches cake purchased from a specific Mexican bakery.

METHODS

ACD accompanied the Food and Milk Unit during an inspection of the bakery. The bakery was asked to supply names and telephone numbers of persons who had purchased Tres Leches cakes on August 1. Lists of persons attending each party were requested from hosts. Interviews were conducted using a standardized questionnaire. Additional case finding methods included notification of the district health centers about the outbreak, and routine surveillance through review of Salmonellosis Case History Forms and Foodborne Illness (FBI) reports. Stool specimens were submitted to the Public Health Laboratory (PHL) as follows: (1) specimens from all bakery employees; (2)specimens from a sampling of ill victims from six parties where illness was reported; (3) twelve environmental samples taken at the bakery during the site visit; (4) samples of pooled egg yolks and egg shells from a flat taken from the bakery (eggs were not from the batch used for the implicated Tres Leches cakes; none were left); (5) leftover cake from four different parties and the whipped cream frosting from one of the cakes. Invoices were requested for the ingredients used to prepare the cakes.

RESULTS

Environmental. During the site visit to the bakery on August 5, eggs were found in flats on the preparation table at a room temperature of >90° F. At delivery, eggs were cracked and encrusted with dirt, straw, and feces. The bakery owner reported that eggs were hand-cracked for pooling. No other high-risk foods, including meats, were found. Milk products were pasteurized, although one carton of milk was found at room temperature. The bakery was closed until the owner corrected the violations and attended a class for foodhandlers.

Epidemiology. Approximately 242 persons attended eight of the ten parties identified as purchasing Tres Leches cakes on August 1; persons from eight of ten parties were contacted. One party denied illness among attendees, and one party reported illness but

refused to submit specimens. The remaining six paties were included in the case-control study. The case-control interviews revealed that the parties had no food in common except the Tres Leches cakes. One hundred seventy persons were interviewed either personally or by proxy; 114 persons (67%) reported illness after eating cake. Four persons were hospitalized; there were no deaths.

Laboratory. The results of cultures conducted by the PHL were as follows: (1) 17 party attendees were stool culture positive for *Salmonella heidelberg* (these persons represented six of the eight parties); (2) three of four leftover cake pieces, as well as one whipped cream frosting used on the cakes were positive for *Salmonella heidelberg;* (3) all employees were stool culture negative;(4) all environmental cultures were negative; (5) cultures of the pooled egg yolks were negative for enteric pathogens; one egg shell pool was positive for *Salmonella cerro* and *infantis*.

On August 9, a site visit by the State Department of Food and Agriculture and ACD was made to the egg distribution plant listed on the bakery invoice . No conclusions could be reached regarding the farm where the eggs originated. Even eggs prior to washing at the distribution plant did not appear as grossly contaminated with dirt, straw, and feces as the eggs found at the bakery on August 5.

CONCLUSIONS

The epidemiological data, stool culture results from ill persons, and culture results from the Tres Leches cakes implicated the cakes as the vehicle for this large outbreak. The combined odds ratio for the Tres Leches cakes for seven parties with illness was OR 62.71 (17.06, 255.12); p value: <0.0000000. The most likely source of *Salmonella* contamination was the eggs which, as seen at the time of inspection, were below standard for sale in California according to the State of California Department of Food and Agriculture. Cross-contamination via hands, from raw eggs (especially if the shells are feces-encrusted) to uncooked whipped cream frosting, equipment, or food preparation surfaces, was the most likely method of transmission. The originating source of the eggs could not be determined. It was likely that these eggs were not acquired through the distributor named on the invoices obtained from the bakery.

VARICELLA ACTIVE SURVEILLANCE AND EPIDEMIOLOGIC STUDIES: 1995-1998

BACKGROUND

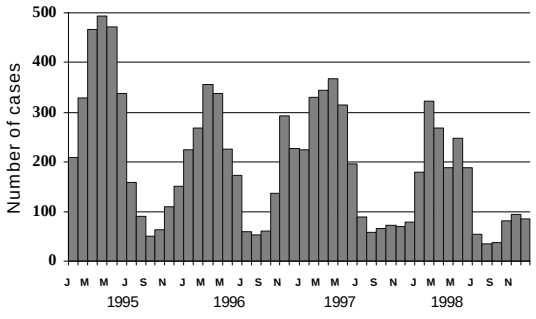
Varicella vaccine was approved by the U.S. Food and Drug Administration in March 1995.[1] In September 1994, the Acute Communicable Disease Control Unit entered into a cooperative agreement with the Centers for Disease Control and Prevention to conduct active surveillance for varicella among the approximately 300,000 residents of the Antelope Valley Health Services District. Our objectives were (1) to define baseline varicella epidemiology before licensure and widespread vaccine use; (2) to identify changes in varicella epidemiology occurring as a result of vaccine use; and (3) to describe the clinical and epidemiologic features of varicella in vaccinated cases. In September 1995, the project was awarded supplemental funding to (4) monitor vaccine use in the study population

METHODS

We selected the Antelope Valley for the study, in part, because its relative geographic isolation tends to encourage use of local schools and health care providers. The project collects case reports of varicella from over 300 surveillance units, representing 100% sampling of the total Antelope Valley population. Surveillance units include all primary care physicians; all hospitals and clinics; all public and private schools and child care centers with enrollments of 12 or more children; employers with 500 or more employees; correctional facilities; and miscellaneous others likely to identify and report cases of varicella. Case reports and data regarding vaccine administration are collected every two weeks. A structured telephone interview is conducted with each case or parent/guardian to collect detailed demographic, clinical, and health impact data and to determine if there are additional cases or susceptible contacts within the household. Susceptible household contacts are reinterviewed four to six weeks after the initial contact to identify additional cases. Data collection began January 1, 1995.

Figure 1

Varicella
Verified Cases by Month
Antelope Valley, 1995 - 1998



RESULTS

Of 2,005 cases of varicella reported between January 1 and December 31, 1998, 1,785 (89%) were verified by telephone interview and collection of clinical data completed, 120 (6%) were unreachable by telephone or declined to participate, and 100 (4%) were excluded when case interviews revealed that illness or school absence was not due to varicella (Table 1). In this report, analysis is limited to verified cases. The number of cases decreased 19.6% in 1998 compared with 1997; verified cases decreased 39.2% since 1995 (Figure 1).

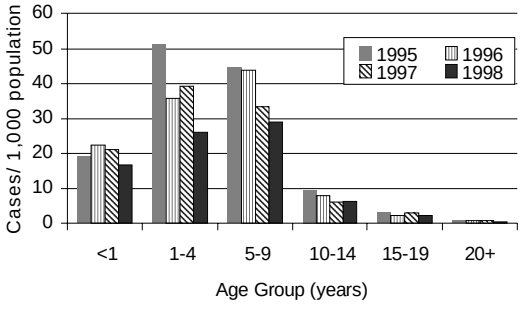
Table 1. Reported Cases of Varicella, Antelope Valley, 1995 - 1998

Case Status	1995		1996		1997		1998		1995-1998	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Verified	2,934	(92)	2,421	**(90)**	2,219	**(90)**	1,785	(90)	9,395	(90)
Probable	166	(5)	189	(7)	138	5	120	(6)	613	(6)
Excluded	101	(3)	86	(3)	130	5	100	(5)	417	(4)
Total Reported	3,201	(100)	2,696	(100)	2,487	(100)	2,005	(100)	10,425	(100)

Age Distribution. Annual incidence rates declined in all age groups over the four-year study period; the largest decrease, 49%, was observed among 1- to 4-year-olds. In 1998, highest incidence rates occurred among children 5 to 9 years of age, followed by 1- to 4-year-olds and infants less than one year old (Figure 2). In 1998, the average age of a case was 8.0 years compared with 7.1 years in 1995.

Figure 2

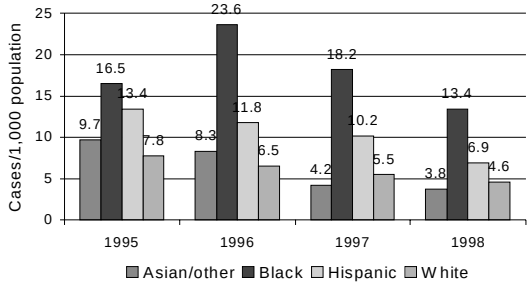
Varicella
Incidence Rates by Age
Antelope Valley, 1995-1998



Race/Ethnicity.
While age-adjusted incidence rates decreased in all racial/ethnic groups in 1998, disproportionately high rates continue to occur among Blacks (Figure 3). Black children 5 to 9 years old experienced the highest rates of any racial/ethnic group (59.4 cases per 1,000 population). Higher than anticipated rates among Blacks may be an artifact of inaccurate midcensus population estimates for the Antelope Valley; data from California Basic Educational Data System (CBEDS) suggest that the number of school-aged Blacks in the Antelope Valley is substantially higher than estimations projected from the 1990 MARS file for the Antelope Valley Health District.

Figure 3

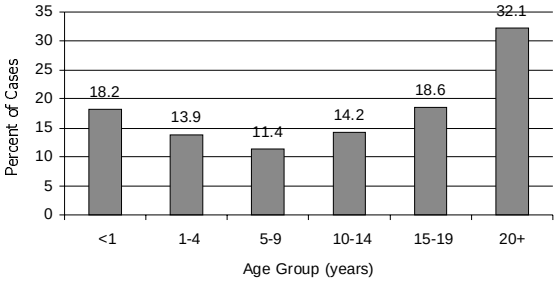
Varicella
Incidence Rates by Race/Ethnicity
Antelope Valley, 1995-1998



Disease Severity. As in previous years, the vast majority of cases (87%) experienced an overall severity of disease rating of 1 (mild, uncomplicated disease). None received a rating of 5 (severe, life-threatening disease or death). Consistently, young children and adults were significantly ($p < 0.05$) more likely to have a severity of disease index of 2 or greater (Figure 4).

Figure 4

Varicella
Proportion of Cases with SDI ≥ 2, by Age
Antelope Valley, 1995-1998

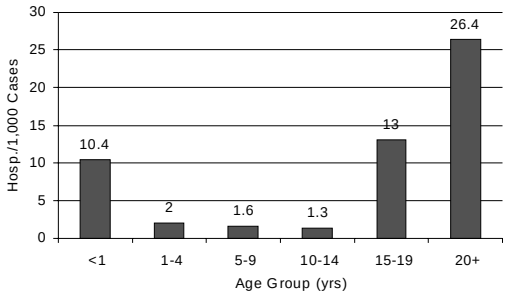


Complications, defined as conditions or events occurring within two weeks of rash onset for which the case-patient was evaluated and treated by a health-care provider, were reported in 191 (11%) cases in 1998, 220 (10%) in 1997, 194 (8%) in 1996, and 381 (13%) in 1995. Otitis media was the most common complication, followed by secondary bacterial infections. Major complications in 1998 included pneumonia (5 cases) and encephalitis and invasive group A streptococcal infection (one case each). In 1998,approximately 8% of cases received antibiotics during varicella, compared with 12% in 1995; 27% of adult cases and 6% of cases in younger age groups received acyclovir in 1998.

Hospitalization rates per 1,000 varicella cases were 2.0 in 1995, 2.9 in 1996, 6.7 in 1997,and 3.4 in 1998. Hospitalization rates were significantly higher for adults than for younger age groups (Figure 5). No deaths or long-term sequelae were reported in 1998.

Figure 5

Varicella
Hospitalization Rates per 1,000 Cases by Age
Antelope Valley, 1995-1998



Reported Second Infections. A history of previous varicella was reported by 169 (9.5%) cases in 1998. The average age was 4.1 years at initial infection and 11.7 years at second infection.

Breakthrough Cases. Of 1,785 verified cases reported in 1998, 89 (5.0%) occurred in persons who reported having received varicella vaccine. Vaccination status was confirmed by asking parents to check the immunization record card at the time of telephone interview or by medical office staff reviewing the office immunization record. Of the 89 cases reporting prior vaccination, 72 developed varicella 42 or more days after vaccination and were considered breakthrough cases. Eighty-two percent of breakthrough cases had 50 or fewer lesions (less than average) and 18% had average number of lesions: overall disease severity was rated as mild (SDI=1) for 90% of breakthrough cases and none had severe disease.

Health Impact Data. The total number of days of school or work missed by cases and caretakers due to varicella declined from 14,842 in 1995 to 8,986 in 1998.

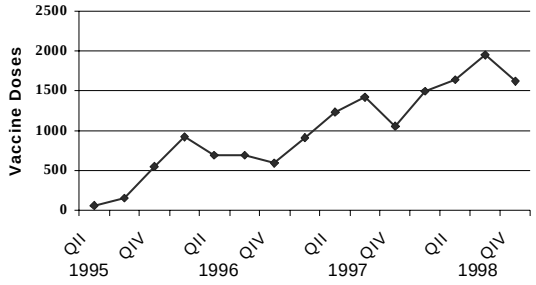
Completeness of Surveillance Data. We estimated completeness of surveillance data for children 2 to 18 years of age using capture-recapture methods by analyzing the degree of overlap between two incomplete lists of cases (two-source capture-recapture methods).[2-4] The two ascertainment sources used were “schools” (elementary, middle and secondary schools, preschools, and daycare facilities), and “health-care providers” (physicians, clinics, hospitals, and health maintenance organizations). We estimated completeness of surveillance data for this age group from all ascertainment sources to be approximately 68%, 70%, 74%, and 78% for 1995, 1996, 1997, and 1998, respectively.

Varicella Vaccine Utilization. Varicella vaccine became available in the private sector in late May 1995, but acceptance by parents and providers appeared to be low throughout much of 1995. Los Angeles County clinics began administering vaccine in March 1997. Vaccine administration levels showed an increasing trend throughout the four-year study period (Figure 6). One-year-olds received 47% (3,139) of the 6,706 doses of vaccine

administered in 1998. Vaccine coverage among one-year-olds was estimated at approximately 63% (based on a birth cohort of 5,000).

Figure 6

Varicella
Vaccine Doses Administered by Quarter
Antelope Valley, 1995-1998



SUMMARY AND DISCUSSION

The Los Angeles County Varicella Active Surveillance Project is providing data on varicella epidemiology that has not been previously available in such detail.[5] Four full years of data suggest that vaccine utilization is having an impact on the burden of varicella disease in the Antelope Valley as evidenced by a 40% reduction in the number of verified cases over the study period. The disproportionate decline in incidence among 1- to 4-year-olds most likely reflects vaccine use in that age group as part of the routine childhood immunization schedule. The finding of disproportionately high rates among Blacks requires further analysis but most likely is an artifact of inaccurate population estimates for the Antelope Valley. The 2000 Census should resolve these questions.

The Los Angeles County Project will be funded at least through September 2000. The study provides a unique opportunity to monitor changes in varicella morbidity and mortality and vaccine field efficacy as vaccine utilization increases.

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4. Regal RR, Hook EB. Goodness-of-fit based confidence intervals for estimates of the size of a closed population. *Stat Med* 1984;3:287-91.

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VARICELLA OUTBREAKS AFTER VACCINE LICENSURE: PROBLEMS WITH VACCINATION COVERAGE, STORAGE OR EFFICACY?

In 1998, three years after vaccine licensure, childcare centers (CCC) and schools in Los Angeles County continued to report varicella outbreaks. Parents and school administrators contacted the Acute Communicable Disease Control Unit (ACD) about the outbreaks, frequently expressing concern that a high proportion of ill children had previously been immunized. This stimulated ACD to investigate two CCC outbreaks in order to identify a cause, such as low vaccination coverage levels or unexpected low vaccine effectiveness.

Information on past history of varicella, illness during the outbreak, and prior varicella vaccination among childcare center attendees was collected. In the first of the two outbreaks (CCC "H"), vaccination coverage levels among the children were high; in the other outbreak (CCC "L"), levels were low. CCC "H" had a vaccination coverage level of 87% (34/39) compared to 30% (6/20) in CCC "L." The overall attack rate was lower in CCC "H"(31%) than in CCC "L" (61%; p-value=0.03). Vaccine effectiveness for varicella was 71% in CCC "H" and 100% in CCC "L." In general, vaccinated children with varicella had milder disease than those who were unvaccinated, although this was not statistically significant. Vaccine had been administered by six different health care providers. Five had stored and handled the vaccine correctly; the sixth had retired and could not be evaluated.

In conclusion, varicella outbreaks occurred in CCCs with both high and low vaccination coverage levels. Vaccination led to a lower attack rate in CCC"H" and appeared to protect from severe disease. Vaccine effectiveness was within the range predicted by the literature (70-90%) and there was no indication of improperly stored or mishandled vaccine.