

Annual Summary

2005

Shigella



Department of Health and Human Services
Centers for Disease Control and Prevention
Coordinating Center for Infectious Diseases
National Center for Zoonotic, Vector-Borne and Enteric Diseases
Division of Foodborne, Bacterial and Mycotic Diseases
Atlanta, Georgia 30333



Richard Bishop
Biostatistician, Northrop Grumman Contractor
Biostatistics Office

Nancy Strockbine, Ph.D.
Chief, National Reference Lab for *E. coli* and *Shigella*
Enteric Disease Laboratory Preparedness Branch

Eric Mintz, M.D., M.P.H.
Chief, Diarrheal Diseases Epidemiology Section
Enteric Diseases Epidemiology Branch

Division of Foodborne, Bacterial and Mycotic Diseases
National Center for Zoonotic, Vector-Borne and Enteric Diseases
Coordinating Center for Infectious Diseases
Centers for Disease Control and Prevention

Recommended Reference Citation:

Centers for Disease Control and Prevention. *Shigella Surveillance: Annual Summary, 2005*. Atlanta, Georgia: US Department of Health and Human Services, November 2006

Single copies of *Shigella Surveillance: Annual Summary 2005* are available from:

Centers for Disease Control and Prevention
Division of Foodborne, Bacterial and Mycotic Diseases
Enteric Diseases Epidemiology Branch
Mail Stop: A38
1600 Clifton Road
Atlanta, Georgia 30333
Telephone: 404-639-2206
<http://www.cdc.gov/ncidod/dbmd/foodborne/index.htm>

The Adobe Acrobat (PDF) version of this document can be viewed on the world-wide web at <http://www.cdc.gov/ncidod/dbmd/phlisdata/shigella.htm>. Further information concerning data described in this report can be obtained by contacting the Foodborne and Diarrheal Diseases Branch at telephone number (404) 639-2206. For further information concerning PHLIS please contact the Biostatistics Office at telephone number (404) 639-1364.

All material in this report is in the public domain and may be used and reprinted without permission;
citation of source is appreciated.

TABLE OF CONTENTS

Introduction	i
Annual Highlights for 2005	ii
Acknowledgements	iii
References	iv
TABLE 1	1
Laboratory confirmed <i>Shigella</i> isolates reported to the CDC by Species in 2005	
TABLE 2	2
Laboratory confirmed <i>Shigella</i> isolates reported to the CDC by Species and Serotype in 2005	
TABLE 3	3
Laboratory confirmed <i>Shigella</i> isolates reported to the CDC by Species, Age Group and Sex, 2005	
TABLE 4 / FIGURE 1	5
Median Age of persons from whom laboratory confirmed <i>Shigella</i> isolates were reported to the CDC by Species and Year for 1991-2005	
TABLE 5 / FIGURE 2	6
Laboratory confirmed <i>Shigella</i> isolates reported to the CDC by Species and Year for 1991-2005	
TABLE 6	7
Laboratory confirmed <i>Shigella</i> isolates reported to the CDC by Species, Serotype and Year for 1991-2005	
TABLE 7	9
Laboratory confirmed <i>Shigella</i> isolates reported to the CDC by Species, Serotype and Month for 2005	
TABLE 8	10
Laboratory confirmed <i>Shigella</i> isolates reported to the CDC by Species, Serotype and Month for 1991-2005	
TABLE 9	12
Laboratory confirmed <i>Shigella</i> isolates reported to the CDC by Species, Geographic Region and Year for 1991-2005	
TABLE 10	14
Laboratory confirmed <i>Shigella</i> isolates reported to the CDC by Species, State and Year for 1991-2005	
FIGURE 3	21
Laboratory confirmed <i>S. sonnei</i> isolates reported to the CDC by Geographical Region and Year for 1991-2005	

Laboratory-Confirmed *Shigella* Surveillance Annual Summary, 2005

The Annual Summary contains surveillance data on reported laboratory-confirmed *Shigella* isolates from humans in the United States. The National *Shigella* Surveillance System collects reports of isolates of *Shigella* from every state in the United States. This information is reported electronically through the Public Health Laboratory Information System (PHLIS) by the State Public Health Laboratory Directors and State and Territorial Epidemiologists to the Enteric Diseases Epidemiology Branch (EDEB) and the Biostatistics Office (BSO) of the Division of Foodborne, Bacterial and Mycotic Diseases in the National Center for Zoonotic, Vector-borne and Enteric Diseases.

The National *Shigella* Surveillance System is based on data collected by state and territorial public health laboratories. *Shigella* isolates are submitted to the state public health laboratory by clinical diagnostic laboratories. The state and territorial laboratories confirm the isolates as *Shigella*, perform subtyping, and submit the data for reporting through PHLIS. Unusual or untypable isolates are forwarded to the National *Shigella* Reference Laboratory at the Centers for Disease Control and Prevention for further characterization or confirmation. These results are reported back to the state laboratory, where they are reported to CDC through PHLIS.

The capture of isolates in the National *Shigella* Surveillance System is considered to be consistent. However, some *Shigella* isolates may not be forwarded or reported to state public health laboratories and therefore are not captured. In addition, irrespective of the surveillance system, many cases of *Shigella* illness are not reported because the ill person does not seek medical care, the health-care provider does not obtain a specimen for diagnosis or the laboratory does not perform culture for *Shigella*. The results of surveillance reported herein are therefore substantial underestimates of the true number of infections.

The number of isolates reported by state represents the state where laboratory confirmation and subtyping were performed. In some instances, the reporting state is not the same as the state of residence of the person from whom the isolate was obtained. For the Annual Summaries, duplicate records were deleted. All isolates reported herein were from infected humans.

There are 4 major subgroups of *Shigella*, designated A, B, C and D, and 44 recognized serotypes (Table A). Subgroups A, B, C and D have historically been treated as species: subgroup A for *Shigella dysenteriae*; subgroup B for *Shigella flexneri*; subgroup C for *Shigella boydii* and subgroup D for *Shigella sonnei*. These subgroups and serotypes are differentiated from one another by their biochemical traits (ability to ferment D-mannitol) and antigenic properties. The most recently recognized serotype belongs to subgroup C (*S. boydii*) (1).

Table A. Classification of *Shigella* Subgroups

Subgroup	Species	Number of serotypes	Fermentation of D-mannitol	Subgroup B group antigens
A	<i>S. dysenteriae</i>	15	-	-
B	<i>S. flexneri</i>	8 ^a	+	+
C	<i>S. boydii</i>	20	+	-
D	<i>S. sonnei</i>	1	+	-

^a = Serotypes 1-5 are subdivided into 11 subserotypes.

The Statistical Outbreak Detection Algorithm (SODA), developed by BSO and EDEB, is a statistical algorithm performed on the National Surveillance Data to detect unusual clusters of Shigella infection. SODA compares current Shigella isolates reported through PHLIS by subgroup or serotype with a 5 year historical baseline for that subgroup or serotype for the specified time period to detect unusual increases from the baseline. Analyses can be conducted at state, regional, or national levels. Since 1996, SODA has been implemented at CDC and selected state health departments. If you would like more information on SODA, please call the PHLIS Helpdesk (404) 639-3365.

Annual Highlights for 2005

A total of 10,484 Shigella isolates were reported from public health laboratories in 50 states in 2005 (Table 1). This represents a stabilization of Shigella rates from the sharp decreases that occurred in 2004. The national rate of reported Shigella isolates in 2005 was 3.5 per 100,000 population based on 2005 census population estimates for the United States.

Similar to previous years, Shigella was isolated frequently from children under 5 years of age, who accounted for 30.0% of all isolates. About 34.3% of all isolates came from persons aged 5-19 years, and 26.6% from persons aged 20-59, with smaller percentages in older age groups. The median age of patients by species is shown in Table 4. The overall distribution of Shigella isolates between the sexes was similar, with females accounting for 49.3% of isolates. Females accounted for more cases than males in all age groups except 40-49 (46.6% female). In one age group, age 20-29 years, the female predominance was particularly evident at 63.9% of isolates. These gender differences were more striking in Shigella sonnei, where females accounted for 70.7% of infections among persons age 20-29 years, 60.4% of infections among persons age 30-39 years, 54.5% of infections among persons age 40-49 years, and 56.3% of infections among persons age 50-59 years. Among isolates of Shigella flexneri, a male predominance was seen, particularly in the age groups 20-29 (52.0%), 30-39 (67.4%), 40-49 (72.2%), and 50-59 years (56.4%). Gender information was not reported for 7.1% of all isolates and age information was not reported for 5.6% of isolates.

The frequency of species, and the frequency of serotypes within these groups for all Shigella isolates are shown in Tables 1 and 2. Of the 10,484 isolates, 7,820 (89.7%) were subgrouped. Trends of subgroups remained similar to recent years, with subgroup D (*S. sonnei*) accounting for the largest percentage of isolates (74.4%), followed by subgroup B (*S. flexneri*, 13.6%), subgroup C (*S. boydii*, 1.2%), and subgroup A (*S. dysenteriae*, 0.5%). Shigella isolate serotype trends by year are shown in Table 5 and in Figure 2. Over the past decade, the numbers of Shigella isolates in subgroups A, B, and C, and the proportions of all Shigella isolates due to these three subgroups have declined. The number (1082) and the proportion (10.3%) of Shigella isolates that were not identified as belonging to a specific subgroup also decreased. The highest numbers and proportions of all reported Shigella isolates that were not identified as belonging to a specific subgroup were reported by Texas (382, 35.3%), California (297, 27.4%), and Illinois (222, 20.5%) .

Shigella transmission occurs via the fecal-oral route. Most subgroup D (*S. sonnei*) infections in the United States occur in young children and in association with crowding and poor personal hygiene. Daycare centers have been implicated in many large *S. sonnei* outbreaks, these can last many months and affect many persons (2,3,4). In 2005, a strain of *S. sonnei* resistant to ampicillin and trimethoprim-sulfamethoxazole emerged as a cause of prolonged, community-wide outbreaks of shigellosis associated with child care centers in three States (2). Antimicrobial treatment options for children infected with this strain are few, and include oral azithromycin, "off-label"

use of fluoroquinolones, or intramuscular agents such as ceftriaxone (2, 14). *S. sonnei* has also been transmitted through unchlorinated wading pools (6), interactive water fountains (7), food items such as parsley (8) and bean dip (9), and men who have sex with men (MSM) (10). Until recently, the dominant subgroup causing illness among MSM was subgroup B (*S. flexneri*) (11, 12). However, in large outbreaks among MSM in San Francisco, the dominant serotype was subgroup D (*S. sonnei*) (10). Recent trends in shigellosis in the United States are reviewed in a publication by Dr. Amita Gupta and co-authors (1,3).

Geographic trends by region for subgroup D (*S. sonnei*) isolates from 1991 to 2005 are illustrated in Figure 3. Several regions showed increases in subgroup D (*S. sonnei*) isolates from 2004 to 2005: the Mountain region, East south Central, New England, West North Central, West South Central and Pacific. These increases likely represent the large daycare related outbreaks that occurred in 2005 (2).

Acknowledgements

Thanks to Richard Bishop and Sandra Bulens for assembling this summary and to all the State Public Health laboratories and epidemiologists who participate in this surveillance

References

- 1 Kalluri P, Cummings K, Abbott S, et al. (Mintz ED). Epidemiological features of a newly described serotype of *Shigella boydii*. *Epidemiology and Infection*. 2004; 132:579-583.
- 2 CDC. Outbreaks of multidrug-resistant *Shigella sonnei* gastroenteritis associated with daycare centers in three states– Kentucky, 2005 and Missouri and Kansas, 2005, *MMWR* 2006; 55: 1068-1071
- 3 Mohle-Boetani JC, Stapleton M, Finger R, Bean N, Poundstone J, Blake P, Griffin PM. Communitywide Shigellosis: Control of an outbreak and risk factors in child day-care centers. *Am J Public Health* 1995;85:812-816.
- 4 Shane AL, Tucker NA, Crump JA, Mintz ED, Painter JA. Sharing Shigella: Risk Factors for a Multicommunity outbreak of Shigellosis. *Arch Pediatr Adolesc Med* Vol 157: 601-603 June 2003.
- 5 CDC. Multistate Outbreak of Rhamnose-negative *Shigella sonnei* – Eastern United States, March 2003. *MMWR*; 2004 53:60-63.
- 6 CDC. Shigellosis outbreak associated with an unchlorinated fill-and-drain wading pool -- Iowa, 2001. *Morbidity and Mortality Weekly Report* 2001;50:797-800.
- 7 CDC. Outbreak of gastroenteritis associated with an interactive water fountain at a beachside park -- Florida, 1999. *MMWR* 2000;49:565-8.
- 8 CDC. Outbreaks of *Shigella sonnei* infection associated with eating fresh parsley--United States and Canada, July-August 1998. *MMWR* 1999;48:285-9.
- 9 Kimura AC, Johnson K, Palumbo MS et al. Multi-state outbreak of drug-resistant *Shigella sonnei* associated with consuming a commercially prepared five-layered dip. *Emerg Infect Dis* 2004;10:1147-9).
- 10 CDC. *Shigella sonnei* outbreak among men who have sex with men--San Francisco, California, 2000-2001. *MMWR* 2001;50; 922-6.
- 11 Tauxe RV, McDonald RC, Hargrett-Bean N, Blake PA. The persistence of *Shigella flexneri* in the United States: increasing role of adult males. *Am J Public Health* 1998;78:1432-5.
- 12 CDC. *Shigella flexneri* Serotype 3 infections among men who have sex with men –Chicago, Illinois, 2003-2004. *MMWR* 2005; 54; 820-2.
- 13 Gupta A, Polyak CS, Bishop RD, Sobel J, Mintz ED. Laboratory-confirmed shigellosis in the United States, 1989-2002: epidemiologic trends and patterns. *Clinical Infectious Diseases*. 2004;38:1372-1377.
- 14 Sivapalasingam S, Nelson JM, JoyceK, Hoekstra M, Angulo FJ, Mintz ED. High prevalence of Antimicrobial Resistance among *Shigella* isolates in the United States, Tested by the National Antimicrobial Resistance Monitoring System from 1999 to 2002. *Antimicrobial Agents and Chemotherapy*. 2006: 50: 49-54.