

Infectious Disease Outbreak Newsletter

Norovirus

Noroviruses are a group of related RNA viruses that are divided into four distinct genogroups (GI, GII, GIII, GIV), which are, in turn, divided into 20 genetic clusters. Noroviruses were originally named after the town of Norwalk, Ohio, where they were first identified to be the cause of an outbreak of acute gastroenteritis in 1968.

Norovirus infections have a relatively short incubation period, usually between 12 and 48 hours; humans are the natural reservoir. Most adults present with acute onset of vomiting, watery non-bloody diarrhea, abdominal cramps, and nausea. Symptoms usually resolve in 24 to 60 hours and most immunocompetent persons recover completely. As many as 30% of infections are asymptomatic and may play a role in the spread of norovirus outbreak situations (Figure 1).

During the early 1990's, a sensitive diagnostic method (reverse transcriptase-polymerase chain reaction [RT-PCR]) was developed to identify noroviruses in vomit and stool. Because individual norovirus infections are not notifiable in Georgia and RT-PCR is not readily available to healthcare providers, the burden of norovirus disease is still relatively unknown. For outbreak investigations, norovirus testing via RT-PCR and electron microscopy (EM) is available through the Georgia Public Health Laboratory (GPHL). Laboratory testing along with clinical and epidemiologic data gathered during outbreak investigations are the keys to understanding norovirus disease.

Norovirus Outbreaks

Noroviruses are very infectious; as few as 10 viral particles can cause infection. Transmission is primarily via the fecal-oral route; infected persons transmit norovirus through stool or vomit. Viral shedding begins with the onset of symptoms and may continue for up to 2 weeks, even after vomiting and diarrhea cease. Norovirus transmission occurs through contamination of food or water as well as direct person-to-person spread or fomites. Environmental contamination through aerosolization of vomitus has also been documented. Noroviruses are very hardy in the environment; they can survive in up to 10 ppm chlorine solutions, temperatures as high as 60° C, and freezing.

Outbreaks of norovirus gastroenteritis occur in institutional settings including nursing homes, prisons/jails, schools, daycares, restaurants, other food service facilities, and other closed settings like cruise ships. Elderly persons or those with incontinence, immobility, or decreased mental awareness often become ill during norovirus institutional outbreaks. Persons with compromised immune systems or underlying illness (i.e. diabetes, chemotherapy, etc) are at increased risk for infection and are more likely to have severe disease outcomes.

Immunity to infection is unpredictable because of the genetic variability of noroviruses. Most individuals can become repeatedly infected within months. Increases in the number of reported norovirus infections are usually seen during the winter months, November through February, i.e. "norovirus season".

The Centers for Disease Control and Prevention (CDC) estimates that at least 50% of all foodborne outbreaks of gastroenteritis can be attributed to noroviruses. Direct contamination of food by an ill food handler is the most common route of transmission. Ready-to-eat foods including salads, sandwiches, and bakery items have been implicated as vehicles in norovirus outbreaks. Oysters from fecally-contaminated waters have also been shown to be vehicles in norovirus outbreaks in the United States.

Figure 1. Keys to Norovirus Outbreak Investigations

- Reservoir
 - Humans
- Incubation period
 - 12 – 48 hours (usually 24–30 hours)
- Duration of illness
 - 12 – 60 hours
- Clinical symptoms
 - Non-bloody diarrhea
 - Vomiting
 - Headache
 - +/- Fever
- Population patterns
 - Institutions
 - Prisons/jails
 - Nursing homes
 - Cruise ships
 - Schools/daycare centers
 - Restaurants
- Associated vehicles
 - Uncooked, ready-to-eat, handled foods (salads, sandwiches, ice)
- Spread
 - Person to food or water
 - Person-to-person

New Strain of Norovirus Identified

Georgia, like many states, experienced large increases in reported acute gastroenteritis outbreaks due to norovirus during the 2006–

2007 norovirus season (see below). New research from the CDC, Enteric Viruses Laboratory Branch indicates that a new norovirus strain may be partially responsible for the increased number of norovirus outbreaks seen nationally during the 2006–2007 norovirus season. In January 2006, the novel strain was detected during an outbreak investigation involving passengers aboard the *Minerva II* cruise ship. Sixty percent of stool specimens analyzed at CDC from October to December of 2006 were found to be the new strain, subsequently named GII/4 *Minerva*.

Evidence of a novel and possibly more virulent strain of norovirus greatly effects the overall norovirus disease burden. Even though lasting immunity is not achieved with infection, a new strain circulating among a naïve population could result in more infections. Virus specific factors including resistance to common disinfectants, along with continued changes in modern life style, such as higher density living, could explain some of the increase in reported norovirus outbreaks this season.

References:

1. ProMED. Available at: http://www.boston.com/news/local/articles/2007/03/10/illnesses_traced_to_a_new_strain/. Accessed March 13, 2007
2. Center for Disease Control and Prevention. Norwalk-like viruses: public health consequences and outbreak management. *MMWR Morb Mortal Wkly Rep.* 2001;50(RR-9):1–13.
3. Leuenberger S, Widdowson M, Feilchenfeldt J, et al. Norovirus outbreak in a district general hospital — new strain identified. *Swiss Med Wkly* 2007;137:57–61.

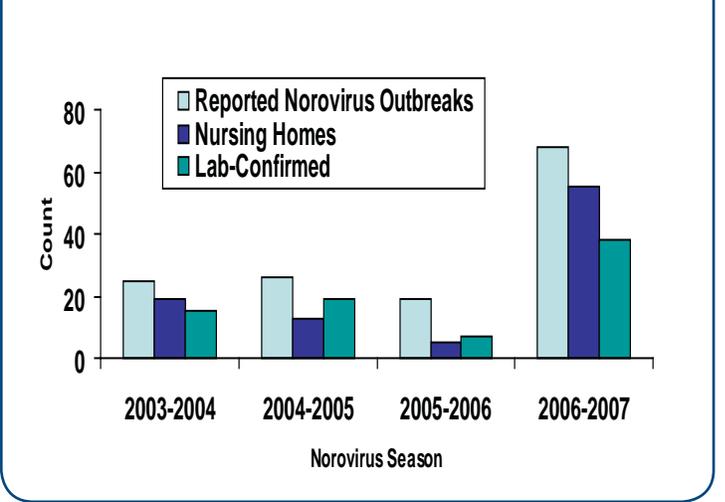
Georgia Norovirus Outbreaks 2006–2007 Season

For the 2006–2007 season (November–February), 65 norovirus outbreaks were investigated in Georgia (Figure 2). Thirty-six (55%) were laboratory-confirmed and almost all were believed to be transmitted person-to-person (95%). GPHL provided norovirus testing for all 36 outbreaks; the strain was identified as GII genotype. Specimens from 17 outbreaks were sent to CDC for further strain characterization. Nine of the 17 (53%) were characterized as the novel strain, GII/4 *Minerva*. A majority of the norovirus outbreaks were reported from nursing home or long-term care facilities [55 (85%)] and a mean of 38 people were ill per reported outbreak.

Georgia Infectious Disease Outbreaks, 1st Quarter: January–March, 2007

The Notifiable Diseases Epidemiology Section (NDES) received 87 reports of infectious disease outbreaks or clusters occurring during the first quarter of 2007. Seventy-five were later confirmed as Georgia outbreaks (Table 1). Norovirus was the most commonly identified etiology (62/75; 83%) and 50% (31/62) were laboratory-confirmed. The majority of norovirus outbreaks in Georgia took place in nursing homes (46/62; 74%). Of the total confirmed Georgia outbreaks, District Epidemiologists reported 64 (85%) and 37 (49%) were laboratory-confirmed. Only 7 (9%) of the first quarter Georgia outbreaks were foodborne; etiology was laboratory-confirmed in 4 (57%) outbreaks.

Figure 2. Number of Reported Norovirus Outbreaks by Season, (November–February), Georgia, 2003–2007



The total number of outbreaks reported to NDES in the first quarter of 2007 was a 240% increase compared to the first quarter of 2006. A large proportion of the increase is related to the severe norovirus season. Reports of norovirus outbreaks increased by 376%; 13 norovirus outbreaks in the first quarter of 2006 compared to 62 outbreaks during the first quarter of 2007. Any suspect outbreak or cluster investigated in Georgia should be reported to Cindy Burnett, Outbreak Coordinator, NDES or Carrie Shuler, Medical Epidemiologist, NDES.

**INFECTIOUS DISEASE
OUTBREAK SPOTLIGHT**

Multistate Outbreak of *Salmonella* Serotype Tennessee Infections Associated with Peanut Butter Consumption — United States, 2006-07

During early January 2007, NDES epidemiologists were notified by the CDC, that a Georgia resident was involved in a large multistate *Salmonella* outbreak investigation. Public Health officials nationwide had been monitoring an increase in *Salmonella* Tennessee infections with three closely related pulsed-field gel electrophoresis (PFGE) patterns. Initial interviews of the patients, including the Georgia case, did not reveal a source of the infections. During the hypothesis generating stage of the investigation, the patient interview results were compared to the national population-based FoodNet survey.¹ A higher proportion of patients reported consuming peanut butter prior to illness compared to the general United States population.

A case-control study was initiated by the CDC to test the hypothesis that peanut butter might be associated with the infections². A case was defined as a culture-confirmed *Salmonella* Tennessee infection, with illness onset after August 1, 2006 with a PFGE pattern matching one of the three outbreak patterns. To be enrolled in the study, the case-patient should have a history of diarrhea, be aged

≥18 years, and not reside in a healthcare facility in the month before illness. Controls were adult persons in the community with no history of diarrhea. The median age of the 65 case-patients and 124 controls were 53 and 58 years, respectively. Patients were more likely than controls to have consumed peanut butter (81% vs. 65%, matched odds ratio [mOR] 1.9, 95% confidence interval [CI] 0.8-5.2), to have eaten peanut butter more than once a week (66% vs. 40%, mOR 3.5, CI 1.4-9.9), and to have eaten either Peter Pan or Great Value peanut butter (67% vs. 13%, mOR 10.9, CI 3.8-43.0). The consumption of other brands of peanut butter was not associated with illness.²

On February 14th, the Food and Drug Administration (FDA) issued a consumer advisory about Peter Pan and Great Value peanut butter manufactured at a single plant in Sylvester, Georgia (lot code beginning with 2111). The Georgia Department of Agriculture, the FDA, and ConAgra (owner of the plant) inspected the manufacturing facility and sampled environmental surfaces, and jars of unopened product. ConAgra voluntarily recalled all of the products made by this plant, destroyed any product in their possession, and closed the plant indefinitely. As of April 25th, 591 persons with the outbreak *S. Tennessee* strains were identified from 47 states. Twenty-four case-patients have been identified in Georgia. Seventeen separate peanut butter jars from 12 different states, including Georgia, have tested positive for one of the outbreak strains. The FDA also found one of the outbreak strains of *S. Tennessee* in four unopened jars of Peter Pan and Great Value peanut butter and on two environmental samples (a peanut roaster and cleaning equipment) taken within the plant. This is the first reported peanut butter-associated outbreak of *Salmonella* in the United States. Peanut butter is a high-fat, low water-activity environment that may allow *Salmonella* to survive at higher temperatures.^{3,4}

The public and media response to this investigation was staggering. The Georgia Poison Center logged over 650 calls in the days following the FDA advisory. All levels (state, district and county) and disciplines of Public Health were involved with the outbreak response including epidemiologists, environmental health specialists, communication officers, administrative personnel, and GPHL microbiologists.

References:

- Centers for Disease Control and Prevention. Foodborne Diseases Active Surveillance Network (FoodNet): Population Survey Atlas of Exposures, 2002. Atlanta: Centers for Disease Control and Prevention; 2004: 81-2. Retrieved March 14, 2007, from <http://www.cdc.gov/foodnet/surveys/pop/2002/2002Atlas.pdf>
- Centers for Disease Control and Prevention. Multistate outbreak of *Salmonella* serotype Tennessee infections associated with peanut butter consumption—United States, 2006–2007. *MMWR Morb Mortal Wkly Dispatch* 2007;56(21):521-524. <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5621a1.htm>
- Mattick KL, Jorgensen F, Legan JD, Lappin-Scott HM, and Humphrey TJ. Habituation of *Salmonella spp.* at reduced water activity and its effect on heat tolerance. *Appl Environ Microbiol* 2001;66:4921-4925.
- Shachar D, and Yaron S. Heat tolerance of *Salmonella enterica* Serovars Agona, Enteritidis, and Typhimurium in Peanut Butter. *J Food Protec* 2006; 69: 2687-2691.

Clostridium Perferingens Outbreak at a Birthday Party — Troup County, Georgia, February 2007

On March 5, 2007, the Georgia Poison Center notified the Troup County Health Department of a possible outbreak of gastroenteritis among persons who attended a catered birthday party two nights earlier. The party had been held on March 3, 2007, at a Troup County Recreation Department facility. The food was provided by an unlicensed caterer. Approximately 120 people attended the event, the meal was served between 7:30 pm and 9:30 pm. Food items included fried chicken, baked chicken in a creamy gravy, rice, gravy (separate from the creamy gravy), macaroni and cheese, green beans, cake, tea, and lemonade.

An outbreak investigation was conducted by Rosanna Boyd, Epidemiologist for the LaGrange Health District, with assistance from Troup County Environmental Health and the Georgia Division of Public Health Environmental Health Branch. Initial steps of the investigation included case-finding, collection of descriptive epidemiologic information, hypothesis-generation, and risk factor evaluation. A list of party attendees was provided to interviewers. Approximately 100 party attendees became ill but only 33 attendees were available for interview. Among the interviewed ill attendees, incubation periods ranged from 1 to 15 hours with a median incubation period of 6 hours. Most case-patients experienced diarrhea and stomach cramps with illness lasting one to two days. No one was hospitalized or died as a result of this outbreak.

Three ill attendees provided stool specimens for analysis at GPHL and two of the three samples tested positive for *Clostridium perfringens* with high levels of bacteria (12,000,000/gram and 6,000,000/gram). Two separate samples of baked chicken with gravy were collected and tested positive for *Clostridium perfringens* (2,900,000 and 54,000,000/gram). A third sample of rice with gravy was collected and *Clostridium perfringens* was isolated at a level of 16,000/gram. It should be noted that the gravy on the rice was different than the gravy on the chicken.

The Environmental Health investigation revealed that the event was located 17 miles away (about 30 minutes travel) from the caterer's home. The foods were not stored in Cambro units that ensure hot or cold temperatures are maintained for up to 3–4 hours. The caterer arrived and set up the food between 4:30-5:00 pm at the Recreation Department facility. The facility was not equipped with a kitchen, so water was retrieved from a janitor's sink for the steam tables. Sternos were used to warm each pan of food. Sternos are self-contained heating devices that usually burn for 3 hours and do not require an outside energy source. It was after 9 p.m. before attendees ate the meal or took food home. Contributing factors to the outbreak include temperature abuse of the food at the caterer's home and inadequate heat control.

Clostridium perfringens is a common cause of foodborne illness outbreaks and usually involves events where large amounts of food are served. Almost all outbreaks are associated with inadequately heated or reheated meats, stews, meat pies, and gravies. Illness usually occurs between 6 to 24 hours after exposure. Symptoms may include nausea, diarrhea, and stomach cramps. This is generally a mild disease, lasting one day or less and is rarely fatal. People infected with *Clostridium perfringens* are not contagious.

Outbreak investigation team: Rosanna Boyd, LaGrange Health District; Arma White, Troup County Health Department; Melody Wegienka, Winston Turner, Susan Ayers, Troup County Environmental Health

Outbreak of *Salmonella* Serotype Montevideo Infections — Statesboro, Georgia, January–April 2007

On March 1, the Notifiable Diseases Epidemiology Section (NDES) initiated an investigation of an increase in reported *Salmonella* Montevideo infections since January 2007 in the Bulloch County, Georgia area. The Georgia Public Health Laboratory (GPHL) performed Pulse-Field Gel Electrophoresis (PFGE) on the isolates and found that they had indistinguishable PFGE patterns. Three very similar *Salmonella* Montevideo strains were classified as the “outbreak strains” for the purpose of the investigation.

Thirty-one case-patients with the outbreak strains of *S.* Montevideo were identified. Lab collection dates ranged from January 21 to March 26, 2007. Investigators interviewed 23/31 (74%) case-patients, as well as 24 non-ill neighborhood controls. The epidemiologic investigation implicated eating at the downtown location of

Restaurant A as the source of the *Salmonella* infections. Sixteen (70%) of the interviewed case-patients and only one (4%) of the controls had eaten at the downtown location of Restaurant A in the past three months (Odds Ratio [OR]=52; 95% CI 5.9–469.9; p value < 0.0001). Two (9%) of the interviewed case-patients and six (25%) of the controls had eaten at the mall location of Restaurant A in the past three months (OR=0.29; 95% CI 0.5–1.6; p value=0.13). Nineteen (83%) interviewed case-patients and 18 (75%) controls ate at Statesboro restaurants on a regular basis (OR=1.5; 95% CI 0.4–6.6; p value=0.50).

On April 6, 2007, investigators from NDES and Bulloch County Environmental Health visited the downtown Restaurant A location to evaluate the possibility of a continuous source *Salmonella* contamination. Investigators collected 21 swab/sponge samples from environmental surfaces in the restaurant and delivered them to GPHL for *Salmonella* testing. The day preceding the visit, the restaurant had scored 59 out of 100 on routine inspection by the County Environmental Health Specialists, citing major violations including hand hygiene.

The restaurant voluntarily closed and began a remodel necessary to comply with food safety regulations. Investigators are continuing to monitor reported cases of *Salmonella* Montevideo infections to determine the effectiveness of control measures. As of May 17, no cases of *S.* Montevideo associated with exposure to the Restaurant A after April 11th have been identified.

Outbreak investigation team: Brad Wiggins, Marlin Thomas, Bulloch County Environmental Health; Ebony Wardlaw, Hollard Phillips, District 9.2 Southeast Health District; Carrie Shuler, Cindy Burnett, Cherie Drenzek, NDES; DHR, Div. of Public Health, Environmental Health Branch; Georgia Public Health Laboratory, Microbiology/Bacteriology.

**Please visit our website for information on Georgia outbreaks.
<http://health.state.ga.us/epi/outbreak/index.asp>**

Outbreak Newsletter | Edited by Carrie Shuler, DVM, MPH & Cindy Burnett, MPH
Notifiable Diseases Epidemiology Section
Please send comments to Carrie Shuler, cmshuler@dhr.state.ga.us

Table 1. Reported Infectious Disease Outbreaks* by Health District— Georgia, 1st Quarter 2006 and 2007**

Health District	Number of Outbreaks		Number of Laboratory-Confirmed Outbreaks		Number of Foodborne Outbreaks		Number of Norovirus Outbreaks	
	2006	2007	2006	2007	2006	2007	2006	2007
1.1: Rome	0	16	0	8	0	0	0	13
1.2: Dalton	0	5	0	2	0	0	0	5
2.0: Gainsville	1	0	0	0	0	0	1	0
3.1:Cobb-Douglas	0	3	1	0	0	1	0	2
3.2: Fulton	0	6	0	1	0	0	0	5
3.3: Clayton	3	1	0	0	1	0	2	0
3.4: Gwinnett	3	5	2	3	1	2	2	4
3.5: DeKalb	6	4	4	2	3	1	4	2
4.0: LeGrange	2	3	1	2	0	1	1	2
5.1: Dublin	1	8	1	7	0	0	0	8
5.2: Macon	3	6	3	4	0	0	1	6
6.0: Augusta	0	0	0	0	0	0	0	0
7.0: Columbus	2	7	0	3	1	0	1	7
8.1: Valdosta	1	0	0	0	0	0	0	2
8.2: Albany	1	2	1	2	0	0	0	2
9.1: Coastal	0	3	0	0	0	0	0	2
9.2: Waycross	0	1	0	1	0	1	0	0
10.0:Athens	1	2	1	2	1	0	1	2
Total	22	75	12	37	7	7	13	62

*Does not include vaccine preventable diseases, environmental or injury outbreaks

**January–March 2006 and January–March 2007