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Surveillance: Public Health's Foundation

In the summer and fall of 1989, an epidemic outbreak of eosinophilia-myalgia syndrome (EMS), associated with the use of dietary supplements containing L-tryptophan, occurred in the New York and across the U.S. More than 1,500 cases were reported across the nation, including at least 37 deaths; New York had 158 cases and four deaths.

Public health's role started when physicians in New Mexico discovered a cluster of three patients with an unexplained acute illness characterized by intense myalgia and peripheral blood eosinophilia and contacted their state health department. All three patients had ingested nutritional supplements containing L-tryptophan. New Mexico public health officials alerted the CDC, which in turn alerted health departments across the nation of the outbreak.

In 1999 two people died and hundreds were sickened as a result of infection with E. coli 0157:H7 after visiting the Washington County Fair. It is believed to be the largest water-borne E. coli 0157:H7 outbreak ever reported in the U.S.

Public health's role started one morning when an infectious disease physician called a New York State Department of Health epidemiologist about a case of hemolytic uremic syndrome in a patient with a history of visiting the fair. By that afternoon, the epidemiologist had collected reports from several other counties of potentially related bloody diarrhea cases, all with histories of visits to the fair. "It was obvious that we were on to something very big," he said.

That same year, hundreds of miles south, a virus never seen before in the Western hemisphere appeared in New York City. West Nile virus caused 62 cases of encephalitis, including seven deaths in its first recognized year in America.

Public health's role started with a call to the New York City Department of Health from an infectious disease physician with two patients with perplexing symptoms.

It seems unlikely that these three clearly unrelated outbreaks could have anything in common, but they do. All three outbreaks, like thousands of other less well-publicized disease clusters and outbreaks, were identified as a result of the public health surveillance system. That system relies, at its roots, on individual practitioners reporting mandated and unusual illnesses to public health authorities. That reporting enables local, state and national epidemiologists to identify outbreaks, clusters and unusual cases quickly and muster public health's forces to identify their causes and

find the best ways to combat them.

The Centers for Disease Control and Prevention (CDC) defines surveillance as “the ongoing systematic collection, analysis, and interpretation of outcome-specific data for use in the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those responsible for prevention and control.”

Surveillance History

Its origins date back centuries, to the days of the bubonic plague in the 1300s. Spread by fleas from infected Old English black rats, the plague killed about 35 million Asians. Sailors traveling to Asia brought both infected rats and fleas back to Europe. The toll was devastating; mortality was 90 percent for those exposed. At its worst, the plague claimed two million individuals annually, 137 million total.

From this emerged what was perhaps the first public health surveillance-related action – public health officials boarded ships in the port near Venice to prevent people who had been stricken with plague-like illness from coming ashore.

It is thought that public health surveillance first surfaced in the United States in Rhode Island in 1741, when tavern owners were required by law to report any infectious diseases among their customers.

National surveillance activities associated with disease began in this country in 1850 when mortality statistics based on death registration were published by the federal government. It wasn't until 1874, when the Massachusetts State Board of Health asked physicians to submit weekly reports on prevalent illnesses, that regular disease reporting began. It took until 1925, after the poliomyelitis epidemic in 1916 and the influenza pandemic in 1918-19, for all states to begin participating in national morbidity reporting.

The Role of Surveillance

The roles of surveillance in public health are multi-faceted and include:

- Estimating the magnitude of the problem
- Determining geographic distribution of illness
- Portraying the natural history of a disease
- Detecting epidemics/defining a problem
- Generating hypotheses, stimulating research
- Implementing prevention and control measures
- Monitoring changes in infectious agents
- Detecting changes in health practices
- Facilitating planning

Along with its routine, **on-going surveillance of more than 65 diseases** (DOH public Web site) including **influenza**, meningitis, pertussis, group B strep and syphilis, the department also participates in specialized surveillance activities that may identify a **bioterrorist attack**, help pinpoint the effectiveness of a **new vaccine**, collect information on **newborns** or track the **oral health** of New Yorkers.

- [Surveillance to Detect Possible Bioterrorism](#)
- [Surveillance Helps Link Pneumococcal Conjugate Vaccine to Decline in Incidence of Invasive *Streptococcus pneumoniae*](#)
- [Statewide Perinatal Data System \(SPDS\)](#)
- [New York State Oral Health Surveillance System](#)

Surveillance Improves the Public's Health

EMS, *E. coli*, West Nile. Public health's response to these outbreaks each started as a result of basic surveillance procedures. With EMS it was doctors calling a state health department resulting in a national CDC warning. For *E. coli* it was an epidemiologist who quickly made calls to his surveillance network of hospitals, doctors, and local health departments to piece together a rapidly exploding epidemic. And, for West Nile, it took a troubled ID doctor who called the New York City Health Department to focus the public health response to that on going outbreak. But public health's role didn't just stop there.

Public health's reactions to the acute situations were rapid, warning people of dangers, telling them how to protect themselves, finding the causes of the illnesses. The long-term results of those initial surveillance "finds" continue to influence the public's health today.

Once the link between L-tryptophan and EMS was made and products were removed from the shelves, the number of cases dropped to virtually zero. New York moved quickly, banning the sales of L-tryptophan in November 1989. In early 1990, the FDA imposed a recall of all dietary supplements containing "manufactured, added" L-tryptophan and later prohibited the importation of manufactured L-tryptophan. Because all of the L-tryptophan sold in the U.S. was produced elsewhere, the net effect has been a ban on most oral dosage forms of L-tryptophan.

On September 13, 1999, the State Health Commissioner issued an emergency order that prohibited the use of untreated water at six agricultural fairgrounds in the state and required them to assess their water supplies. As a result of the Washington County Fair outbreak, the State Sanitary Code was revised giving the department regulatory authority over agricultural fairgrounds effective April 2002.

On going surveillance shows that West Nile has now spread across New York and the country. New, sophisticated surveillance techniques, using geographic information system (GIS) technology, are being developed. These techniques can not only help track the disease's progression but may also provide better information on how and when to warn local health officials and residents of an increased risk for infection. The knowledge gained from the application of this tracking system can be applied to other potential disease outbreaks—naturally occurring and man-made.

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