Testimony before the Committee on Agriculture, Nutrition, and Forestry

United States Senate

CDC Response to the Multistate Outbreak of *Salmonella* Typhimurium

Statement of

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For Release and Delivery
Expected at 10:00am
Thursday, February 5, 2009

Introduction

Good morning, Chairman Harkin and Members of the Committee. I am Ali Khan, an Assistant Surgeon General and Deputy Director of the National Center for Zoonotic, Vector-Borne, and Enteric Diseases, at the Centers for Disease Control and Prevention (CDC). Thank you for the invitation to address the Committee on CDC's activities related to the prevention of foodborne disease and CDC's role in the response to the current outbreak of *Salmonella* Typhimurium infections associated with peanut containing products.

Background

Diseases spread by contaminated foods continue to challenge the public health system. Large foodborne outbreaks now often are attributed to fresh produce and processed foods, as well as foods of animal origin. Numerous factors are responsible for these large outbreaks such as the complexity of evolving microbes and changing food consumption patterns. In addition, CDC relies on local and state health departments, which have varying capacity to detect and respond to food-related illnesses

As an agency within the Department of Health and Human Services (HHS), CDC leads federal efforts to gather data on foodborne illnesses, investigate foodborne illnesses and outbreaks, and monitor the effectiveness of prevention and control efforts. CDC is not a food safety regulatory agency, but CDC works closely with the food safety regulatory agencies, in particular with HHS's Food and Drug Administration (FDA) and the Food Safety and Inspection Service within the United States Department of Agriculture (USDA/FSIS). CDC also plays a key role in building state and local health department epidemiology, laboratory, environmental health, and

communication capacity to support foodborne disease surveillance and outbreak response. Importantly, CDC data can be used to help document the effectiveness of prevention interventions.

Everything that CDC does depends on critical partnerships with state and local public health departments that collect surveillance data, conduct laboratory testing, investigate most outbreaks, and take public health action. CDC has worked with the Association of Public Health Laboratories (APHL) and the Council of State and Territorial Epidemiologists (CSTE) to develop networks for foodborne disease surveillance. For example, PulseNet, the national network for molecular subtyping of foodborne bacteria coordinated by CDC, allows every state health laboratory to test strains of bacteria from sick persons in that state and to compare them with DNA "fingerprint" patterns in the national database at CDC. This has greatly improved the ability to detect clusters of illness that may be related, even if they are dispersed across multiple states. There are similarly other related systems that coordinate the investigation of the large, multistate clusters detected by PulseNet [OutbreakNet team], facilitate state reporting of outbreaks to CDC [National Outbreak Reporting System], develop baseline information on what foods are commonly consumed and trends in foodborne illness [FoodNet], and assess policies and practices of retail foodservice establishments that could lead to or prevent foodborne outbreaks [Environmental Health Specialist Network].

CDC also works with a broad range of other partners to improve capacity and knowledge regarding foodborne disease control and prevention. In collaboration with the National Environmental Health Association (NEHA), CDC conducts team training programs for local and state health department officials including specialists in environmental health, laboratory science, and epidemiology. CDC works with the World Health Organization (WHO) and a variety of

other international partners to conduct similar training programs in other countries. CDC supports the Council to Improve Foodborne Outbreak Response (CIFOR), which was created to help develop model programs and processes that will facilitate the investigation and control of foodborne disease outbreaks. CSTE and the National Association of County and City Health Officials (NACCHO) are co-chairing CIFOR, and it includes representatives from CDC, FDA, USDA, APHL, NEHA, the Association of State and Territorial Health Officials, the Association of Food and Drug Officials, and industry.

Salmonella

Salmonella is a group of bacteria that is widespread in the intestines of birds, reptiles, and mammals. *Salmonella* is the most commonly diagnosed bacterial cause of foodborne diseases in the U.S., causing 15 reported laboratory-confirmed infections per 100,000 persons in 2007, as measured in FoodNet. There are many different kinds, or serotypes, of *Salmonella* bacteria. Serotyping is a classification system based on differences in structures on the surfaces of bacteria or other disease-causing agents. Serotyping performed by public health laboratories around the nation divides *Salmonella* into more than 2,500 different serotypes, some common and some rare. Serotype Typhimurium is the most common serotype in the U.S. and causes 15-20 outbreaks every year. In 2006, Typhimurium represented 19% of reported *Salmonella* illnesses. Each serotype can be further sub-divided into many more subtypes based on additional laboratory tests of their DNA.

Salmonella infections have often been associated with meat, poultry, eggs, and raw milk; these products are derived from animals that can carry *Salmonella*. *Salmonella* has also been associated with fresh produce and other plant-derived foods and can be transmitted through

processed foods, like pot pies, breakfast cereal, snack foods, and peanut butter. *Salmonella*, like other pathogens that are commonly foodborne, can also be transmitted in other ways besides food, such as from contact with reptiles or other animals, between children at a child care center, or in water.

Many foodborne infections, including *Salmonella*, occur in persons without obvious connections to each other. These are called sporadic cases; determining the source of a single sporadic case can be very difficult. Cases of similar infections can also occur as a group or "cluster." Epidemiological investigation of clusters of possibly related cases permits public health officials to determine if the cases were connected and, specifically, if they were linked to food. A cluster of foodborne illnesses is considered an outbreak if an investigation demonstrates that two or more infections caused by the same agent are linked to the same food.

In general, for a foodborne illness to be recognized by the public health surveillance system, a patient must seek medical attention; the physician must decide to order diagnostic tests; and the laboratory must conduct the test using the appropriate procedures and report the results to a health department. Many ill people do not seek medical attention, and of those who do, many are not tested for *Salmonella* or other agents causing food borne illness. Therefore, many cases of foodborne illness are neither diagnosed nor reported. For example, *Salmonella* infection has been estimated to cause about 1.4 million foodborne illnesses annually; however, only about 40,000 laboratory-confirmed cases of *Salmonella* are reported to CDC each year.

Regular reporting about detection of *Salmonella* serotypes and subtypes from ill persons is critical in determining whether a surge in incidence has occurred signaling a possible outbreak. Each serotype can be further divided by DNA analysis into subtypes that are distinguished by

different DNA fingerprint patterns. The fingerprint pattern is determined with a test known as pulsed-field gel electrophoresis (PFGE). PFGE is a very good method for differentiating among epidemiologically unrelated isolates of many serotypes.

Public health laboratories determine the serotype and PFGE patterns for *Salmonella* strains and share the patterns through PulseNet. The laboratories participating in PulseNet are in state health departments, some local health departments, USDA, and FDA. When a clinical laboratory detects *Salmonella* from an ill person, a sample is sent to a State or local PulseNet laboratory where it is serotyped and DNA fingerprinted. The laboratory compares the fingerprint pattern to that of other *Salmonella* strains from people in that area and uploads the pattern electronically to the national PulseNet database maintained at CDC, where it can be compared with patterns from all over the country. This gives us the capability to detect an unusual number of *Salmonella* cases with the same pattern in a single area or in multiple states. The system can identify patterns even if the affected persons live far apart, which is important given the widespread U.S. food distribution systems. Thousands of different fingerprints have been described, and it is not unusual to find some matches in the system, and at any given moment, the PulseNet system may be tracking many small clusters. When the number of matching strains in a cluster increases, and the number of states reporting the matching pattern increases, then the cluster is flagged for investigation at the national level. The current outbreak is caused by *Salmonella* with two closely related patterns that had not been seen in PulseNet before this outbreak.

The current outbreak represents a typical timeline for detecting and investigating foodborne illnesses. There is an inherent time lapse between when a person becomes ill with *Salmonella* infection and when the results of testing are reported to PulseNet**.** It takes time for a person to

become ill, seek medical care, and submit a sample for testing. It then takes time for the clinical laboratory to detect *Salmonella* and send the strain to the public health laboratory; finally, the public health laboratory must perform serotyping and DNA fingerprinting and then submit that finding to Pulsenet, which is when CDC becomes aware of the illness.

The Current Salmonella Typhimurium Outbreak

On November 10, 2008, CDC's PulseNet staff noted a small and highly dispersed multistate cluster of 13 *S.* Typhimurium isolates with an unusual PFGE pattern reported from 12 states, and the OutbreakNet team began monitoring it. On November 25, CDC worked with state and local partners to begin an epidemiologic assessment of that cluster, which had increased to 35 isolates reported from 16 states. On December 2, CDC and state and local partners began an assessment of a second cluster of 41 *S.* Typhimurium isolates from 17 states. The PFGE patterns of the second cluster were very similar to the patterns in the first cluster. This second cluster had been first noted by PulseNet on November 24, as a cluster of 27 isolates from 14 states. Neither of these patterns was seen previously in the PulseNet *S.* Typhimurium database. In December, the two clusters were being investigated in parallel because they appeared to be similar. On January 7, 2009, after *Salmonella* from the two patterns were shown to be indistinguishable by other advanced laboratory tests, the two patterns were grouped together as a single outbreak strain, and the investigations were merged.

The initial steps in an epidemiological investigation are to collect information from which hypotheses can be generated about the possible source of the outbreak. As cases with the same DNA fingerprint pattern were identified, CDC collaborated with public health professionals in local and state health departments who were interviewing patients to determine what specific

foods or other exposures they may have had in common. Many affected state and local health departments, including the Minnesota Department of Health (MDH), conducted intensive investigations of patients infected with the outbreak strain and shared the findings with CDC. These interviews did not immediately point to a specific product, but raised the possibility of peanut butter and chicken products, without suggesting a particular brand.

By December 28, the Minnesota Department of Health had learned from patient interviews that some patients infected with the outbreak strain lived or ate meals in one of at least three institutions (two long-term care facilities and one elementary school). A review of menus and invoices by MDH and the Minnesota Department of Agriculture (MDA) revealed that the institutions had a common food distributor in North Dakota, and the only food common to the three institutions was King Nut creamy peanut butter. By January 9, 2009, six additional cases in six other Minnesota institutions were identified by MDH; each of those institutions had received King Nut peanut butter. On January 9, the MDA laboratory reported isolation of *Salmonella* from an open container of King Nut peanut butter. This was confirmed on January 12 as *S.* Typhimurium of the outbreak strain.

On January 3 and 4, 2009, data were gathered for a study by CDC and state and local health departments to identify whether illness was associated with eating specific food items. Preliminary analysis found that ill persons were significantly more likely than non-ill persons to have eaten peanut butter, though illness was not associated with eating national brands of jarred peanut butter sold in grocery stores. By January 9, when an opened jar of King Nut peanut butter collected at a nursing home in Minnesota was reported to be growing an as yet

uncharacterized *Salmonella*, the FDA had identified a Peanut Corporation of America (PCA) factory in Blakely, Georgia, as the sole producer of King Nut brand peanut butter.

On January 16, the Connecticut Department of Public Health Laboratory isolated the outbreak strain of *S*. Typhimurium from a previously unopened 5-pound container of King Nut creamy peanut butter, suggesting that contamination occurred during production. However, CDC's ongoing collaboration with states indicated that many cases did not eat peanut butter in institutions, but had eaten various other peanut butter-containing products. FDA investigators reported that the PCA facility in Blakely produced peanut butter and also peanut paste (made from ground roasted peanuts) and other peanut products, which were sold to many food companies for use as an ingredient in peanut butter-containing foods.

To better determine the association of illness with other peanut-butter containing foods, a second study was conducted by CDC and state and local health departments January 17-19 to further assess exposures in persons who did not live in institutions and had become ill since December 1. Preliminary analysis found that ill persons were more likely than non-ill persons to have eaten specific brands of prepackaged peanut butter crackers. Both brands of peanut butter crackers are made at one plant, which is known to receive peanut paste from PCA.

Intact packages of peanut butter crackers that had been purchased in the United States were obtained from the home of a patient in Canada by the Canadian Food Inspection Agency. Culture of a composite sample of the crackers yielded the outbreak strain of *S*. Typhimurium. Other testing of three intact packages of peanut butter crackers obtained from a patient's home in Oregon showed similar *Salmonella* contamination.

Throughout the investigative process, to ensure that information was disseminated to the public as accurately and quickly as possible about health threats and other information related to this outbreak, CDC and FDA coordinated their communication strategies and messages and discussed these strategies in daily calls with state health officials. We balance the rapid release of information on sources of illness against the potential negative consequences to consumers, food growers, producers, and industry. Continued collaborations and communications between federal agencies, state and local health departments, and all relevant stakeholders are essential.

Status of Investigation

As of February 1, 2009, 550 persons from 43 states and one person from Canada had been reported infected with the outbreak strain. Confirmed, reported onset of illness dates have ranged from September 1, 2008, to January 17, 2009. A total of 120 patients were reported hospitalized, and the infection may have contributed to eight deaths. The epidemiologic, laboratory, and traceback findings from this continuing investigation indicate that peanut butter and peanut paste produced at the PCA plant are the source of the outbreak. More specifically, the outbreak was caused by contaminated peanut butter used in institutions, and by peanut butter and peanut paste used as ingredients in food products. The second case-control study indicated a particular risk with peanut butter crackers, but this does not exonerate other peanut-containing products.

After one brand of peanut butter served in institutions was implicated by epidemiologic and laboratory evidence, the investigation was expanded to include food items that use peanut butter and peanut paste made in the same factory as ingredients in peanut butter-containing products. This was an ingredient-driven outbreak, in which a contaminated ingredient affected many different products that are distributed through various channels and consumed in various settings.

Peanut butter and peanut paste are common ingredients in cookies, crackers, cereal, candy, ice cream, pet treats, and other foods. Mass food distribution can lead to widely distributed nationwide outbreaks.

Conclusion

The large number of products and brands recalled already, and the large quantities of some products recalled, makes this one of the largest recalls in the United States. The outbreak appears to be slowing, but we are not able to say that the outbreak is over at this point. Because of the time lag in reporting, we expect reports of new cases to continue for 2-3 weeks after the outbreak actually ends. The event illustrates how a large and widespread outbreak can occur, from distribution of a single item to hundreds of foods. It also highlights the continued need for robust disease detection systems at all levels—local, state, and federal—to ensure prompt recognition, response, and investigation of these outbreaks. CDC will continue its efforts to:

- focus on research, education, and training that will assist with Federal strategies to prevent foodborne illnesses before they happen;
- incorporate food industries into prevention, response and information sharing; and
- bolster state health infrastructures to effectively and promptly identify and respond to outbreaks.

This will entail continuing to work with regulatory authorities, state and local partners, food and environmental microbiologist scientists, and the food industry to prevent future food borne illness outbreaks. Thank you again for the invitation to testify before you today. I will be happy to answer any questions you may have.