Outbreaks of Gastroenteritis Associated With Noroviruses on Cruise Ships—United States, 2002

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2 figures omitted

DURING JANUARY 1–DECEMBER 2, 2002, CDC’s Vessel Sanitation Program (VSP), which conducts surveillance for acute gastroenteritis (AGE) on cruise ships with foreign itineraries sailing into U.S. ports,1 received reports of 21 outbreaks of AGE2 on 17 cruise ships. Of the 21 outbreaks, nine were confirmed by laboratory analysis of stool specimens from affected persons to be associated with noroviruses, three were attributable to bacterial agents, and nine were of unknown etiology. Seven outbreaks were reported in 2001, and of these, four were confirmed to be associated with norovirus (CDC, unpublished data, 2002). This report describes five of the norovirus outbreaks that occurred during July 1–December 2, 2002, on cruise ships.

Outbreaks
Cruise Ship A. On July 18, cruise ship A, owned by cruise line A, embarked 1,318 passengers and 564 crew members for a 7-day cruise from Vancouver to Alaska. On July 19, five passengers reported to the ship’s infirmary with symptoms of AGE. By July 25, a total of 167 (13%) passengers and nine (2%) crew members had reported illness. Among the 176 patients, the predominant symptoms were vomiting (76%) and diarrhea (73%). Five of 10 stool specimens from ill passengers were positive for norovirus by reverse transcriptase polymerase chain reaction (RT-PCR). On July 25, when passengers disembarked, the ship was disinfected in accordance with CDC recommendations, and the same day, a new group of passengers embarked for another 7-day cruise. During the cruise, 189 (14%) of 1,336 passengers and 30 (3.3%) of 571 crew members had AGE with diarrhea (91%) and vomiting (85%). An environmental health inspection conducted by CDC revealed no sanitary deficiencies. Cruise line A cancelled a subsequent cruise and voluntarily took the ship out of service for 1 week for aggressive cleaning and sanitizing. No outbreaks were reported on subsequent cruises.

Cruise Ship B. On October 1, cruise ship B, also owned by cruise line A, embarked 1,281 passengers and 598 crew members for a 21-day cruise from Washington to Florida. By October 16, a total of 101 (8%) passengers and 14 (2%) crew members reported to the infirmary with AGE symptoms. On October 18, CDC investigators boarded the ship to conduct an epidemiologic and environmental investigation. Of 972 surveyed passengers, 399 (41%) met the case definition for AGE. Investigators found no association between illness and water, specific meals served on the ship, or with offshore excursions. Stool specimens from 12 of 13 patients tested positive for norovirus. Characterization of the strain by sequence analysis of RT-PCR products matched those from an outbreak on the same ship that occurred 3 weeks previously but was not identical to the outbreak strain on cruise ships A and B. CDC recommended reinforcing sanitation practices and excluding ill food handlers from the work place. Cruise ship C continued service, and no new cases were reported on subsequent cruises.

Cruise Ship D. On October 25, cruise ship D, owned by cruise line C, embarked 2,882 passengers and 944 crew members in Spain for a 14-day cruise to Florida. On October 28, a total of 70 (2.5%) passengers reported to the infirmary with AGE; the number of ill passengers declined rapidly during the following days. By November 2, a total of 106 (5%) passengers and 25 (3%) crew members had reported illness. Stool specimens from four of six patients tested positive for norovirus by RT-PCR. Characterization of the strain by sequence analysis of RT-PCR products identified a strain distinct from the
other cruise-ship outbreaks. With passengers aboard, control measures included quarantine of ill crew members until symptom-free for 72 hours, disinfection of the ship, and reinforcement of sanitation practices. No new outbreaks were reported on subsequent cruises.

Cruise Ship E. On November 16, cruise ship E, owned by cruise line D, embarked 2,318 passengers and 988 crew members for a 7-day cruise from Florida to the Caribbean. By November 20, a total of 28 (1%) passengers and seven (1%) crew members had reported to the ship’s infirmary with AGE. By disembarkation on November 23, a total of 260 (12%) passengers and 17 (2%) crew members had reported illness. On November 23, CDC investigators boarded the ship and collected questionnaires that had been distributed to all passengers before disembarkation. A total of 1,280 (55%) passengers returned a questionnaire; of these, 492 (21%) met the case definition for AGE. Seven of 12 specimens from patients were positive for norovirus by RT-PCR. Characterization of the strain by sequence analysis of RT-PCR products identified a perfect match with those products from the outbreaks on cruise ships A and B. Despite implementation of disinfection and sanitation measures, the outbreak continued on the subsequent cruise. On November 30, cruise line D removed the ship from service for 1 week for aggressive cleaning and sanitizing.

Noroviruses (i.e., Norwalk-like viruses or NLV) are members of the family Caliciviridae and are well-recognized etiologic agents of nonbacterial AGE. Noroviruses cause approximately 23 million cases of AGE each year and are the leading cause of outbreaks of gastroenteritis. Illness caused by norovirus infection lasts 12-60 hours and is characterized by sudden onset of nausea, vomiting, and watery diarrhea; the incubation period is 12-48 hours. The virus is transmitted by hands contaminated through the fecal-oral route, directed from person to person, through contaminated food or water, or by contact with contaminated surfaces or fomites. Aerosolized vomitus also has been implicated as a transmission mode. Because of high infectivity and persistence in the environment, transmission of noroviruses is difficult to control through routine sanitary measures. Although norovirus causes a self-limited AGE, elderly passengers, children, and those with severe underlying medical conditions might be at increased risk for complications because of volume depletion and electrolyte disturbances. Hospitalization of adults with norovirus who are otherwise healthy is rare. Neither specific antiviral treatment nor a vaccine has been developed for noroviruses.

In addition to emphasizing basic food and water sanitation measures, control efforts should include thorough and prompt disinfection of ships during cruises, and isolation of ill crew members and, if possible, passengers for 72 hours after clinical recovery. Suitable disinfectants include freshly prepared chlorine solutions at concentrations of ≥1,000 ppm, phenol-based compounds, and accelerated hydrogen peroxide products. Cruise ships also should promote frequent, rigorous hand washing with soap and water by passengers and crew members. Rapid implementation of control measures at the first sign of a suspected AGE outbreak is critical in preventing additional cases. When routine disinfection measures are unsuccessful at interrupting the spread of virus during an outbreak, more extensive disinfection and a period of time without passengers aboard a ship might facilitate elimination of the virus.

CDC encourages local and state health departments to test for noroviruses when investigating outbreaks of suspected viral AGE. For assistance in testing for noroviruses and for strain characterization, local and state health departments should contact CDC’s Viral Gastroenteritis Section, telephone 404-639-3577 or by e-mail: CaliciNet@cdc.gov.

REFERENCES
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*An outbreak of AGE was defined as one in which ≥3% of passengers or crew members report illness (defined as three or more episodes of loose stools in a 24-hour period or as vomiting with one additional symptom such as abdominal cramps, headache, myalgia, or fever). The evaluation of an outbreak might consist of environmental, epidemiologic, and laboratory investigative components, including an epidemic survey distributed to passengers and crew members, environmental sampling, and collection of stool specimens from patients.

Involvement by Young Drivers in Fatal Alcohol-Related Motor-Vehicle Crashes—United States, 1982-2001

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Motor-vehicle crashes are the leading cause of death in the United States for persons aged 16-24 years, and a substantial proportion of these crashes are alcohol-related. Alcohol-impaired driving is highest among persons aged 21-24 years,1 and the percentage of fatal crashes that are alcohol-related is highest for this age group.2 However, alcohol-related crashes are a serious problem even for the youngest drivers. Not only are drivers aged <21 years more likely than older drivers to be involved in fatal crashes, but their added risk for fatal crash involvement increases more sharply at all levels of alcohol use.3 To characterize the rate of alcohol-related fatal crashes among young drivers, CDC analyzed unpublished data from the Fatality Analysis Reporting System (FARS), a national database of information on fatal crashes. The findings indicate that the largest decrease in alcohol-related fatal crashes during 1982-2001 was among drivers aged <21 years, who have been the target of several interventions to reduce alcohol-impaired driving. Public health and traffic safety professionals should ensure that communities implement comprehensive and effective strategies to reduce alcohol-impaired driving.

FARS contains data on a census of fatal traffic crashes within the United States. To be included in FARS, a crash must occur on a public road and result in a death within 30 days of the crash. Trend data for alcohol-related fatal crash rates for 1982-2001 are presented for four age groups: 16-17 years, 18-20 years, 21-24 years, and ≥25 years. Data on older drivers are presented for comparison. Drivers are considered alcohol-involved if their blood alcohol concentration (BAC) was ≥0.01 g/dL. When BACs are unavailable, they are imputed from driver and crash characteristics by using a two-stage estimation procedure.4 Crash rates are calculated by dividing the number of alcohol-involved crashes for each age group by the census estimate for the number of U.S. residents in that age group (per 100,000 population).5,6

During 1982-2001, fatal crash involvement by drinking drivers decreased 46% (95% confidence interval [CI] = −48%−−5%). The most dramatic decreases were among drivers aged <21 years. Fatal alcohol-related crash rates decreased 60% (95% CI = −65%−−56%) for drivers aged 16-17 years, 55% (95% CI = −58%−−52%) for drivers aged 18-20 years, 41% (95% CI = −44%−−38%) for drivers aged 21-24 years, and 39% (95% CI = −41%−−38%) for drivers aged ≥25 years. These decreases had been achieved by 1997 (48% overall decrease, 95% CI = −49%−−47%), when the trend began to level off. Since 1999, rates have increased slightly for all age groups except those aged 16-17 years (16-17 years: −3% to 95% CI = −16%-11%; 18-20 years: 6%, 95% CI = −2%-14%; 21-24 years: 10%, 95% CI = 3%-16%; ≥25 years: 4%, 95% CI = 1%-7%). Despite the overall decreases, alcohol-related crashes resulted in 17,448 fatalities during 2001.

The risks for involvement in alcohol-related fatal crashes remain high for young drivers, particularly when driving exposure is considered. For example, in 1996, rates of involvement in alcohol-related fatal crashes were similar for drivers aged 16-17 years and those aged ≥25 years (5.8 versus 6.0 per 100,000 population); in comparison, their risk was approximately three times greater per mile driven (1.6 per 100,000,000 vehicle miles traveled [VMT] versus 0.6 VMT).6,7

Reported by: RW Elder, MEd, RA Shults, PhD, Div of Unintentional Injury Prevention, National Center for Injury Prevention and Control, CDC.

CDC Editorial Note: During 1982-2001, rates of alcohol-related fatal crashes decreased substantially across all age groups, with the largest decrease among drivers aged <21 years. These drivers were recognized increasingly as a high-risk group during the 1970s, when many states lowered their legal drinking age and alcohol-related crashes increased. Subsequently, targeted interventions were implemented to reduce rates of alcohol-impaired driving. The 1984 Uniform Drinking Age Act required states to adopt a minimum legal drinking age of 21 years by 1988. Other interventions targeted directly at young drivers include “zero tolerance” BAC standards for drivers under the legal drinking age and graduated driver licensing programs, which require new drivers to progress through stages, allowing them increased driving privileges as they gain experience. Other factors that have probably reduced overall levels of drinking and driving include new laws