Norovirus Infection (Formerly Known as Norwalk Virus)

Single norovirus infections are treated symptomatically and are not reportable to the state. Outbreaks are 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 small, round, structured viruses that belong in the family Caliciviridae.

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, through consumption of fecally contaminated food or water, by direct person-to-person spread or by contact with contaminated objects. Outbreaks have been described where the initial mode of transmission was foodborne, followed by person-to-person transmission. Evidence exists showing transmission can occur from the aerosolization of vomitus, resulting in contamination of surfaces or viral entry through oral mucosa.

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 30% of those infected. Viral shedding begins with the onset of symptoms and potentially persists up to two weeks. It is unclear if viral shedding over 72 hours post recovery signifies continued infectivity.

In an analysis of outbreaks in Louisiana from 2000 to 2010, nausea or vomiting with diarrhea were reported as the main symptoms in 73% of the outbreaks. Diarrhea only (no vomiting) was the symptom in 14% of the outbreaks, and vomiting only (no diarrhea) was the symptom in 12% of the outbreaks.

There are approximately 4,500,000 episodes of diarrhea in Louisiana yearly, leading to 10,000 hospitalizations and 50 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 10% of these cases. Estimation of the number of norovirus cases is 400,000 cases per year in Louisiana, one-third of these being foodborne. Of the norovirus outbreaks in Louisiana between 2000 and 2010, 58% were person to person outbreaks, 27% were solely foodborne, and 15% were a combination of foodborne and person-to-person (Table 1). Difficulty arises in determining if an outbreak is considered foodborne or person-to-person in a setting where food is served but no food item is significantly associated with illness.

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.

According to The Centers for Disease Control and Prevention (CDC), of the 479 foodborne outbreaks reported in the United States in 2008, 49% were caused by norovirus (Surveillance of Foodborne Disease Outbreaks - United States, 2008. MMWR 60(35); 1197-1202). Foodborne outbreaks of norovirus can 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 48 to 72 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 12 to 60 hours
- mean (or median) incubation period of 24 to 48 hours
- greater than 50% 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 27 hours. Mean duration of illness was 44 hours.

Prevention of Norovirus

Noroviruses are relatively resistant to environmental challenges. These viruses survive freezing, are heat stable at temperatures up to 60°C and when in water, can survive chlorine levels above those found in public water systems. 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 norovirus.

Table 1: Summary of outbreak investigations – Norovirus – Louisiana, 2000-2010

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	NVD		-	PP	E. Feliciana	OY, PH
R	01	2001	13	46	28	P	0	-	NDF	27	22	FB	Orleans	RF
V	06	2001	75	269	28	W,P	4	25	VDC	26	24	FB PP	Orleans	
R	03	2002	26	61	43	P	9	67	NDC	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	NVD	-	21	FB	Orleans	-
R	10	2003	15	22	68	P	3	100	NDC	37	44	FB	St Bernard	-
P	01	2004	11	17	65	P	2	50	NVD	37	51	FB	OOS	-
R	03	2004	26	35	74	P	7	100	NVC	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	-	NVD	33	24	FB	Ouachita	-
N	04	2005	79	240	33	H,R	3	100	NDC	-	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	NVD	-	-	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	-	-	NVD	-	60	PP	P. Coupee	-
N	03	2007	37	-	-	R	7	14	NVD	-	-	PP	E. Feliciana	-
N	11	2007	80	196	41	R, H	-	-	NVD	-	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	Month	Year	Number Ill	Number Investigated	Attack Rate	Case Type	Samples Tested	% Positive	Symptoms	Mean Incubation (Hrs)	Duration (Hrs)	Transmission	Parish	Source
R	1	2009	19	-	-	P	1	100	NVD	27	36	FB	Rapides	U
R	1	2009	14	-	-	P	1	100	NVD	27	-	PP	Rapides	-
O	3	2009	18	42	43	W	5	40	VD	-	-	FB/PP	St. Bernard	U
N	4	2009	34			R,W	4	25	D	-	-	PP	Concordia	-
N	12	2009	29	-	-	R	0	-	VD	-	-	FB	Orleans	U
N	2	2010	37	54	68.5	R,W	2	50	NVD	-	-	PP	Jefferson	-
N	2	2010	17	-	-	R,W	12	58	NVDC	-	36	PP	Calcasieu	-
N	2	2010	17	-	-	R,W	5	80	NVD	-	48	PP	Orleans	-
O	2	2010	10	-	-	R,W	0		VD	-	-	PP	Jefferson	-
N	3	2010	68	190	35.8	R	4	100	NVDC	-	-	PP	East Baton Rouge	-
N	3	2010	40	250	16	R,W	2	50	NVDC	-	-	PP	Jefferson	-
N	3	2010	13	-	-	R,W	3	33	NVDC	-	72	PP	East Baton Rouge	-
O	3	2010	91	-	-	W	2	100	NVDC	-	120	PP	East Baton Rouge	-
R	3	2010	14	15	93.3	P	1	100	NVDC	25	17	FB	Orleans	OY
N	3	2010	25	-	-	R,W	0	-	NVDC	-	-	PP	Terrebonne	-
R	3	2010	19	47	40.4	P	3	100	NVDC	30	18	FB	Orleans	OY
R	3	2010	9	13	69.2	P	0	-	NVDC	27	57	FB	Orleans	OY
N	3	2010	104	280	37.1	R,W	7	86	NVDC	-	72	PP	Jefferson Davis	-
N	4	2010	44	-	-	R,W	2	50	NVDC	-	-	PP	St Tammany	-
R	6	2010	10	18	55.6	P	3	100	NVDC	34	34	FB/PP	Ascension	U
S	11	2010	16	-	-	P	1	100	NV	-	-	FB/PP	East Baton Rouge	U
R	12	2010	12	19	63.2	P	2	100	NV	31	49	FB/PP	Orleans	U

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