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Outbreak Alert!
Trends in Foodborne Illness Outbreaks
in the United States (1990 – 2005)

Caroline Smith DeWaal
Food Safety Director
Center for Science in the Public Interest

1. INTRODUCTION

1. The Center for Science in the Public Interest is a private non-profit organization representing consumers in both the U.S. and Canada. Our membership includes over 900,000 consumer members and subscribers to Nutrition Action Healthletter. We accept no funding from the government or industry. CSPI is also a founder of the International Association of Consumer Food Organizations, recognized by Codex as a representative of consumer organizations on five continents and the Safe Food International project, which provides information to over 50 consumer organizations around the world.
2. Thank you for the opportunity to address this meeting of the Reunión Comisión Pan Americana de Inocuidad de Alimentos/the Pan American Commission on Food Safety. Tracking foodborne illnesses is an integral part of a global effort to reduce diarrheal diseases, which cause 1.8 million deaths per year, according to the World Health Organization. As governments and industries work together to tackle diarrheal diseases and to achieve other Millennium Development Goals, consumer organizations have also stepped up to contribute research and information. I want to share with you today two pieces of work we are doing that increase the sharing of knowledge and information about reported instances of foodborne illness outbreaks.

2. FOODBORNE DISEASE SURVEILLANCE & INVESTIGATION IN THE U.S.

3. The starting point for analyzing foodborne disease in the U.S. is the Centers for Disease Control and Prevention (CDC) estimates that foodborne diseases affect 76 million Americans annually, causing 5,000 deaths and another 325,000 hospitalizations. The worst cases of foodborne illness occur in the most vulnerable: the old, the young, and those with weakened immune systems. These estimates represent the base of a pyramid.
4. Reporting and surveillance of foodborne disease begins at the local government level and works its way to the federal government over time. Most illnesses escape the surveillance system all together, reflecting people who experienced symptoms but did not have medical care or laboratory specimens to confirm the cause.
5. At each level of the pyramid, fewer and fewer cases are being described, further reflecting gaps in reporting systems between the medical community and the state public health system, and further between the states and our federal CDC. At the very top of the pyramid are the illnesses discussed in this paper, those captured by FoodNet, PulseNet, or the outbreak surveillance system. Importantly, each of these systems captures actual reported cases and outbreaks, and from these we attempt to identify corrections that will reduce the overall burden of disease.
6. These three programs provide the principle data on which the United States can identify, investigate, and manage foodborne illnesses and foodborne outbreaks, and they are crucial to protect the public's health.
 - The Foodborne Diseases Active Surveillance Network, otherwise known as FoodNet, is a program of active surveillance of laboratory cases of foodborne illness. FoodNet is collaboration between the CDC, Emerging Infectious Disease Program, the United States Department of Agriculture's Food Safety Inspection Services (FSIS), the Department of Health and Human Services' Food and Drug Administration (FDA), and ten collection sites (CA, CO, CT, GA, MD, MN, NW, NY, OR, TN).
 - PulseNet is a program that compiles microbial sub-typing data on several species of bacteria, and maintains a national database for reference and comparison of sub-typing information. It is coordinated by the CDC, and comprised of a network of state health departments, local health departments, and federal agencies (CDC, FSIS, and FDA).
 - CSPI's Outbreak Alert! Database is a unique program developed and maintained by CSPI which catalogues identified foodborne illness outbreaks into food categories, a process known as food attribution.

Foodborne Diseases Active Surveillance Network (FoodNet)

7. The U.S. CDC manages the Foodborne Diseases Active Surveillance Network (FoodNet), which conducts active surveillance for nine foodborne pathogens in 650 labs within ten well-defined geographic areas across the country. Those sites cover 44.5 million people or 15% of the U.S. population. FoodNet collects data on individual cases of foodborne illness by routinely contacting the laboratories in the key areas for information on confirmed infections. FoodNet is used to determine precise estimates of the burden of foodborne illnesses, to monitor trends in foodborne diseases, and to conduct case-control studies on sporadic foodborne disease.

8. FoodNet collects and analyzes approximately 17,000 laboratory-diagnosed cases each year. Data collected includes patient demographics, co-morbidities, hospital stay details, and laboratory results. It analyzes trends in laboratory reporting overtime, using a baseline of the lab reports received in the first two years of operations, 1996-1998.
9. There are several limitations to the FoodNet data. It only contains laboratory-diagnosed cases (and most foodborne illnesses are not laboratory-diagnosed). Many foodborne pathogens (e.g. norovirus) are not reported to FoodNet, and FoodNet cannot distinguish cases acquired from food from non-foodborne sources (i.e. contaminated water, person-to-person contact, or direct animal exposure). Also, findings may not reflect disease trends across the entire U.S. population as some groups may be over- or under-represented in the laboratory data collected. As FoodNet grows, however, its results are providing important information to guide policy-making in the future.

FoodNet Pathogens

Campylobacter
Cyclospora
Cryptosporidium
Escherichia coli O157:H7
Listeria monocytogenes
Salmonella
Shigella
Vibrio
Yersinia enterocolitica

PulseNet USA

10. PulseNet is a national network of public health and food regulatory laboratories that perform microbial sub-typing on bacteria isolated from human samples and suspected food samples for pathogens like *Escherichia coli*, *Salmonella*, *Shigella*, *Listeria*, and *Campylobacter*. Microbial sub-typing enables the different strains of bacteria to be uniquely identified from each other, otherwise known as DNA “fingerprinting,” using pulsed-field gel electrophoresis (PFGE).
11. PFGE is a method used to differentiate specific strains of bacteria using DNA migration by size in an agarose gel stimulated by an electrical current. It is more sensitive and discriminating than conventional gel electrophoresis because the electrical field used to stimulate DNA migration is pulsed (constantly changing) rather than uniform.
12. Even within the same family, DNA from each strain will migrate differently on an agarose gel when stimulated by an electrical current, creating a unique “fingerprint.” All of the PFGE patterns are electronically submitted to a national database at the CDC, from which federal and state laboratories can compare patterns, and identify indistinguishable patterns.
13. The PulseNet database is used to detect foodborne disease case clusters, to facilitate early identification of common source outbreaks, and to assist epidemiologists in outbreak investigations. PulseNet enables seemingly sporadic cases of foodborne illness to be linked and identified as part of an emerging outbreak (especially when the cases have wide geographic dispersion), allows

outbreak-associated foodborne cases to be distinguished from sporadic cases, and can assist in the rapid identification of an outbreak food source.

14. PulseNet is not an active surveillance program like FoodNet, nor does it include routine submission of bacterial PFGE patterns from food and animal sources. Other countries like Denmark are using PFGE to routinely link outbreaks to food sources or animal sources.
15. Today, the PulseNet database includes tens of thousands of PFGE patterns. Labs at the national, state, and local levels have access to the database, as do other government agencies.
16. There are some limitations of PFGE method and analysis: It is time consuming; requires a high-level of skill; and does not work for everything (i.e. clonal patterns). Financial limitations and lack of coordination can further limit the effectiveness of PulseNet. Competing priorities and a lack of resources at state, local, and federal laboratories can delay submission of lab samples to the PulseNet system.

PulseNet Pathogens

Campylobacter jejuni
Escherichia coli O157:H7
Listeria monocytogenes
Salmonella
Shigella
Vibrio cholerae
Yersinia pestis

Outbreak Alert! CSPI's Database of Foodborne Illness Outbreaks in the U.S.

17. Outbreak reporting is our longest operating system of surveillance, but for many years it was discounted by CDC epidemiologists because the reliability of data collected at the state level varies from state to state.
18. CSPI's database was originally conceived in 1997 as a food attribution tool, to help identify important pathogen/food combinations and to compare the rates of illness in commodities regulated by our nation's two main food regulatory bodies, the FDA and FSIS. The data were not readily available from CDC; however, with our continued requests, CDC started posting a yearly line listing on the Internet. In 1999, CSPI published the first line listing of foodborne illness outbreaks organized by food category and by regulatory agency.
19. As the database evolved, our approach was peer reviewed and our methodology published in the journal Food Protection Trends. Our method of organizing outbreaks by food group proved helpful in identifying trends in foodborne illnesses and in fact, provided the core category structure used by other researchers working on food attribution.
20. The database is now widely used as a tool to inform researchers, regulatory agencies, and the public about disease patterns linked to different commodities, including several Codex working groups and expert consultations. For instance, the database documented an increase in outbreaks linked to fresh produce for years leading up to the spinach outbreak of 2006. As outbreaks with fresh produce continued in late 2006, we were able to demonstrate the significance of the trends in prior years and lobby the government for stricter regulations on fresh produce production.

21. Outbreak Alert is a unique listing of foodborne illness outbreaks, categorized by food source, and published annually in a report by the CSPI Food Safety Program. The Outbreak Alert data are compiled from a variety of sources including the CDC, state health departments, and scientific journals. CSPI's database contains only those outbreaks with known or suspected etiology and an identified food source.
22. Outbreak Alert data have been useful for attributing illnesses to food commodities in the U.S. For example, using our database, CSPI has identified seafood, produce, poultry, beef, and eggs as the foods most frequently linked to foodborne illness outbreaks in the United States. The database delivers much other useful information, as will be described later in this paper.

■ *Unique Data*

23. CSPI's database contains over 5300 outbreaks, with both known food source and etiology, which occurred in the U.S. between 1990-2005. Outbreaks are grouped by food vehicle and placed in one of 13 food categories. Outbreak data are compiled from several different sources in addition to the CDC, such as state and local health departments, and scientific journals. This database is one of the best sources of food attribution data, as well as data on food/pathogen combinations.

■ *Database Applications*

- Allows for study of outbreak reporting trends over time
- Provides data essential to conduct a food/hazard assessment for HACCP
- Assesses food types most often linked to foodborne illness outbreaks by location
- Assesses pathogens causing outbreaks by location and food type
- Compares trends in outbreaks linked to different agencies and different regulatory structures
- Quantifies the number of outbreak-associated illnesses

■ *Limitations of CSPI's database*

24. While the database of reported outbreaks is very useful, it represents a small percentage of actual foodborne illnesses. Our analysis of CDC data coming from the states shows that outbreaks that meet our criteria of having an identified pathogen and food source represent only about 25% - 30% of reported foodborne outbreaks. All others include unknown food or pathogen, which means that the investigations were not thorough enough to answer these important questions.
25. The second important limitation is that sporadic cases of foodborne illnesses are omitted. Thus if only one person reports getting sick, which probably represents the majority of foodborne illnesses, these data are not being captured by this tool. Certain pathogen reporting is largely captured in sporadic reports, especially *Campylobacter* and *Vibrio vulnificus*, and these pathogens are underreported in the CSPI data.

Outbreak Alert!
Food Categories

Beef
Beverages
Breads & Bakery
Dairy
Eggs & Egg Dishes
Game
Luncheon/Other Meats
Multi-Ingredient Foods
Multiple Foods
Pork
Poultry
Produce
Seafood

3. NEW WORK: COMPILING OUTBREAK INFORMATION IN OTHER REGIONS

26. Following the example of Outbreak Alert, CSPI's Safe Food International, a coalition of consumer groups from around the world, has begun an endeavor to collect and share foodborne illness information on a global scale through bi-monthly Regional Updates. The Regional Updates consist of news articles and official releases related to foodborne illness organized by region and topic. The geographic regions follow the seven regions outlined by the World Health Organization, though unfortunately information from Latin America has proven hard to compile until we can obtain help from a researcher in this region.
27. Topic categories include foodborne illness outbreaks, animal health, avian influenza, food safety studies, and food safety policy. While we just started last fall, we face challenges, as much important data are not available in English from all regions, so we need to address the reporting that is not being captured by the English press in each region. However, following the model of Outbreak Alert, SFI intends for the Regional Updates to provide a warehouse of information on global foodborne illness information that overtime may provide some useful information to consumer advocates, researchers and public health officials in each region.

4. RECOMMENDATIONS

28. While every researcher likes to believe that his or her measuring stick is the best one, it is important for public health officials to utilize every tool to analyze and address the burden of disease. If we look at FoodNet, PulseNet and Outbreak Alert data sets in isolation, it is like the parable of the three blind men who encountered an elephant. The first blind man compared it to a tree, the second a fan, and the third a snake, depending on the body part that each man touched. All were wrong.
29. Looking at these indices together, as equal reflections of the same problem, public health officials can get a much broader sense of the dimensions and causes of the foodborne illness problems and the overall burden of disease in their country. We have also recommended to the World Health Organization that examining these relationships in the context of countries where the foodborne

disease estimates and data already exist may help inform the estimates for the many countries and regions where such evidence is only partially available.

5. REFERENCES

- 1) FoodNet- Foodborne Diseases Active Surveillance Network. Centers for Disease Control and Prevention. <<http://www.cdc.gov/FoodNet/>> April 14, 2008.
- 2) PulseNet. Centers for Disease Control and Prevention. <<http://www.cdc.gov/pulsenet/>> July 24, 2006.
- 3) Outbreak Alert! Center for Science in the Public Interest. <http://www.cspinet.org/foodsafety/outbreak_report.html> 2008.