

# Shigella

The Shigella germ is a genus of bacteria that can cause sudden and severe diarrhea (gastroenteritis) in humans. Shigella thrives in the human intestine and is commonly spread both through food and by person-to-person contact. A Japanese scientist Kiyoshi Shiga discovered these bacteria over 100 years ago. Shigellosis is the name of the disease that Shigella causes. The illness is also known as "bacillary dysentery."

## What are the typical symptoms of Shigella?

Most people who are infected with Shigella develop diarrhea, fever, and abdominal cramps. The diarrhea is bloody 25-50% of the time and most often contains mucus. Rectal spasms, medically termed "tenesmus," are common. The illness starts 12 hours to 6 days, usually 1-2 days, after exposure.<sup>1</sup> 1CDC. Guidelines for confirmation of foodborne-disease outbreaks. MMWR, 1996; 45:59-66.

## What are the serious and long-term risks of Shigella?

Shigellosis is more severe than other forms of gastroenteritis. This is because when Shigella bacteria multiply in the human gut they invade cells and result in much tissue destruction.<sup>1</sup> Also, many strains produce a toxin called "shiga toxin" which is very potent and destructive. Shiga toxin is very similar to the verotoxin of E.Coli O157:H7.

Shigellosis usually resolves in 5 to 7 days, although it may be several months before a victim's bowel habits are entirely normal. In some persons, especially young children, the elderly, and immune compromised persons, the diarrhea can be so severe that the patient needs to be hospitalized. The hospitalization rate for shigellosis is estimated to be 0.139 and in excess of 50,000 persons in the U.S. are hospitalized yearly because of Shigella.<sup>2</sup> Complications of shigellosis include severe dehydration, seizures in small children, rectal bleeding, and invasion of the blood stream by the bacterium.

More than one million deaths occur yearly due to infections with Shigella and the victims are mostly children of the developing world.<sup>1</sup> In the United States, it is estimated that about 700 persons die yearly from shigellosis.<sup>2</sup> Small children and the elderly are at greatest risk to experience mortality from a Shigella infection.

Up to 3% of persons who are infected with Shigella may later develop a syndrome that includes joint pain and swelling, irritation of the eyes, and sometimes painful urination as well. This is a reaction to the previous gastroenteritis and is called reactive arthritis. It is also called Reiter's Syndrome. It occurs because of protein mimicry; basically, the immune system, intending to fight Shigella, attacks the self.<sup>3</sup> Reiter's syndrome is most common in persons with the HLA-B27

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genetic makeup. (Testing for this is readily available.) Reiter's syndrome can last for months or years, can lead to chronic arthritis, and may be difficult to treat.

1Philpott D J; Edgeworth J D; Sansonetti P J. The pathogenesis of *Shigella flexneri* infection: lessons from in vitro and in vivo studies. *Philos Trans R Soc Lond B Biol Sci* 2000; 355:575-86.

2Mead PS, Slutsker L, Dietz V, et al. Food-related illness and death in the United States. *Emerg Infect Dis* 1999;5:607-25.

3Ringrose JH; Muijsers AO; Pannekoek Y, et al. Influence of infection of cells with bacteria associated with reactive arthritis on the peptide repertoire presented by HLA-B27. *J Med Microbiol* 2001; 50:385-9.

### **How common is Shigella infection?**

About 25,000 or so laboratory confirmed cases of shigellosis are reported each year in the U.S.<sup>1</sup> However, many cases go undiagnosed and/or unreported<sup>2</sup> and the best estimates are that 450,000 cases of *Shigella* infection actually occur annually in the U.S.<sup>2</sup>

No group of individuals is immune to shigellosis, but certain individuals are at increased risk. Small children acquire *Shigella* at the highest rate. Persons infected with HIV experience shigellosis much more commonly than other individuals, but this may largely be due to an increased risk among men having sex with men.<sup>2</sup>

1Mead PS, Slutsker L, Dietz V, et al. Food-related illness and death in the United States. *Emerg Infect Dis* 1999;5:607-25.

2Baer JT, Vugia DJ, Reingold AL, et al. HIV Infection as a Risk Factor for Shigellosis. *Emerg Infect Dis*, 1999; 5:820-23.

### **Where does Shigella come from?**

The ultimate source of *Shigella* bacteria is the infected excrement of a previously infected individual. That infectious material is spread to new cases by person-to-person contact or via contaminated food or water. A new case of bacillary dysentery occurs after the organism is ingested.

*Shigella* bacteria are in a small group of germs (that also includes *E. coli* O157:H7 and *Cryptosporidium*) that can infect the gut after the ingestion of relatively few organisms. Volunteer experiments have demonstrated that shigellosis can occur after ingestion of fewer than 200 bacteria,<sup>1</sup> a very small amount. This is why bacillary dysentery is the most communicable of the bacterial-induced diarrheas and that is most commonly transmitted by person-to person contact. This contact may be ordinary household contact, caring for an ill child, or sexual contact.

Approximately 20% of cases of shigellosis are transmitted via contaminated food or water.<sup>2</sup>

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Generally, the food preparer is the individual who contaminates the food, but food may also become contaminated previously during processing. Contamination of drinking water by Shigella is a problem that generally only occurs in the developing world.<sup>3</sup>

1DuPont HL, Levine MM, Hornick RB, et al. Inoculum size in shigellosis and implications for expected mode of transmission. *J Infect Dis*, 1989; 159:1126.

2Mead PS, Slutsker L, Dietz V, et al. Food-related illness and death in the United States. *Emerg Infect Dis* 1999;5:607-25.

3Barzilay JI, Weinberg WG, Eley JW. *The Water We Drink*. Rutgers University Press, New Brunswick, NJ, 1999.

### **How can a Shigella infection be prevented?**

- The spread of Shigella from an infected person can be stopped by frequent and careful hand washing with soap and water.<sup>1</sup> The ill individual should practice this, as well as any contacts. Supervised hand washing of all children should be followed in day care centers and as soon as children return home.<sup>2</sup> Young children with a Shigella infection, or with diarrhea of any cause, should not be in contact with uninfected children.
- If a child in diapers has shigellosis, everyone who changes the child's diapers should be sure the diapers are disposed of properly in a closed-lid garbage can, and should wash his or her hands carefully with soap and warm water immediately after changing the diapers. After use, the diaper changing area should be wiped down with disinfectant, such as household bleach or bactericidal wipes.
- At swimming pools, maintaining a chlorine level of at least 0.5-PPM will kill Shigella. At swimming beaches, children not yet toilet trained should be excluded from public swimming areas; stay clear if this rule is broken. Children with diarrhea should never be taken to public swimming areas.
- Basic food safety precautions will also help to prevent shigellosis. Shigella organisms are killed by heat used in cooking. People who have shigellosis or any diarrhea should not prepare food for others until they have been shown to no longer be carrying the bacterium.
- Drink water only if it has been chlorinated (most tap water) or treated with ozone (most bottled water) and then you know it will not contain pathogenic bacteria. Consume only pasteurized dairy products. · In the developing world, shigellosis is far more common and is present in most communities most of the time. Simple precautions taken while traveling to the developing world can also prevent getting shigellosis.<sup>3</sup> Drink beverages only if they are imported (e.g. Evian), carbonated (e.g. cola - without ice), boiled (e.g. coffee) or have been in contact with alcohol for a prolonged period (e.g. wine or beer, not mixed drinks). Eat a cooked diet with the exception of fruits you peel yourself.

1Doyle MP, Ruoff KL, Weinberg WG. Reducing transmission of infectious agents in the home. *Dairy, Food and Environmental Sanitation*, 2000; 20:330-337.

2Krilov LR; Barone SR; Mandel FS, et al. Impact of an infection control program in a specialized

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preschool. Am J Infect Control, 1996; 24:167-73.

3Weinberg WG. No Germs Allowed! How to avoid infectious diseases at home and on the road. Rutgers University Press, New Brunswick, NJ, 1996.

### **How is Shigella detected?**

Determining that Shigella is the cause of an illness depends on laboratory tests that identify the bacteria in the stool of an infected person. The laboratory can also do special tests to tell which species of Shigella the person has and which antibiotics would be best to treat it. Shigella is not a normal inhabitant in the colon, but the culture tests are sometimes falsely negative. This is because Shigella is somewhat difficult to isolate from a stool specimen because it has characteristics that are similar to normal colon bacteria.

Newer methods are being developed to identify foodborne pathogens, like Shigella, in food samples. These tests often work by locating segments of RNA unique to the organism.

### **How is Shigella treated?**

Although shigellosis is usually a self-limited illness, antibiotics can shorten the course, and in the most serious cases, might be life saving. When oral therapy is adequate, a fluoroquinolone antibiotic is the recommended first-line treatment for non-pregnant adults.<sup>1</sup> One good choice is ciprofloxacin 500 mg twice daily for three days. Alternative antimicrobial agents include trimethoprim-sulfamethoxazole, azithromycin, and ceftriaxone.

<sup>1</sup>Gilbert DN, Moellering RC, Sande MA. The Sanford guide to antimicrobial therapy 2001. Antimicrobial Therapy, Inc., Hyde Park VT, 2001.

#### Selected Listing of Prior Shigella Outbreaks

Pathogen Year Cases / Source Location

Shigella 2000 300 / Salsa CA

Shigella 1992 46 / Vegetable salad MI

Shigella 1991 25 / Moose Soup AK

Shigella 1988 30 / Cold Sandwiches Flight

Shigella 1988 3,175 / Tofu Salad MI

Shigella 1986 24 / Oysters TX

Shigella 1986 347 / Shredded lettuce TX

Shigella 2000 295 / Layer dip WA, OR, CA

Please visit the About-Shigella bulletin board to share your experiences and/or find others with similar interests

<http://groups.yahoo.com/group/About-Shigella>

This site is supported by the attorneys at [www.marlerclark.com](http://www.marlerclark.com) and [www.outbreakinc.com](http://www.outbreakinc.com).

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