

**BOX. Injection safety recommendations**

- Never administer medications from the same syringe to more than one patient, even if the needle is changed.
- Consider a syringe or needle contaminated after it has been used to enter or connect to a patients' intravenous infusion bag or administration set.
- Do not enter a vial with a used syringe or needle.
- Never use medications packaged as single-use vials for more than one patient.
- Assign medications packaged as multi-use vials to a single patient whenever possible.
- Do not use bags or bottles of intravenous solution as a common source of supply for more than one patient.
- Follow proper infection-control practices during the preparation and administration of injected medications.

Adapted from: CDC. Guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings 2007. Atlanta, GA: US Department of Health and Human Services, CDC; 2007. Available at [http://www.cdc.gov/ncidod/dhqp/gl\\_isolation.html](http://www.cdc.gov/ncidod/dhqp/gl_isolation.html).

needed to provide similar oversight for outpatient clinics. Better surveillance, education, and oversight are needed to detect and prevent bloodborne pathogen transmission in ambulatory and other health-care settings.

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## **Use of Enhanced Surveillance for Hepatitis C Virus Infection to Detect a Cluster Among Young Injection-Drug Users — New York, November 2004–April 2007**

Infection with hepatitis C virus (HCV) is a leading cause of chronic liver disease in the United States (1). Chronic hepatitis B and C virus infections were added to the nationally notifiable diseases list in 2003 (2). Approximately 3.2 million persons in the United States have chronic HCV infection (3). The most common risk factor for HCV infection is illicit drug use (specifically injection-drug use [IDU]) (3,4), although approximately one third to one half of cases have no identified risk factor (4; New York State Department of Health [NYSDOH], unpublished data, 2008). Because approximately 80% of acute HCV infections are asymptomatic and no serologic markers for recent infection exist, distinguishing recent from distant infection based on serology alone is challenging (5) and establishment of national HCV infection incidence is difficult. CDC provides funding to enhance surveillance for HCV infection and other forms of viral hepatitis in New York State (NYS) and seven other areas. One project of enhanced surveillance is to identify those HCV infections most likely to have been acquired recently. Since January 2006, NYSDOH has prioritized follow-up of positive laboratory markers for HCV infection among persons aged <30 years because they are more likely to be newly infected than older persons (6). In February 2007, NYSDOH detected a cluster of HCV infections among persons in this age group by using the prioritized algorithm. This report describes the subsequent investigation by NYSDOH and the Erie County Department of Health (ECDOH), which identified a group of patients with histories of IDU who were linked through a single high school that all the patients had attended at some time. The findings demonstrate how targeted enhanced surveillance can effectively detect clusters and outbreaks and guide appropriate interventions.

In 2004, the enhanced viral hepatitis surveillance project was launched in 34 of the 57 NYS counties outside of New York City. Detection and follow-up of reports of newly identified persons with HCV infections among NYS residents are given high priority to 1) collect accurate risk factor data, 2) guide prevention efforts, and 3) ensure patient referral to appropriate treatment. NYSDOH hepatitis surveillance staff members prioritize for immediate investigation any positive laboratory reports for markers of HCV infection among persons aged <30 years. Each week, the NYSDOH

**TABLE. Demographic characteristics, risk factors, surveillance status, and clinical information for 20 patients with hepatitis C virus (HCV) infection — postal code A, Buffalo, New York, November 2004–April 2007\***

Case	Interviewed	Age (yrs)	Sex	Race	Date of diagnosis	Reason for test	IDU†	Shared needles	Noninjection-drug use
1	Yes	17	Male	White	11/3/04	Risk factors	Yes	Yes††	Yes
2	No	23	Female	White	1/25/05	Symptomatic	Yes	—	Yes
3	No	26	Male	White	3/9/05	Risk factors	Yes	—	—
4	Yes	28	Male	White	12/6/05	Symptomatic	Yes	Yes	Yes
5	Yes	17	Male	White	12/29/05	Risk factors	Yes	Yes††	Yes
6	No	19	Male	White	1/20/06	Symptomatic	Yes	Yes††	Yes
7	Yes	17	Male	White	1/24/06	Risk factors	Yes	Yes††	Yes
8	Yes	16	Female	White	2/17/06	Risk factors	Yes	Yes††	Yes
9	Yes	21	Male	White	2/23/06	Risk factors	Yes	Yes††	Yes
10	No	22	Male	White	3/2/06	Risk factors	Yes	—	—
11	Yes	18	Female	White	5/17/06	Risk factors	Yes	Yes	Yes
12	Yes	19	Male	White	5/24/06	Risk factors	Yes	Yes	Yes
13	No	19	Male	White	5/24/06	Risk factors	Yes	—	—
14	No	20	Male	White	5/26/06	Symptomatic	Yes	Yes††	Yes
15	Yes	17	Female	White	8/14/06	Risk factors	No	No	No
16	Yes	23	Male	White	10/10/06	Risk factors	Yes	Yes††	Yes
17	No	19	Male	White	12/19/06	Risk factors	Yes	Yes††	Yes
18	No	26	Female	White	1/6/07	Risk factors	Yes	Yes	Yes
19	No	17	Female	White	3/13/07	Risk factors	Yes	Yes††	Yes
20	Yes	19	Male	White	4/26/07	Risk factors	Yes	Yes††	Yes

\* Data were compiled from standard surveillance forms and patient interviews.

† Injection-drug use.

§ Alanine aminotransferase.

¶ Based on surveillance case definitions (available at <http://www.cdc.gov/ncphi/disss/nndss/casedef/hepatitiscurrent.htm> and <http://www.cdc.gov/ncphi/disss/nndss/casedef/hepatitiscurrent.htm>).

\*\* Polymerase chain reaction.

†† Shared needles with a person known or believed to be HCV positive.

§§ Not reported.

¶¶ With a partner known or believed to be HCV positive.

\*\*\* With a sex worker.

Electronic Clinical Laboratory Reporting System generates databases containing any HCV-positive laboratory reports for persons aged <30 years; these data are then sent to local health departments. Investigation is conducted by local health department staff members with NYSDOH assistance and includes complete laboratory results collection, healthcare provider interview, medical record review, and patient interview.

In February 2007, NYSDOH staff members noticed an apparent high number of newly identified HCV infections among persons aged <30 years who resided in the same postal code (postal code A), corresponding to a suburban community of Buffalo, New York. An initial retrospective review found eight cases dating back to May 2006 in persons who resided in postal code A (case numbers 11–18) (Table), one of which was in a patient who had acute hepa-

titis C (7). All but one of the eight initially identified cases were in persons who reported a history of IDU. Further analysis of cases in persons residing in postal code A indicated that during November 2004–April 2007, a total of 20 HCV-positive persons aged <30 years had been reported. Fifteen of the 20 cases were diagnosed in 2006 or 2007. The community (2000 population: 42,000) in which postal code A is located is part of Erie County and had 47.5 new reports of HCV infection per 100,000 population aged <30 years during November 2004–April 2007. During the same period, Erie County had 18.6 new reports of HCV infection per 100,000 population; two suburban postal codes with similar populations, socioeconomic composition, and proximity to the inner city as the investigated community had 7.0 and 4.9 new reports of HCV infection per 100,000 population, respectively. Because the incidence of new

TABLE. (Continued) Demographic characteristics, risk factors, surveillance status, and clinical information for 20 patients with hepatitis C virus (HCV) infection — postal code A, Buffalo, New York, November 2004–April 2007\*

Case	History of incarceration	History of high-risk sexual contact	Drug equipment sharing or high-risk sexual activity with another patient (patient no.)	Multiple sex partners	Attended high school A	Jaundice (at time of diagnosis)	Elevated ALT <sup>§</sup>		Disease status <sup>¶</sup>	HCV PCR <sup>**</sup> (genotype)
							(at time of diagnosis)	Disease status <sup>¶</sup>		
1	Yes	No	Yes (9)	Yes	Yes	No	— <sup>§§</sup>	Chronic	+ (1B)	
2	—	Yes <sup>¶¶</sup>	No	Yes	Yes	Yes	Yes	Acute	+	
3	—	—	No	—	Yes	No	—	Chronic	—	
4	No	Yes <sup>***</sup>	No	Yes	No	Yes	Yes	Acute	+	
5	No	Yes <sup>¶¶</sup>	Yes (8)	—	Yes	No	—	Chronic	+	
6	Yes	—	Yes (7,16)	Yes	Yes	Yes	Yes	Acute	+	
7	Yes	No	Yes (6,16)	Yes	Yes	No	—	Chronic	+	
8	No	Yes <sup>¶¶</sup>	Yes (5)	Yes	Yes	No	Yes	Chronic	+	
9	Yes	Yes <sup>¶¶</sup>	Yes (1)	Yes	Yes	No	Yes	Chronic	+	
10	—	—	No	—	Yes	No	Yes	Chronic	+	
11	No	Yes <sup>¶¶</sup>	No	—	Yes	No	Yes	Chronic	+	
12	Yes	No	No	Yes	Yes	No	—	Chronic	—	
13	—	—	No	—	Yes	No	—	Chronic	—	
14	—	—	No	Yes	Yes	No	Yes	Acute	—	
15	No	No	No	No	Yes	No	No	Chronic	—	
16	Yes	No	Yes (6,7)	Yes	Yes	No	No	Chronic	—	
17	—	—	Yes (20)	Yes	Yes	No	Yes	Chronic	+ (1A)	
18	—	Yes <sup>¶</sup>	No	Yes	Yes	No	Yes	Chronic	+ (1A)	
19	—	—	No	Yes	Yes	No	Yes	Chronic	+	
20	No	No	Yes (17)	Yes	Yes	No	—	Chronic	+	

reports in the community per population appeared to be approximately twice that of the county and approximately six times greater than that of any similar suburb, further investigation to characterize the cluster was warranted.

With initial detection of the cluster, an epidemiologic investigation was launched by NYSDOH in collaboration with ECDOH. Patients were interviewed in person by a two-person team at various locales, including correctional facilities, rehabilitation clinics, patient residences, and other locations. Current CDC case definitions for acute and chronic hepatitis C were used.\* Four (20%) of the 20 patients had evidence of elevated serum alanine transaminase levels and discrete symptom onset and were classified as having acute hepatitis C. Sixteen (80%) other patients were asymptomatic or had illness that did not meet the acute case definition and were classified as having chronic HCV infection. Median age of the 20 patients was 19 years (range: 17–29 years), all were white, 15 (75%) were male, and 19 (95%) reported a history of IDU. Nineteen (95%) of the 20 patients attended or had attended one of the two

high schools in postal code A (high school A) (Table). Fourteen (70%) had evidence of viremia by polymerase chain reaction; three (21%) of these 14 had a viral genotype reported. NYSDOH and ECDOH staff members successfully interviewed 11 of the 20 patients (one with acute hepatitis C and 10 with chronic HCV infection) using an integrated interview tool and a chart abstraction tool developed for this investigation; the remaining nine patients could not be contacted.

At the time of interview, all of the 11 interviewed patients were aware that they had tested HCV positive. However, three (27%) of the patients interviewed believed that their test results were false and that they were no longer (or never were) HCV infected. Ten (91%) interviewed patients reported previous but not current IDU (including use of heroin, cocaine, loritabs, oxycodin, morphine, valium, or crack cocaine) and sharing of drug-use equipment; some patients shared equipment with other identified patients. All 10 patients reported purchasing heroin in the same inner-city Buffalo location. Noninjectable-drug use, reported by 10 (91%) patients, was initiated at a median age of 14 years (range: 9–17 years); IDU was initiated at a median age of 16.5 years (range: 14–26 years).

\* Case definitions available at <http://www.cdc.gov/ncphi/disss/nndss/casedef/hepatitisacutecurrent.htm> and <http://www.cdc.gov/ncphi/disss/nndss/casedef/hepatitisccurrent.htm>.

At least four partnerships involving drug equipment sharing and high-risk sexual activity were reported among the 20 patients. The members of these partnerships knew other members who had experienced symptoms consistent with acute hepatitis, such as jaundice. However, documented HCV infection in these members, as evidenced by a report in the NYSDOH Chronic Hepatitis Registry, could not be verified.

Among interviewed patients, median reported number of lifetime sex partners was 10 (range: four to 100). Six (54%) patients claimed they had private health insurance, two reported having Medicaid, and three reported that they had no health insurance. Seven of the interviewed patients reported having a primary-care physician; four of these seven reported seeing a specialist for their HCV infection. None of the interviewed patients had received HCV treatment. Several barriers to potential treatment were cited, including concerns regarding the side effects of medication, lack of information regarding the availability of treatment services, lack of health insurance reimbursement, and a perceived lack of health-care providers capable or willing to treat HCV in patients with comorbidities such as IDU or mental health issues.

Several initiatives were launched by NYSDOH and ECDOH throughout Erie County to address the apparent clustering of HCV infection among injection-drug users. Staff members from NYSDOH, the NYS Office of Alcoholism and Substance Abuse Services, and ECDOH conducted cross-training sessions and developed a resource manual to help identify primary care, sexually transmitted disease (STD)/human immunodeficiency virus (HIV) screening, drug treatment, harm reduction, and HCV treatment services for patients. All interviewed patients were referred to ECDOH counselors for HIV/acquired immunodeficiency syndrome (AIDS) risk assessment and personalized intervention development. ECDOH conducted multiple events held at various community locations and ECDOH clinics, offering HCV, HIV, and STD screening, referral for services, and education on prevention, risk reduction, and family planning; these services are ongoing at all five ECDOH clinics. Presentations on hepatitis epidemiology, diagnosis and testing, and prevention were conducted at medical practices that serve high-risk communities throughout Erie County. ECDOH also collaborated with the Erie County Department of Mental Health to integrate HCV messages into existing prevention programs and implement screening programs in target areas with high HCV infection rates. Finally, ECDOH worked with school district representatives and high schools to address prevention of IDU and HCV transmission.

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**Editorial Note:** One goal of the CDC-funded enhanced viral hepatitis surveillance protocols is high-priority follow-up of cases that are likely to represent acute HCV infection. Another goal is detection of clusters or outbreaks of such cases, as this report describes. The markedly elevated number of new reports of HCV infection per population detected among persons aged  $<30$  years in postal code A, compared with the number of reports in the surrounding community, indicated an apparent cluster of recently infected patients. Nearly all of the identified patients in the cluster reported a history of IDU, and partnerships involving drug equipment sharing, which have been described previously (8), were identified among the cluster. The cause of this cluster likely was IDU with shared, inadequately cleaned equipment. Because the investigation targeted only cases in persons aged  $<30$  years, more direct links among members of this cluster involving persons aged  $\geq 30$  years might exist within the community. Furthermore, although infections identified in persons aged  $<30$  years are more likely to be new infections than those identified in persons aged  $\geq 30$  years, not all infections in the population aged  $<30$  years are new; a portion of the patients in this cluster likely had been infected with HCV for years.

Although the number of new reports of HCV infection per population in postal code A was higher than the overall Erie County number during November 2004–April 2007, this analysis could not determine whether this elevated number of reports represented a previously established and ongoing higher rate of HCV infection among persons aged  $<30$  years or a more recent phenomenon. Cases within this apparent cluster likely are a reflection of the ongoing HCV epidemic among injection-drug users in the United States (9). Ongoing educational efforts and increased public awareness of hepatitis C, particularly among injection-drug users, might have led to higher rates of testing, which yielded additional reports. Because the prioritized algorithm was not in place before January 2006, earlier reported cases of HCV infection among this population might have gone unrecognized. Continued enhanced surveillance is needed to complement routine surveillance for HCV infections to better understand the burden of hepatitis C and to identify and prevent new HCV infections.

The results of this investigation demonstrate the potential for improved and consistent national hepatitis C surveillance to identify cases for investigation, estimate the magnitude of HCV infection and disease, detect outbreaks,

evaluate response measures, and facilitate research to initiate appropriate prevention measures. Given limited resources, an enhanced surveillance approach to give highest priority to likely new cases of HCV infection, such as those in persons aged <30 years, can be implemented to identify clusters and outbreaks. Establishing effective systems that provide reliable data to detect HCV infections among all populations could have a lasting effect on HCV disease control.

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## Multistate Outbreak of Human *Salmonella* Infections Caused by Contaminated Dry Dog Food — United States, 2006–2007

During January 1, 2006–December 31, 2007, CDC collaborated with public health officials in Pennsylvania, other states, and the Food and Drug Administration (FDA) to investigate a prolonged multistate outbreak of *Salmonella enterica* serotype Schwarzengrund infections in humans. A total of 70 cases of *S. Schwarzengrund* infection with the outbreak strain (XbaI pulsed-field gel electrophoresis [PFGE] pattern JM6X01.0015) were identified

in 19 states, mostly in the northeastern United States. This report describes the outbreak investigation, which identified the source of infection as dry dog food produced at a manufacturing plant in Pennsylvania. This investigation is the first to identify contaminated dry dog food as a source of human *Salmonella* infections. After handling pet foods, pet owners should wash their hands immediately, and infants should be kept away from pet feeding areas.

On May 8, 2007, the Pennsylvania Bureau of Laboratories reported three cases of *S. Schwarzengrund* infection with indistinguishable PFGE patterns to CDC's PulseNet.\* On June 9, 2007, after PulseNet identified cases in Ohio and other states, CDC's OutbreakNet† team was notified of a potential multistate outbreak of *S. Schwarzengrund* infections. During June 2007, the Pennsylvania Department of Health (PADOH) interviewed persons identified by PulseNet as infected with the outbreak strain of *S. Schwarzengrund*. These initial interviews suggested exposure to dogs or dry dog food as a possible source of infection. Thirteen infected persons from Pennsylvania were questioned about dog-related exposures: eight (62%) owned one or more dogs, and the other five reported regular contact with a dog. Seven of the eight persons who owned dogs were able to recall the types of dog food they had purchased recently. Several brands had been purchased, but persons in the households of six patients recalled purchasing dog food products made by manufacturer A. These interviews suggested exposure to dogs or dry dog foods as a possible source of infection.

PADOH collected dog stool specimens and opened bags of dry dog food from the homes of the 13 Pennsylvania patients. The outbreak strain of *S. Schwarzengrund* was isolated from five of 13 dog stool specimens and two of 22 dry dog food specimens collected from the homes. The contaminated dry dog food bags were two different brands (brand A and brand B), both produced by manufacturer A at plant A in Pennsylvania.

In July 2007, the Ohio Department of Health also interviewed persons infected with the outbreak strain of *S. Schwarzengrund* and collected two dog stool specimens from one patient's home. The outbreak strain of *S. Schwarzengrund* was isolated from one of the dog stool specimens. The dog recently had been fed brand A dry dog food, but the bag of dog food was no longer available for testing.

\* PulseNet is the national molecular subtyping network for foodborne disease surveillance.

† OutbreakNet is a national network of epidemiologists and other public health officials who investigate outbreaks of foodborne, waterborne, and other enteric illnesses in the United States.