

Stopping Norovirus in its Tracks – What Every Clinician Should Know

**Clinician Outreach and
Communication Activity (COCA)
Conference Call
January 17, 2013**

Objectives

At the conclusion of this session, the participant will be able to accomplish the following:

- ❑ Describe the basic epidemiology of norovirus including burden of disease, and diagnostics and surveillance in the United States.**
- ❑ Define the role of norovirus in foodborne disease in the United States.**
- ❑ Identify community groups and healthcare settings most susceptible to severe outcomes from norovirus gastroenteritis.**
- ❑ List infection control measures and resources available for the control of norovirus.**

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TODAY'S PRESENTER



Ben Lopman, PhD, MSc

Epidemiologist

Division of Viral Diseases

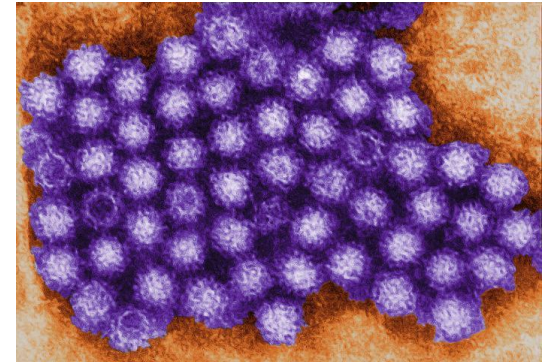
National Center for Immunization and Respiratory Diseases

Centers for Disease Control and Prevention



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COCA Call
Jan 17, 2013



Ben Lopman, PhD
Epidemiologist
Division of Viral Diseases

National Center for Immunization and Respiratory Diseases

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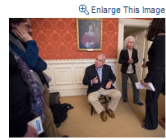
Inside Health
Research Fitness & Nutrition



Flu Widespread, Leading a Range of Winter's Ills

By DONALD G. MCNEIL Jr. and KATHARINE Q. SEELYE
Published: January 9, 2013 | 588 Comments

It is not your imagination — more people you know are sick this winter, even people who have had flu shots.



Rick Friedman for The New York Times
Boston's mayor, Thomas M. Menino, on Wednesday after he declared the spread of the flu a public health emergency.

The country is in the grip of three emerging flu or flulike epidemics: an early start to the annual flu season with an unusually aggressive virus, a surge in a new type of norovirus, and the worst whooping cough outbreak in 60 years. And these are all developing amid the normal winter highs for the many viruses that cause symptoms on the "colds and flu" spectrum.

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31 December 2012 Last updated at 09:08 ET



Ninewells and Stracathro wards reopen after norovirus outbreaks

NHS Tayside has reopened three hospital wards that were closed to new admissions due to an outbreak of norovirus.



Ward 5 and ward 33 at Ninewells hospital in Dundee had been closed to new admissions

Wards 5 and 33 at Dundee's Ninewells Hospital are now accepting new patients, as is ward 2 at Stracathro Hospital in Angus.

The three wards had been closed as a precautionary measure.

Norovirus causes vomiting, stomach cramps, fever and diarrhoea, and is easily spread from person to person.

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Rafael Nadal delays comeback because of stomach virus, pulls out of Abu Dhabi tournament

Published December 25, 2012 / Associated Press



Why has norovirus been so bad this winter?

abc NEWS VIDEO HOT TOPICS: Golden Globes 2013 - Jodie Foster Speech - Kate Winslet
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SICK at Sea
Dangerous Virus on Cruise Liners Leaves Hundreds Ill
Norovirus outbreak spreads to passengers, crew on Queen Mary 2 and Emerald Princess.
01/24/12 2/28/2012
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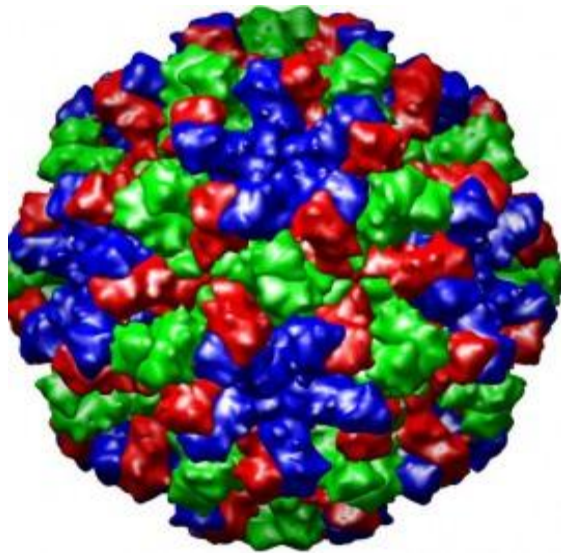
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Distinguishing the flu from norovirus
By Deborah Kotz | GLOBE STAFF JANUARY 14, 2013
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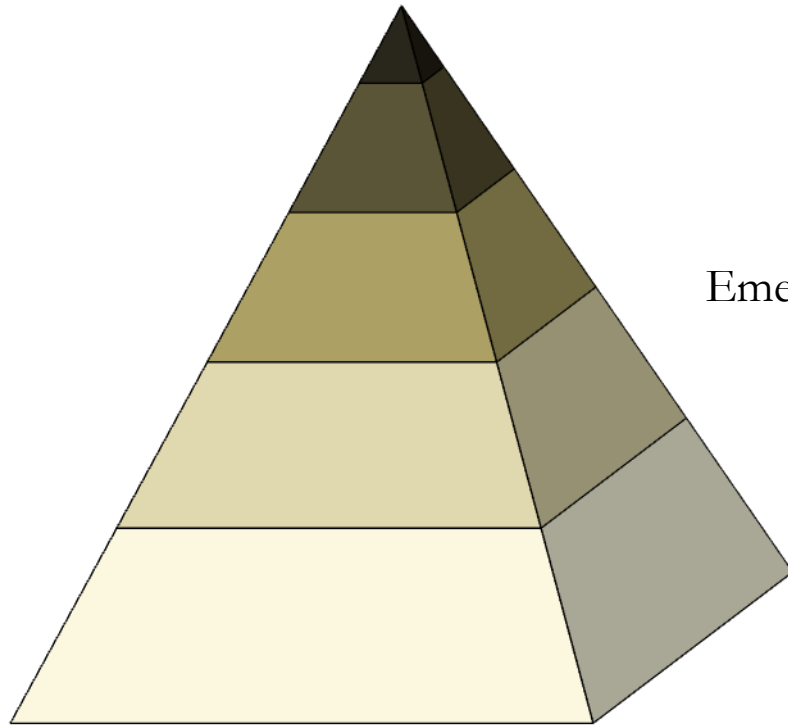
Outline

1. Basic epidemiology of norovirus
2. Groups susceptible to severe outcomes
3. Role of norovirus in foodborne disease
4. Available infection control measures and resources

Noroviruses



Norovirus disease burden in the United States



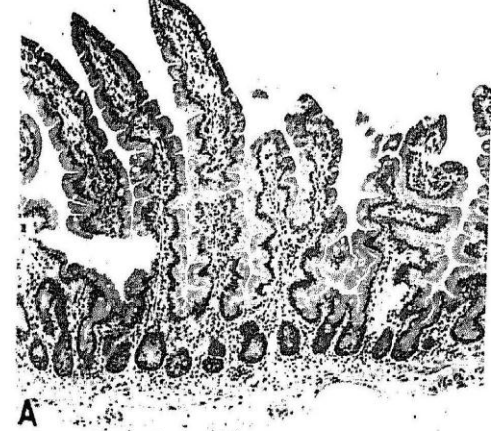
	Annual estimate	Lifetime risk
Deaths	800	1 in ~5,000
Hospitalizations	71,000	1 in ~50
Emergency department visits	414,000	1 in ~9
Outpatient visits	1.7 million	1 in ~2
Cases	21 million	5.6

Hall 2012 CID
Lopman 2011 CID
Gatanaduy 2013 JID
Scallan 2010 EID

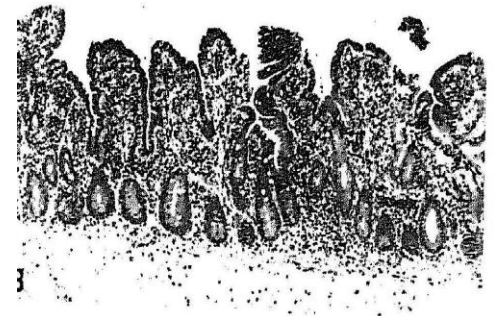
Clinical Disease

- Incubation period: 12-48 hours
- Acute-onset vomiting and/or diarrhea
 - Watery, non-bloody stools
 - Abdominal cramps, nausea, low-grade fever
- Most recover after 12-72 hours
 - 10-12% seek medical attention; some require hospitalization and fluid therapy
 - More severe illness and death possible in elderly and those with other illnesses
- 30% of infections are asymptomatic

Normal intestine

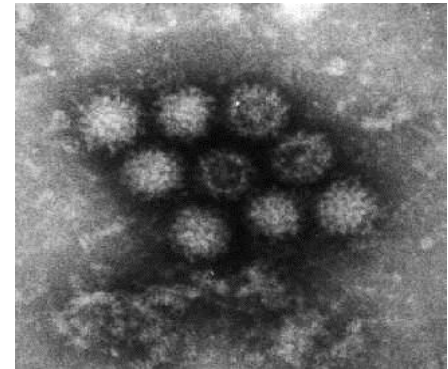


Virus-infected intestine



Viral Shedding

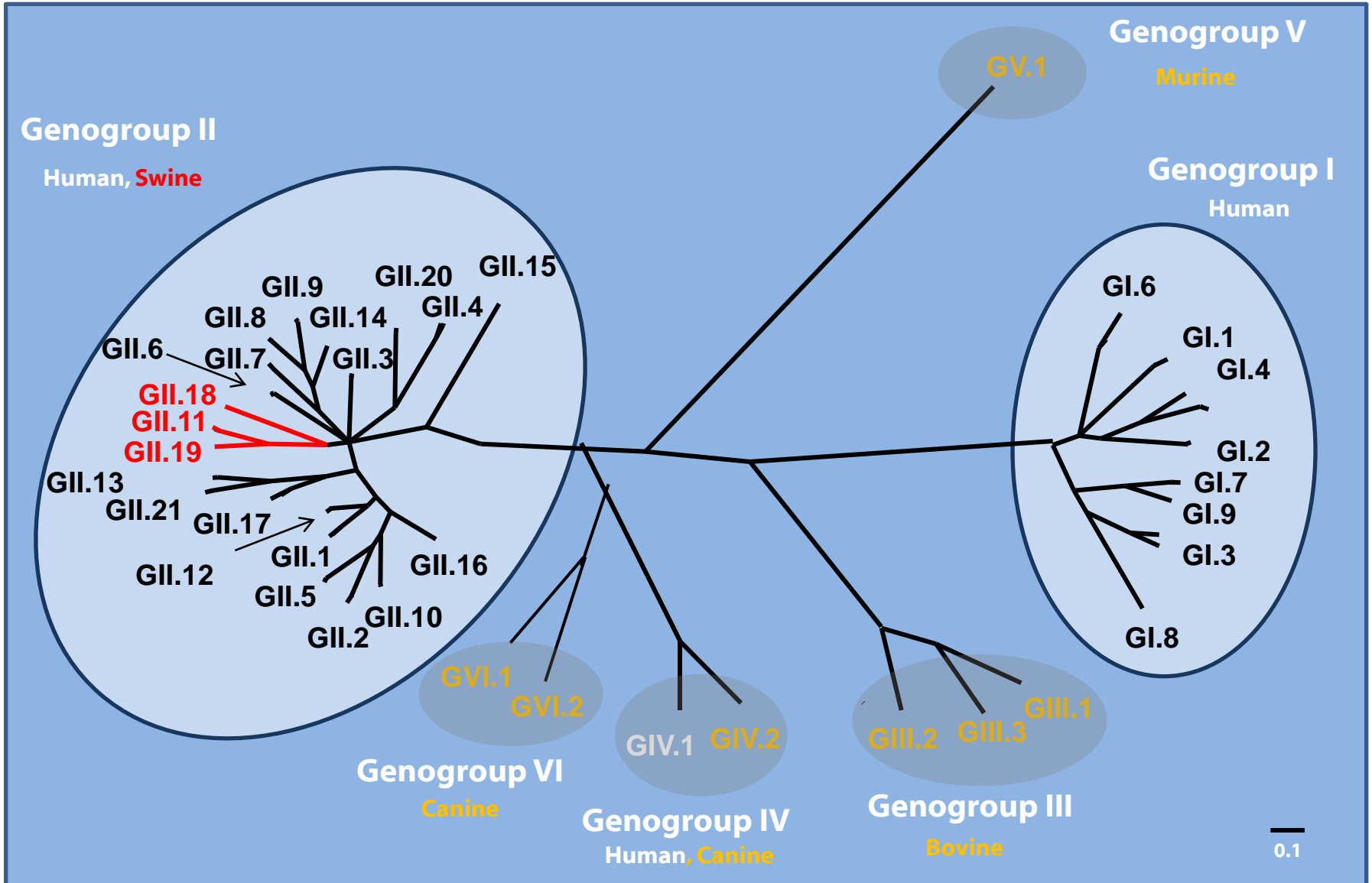
- Primarily in stool, but also vomitus
- Occurs for at least 2-3 weeks
- Peaks 4 days after exposure
 - 10^{10} viral copies/gram feces
 - May persist after resolution of symptoms
- Infectious dose: 18 to 1000 viral particles
- Infectivity of shed virus and role of asymptomatic shedding in transmission is unknown



Immunity and Genetic Susceptibility

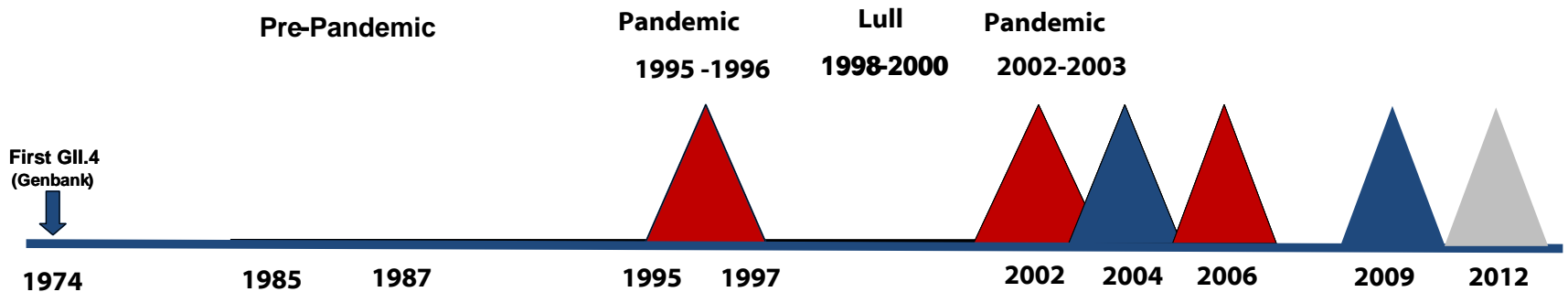
- Human volunteer studies demonstrated short-term homologous immunity (<6-12 mos)
- Little persistent cross-protective immunity
- Genetic susceptibility/resistance
 - Histo-blood group antigens
 - Secretor status (FUT2 gene)

Genetic classification of noroviruses



GII.4 Norovirus Pandemics

Winter Season	GII.4 Strain	Increase of outbreaks in US
1995-96	Grimsby (US95/96)	Yes
2002-03	Farmington Hills	Yes
2004-05	Hunter	No
2006-07	Minerva (2006b)	Yes
2009-10	New Orleans	No
2012-13	Sydney	??

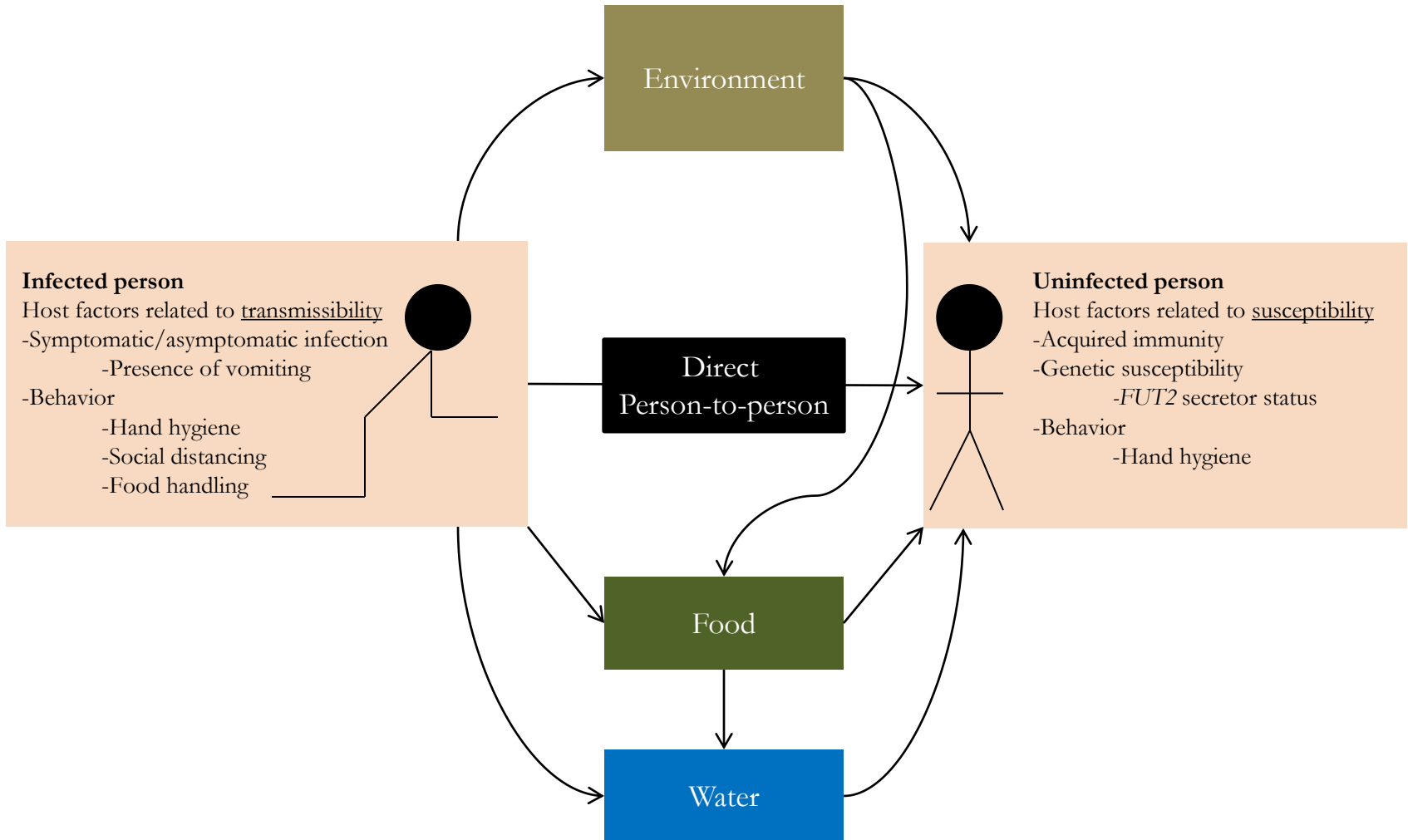


Noel et al., 1999
Widdowson et al., 2004
MMWR 2007
Yen et al., 2011
van Beek 2013

Laboratory Diagnostics

- No cell culture or animal model available
- Real-time RT-PCR
 - Quantitative assay provides estimate of viral load
 - Available in public health laboratories and research facilities
- Conventional RT-PCR
 - Sequence analysis used for genotyping
 - Capsid gene (regions C and D)
- Enzyme immunoassays (EIA)
 - Complicated by antigenic diversity
 - Currently inadequate sensitivity for clinical use in diagnosing sporadic cases

Norovirus Transmission Cycle

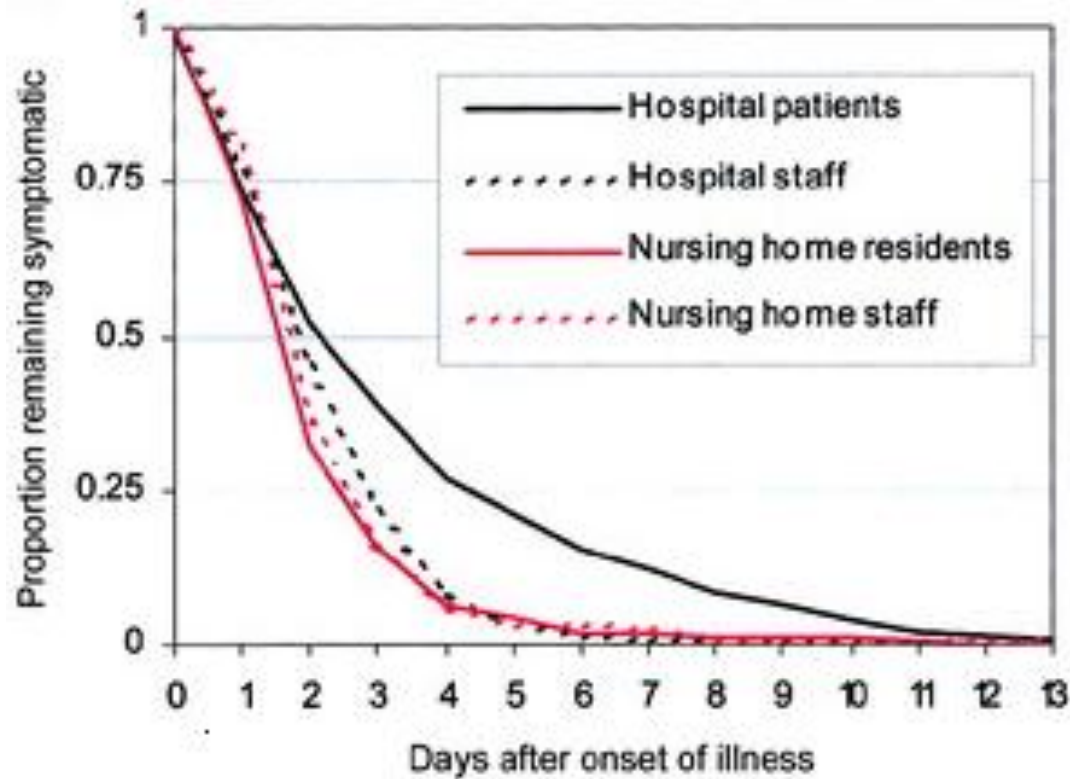


Community norovirus incidence in England

ANNUAL INCIDENCE

< 5 years	27% (19 – 37)
5-14 years	9.6% (6.1 - 14.1)
15-44 years	5.2% (3.5 - 7.2)
45+ years	2.4% (1.5 - 3.6)
All ages	4.4% (3.6 - 5.4)

Duration of norovirus illness among staff, patients and residents of hospitals and resident homes.



Severe outcomes are associated with GII.4 norovirus outbreaks: A systematic literature review: HOSPITALIZATION

		Crude rate per 1,000	Multivariable IRR
Setting	Community settings	7	1
	Health care facilities	15	1.4 (1.0 - 1.8)
Transmission	Food/water	9	1
	Person-to-person	14	1.0 (0.8 - 1.3)
Strain ¹	Non-GII.4 outbreaks	2	1
	GII.4 outbreaks	6	9.4 (6.1 - 14.4)

*Based 843 outbreaks with:

71,724 cases

501 hospitalizations

45 deaths

Severe outcomes are associated with GII.4 norovirus outbreaks: A systematic literature review: DEATHS

		Crude rate per 1,000,000	Multivariable IRR
Setting	Community settings	2	1
	Health care facilities	396	60 (6 - 609)
Transmission	Food/water	3	1
	Person-to-person	271	2.8 (0.3 - 28.0)
Strain ¹	Non-GII.4 outbreaks	36	1
	GII.4 outbreaks	139	3.1 (1.3 - 7.6)

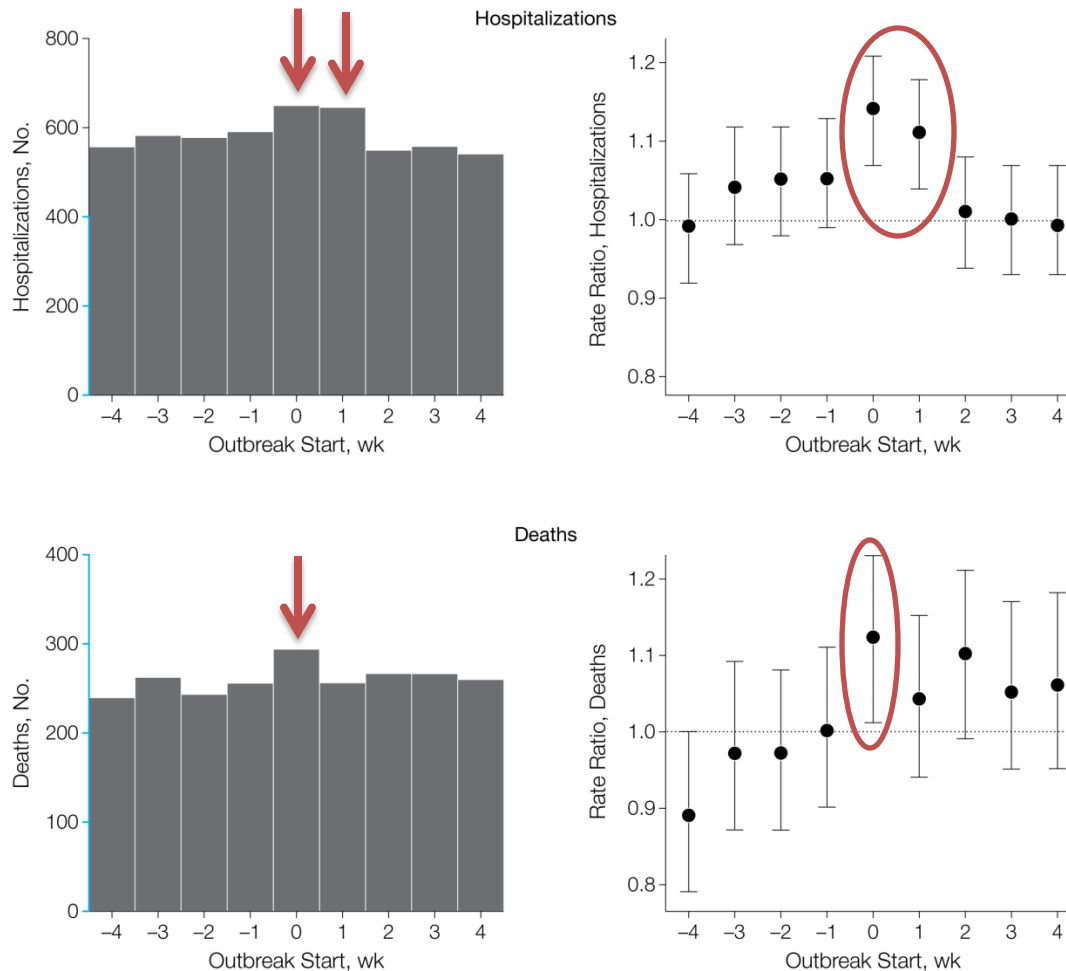
*Based 843 outbreaks with:

71,724 cases

501 hospitalizations

45 deaths

Is norovirus a *cause* of death?



Estimates of economic burden

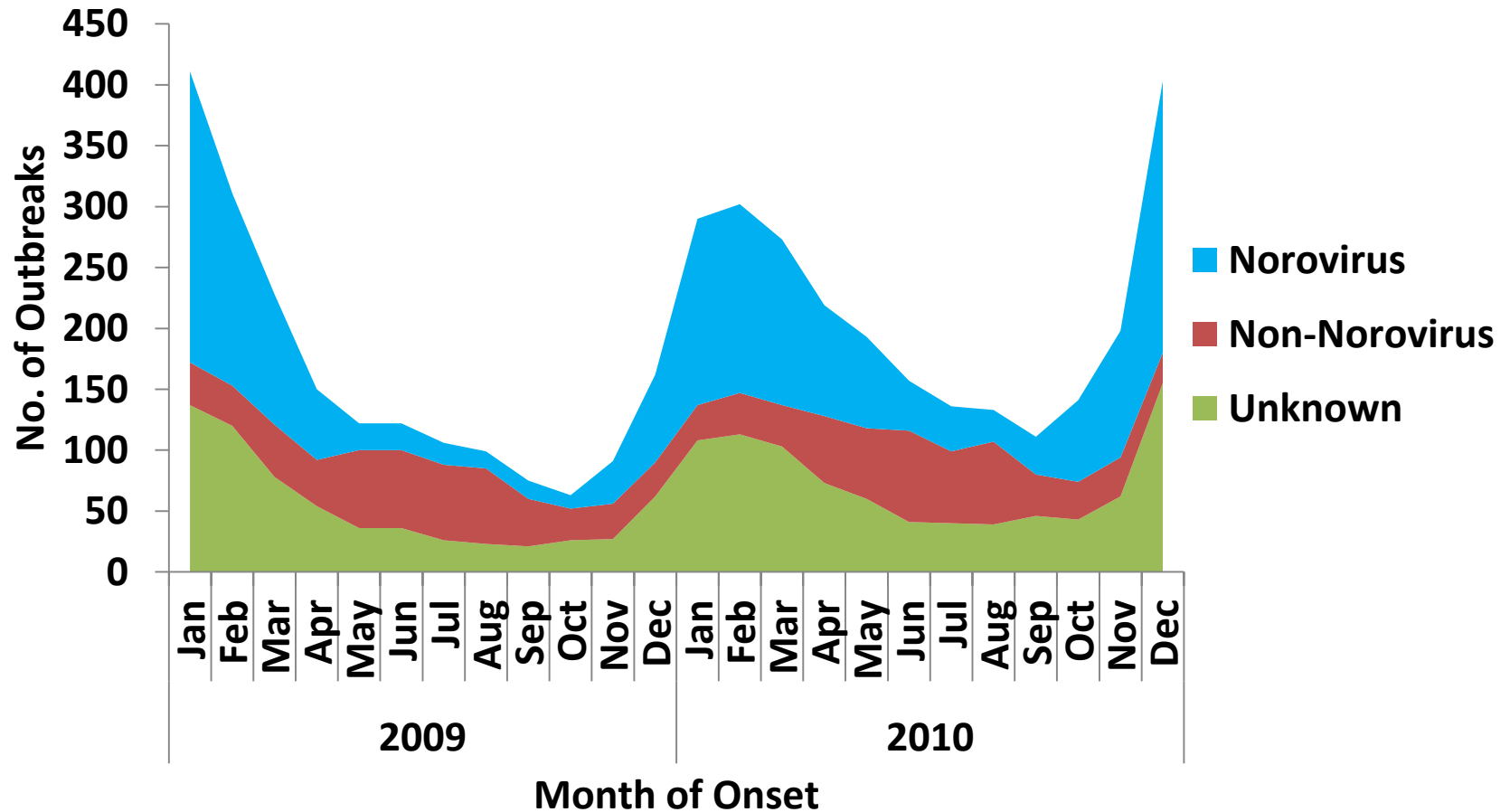
- Total cost of endemic norovirus ~\$5.5 billion/year
 - ~\$500 million/ year in hospital costs
- Most studies have quantified the cost of outbreaks
 - An outbreak in a single 946-bed U.S. hospital cost an estimated \$650,000
 - Cost to the English National Health Service of nosocomial AGE outbreaks \$184 million (2002/03)

National Outbreak Reporting System (NORS)

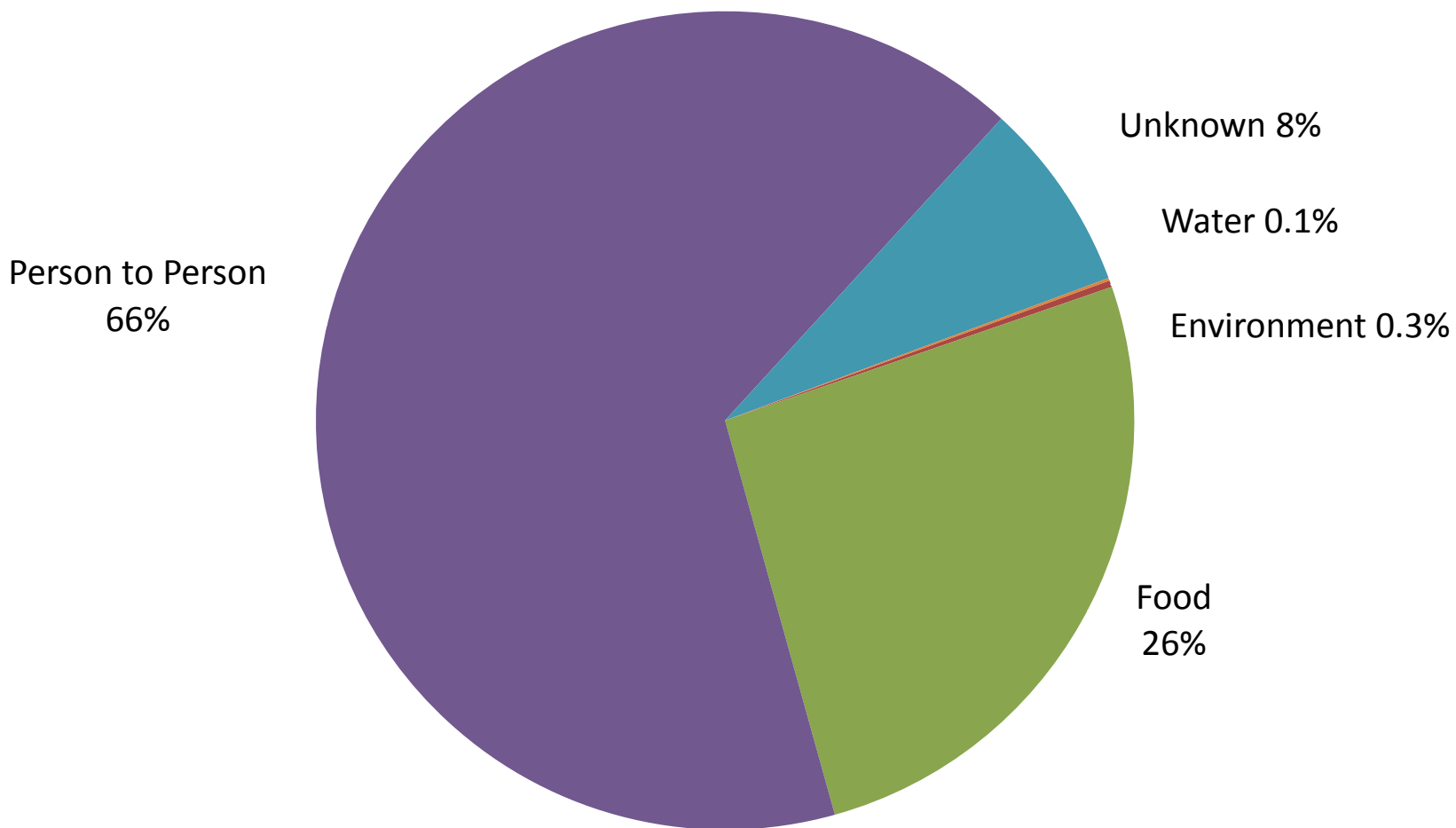
- **Comprehensive national surveillance system for all US enteric disease outbreaks**
- **Launched February 2009**
- **Assess the national burden and temporal trends of outbreaks**
- **Identify priority settings and populations for interventions**
- **Characterize outbreaks, e.g.:**
 - Pathogen
 - Setting
 - Mode of transmission



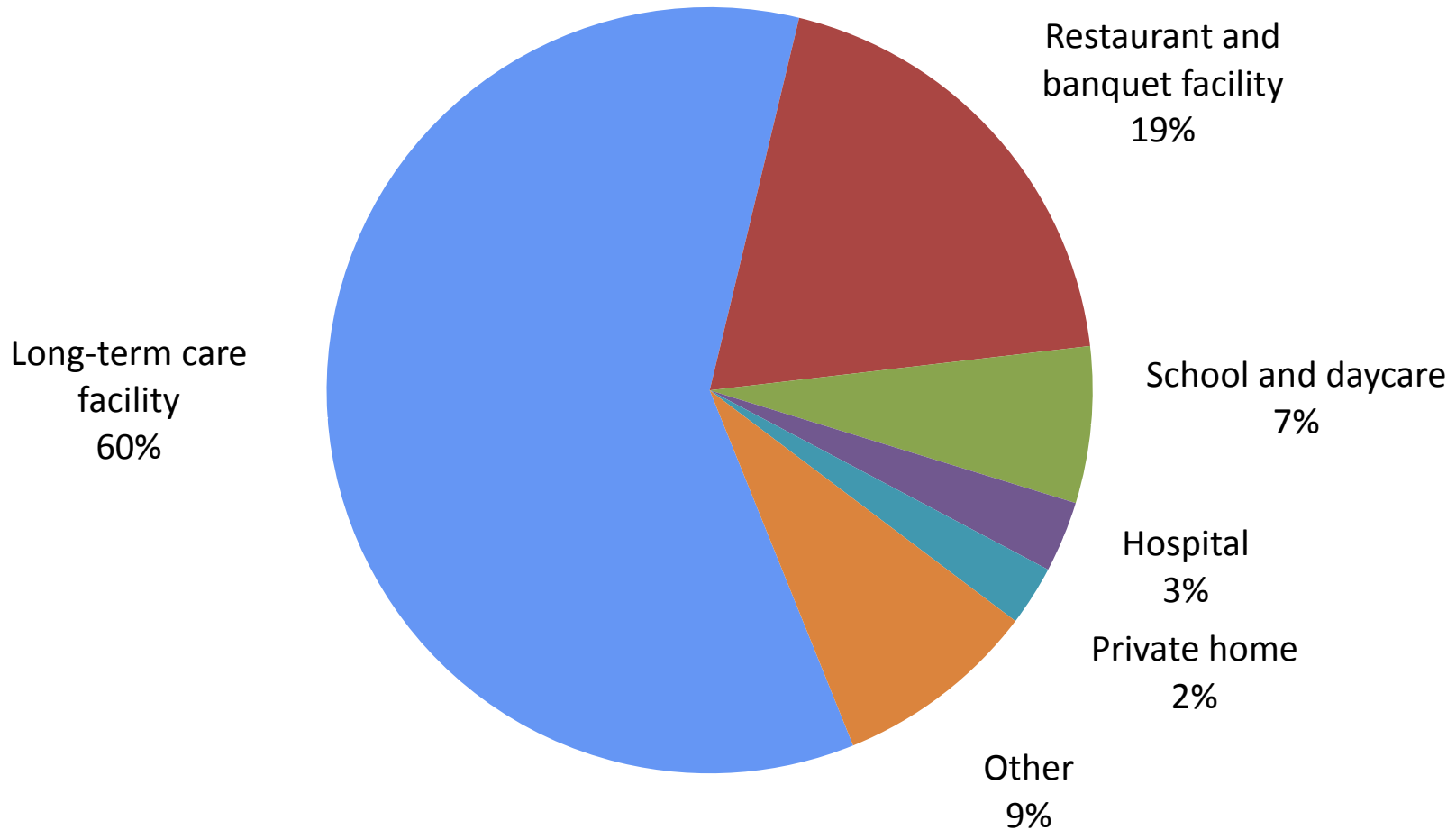
Acute Gastroenteritis Outbreaks Reported to NORS, 2009-2010



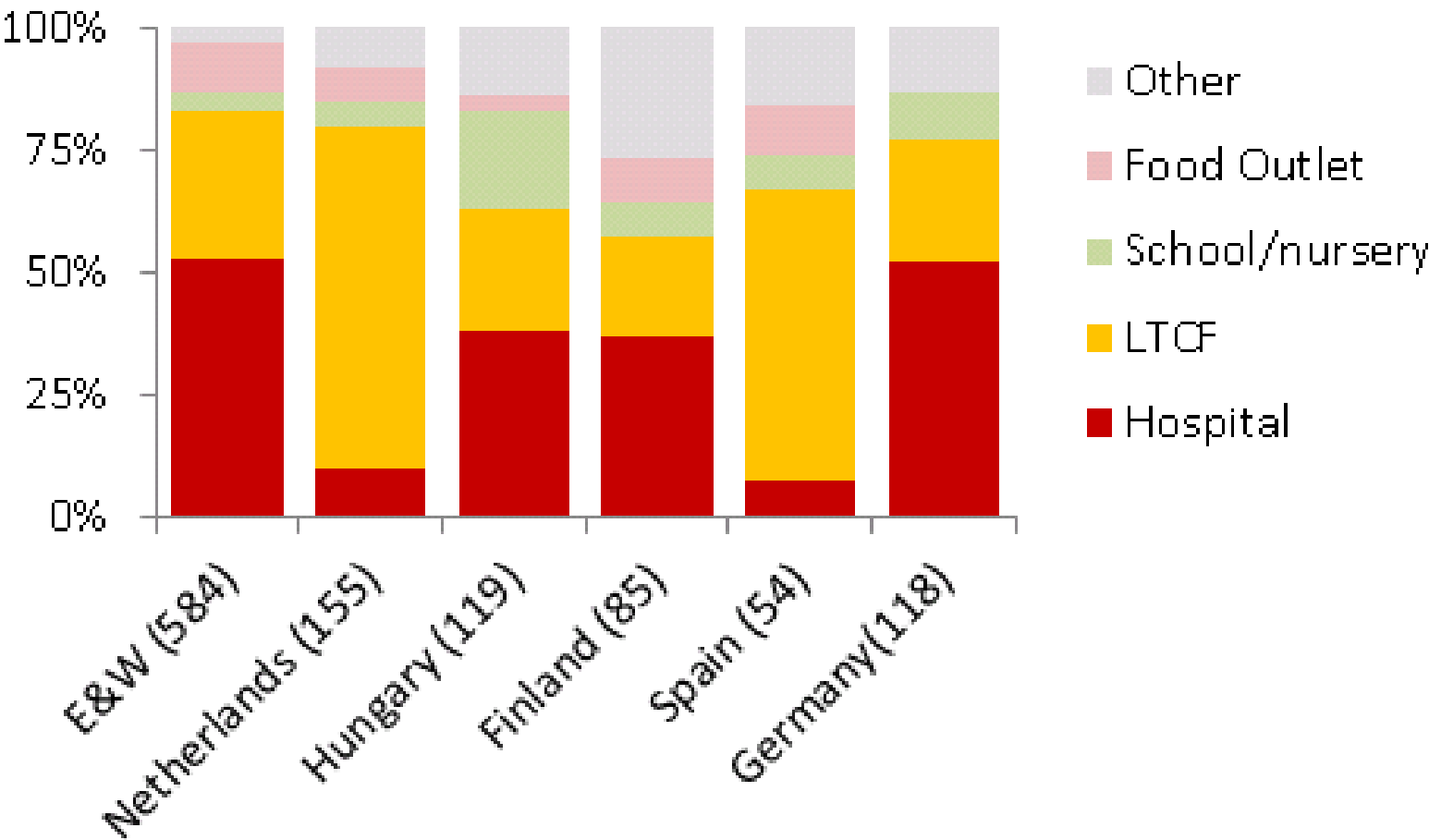
Transmission Mode of Norovirus Outbreaks Reported to NORS, 2009-2010 (N=1910)



Setting of Norovirus Outbreaks Reported to NORS, 2009-2010 (N=1500)



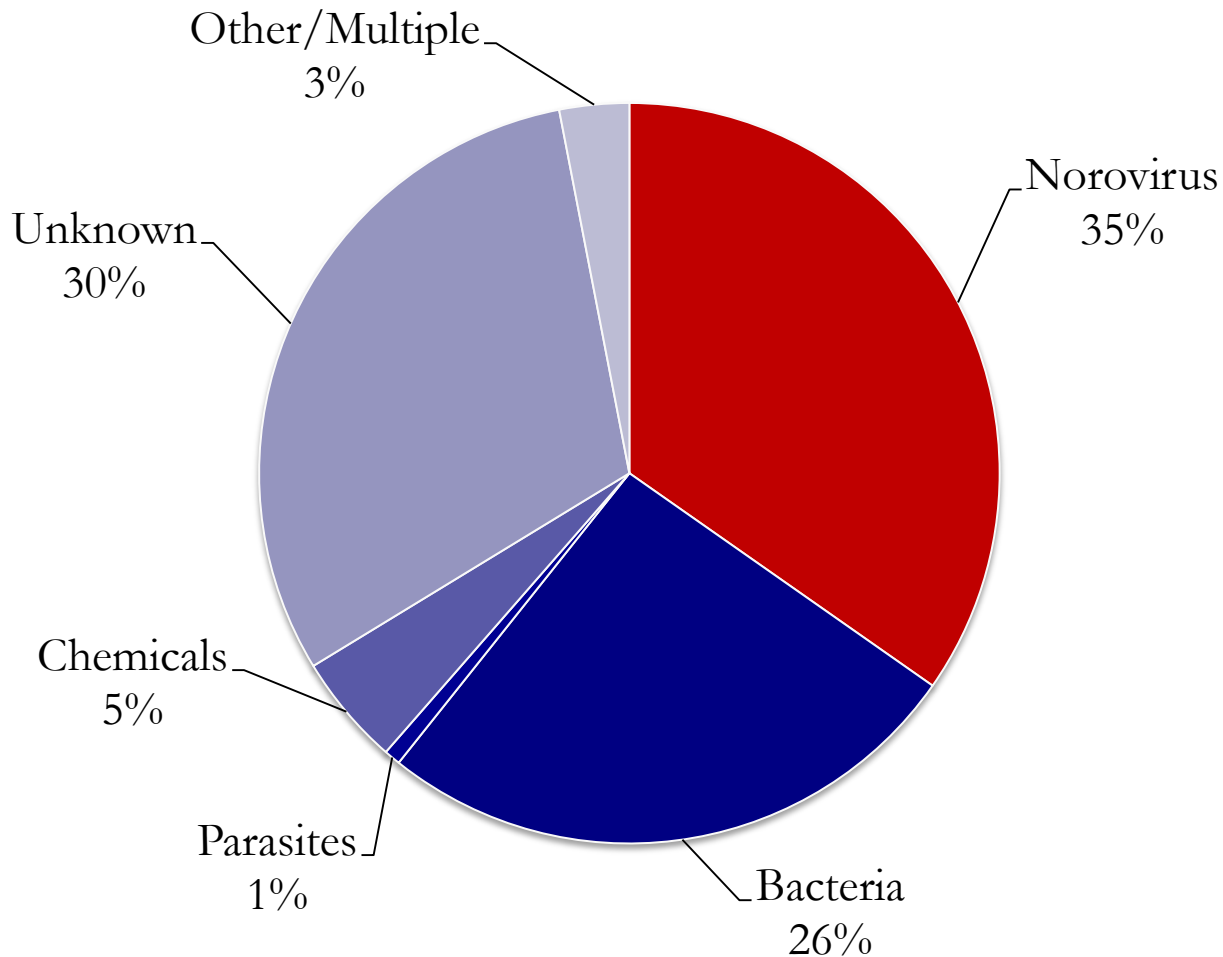
Setting of 1115 Norovirus Outbreaks in Six European Counties, 2002



Burden of Foodborne Norovirus in the United States

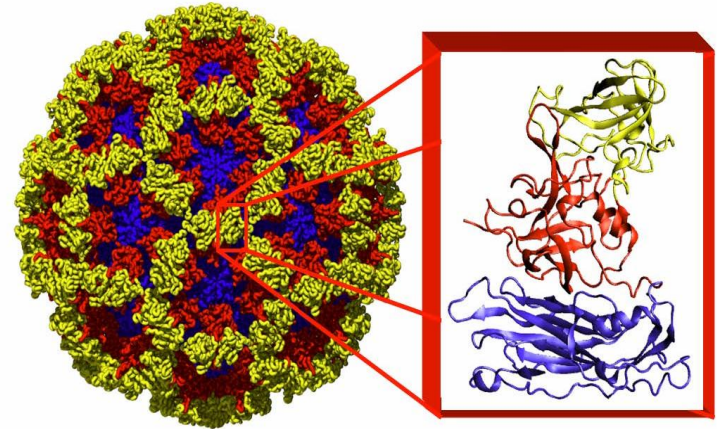
- Causes 58% of all domestically-acquired foodborne illness from known agents
 - #1 cause of illness
 - #2 cause of hospitalization
 - #4 cause of death
- Costs \$2 billion per year in medical care services and lost productivity

Etiology of Foodborne Outbreaks Reported to CDC, 2006-2007



CaliciNet

- Molecular norovirus genotyping network (similar to PulseNet)
- Data shared between public health labs and CDC
- Link outbreaks and identify common sources
- Identify emergent variants
- Implemented March 2009



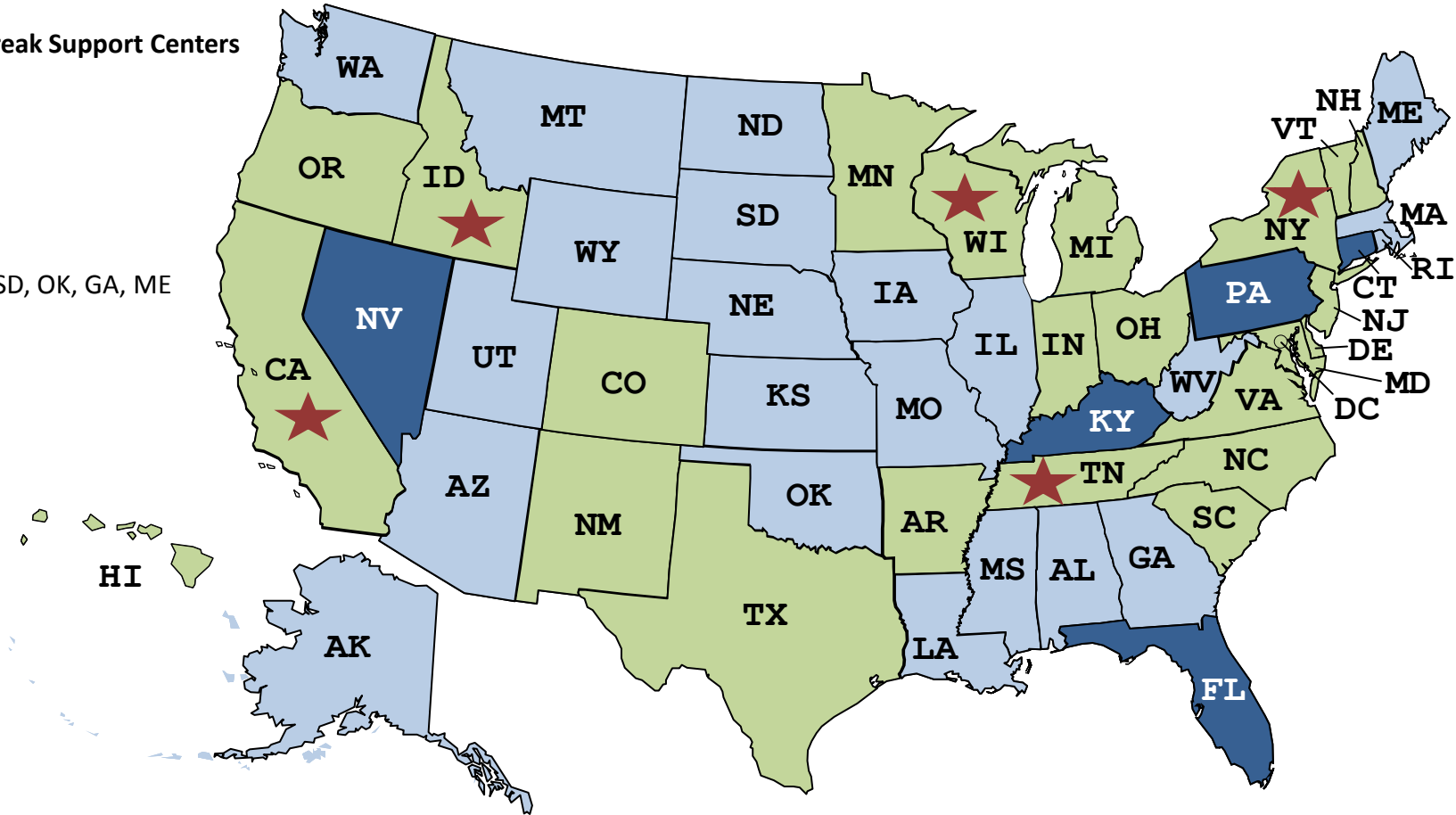
National Norovirus Outbreak Network



CaliciNet: Participating States and OSC

★ CN-Outbreak Support Centers

CA: AZ, UT, WA
ID: AK, MT, WY
WI: IA, KS, MO
TN: AL, LA, MS
NY: MA, RI, WV
CDC: IL, ND, NE, SD, OK, GA, ME



CaliciNet: Initiated March 2009

CN-Outbreak Support Centers: Initiated November 2010

State laboratories certified (n = 23)
State laboratories pending certification (n = 5)
State laboratories submitting to CN-OSC (n = 22)

Updated: 7/20/12

Prevention and Control

General

- Rapid reporting, response, and investigation
 - Identify mode of transmission and source of contamination
 - Collect appropriate specimens
- Promote appropriate hand hygiene
 - Wash with soap and water ≥ 20 seconds
 - Alcohol-based hand sanitizers?
- Prompt and thorough disinfection
 - Bleach solution for contaminated surfaces
 - Other EPA-approved disinfectants?
- Manage and exclude ill persons
 - ≥ 24 -72 hrs after symptom resolution
 - Accommodating sick pay/leave policies for staff

Prevention and Control In healthcare settings

- Patient cohorting
 - Place patients with norovirus gastroenteritis on Contact Precautions for a minimum of 48 hours after the resolution of symptoms
- Personal Protective Equipment (PPE)
 - Gowns and gloves upon entry
- Patient Transfer and Ward Closure
 - Consider the closure of wards to new admissions or transfers
- Environmental Cleaning
 - Consider changing privacy curtains routinely and upon patient discharge or transfer.
- Rehydration therapy
 - Particular attention to children, elderly or otherwise vulnerable

Norovirus



Norovirus is a very contagious virus that can infect anyone. You can get it from an infected person, contaminated food or water, or by touching contaminated surfaces. The virus causes your stomach or intestines or both to get inflamed. This leads you to have stomach pain, nausea, and diarrhea and to throw up. These symptoms can be serious for some people, especially young children and older adults... [more](#)

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Norovirus Topics

About Norovirus

Overview about the virus, how it spreads, symptoms, treatment...

Preventing Norovirus Infection

You can help protect yourself and others from norovirus infection by following some simple tips...

For Food Handlers

Information about how norovirus spreads through contaminated food and water...

Trends and Outbreaks

Information about how common norovirus illness is, who gets infected, and when...

For Health Care Providers

Clinical features, transmission, diagnosis, disease burden, treatment...

Laboratory Testing

Types of laboratory testing done to diagnose norovirus infection, guidelines, reporting systems...

For Public Health Professionals

Information about burden of norovirus illness and outbreaks, surveillance & reporting, investigations...

Resources & References

Scientific articles and educational materials related to norovirus...

Protect Yourself from Norovirus!



Wash your hands often



Rinse fruits & vegetables



Cook shellfish thoroughly



Clean surfaces & wash laundry



When you're sick, don't prepare food or care for others

Share this widget | More info
www.cdc.gov/Norovirus

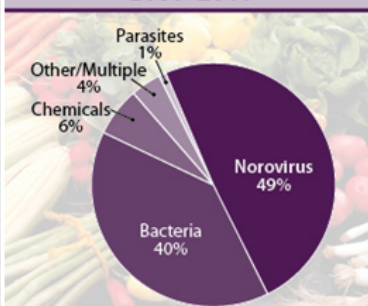


Many Names, Same Symptoms

You may hear norovirus illness called "food poisoning" or "stomach flu." It is true that food poisoning can be caused by noroviruses. But, other germs and chemicals can also cause food poisoning.

Norovirus illness is not related to the flu, which is a respiratory illness caused by influenza virus.

Known Causes of Foodborne Illness Outbreaks, U.S., 2006–2010



Symptoms

The most common symptoms are:

- diarrhea
- throwing up
- nausea
- stomach pain

Other symptoms include:

- fever
- headache



NOROVIRUS

What healthcare providers should know

What is norovirus?

A virus that can cause severe and sudden gastroenteritis (i.e., inflammation of the lining of the stomach and intestines). Both healthy and compromised persons can be affected.

What are the symptoms?

Nausea, vomiting, diarrhea, and some stomach cramping

Is it contagious?

Norovirus is very easily transmitted through contaminated hands, equipment/surfaces, or food/water

What can I do to prevent norovirus?

Always perform appropriate hand hygiene, particularly after contact with fecal material or after contact with anyone suspected /confirmed with norovirus. Wear gloves when caring for symptomatic patients.

If you have symptoms consistent with norovirus infection, stay home for a *minimum* of 48 hrs after symptom resolution

If an outbreak is suspected contact Infection Prevention and Control

► For more information, visit www.cdc.gov



Norovirus Prevention Toolkit

<http://www.cdc.gov/HAI/organisms/norovirus.html#a4>



U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Guidelines

- Updated Norovirus Outbreak Management and Disease Prevention Guidelines
 - MMWR Recommendations and Reports
 - <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6003a1.htm>
- Guideline for the Prevention and Control of Norovirus Gastroenteritis Outbreaks in Healthcare Settings
 - Healthcare Infection Control Practices Advisory Committee (HICPAC)
 - http://www.cdc.gov/hicpac/norovirus/002_norovirus-toc.html

A norovirus vaccine?

- Intranasal vaccine based on Norwalk GI.1 VLPs
- Safe and immunogenic
- 47% effective against norovirus gastroenteritis
- 26% effective against norovirus infection
- Bivalent GI.1/GII.4 vaccine currently being tested in human volunteers



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ORIGINAL ARTICLE

Norovirus Vaccine against Experimental Human Norwalk Virus Illness

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Thank You

<http://www.cdc.gov/norovirus/index.html>

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<http://www2a.cdc.gov/TCEOnline/>

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Thank you for joining!

Please email us questions at coca@cdc.gov

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Stopping Norovirus in its Tracks - What Every Clinician Should Know

 = Continuing Education

Date: Thursday, January 17, 2013

Time: 2:00 - 3:00 pm (Eastern Time)

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Passcode: 1281914

Participate By Webinar: <https://www.mymeetings.com/nc/join.php?i=PW7035569&p=1281914&t=c>

Presenter(s):

 **Ben Lopman, PhD, MSc**
Epidemiologist
Division of Viral Diseases
National Center for Immunization and Respiratory Diseases
Centers for Disease and Control and Prevention

Overview:

Noroviruses are responsible for more than half of all reported outbreaks of gastroenteritis in the United States., and contribute to about 70,000 hospitalizations and 800 deaths each year. While outbreaks can occur in a variety of settings, healthcare facilities, to include nursing homes and hospitals, are the most commonly reported settings for norovirus outbreaks. Clinicians have a critical role in the management and prevention of norovirus outbreaks. During this COCA call, a CDC subject matter expert will discuss the burden of norovirus outbreaks, review diagnostics and surveillance tools, and share resources to promote the prevention and control of norovirus infections.

<http://emergency.cdc.gov/coca>

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CDC Facebook page for Health Partners! “Like” our page today to receive COCA updates, guidance, and situational awareness about preparing for and responding to public health emergencies.



The screenshot shows the Facebook profile for CDC Health Partners Outreach. The page header includes the Facebook logo, a search bar, and login options for Email and Password. Below the header, there is a 'Sign Up' button and the text 'Facebook helps you connect and share with the people in your life.' The profile picture is a group of people, and the cover photo shows a group of people in a meeting. The page is categorized as a 'Government Organization' in 'Atlanta, Georgia'. The 'Wall' section features a post from CDC Health Partners Outreach announcing a webinar on Crisis and Emergency Risk Communication - Radiation. The post includes the CDC logo, the title 'Crisis and Emergency Risk Communication - Radiation Webinar', the URL 'events.720.constantcontact.com', and the date 'CERC Webinar - July 21'. The post is dated 'Monday at 7:08am' and has been liked by 'Jessica Guidry, Marta Lugo, Marcy Dalziel Belvin and 3 others like this.' Below the post, there is another announcement for the CDC Health Partners Outreach booth at the AVMA Convention, located in St. Louis, MO, on Saturday, July 16th, from 7:00AM to 7:00PM.

<http://www.facebook.com/CDCHealthPartnersOutreach>