VIRGINIA
EPIDEMIOLOGY BULLETIN

Robert B. Stroube, MD, MPH, Health Commissioner
John S. Marr, MD, MPH, State Epidemiologist
Christopher Novak, MD, MPH, Editor
Vickie L. O'Dell, Layout Editor

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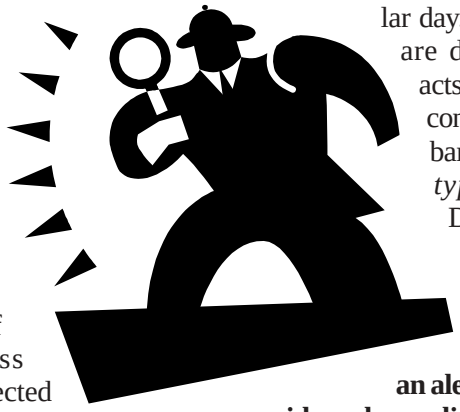
Outbreak Investigations: Disease Prevention in Action

Disease outbreaks come in many forms: vancomycin-resistant enterococcal clusters in an intensive care unit, foodborne illness epidemics, influenza pandemics, etc. Some outbreaks are local and resolve naturally. Other outbreaks have significant health and economic impacts. Recently, the Pennsylvania Department of Health and the Centers for Disease Control and Prevention (CDC) investigated a hepatitis A outbreak. In a 3-day period in early October thousands of patrons at a single restaurant were exposed. More than 550 people contracted hepatitis A—three people died. Immune globulin was needed for 9,000 persons who ate at the restaurant. The restaurant has since closed. Preliminary analysis has implicated green onions from Mexico as the source of the outbreak.

To better appreciate the importance of disease reporting, and the need for cooperation between healthcare providers and public health, it is helpful to understand what happens during an outbreak investigation, and why.

What is an Outbreak?



An outbreak of an illness occurs when one or more people linked by some common factor become ill. Outbreaks are defined as an increase in the number of people with an illness above the normally expected level in a given time period. The classic example is the foodborne outbreak, where cases are persons who have consumed the same contaminated food. To complicate things, they may be a group that ate a meal together somewhere, or it may be a group of people who do not know each other at all but who all happened to eat the same contaminated item from a grocery store or restaurant. Often, a combination of events contributes to the outbreak (e.g., a series of food handling errors, such as poor handwashing practices followed by inadequate cooking temperatures).

A local outbreak might follow a catered meal at a reception, a pot-luck supper, or eating a meal at a restaurant on a particular day. Rarely, outbreaks are due to intentional acts—for example, the contamination of salad bars with *Salmonella typhimurium* in Dalles, Oregon by the Rajneeshees cult in 1984. **Outbreaks are usually identified by an alert healthcare provider who realizes that he or she is seeing more than the expected number of patients with a similar illness.** For widespread illnesses, outbreak detection may require county or state health departments recognizing an unusually large number of reports of illness through surveillance.

With new techniques and methods for sharing information, outbreaks are also being recognized that are widespread, affecting persons in many different places over a prolonged time period. For example, a recent outbreak of salmonellosis was traced to a breakfast cereal produced at one factory, but marketed under several different brand names in different states. No one county or state had many cases and cases did not know each other. The outbreak was recognized because state public health laboratories noticed a sudden increase in one rare strain. Therefore, **every** reported illness counts, and laboratory confirmation of the illness may prove critical to disease prevention.

> "The reason for collecting, analyzing and disseminating information on a disease is to control that disease."
>
> —Foege WH et al. *Int. J of Epidemiology* 1976; 5:29-37.

In This Issue:

Investigations: Applied Epidemiology

When an outbreak is recognized, the first step is to keep the immediate danger from spreading. This involves rapidly identifying potential sources of the illness, and determining methods for control and treatment.

The second step is a detailed investigation to learn what happened. Full investigations can require a team with multiple talents, including epidemiologists, microbiologists, nurses, sanitarians, veterinarians, factory process engineers, etc. A search is made for additional cases among persons who may have been exposed. The outbreak is described by time, place, and person. A graph ("epidemic curve") is frequently drawn to look at the number of people who fell ill on each successive time period in question and to provide clues on when the exposure occurred, if the outbreak was likely from a single or multiple sources, if the exposure is ongoing, and if the illness is likely to spread from person to person. Maps of where the ill people live, work, or eat may also be helpful. Detailed case histories and specimens (e.g., stool, blood, leftover food) can help to diagnose the specific organism or toxin involved.

To identify the source of the outbreak, investigators interview persons with the most typical signs and symptoms about exposures that they may have had before they became ill. In this way, some exposures may be excluded while others emerge as potential culprits for the outbreak. Hypotheses are generated, then tested in a formal epidemiologic investigation. Investigators conduct systematic interviews with ill persons, and a comparable group of people who are not ill, about possible exposures. By comparing how often an exposure is reported by ill people and by well people, investigators can quantify the strength of the association of the exposure with illness (e.g., as a Relative Risk, or an Odds Ratio, depending on the type of study).

A well-conducted epidemiologic investigation can also guide further efforts to control the outbreak. A strong and consistent association between illness and a particular food item that explains the distribution of the outbreak in time, place and person can be acted upon to prevent further illness from occurring.

An outbreak ends when the critical exposure stops. This may happen because all of the contaminated food is consumed or recalled, or the implicated restaurant or food processor is closed or changes its procedures, or an infected food handler is no longer infectious or is no longer working with food, or appropriate infection control methods are implemented. An investigation that clarifies the nature and mechanism of contamination can provide critical information even if the outbreak is over. Understanding the contamination event well enough to prevent it can guide the decision to resume usual operations, and lead to more general prevention measures that reduce the risk of similar outbreaks happening elsewhere. For example, it was possible to trace the green onions associated with the restaurant outbreak in Pennsylvania to specific farms. Implementing

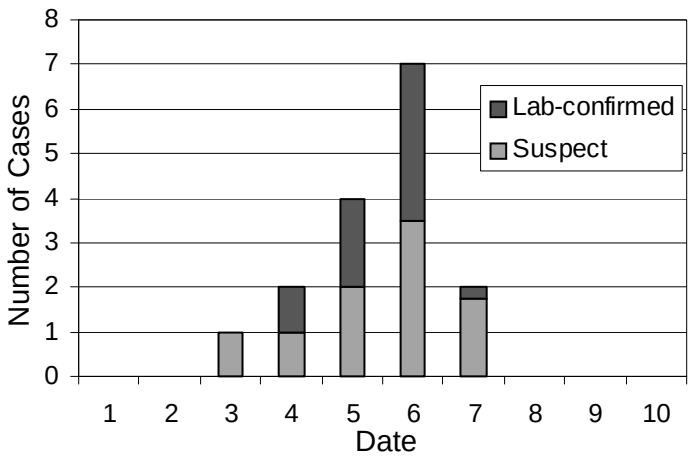
Example

Imagine an outbreak at a catered party: initial investigation suggests that green onions were eaten by at least some of the attendees, so it is on the list of possible exposures. Now, we interview the 100 people who attended the affair. Each ill or well person is interviewed about whether or not he/she ate the green onions, as well as various other food items. If the green onions were not associated with the illness, then we would expect each person to have a 50:50 chance of reporting that they ate green onions, regardless of whether they were ill or not. Instead, we find that most of the ill people, but few of the well persons, reported eating green onions. In fact, the distribution given by the table below shows that risk of getting sick for those who ate green onions would be 4 times the risk of getting sick for those who did not eat green onions. This result would be very unlikely to occur if the green onions were not somehow related to the risk of illness. If no other foods are implicated, contamination of the green onions is very likely to have been the source of the outbreak. Note that the investigator can draw this conclusion even though there are no green onions left to test in a laboratory.

		Ill	
		Yes	No
Ate green onions	Yes	40	10
	No	10	40

Relative Risk = 4.0
p< 0.0000001

Note: In real life, things are rarely this easy—that's where the skills and experience of healthcare workers and public health professionals come in…



improved sanitation at these sites could help to limit future cases of foodborne illness.

Conclusions

Detecting and investigating outbreaks is a major challenge to health professionals. However, factors such as ease of international travel, widespread transport of goods (and pathogens), emerging diseases (e.g., avian influenza, SARS), and the threat of bioterrorism mean that future outbreaks are likely.

Therefore, public health departments, healthcare providers and clinical laboratories need to continue to work together to rapidly identify and act on important communicable diseases. Timely reporting provides public health scientists with the opportunity to intervene and prevent further illness and to identify exposed people so that earlier treatment can be started. This directly reduces the health and economic impact (e.g., lost work days, treatment costs, law suits, etc) of outbreaks.

Disease reporting isn't meant to make healthcare providers' lives difficult—in most cases, the diseases are rare, and the reporting is easy. If you suspect a possible disease outbreak, your local health department is just a phone call away. The Health Department acts on the information that it receives, and work begins immediately to minimize the impact of disease on our communities.

Welcome!

The Office of Epidemiology is pleased to welcome Tanya Bobo, who has joined the Division of Zoonotic and Environmental Epidemiology as an Applied Epidemiology Fellow for a two year assignment. She comes to us through a new Council of State and Territorial Epidemiologists (CSTE)/ Centers for Disease Control and Prevention (CDC) program to encourage more trained epidemiologists to enter state and local health departments. Tanya earned her MPH with a concentration on infectious diseases from the University of California, Berkeley. She has worked in the Pacific Institute for Research and Evaluation, the San Francisco Health Department and the Caribbean Epidemiology Center.

Some of Tanya's projects will include coordinating surveillance for human West Nile Virus, and enhancing surveillance for illnesses related to recreational water (e.g., harmful algal blooms, *Vibrio* outbreaks, etc.).

National Public Health Week
April 5-11, 2004

The American Public Health Association has selected "Eliminating Health Disparities—Communities Moving from Statistics to Solutions" as the topic for National Public Health Week. The goal of the week is to highlight projects and interventions that are working to reduce health disparities in communities, and to inspire other people who work on healthcare issues to join in this effort.

The American Public Health Association has developed a Web site for National Public Health Week – for more information, go to www.apha.org/nphw/.

National Public Health Week, April 5-11, 2004

Eliminating *Health Disparities* Communities Moving from Statistics to Solutions

Notes on Norovirus

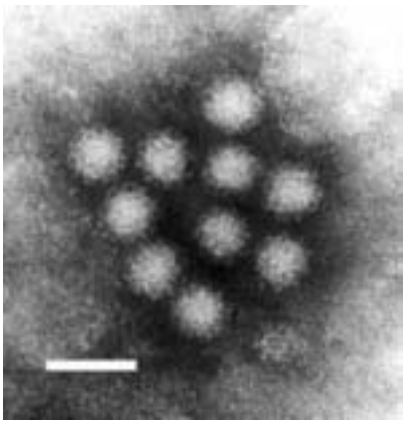


Photo Credit: F.P. Williams, U.S. EPA

Reports from across Virginia suggest that it's 'Norovirus season' again…

Noroviruses cause acute gastroenteritis ("stomach flu" or "winter vomiting disease")—symptoms include nausea, vomiting, watery non-bloody diarrhea, stomach cramps, and low-grade fever. Although the illness is generally short-lived and self-limiting, its high attack rate can severely affect group living arrangements. Hospitalizations and deaths from dehydration have occurred, especially among the elderly and the very young. Since norovirus thrives in closed environments, it should be a major concern for health care institutions such as nursing homes.

Norovirus outbreaks are most commonly spread by the fecal-oral OR vomit-oral routes. Guidelines have been developed to help stop outbreaks (see below)—but these viruses are highly contagious, so strict adherence is necessary. Preventive measures should be continued for at least three days after an outbreak appears to be over since infected persons continue to shed the virus after they have recovered. **Remember: this virus is very hardy—it can survive on environmental surfaces.**

The Division of Consolidated Laboratory Services (DCLS) wants to remind you that they offer testing for norovirus outbreaks. Contact your local health department to discuss suspicious cases of gastroenteritis—they can help investigate and arrange for norovirus testing. When indicated, specimens (raw stool or vomitus) from at least 10 cases should be collected, properly labeled, and shipped on cool packs to the laboratory. Consult your local health department for further details on laboratory testing and norovirus control guidelines.

Remember:

√ Individual cases of norovirus are NOT notifiable diseases.

√ Known or suspected OUTBREAKS of norovirus ARE notifiable, and should be reported to your local health department as soon as possible.

Some recommendations for the control of norovirus outbreaks include

1. Isolate ill residents by confining them to their rooms (until 3 days after their last symptoms). Group ill people together if possible. Discontinue activities where ill and well residents would be together.
2. Ideally, keep all residents in their rooms and serve meals in rooms.
3. Ill staff should remain out of work for 3 days following the end of diarrhea and/or vomiting.
4. Minimize the flow of staff between sick and well residents. Staff should be assigned to work with either well residents or sick residents, but should not care for both groups.
5. **Staff should wash their hands when entering and leaving *every* resident room.**
6. Staff should wear gloves when caring for ill residents or when touching potentially contaminated surfaces. Gloves should be discarded and hands washed immediately after completing patient care.
7. Masks should be worn when caring for residents who are vomiting.
8. Use a disinfectant to frequently clean surfaces such as handrails, doorknobs, physical/occupational therapy equipment, etc. Dilute (1:9) bleach solution is one option; commonly-used quaternary ammonium products are **not** effective against norovirus. The laundry coming from known cases, or any soiled laundry during an outbreak, must also be considered to be infectious.
9. It may be necessary to discontinue visitation until the outbreak is over. If visitation is allowed, visitors should go directly to the person they are visiting and not spend time with anyone else. They should wash their hands upon entering and leaving the room. They should not visit if they are sick.
10. **Contact your local health department to assist in implementing control measures.**

Featured Website

Interested in learning more about what public health departments do? Do you have students or residents who should learn the basics of public health?

The New York-New Jersey Public Health Training Center has created a free web-based *Orientation to Public Health,* helpful for anyone new to public health. The goals of the program are to:

- define public health and its obligations,
- explain how public health differs from health care, and
- give examples of how a local health agency carries out the essential services of public health.

The course incorporates simulated e-mail messaging, assignment of tasks, simulated interviews, and tests to make learning more interesting. To access this resource, go to http://www.nynj-phtc.org/. Registration (creating a username and password) is required. Enjoy!

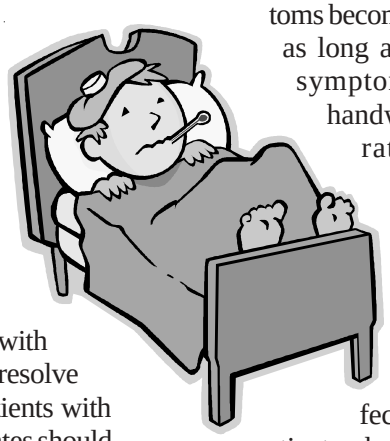
Reminders to Healthcare Workers

Prevention of RSV

As if norovirus wasn't bad enough, Respiratory Syncytial Virus (RSV) has hit hard this year. Surveillance from a hospital in one region of Virginia over the past few weeks suggests that ~ 46/100,000 infants were admitted for bronchiolitis. This is significantly higher than the expected bronchiolitis hospitalization rate of approximately 31/100,000 infants for this time period.

The Centers for Disease Control and Prevention recommend that during the RSV season, healthcare providers should consider RSV as a cause of acute respiratory disease in both children and adults. RSV affects the upper and lower respiratory tracts, but its most severe forms include pneumonia and bronchiolitis. Symptoms of RSV bronchiolitis include:

- Rhinorrhea (runny nose);
- Wheezing and coughing (can persist for several months after severe infections);
- Irritability and restlessness;
- Low grade fever (102°F); but temperatures can be as high as 104°F when another illness such as otitis media is present;
- Nasal flaring and retractions (intercostal, subcostal, and sternal) are indicative of airway obstruction; The chest may appear hyperexpanded and be hyperresonant to percussion. As a result of hyperexpansion of the lungs, the liver and spleen may be palpable several centimeters below the costal margins;
- X-ray findings often show air trapping and hyperinflation or appear normal;
- Apnea; or
- Circumoral and nail bed cyanosis (severely affected infant).



In the majority of patients with RSV bronchiolitis, symptoms resolve within 5-7 days. However, patients with underlying illness or disease states should be considered for early treatment with an antiviral agent.

Infection with RSV can be confirmed using several methods, including viral isolation and culture of nasopharyngeal secretions, as well as rapid diagnostic (direct antigen) tests that use immunofluorescence or enzyme-linked immunosorbent assays.

Prevention

RSV is easily transmitted via large, aerosolized respiratory particles, or through contact with nasal secretions, and may even be transmitted indirectly by contact with contaminated objects. RSV can live for half an hour or more on hands. The virus can also live up to five hours on countertops and for several hours on used tissues. The most common sites of inoculation are the eyes and nose.

Family members often pass it on to one another, but hospital staff are also frequent vectors in transmission. Since viral shedding may occur 1-2 days before symptoms become apparent and last as long as two weeks after symptom onset, regular handwashing and respiratory hygiene are critical to minimizing the impact of this disease.

In addition, use contact precautions for all patients that may be infected with RSV. Patient cohorting (rooming patients with RSV together and rooming RSV patients and non-RSV patients separately) should be used whenever possible. In addition, when possible staff should be cohorted (i.e., staff should work either with RSV patients, or non-RSV patients, but not both).

Children who have chronic disease, immune disorders, or a history of prematurity and are at high risk of having severe problems if they do get infected with RSV may benefit from monthly palivizumab or respiratory syncytial virus immune globulin intravenous (human) during RSV season.

Healthcare workers should remind parents to keep symptomatic children out of daycare or school until symptoms resolve, to teach good hand hygiene and respiratory etiquette, and not to share items such as cups, glasses, and utensils with persons who have RSV illness.

References:

The RSV Info Center: http://www.rsvinfo.com/

Cases of Selected Notifiable Diseases Reported in Virginia*

Disease	Total Cases Reported, January 2004						Total Cases Reported Statewide, January		
		Regions							
	State	NW	N	SW	C	E	This Year	Last Year	5 Yr Avg
AIDS	25	6	10	5	1	3	25	45	44
Campylobacteriosis	15	1	4	3	4	3	15	10	11
***E. coli* O157:H7**	0	0	0	0	0	0	0	1	1
Giardiasis	8	3	2	0	2	1	8	7	12
Gonorrhea	730	54	42	93	221	320	730	644	822
Hepatitis, viral									
A, acute	4	1	2	1	0	0	4	3	4
B, acute	1	1	0	0	0	0	1	4	4
C, acute	0	0	0	0	0	0	0	0	0
HIV Infection	38	6	10	5	9	8	38	62	53
Lead in Children†	33	3	6	12	8	4	33	15	26
Legionellosis	0	0	0	0	0	0	0	2	1
Lyme Disease	0	0	0	0	0	0	0	0	<1
Measles	0	0	0	0	0	0	0	0	0
Meningococcal Infection	2	1	0	1	0	0	2	1	2
Mumps	0	0	0	0	0	0	0	0	<1
Pertussis	3	2	0	1	0	0	3	0	<1
Rabies in Animals	25	9	8	3	2	3	25	23	23
Rocky Mountain Spotted Fever	0	0	0	0	0	0	0	0	0
Rubella	0	0	0	0	0	0	0	0	0
Salmonellosis	25	5	8	1	5	6	25	15	22
Shigellosis	6	0	5	1	0	0	6	12	9
Syphilis, Early§	6	1	1	0	1	3	6	11	18
Tuberculosis	0	0	0	0	0	0	0	3	5

Localities Reporting Animal Rabies This Month: Accomack 1 raccoon; Alexandria 2 raccoons; Augusta 1 cat, 1 raccoon; Bath 1 cow; Bedford 1 skunk; Buckingham 1 raccoon; Caroline 1 raccoon; Fairfax 2 foxes, 3 raccoons; Loudoun 1 raccoon; New Kent 1 skunk; Norfolk 1 raccoon; Northampton 1 raccoon; Page 2 raccoons; Pittsylvania 1 raccoon; Rockingham 1 raccoon; Shenandoah 1 cat; Spotsylvania 1 skunk; Wythe 1 skunk.
Toxic Substance-related Illnesses: Lead Exposure 3; Methemoglobinemia 1.
*Data for 2004 are provisional. †Elevated blood lead levels ≥10µg/dL.
§Includes primary, secondary, and early latent.

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Office of Epidemiology
P.O. Box 2448
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