

Norovirus Infection (Formerly Known as Norwalk Virus)

Norovirus Infections are treated symptomatically and are not reportable to the state.

Noroviral infection, extremely common and rarely diagnosed, is a viral infection that causes acute gastroenteritis. These viruses were previously referred to as Norwalk-like viruses. They are also often called caliciviruses, although caliciviruses are small, round structured viruses that can include agents of other illnesses.

Noroviruses are very contagious. An inoculum of as few as ten viral particles may cause infection. The viruses are transmitted primarily through fecal-oral transmission, either through consumption of fecally contaminated food or water or by direct person to person spread. Evidence exists that transmission can occur due to aerosolization of vomitus with resultant contamination of surfaces or entrance through oral mucosa. Outbreaks have been described where the initial mode of transmission was foodborne, followed by person-to-person transmission (23.1% of suspected outbreaks in Louisiana since 2000). (Table 1 on second page following).

Viral shedding may occur. Shedding begins with the onset of symptoms and potentially persists up to two weeks, although it is unclear if viral shedding over seventy-two hours post recovery signifies continued infectivity.

Norovirus infection usually presents as acute onset vomiting, watery diarrhea (non-bloody) with abdominal cramps and nausea; however asymptomatic infections may occur in as many as thirty percent of those infected.

In an analysis of sixteen suspected Louisiana outbreaks since 2000, nausea (or vomiting) with diarrhea were listed as one of the three most frequently reported syndrome in seventy-five percent (n = 12) of the outbreaks. The other twenty-five percent only had nausea and vomiting.

There are approximately 4,500,000 episodes of diarrhea in Louisiana yearly, leading to 10,000 hospitalizations and fifty deaths (Extrapolation to Louisiana based on Mounts AW 1999. *Trends in hospitalizations associated with gastroenteritis among adults in the USA, 1979-1995*. *Epidemiology & Infection* 123: 3-8).

An etiologic agent can be identified in less than ten percent of these cases. Estimation of the number of norovirus cases is 400,000 cases per year in Louisiana, one-third of these being foodborne.

The Centers for Disease Control and Prevention (CDC) estimates that norovirus is the etiology in at least fifty percent of all foodborne outbreaks of gastroenteritis in the United States. Table 1 shows that foodborne transmission was suspected in ten of sixteen (62.5%) outbreaks investigated in Louisiana after 2000. This elevated percentage is likely due to more frequent reporting of outbreaks from common source foods.

Outbreaks of norovirus are usually characterized by high attack rates in all ages. This phenomenon may be explained by strain specific immunity of only a few months duration. Recent evidence also suggests that susceptibility to infections may be genetically determined, with people of the O blood group being at greatest risk for severe infection.

Most outbreaks of norovirus arise through direct contamination of food by a food handler immediately preceding its consumption. Outbreaks are commonly associated with consumption of cold foods including salads, sandwiches and bakery products. Liquid foods such as salad dressings and cake icings have also been implicated. Foods can be contaminated at their source or prior to distribution, with examples being oysters from contaminated waters or raspberries and salads processed prior to widespread distribution. Table 1 shows that oysters contaminated at their source were the most likely foods implicated in several norovirus outbreaks in Louisiana. Waterborne outbreaks are frequently caused by sewage contamination of wells and recreational waters.

Diagnosis of Norovirus

Since the discovery of viral gastro-enteritis outbreaks in the 1970s, laboratory confirmation of this etiology has continued to develop. Molecular assays such as Reverse Transcription Polymerase Chain Reaction (RT-PCR) have now made the etiologic diagnosis much easier to obtain. Serology, as well as direct and immune electron microscopy, are also used.

Identification of the virus is best made from stool specimens taken within forty-eight to seventy-two hours after symptom onset, although diagnosis is possible on stool taken as long as five to fourteen days post onset. Assays for identification of norovirus in foods are not helpful on a consistent basis and are generally not used, although assays to detect the virus in shellfish are routinely utilized.

The criteria for a presumptive diagnosis of viral gastroenteritis outbreaks are:

- mean (or median) illness duration of twelve to sixty hours
- mean (or median) incubation period of twenty-four to forty-eight hours
- greater than fifty percent of the cases with vomiting
- no bacterial agent previously found

Table 1 illustrates that the mean incubation period in outbreaks in Louisiana where norovirus was the only suspected etiology, was thirty hours (range: 23-37). Mean duration of illness was thirty-five hours (range: 21-51).

Prevention of Norovirus

Noroviruses are relatively resistant to environmental challenges. These viruses survive freezing, are heat stable at temperatures up to 60°C and in water, can survive when chlorine levels are above those found in public water systems. Illness has been also been associated with consumption of steamed shellfish. Despite the environmental resistance, simple measures, including proper handling of food (especially cold items), frequent hand-washing and paid sick leave for food service employees may substantially limit transmission of noroviruses.

Table 1: Summary of outbreak investigations – Norovirus – Louisiana, 2000-2008

Location	Month	Year	Number Ill	Number Investigated	Attack Rate	Case Type	Samples Tested	% Positive	Symptoms	Mean Incubation (Hrs)	Duration (Hrs)	Transmission	Parish	Source
N	05	2000	55	178	31	H,R	5	100	DNV		-	PP	E. Feliciana	OY, PH
R	01	2001	13	46	28	P	0	-	DNF	27	22	FB	Orleans	RF
V	06	2001	75	269	28	W,P	4	25	DVC	26	24	FB PP	Orleans	
R	03	2002	26	61	43	P	9	67	CDN	23	37	FB	Orleans	OY
P	12	2002	20	30	67	P	4	25	NDC	8	90	FB	OOS	OY
V	04	2003	13	53	25	W,P	3	100	VDN	-	21	FB	Orleans	-
R	10	2003	15	22	68	P	3	100	DCN	37	44	FB	St Bernard	-
P	01	2004	11	17	65	P	2	50	DNV	37	51	FB	OOS	-
R	03	2004	26	35	74	P	7	100	CNV	37	38	-	Lafayette	-
S	10	2004	59	113	52	P	8	0	VD	-	36	FB, PP	Calcasieu	M
R	12	2004	12	18	67	P	0	-	VDN	33	24	FB	Ouachita	-
N	04	2005	79	240	33	H,R	3	100	DNC	-	48	PP	Orleans	-
R	05	2005	65	1380	5	P,W	3	33	NVC	20	35	FB, PP	Jefferson	-
N	05	2006	19	19	15	R	5	100	NV	-	-	PP	Lafayette	-
N	07	2006	53	53	47	R,W	3	100	NV	-	-	PP	Concordia	-
N	07	2006	15	15	-	R	4	25	DNV	-	-	PP	Franklin	-
N	02	2007	41	102	40	R	19	37	NV	-	36	PP	Orleans	-
O	02	2007	-	-	25	R	-	-	D	-	-	PP	Baton Rouge	-
S	03	2007	332	-	-	P	-	-	DNV	-	60	PP	P. Coupee	-
N	03	2007	37	-	-	R	7	14	DNV	-	-	PP	E. Feliciana	-
N	11	2007	80	196	41	R, H	-	-	DNV	-	24	PP	Orleans	-
N	02	2008	39	88	44	R,H	3	67	VD	-	24	PP	Lafourche	-
O	03	2008	12	21	57	P,W	4	75	VD	35.3	-	PP	Iberia	-
R	09	2008	7	8	88	H	1	100	NVD	9	-	FB	Orleans	U
O	09	2008	22	66	33	R	2	100	NVD	-	-	PP	Terrebonne	-
N	12	2008	23	43	53	R, H,W	1	100	VD	-	-	PP	St. Tammany	-
N	12	2008	43	203	21	R, W	3	67	NVD	-	60	PP	St. Tammany	-

Location: N=nursing home; R=Restaurant/Caterer; V=Vessel; P=Picnic; S=School, O=Other

Case type: H=Health care worker; R=Resident/patient; P=General public; W=worker/employee

Symptoms: D=Diarrhea; N=Nausea; V=Vomiting; F=Fever; C=Cramps Transmission: PP=Person to person; FB=Foodborne

Source: OY=Oysters from bed; OZ=Oyster post harvest contamination; F=Fruit; M=Meat; U=Undetermined; OOS=Out of State