



Outbreak of Multidrug-Resistant *Shigella sonnei* Infection Among Daycare Attendees — Fayette County, Kentucky, 2005

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Background

Shigella, a bacterial dysentery infection, can result in bloody diarrhea, nausea, vomiting, cramps, fever, and although uncommon in this country, even death. There are four specific serogroups of shigella: *S. boydii*, *S. dysenteriae*, *S. flexneri*, and *S. sonnei*. During the last decade, *Shigella sonnei* infections resistant to commonly used antibiotics have become more frequent in the United States (1). This report characterizes an outbreak investigation conducted by the state and local health departments, during which preventive measures and control strategies were implemented against one such challenging strain.

From May 6 - August 29, 2005 a total of 148 *Shigella sonnei* cases were reported in Fayette County, Kentucky. The outbreak-related strain circulated mostly among daycare attendees, but a few non-daycare related cases also arose indicating limited community spread. The *S. sonnei* strain identified was resistant to ampicillin and trimethoprim/sulfamethoxazole (TS, Bactrim, Septra), antibiotics most commonly used against shigella infections. The Lexington-Fayette County Health Department, in coordination with the Kentucky Department for Public Health, Division of Epidemiology and Health Planning, initiated an investigation.

Characteristics of the *Shigella* cases were obtained from surveillance records and patient's medical charts. Information obtained included age, sex, date

of onset, date of specimen collection, antibiotic(s) used, dates of repeat stool culture submission, and original and repeat test results. A case was defined as a resident of Fayette County with onset of diarrhea between May 6 and August 31, 2005, with *Shigella sonnei* isolated from a stool specimen. Selected isolates and pulsed field gel electrophoresis (PFGE) patterns were submitted to the Centers for Disease Control and Prevention (CDC) for antimicrobial susceptibility testing and the National Molecular Subtyping Network for Foodborne Disease Surveillance (PulseNet) for comparison among states.

A total of 148 *Shigella sonnei* cases were reported between May 6 and August 8, 2005. This represented a greater than 21-fold increase over the baseline level of 2000–2004 (average 7/year). Median age of cases was four years old (range 0–61 years old). Seventy-nine (53.4%) cases were female. The majority of cases identified were children (83% ≤ 12 years old). Most cases (137) (92.6%) had a direct link to one of 15 childcare centers. Eleven (7.4%) had no known association with a childcare center. A total of 113 (76.4%) cases were considered primary daycare-associated infections and 24 (16.2%) were secondary daycare-associated cases (linked to a primary case).

Twelve *Shigella sonnei* isolates were tested for antimicrobial susceptibility. All 12 isolates were re-

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sistant to ampicillin and trimethoprim/sulfamethoxazole. Isolates of seven patients were tested by PFGE at the state laboratory. Two distinct patterns were seen among the seven isolates tested: three daycare and two non-daycare related cases fit one pattern while the remaining two non-daycare related cases fit another pattern.

All affected childcare centers were asked to exclude children with any diarrhea, and four daycare centers were each closed to new admissions for a one week period (one week = two complete incubation periods). A statement from a health care provider documenting two negative stool cultures taken 24 hours after completing antibiotic therapy and 24 hours apart was required for child readmission to daycare centers. Public health authorities visited childcare centers, observed common procedures (food preparation, diaper changing, cleaning, etc.), and instructed childcare staff on proper hand washing and other preventive measures. Physicians were advised to use antimicrobial resistance data to guide the selection of treatment agents, depending on the age of a patient.

In order to test the hypothesis of effectiveness and usefulness of the traditional requirement for daycare readmission (two negative stool cultures to be taken after completing therapy), data was abstracted from the medical records of *Shigella*-positive patients. A total of 98 non-random medical records were abstracted and reviewed. Forty-one (42%) of 98 patients were retested twice. All 41 patients who tested negative on the first stool culture also tested negative on the second stool culture regardless of time interval between first and second repeat stool cultures. Only 12 (12%) patients were retested exactly 24 hours apart. Azithromycin demonstrated high effectiveness for treating shigellosis in this outbreak. Four patients who were prescribed Bactrim empirically continued to test positive on repeat stool cultures, until the antibiotic regimen was switched to azithromycin.

Discussion

Shigella sonnei infections cause an acute, self-limited diarrheal illness, but antibiotics are prescribed to shorten the duration of illness and hasten the bacteriologic cure (2), which is required for re-

admission to child care facilities as a measure of public health control. Multidrug-resistant *S. sonnei* is an emerging problem. According to the National Antimicrobial Resistance Monitoring System, the proportion of multidrug-resistant *Shigella* isolates is on the rise nationwide (1). Fewer appropriate oral antimicrobial agents are now available for the treatment of pediatric shigellosis. While ampicillin and trimethoprim-sulfamethoxazole have long been the drugs of choice for the treatment of *S. sonnei* disease in the United States, recent studies show increasing rates of resistance to these two agents, limiting their efficacy (3). In one prospective, randomized study, treatment with azithromycin led to a significantly higher bacteriologic eradication rate and a trend toward better clinical efficacy than with cefixime therapy (4).

This investigation supports previous studies on azithromycin's effectiveness in treating multi drug-resistant *Shigella sonnei*. Empirically prescribed antibiotics (Bactrim) failed to eradicate *Shigella* from the patients' stool, but switching to azithromycin was followed by clinical and bacteriological cure among all patients first treated with Bactrim.

Despite increasing prevalence of resistant *S. sonnei* strains nationwide, azithromycin is not included in the recommended susceptibility panel. Childcare centers pose a special challenge because of the difficulty of controlling *Shigella* infection among pediatric populations due to the low infective dose needed and ease of spread of the organism (5). In fact, two other states were affected at the same time with similar outbreaks of *Shigella* in daycares that were also resistant to Bactrim, indicating a growing threat of multi drug-resistant *Shigella* infection.

The traditional requirement of two negative stool cultures taken 24 hours after completing antimicrobial therapy and 24 hours apart is a time and resource consuming requirement. Results of this investigation indicate that one negative stool culture may be adequate for resubmission of affected children to daycare centers. However, further research is needed to verify this finding with repeated testing at longer intervals post-illness.

The findings in this report are subject to at least two limitations. First, retest results were available for only a limited number of patients. Second, we were unable to test every isolate for antimicrobial susceptibility and PFGE, so that cases unrelated to the current outbreak could be excluded.

Medical and public health officials in Kentucky should consider the emergence of multidrug resistant *Shigella sonnei* in their communities and take measures to prevent disease spread in daycare centers by: 1) administering proper control measures; 2) testing all *Shigella* isolates for antimicrobial susceptibility in order to guide proper antimicrobial therapy for affected individuals; and 3) routinely including azithromycin in susceptibility panels for shigella strains.

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World Tuberculosis Day – March 24

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Each year, World Tuberculosis (TB) Day is observed on March 24th as a day to recognize the collaborative efforts of all countries involved in fighting TB and to commemorate the date when Robert Koch announced his discovery of the bacillus that causes TB. Around the world, TB programs, non-governmental organizations and others take advantage of the increased interest and awareness that World TB Day generates concerning the international health threat that the disease presents. TB can be cured, controlled, and with diligent efforts and sufficient resources, eventually eliminated.

Since 1993, TB case rates have been declining, suggesting that the nation is recovering from a resurgence of TB that occurred in the mid-1980s, and is back on track toward elimination. While the decrease in TB case rates is encouraging, the following facts concerning TB continue to be alarming:

- TB continues to kill more people in the world each year than any other infectious disease.
- TB cases continue to be reported in every state.
- Drug-resistant TB cases continue to be reported in almost every state.
- An estimated 10 to 15 million people in the U.S. are infected with *Mycobacterium tuberculosis*.
- Without intervention, approximately 10% of the 10 to 15 million people infected in the U.S. will develop TB disease at some point in their lifetimes.
- Certain other medical conditions such as HIV, diabetes mellitus, cancers of the head and neck, jejunoileal bypass, solid organ transplantation and other immunocompromising conditions increase the risk that a person with TB infection will develop TB disease (Table 1).
- HIV infection is the strongest risk factor for progression from TB infection to TB disease. Approximately

50% of those infected with HIV who become infected with TB will develop the disease within the first two years of exposure.

TABLE 1. Risk factors for the development of TB disease after TB infection¹ (by selected high-risk clinical conditions)

RISK FACTOR	HOW MANY TIMES HIGHER IS THE RISK OF TB DISEASE? ²
HIV/AIDS	200-800
Silicosis	30
Jejunioileal Bypass	27 – 63
Gastrectomy	2 – 5
Renal Failure / Hemodialysis	10.0 - 25.3
Solid Organ Transplant Renal Cardiac	37 20 – 74
Cancer of the Head or Neck	16
Diabetes Mellitus	2.0 - 4.1

¹Relative to control population

²Compared to the risk for people with no known risk factors

History of World TB Day

In the late 19th century, TB killed one out of every seven people living in the U.S. and Europe. Dr. Robert Koch's announcement of discovering the TB bacillus in 1882 was the most important step taken towards the control and elimination of this deadly disease. In 1982, a century after Dr. Koch's announcement, the first World TB Day was sponsored by the World Health Organization (WHO) and the International Union Against Tuberculosis and Lung Disease (IUATLD).

Where Are We Now?

TB remains a health threat to people around the world. Among infectious diseases, TB remains the second leading killer of adults in the world today, with more than two million TB-related deaths occurring each year. Until TB is controlled, World

TB Day will not be a celebration, but a valuable opportunity to educate the public about the devastation that TB can spread and how it can be stopped.

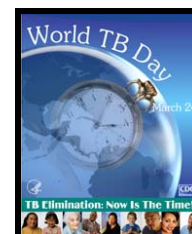
TB in Kentucky

Reported cases of TB have reached an all-time low in 2005. There were 124 TB cases reported for a statewide rate of 3.1 cases per 100,000 population. This rate places Kentucky well below the national TB case rate of 5.1 cases per 100,000 population, and below the state objective of reducing the verified TB case rate to 3.5 per 100,000 population. In 2004, the Kentucky TB Control Program reported 127 cases, compared to 138 cases in 2003 and 146 cases in 2002. This decline in active cases illustrates the hard work and dedication of TB control staff at local health departments. The TB Program plans to reach additional goals by achieving the following objectives:

- Completion of therapy for cases, and identification, evaluation, and treatment of contacts.
- Continued TB surveillance.
- Testing and reporting of specimens in the TB public health laboratory.
- Education and referral of patients for HIV testing.
- Education and training for health care providers.
- Active identification of high TB risk populations.
- Completion of preventive therapy for patients with TB infection who are at high-risk for developing TB disease.

The future of TB Control in Kentucky

Lowering case numbers are not an indication that the war on TB has been won in Kentucky. Diligent efforts to identify and treat persons with TB infection who are at high risk for developing TB disease are key to the continued reduction of incidences of TB disease in Kentucky. To prevent resurgence, staff and resource levels must be maintained in order for Kentucky to have the tools necessary to continue working toward elimination of this most persistent disease.



National Infant Immunization Week

April 22 - 29, 2006

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National Infant Immunization Week (NIIW), observed from April 22-29, 2006, is a chance for all communities throughout the United States to educate parents and health care providers on the importance of timely immunizations in early childhood.

According to the National Immunization Survey [www.cdc.gov/nip/coverage/default.htm#nis], Kentucky has an early childhood immunization coverage level of 79.1% (+/- 7.0) for children 19 – 35 months of age for the year 2004. This coverage level includes the 4:3:1:3:3 vaccine series (4-DTaP, 3-Polio, 1-MMR, 3-Hib, and 3-HBV). Additionally, the coverage level for the 4:3:1:3:3:1 vaccine series (the above series plus 1-Varicella) was 77.1% (+/- 7.1) for children 19 – 35 months of age for the year 2004. Further improving on these accomplishments will protect Kentucky's children even more against potentially serious diseases.

As NIIW approaches, local communities, health departments, healthcare organizations, and healthcare providers can plan activities or campaigns about immunizing Kentucky's infants and children. Additional information and materials for NIIW 2006 should be posted soon on the National Immunization Program's Web site at www.cdc.gov/nip/events/niiw/default.htm.

The following steps may assist in achieving a successful campaign:

- Review past activities and build upon them for 2006.
- Activities should be interactive and diverse to include all levels of education and cultures.
- Utilize all organizations, businesses, and media when conducting activities.
- Evaluate successful activities and build upon them for 2007 activities.

Examples of 2005 NIIW week activities in Kentucky included:

➤ Let's Immunize Very Early (L.I.V.E.) Coalition Immunization Event in Bowling Green, Kentucky. During this event, the L.I.V.E. Coalition partnered with Chuck E. Cheese pizza to host a birthday party for two-year-olds from the Community Action Day Care who were up-to-date on their immunizations. Refreshments were served and each child received a t-shirt and goody bag containing immunization information and a lock-top sippy cup. A drawing was held and one lucky child won a tricycle. An interview with WBKO television helped highlight the event.

➤ The Parenting Extravaganza in Flemingsburg, Kentucky included free immunizations to children ages 0 – 5 years old. The health center offered a child safety luncheon, car seat safety training, health seminars for prenatal and experienced parents, a poison control presentation and a breathing technique class.

Additional tips for healthcare providers to improve timely vaccinations and ultimately increase immunization coverage rates include:

- Periodic chart review in order to recall children who are overdue for vaccines.
- Implement a reminder/recall system to recall children for overdue vaccinations, and remind parents when to return for additional vaccines.
- Use appointment cards or other written documentation to remind parents or guardians about return visits for subsequent immunizations.

The Department for Public Health and the Immunization Program challenge each provider to increase timely vaccinations in your locations in recognition of National Infant Immunization Week. If you have any questions, please contact Diane Chism, R.N. or Shirley Herald, R.N. at (502) 564-4478 or send an e-mail to Diane.Chism@ky.gov or Shirley.Herald@ky.gov.

National Infant Immunization Week April 22-29, 2006

Love them. Protect them. Immunize them.

Vaccination: An act of love



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