Shigella

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In Brief

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Author Disclosure

Dr Holmes has disclosed no financial relationships relevant to this article. This commentary does contain a discussion of an unapproved/investigative use of a commercial product/device.

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Shigella is a gram-negative bacillus in the family Enterobacteriaceae. It consists of 4 species (with >40 serotypes), including *Shigella sonnei*, *Shigella dysenteriae*, *Shigella flexneri*, and *Shigella boydii*, and each is more predominant in different areas of the world. In the United States, approximately 86% of shigella infections were caused by *S sonnei* in 2009, whereas in African and Asian countries, *S flexneri* is more common. *S dysenteriae* serotype 1 produces Shiga toxin that may cause hemolytic uremic syndrome.

Shigellosis commonly occurs in children in developing countries where there is overcrowding and poor sanitation. In the United States, it is the third most common cause of bacterial gastroenteritis and is frequently spread in daycare centers and other areas where people are in close contact. Transmission occurs via the fecal-oral route, person-to-person contact, and contact with contaminated food, water, and inanimate objects. Only a small number of bacteria (10–100 organisms) are required to cause disease. The incubation period varies between 1 and 7 days, although it is usually 1 to 3 days. Patients not undergoing antimicrobial therapy may shed the organism for up to 4 weeks, whereas immunocompromised patients may shed for a longer time frame. Chronic carrier states are uncommon and do not correlate with a patient's underlying intestinal disease.

Symptoms of shigella most commonly present as diarrhea and/or dysentery with frequent watery stools, often with blood and/or mucus, and associated with pain, tenesmus, fever, and/or dehydration. In some children, the infection may be asymptomatic. Rarely, in severe cases, shigella may cause bacteremia or sepsis. *S dysenteriae* serotype 1 is associated with more severe disease and more complications. These complications include pseudomembranous colitis, intestinal perforation, toxic megacolon, hemolysis, hemolytic uremic syndrome, seizures, and electrolyte abnormalities. Reiter syndrome may develop in approximately 3% of patients infected with *S flexneri,* who are genetically predisposed by expression of HLA-B27, and leads to symptoms of chronic arthritis. Mortality, although rare, may occur in infants, malnourished children, and those with *S dysenteriae* serotype 1 infections.

Fecal leukocytes seen in a methylene blue–stained stool sample suggest the presence of colitis. Diagnosis of shigella infection is confirmed with a stool culture from feces or a rectal swab specimen. In some centers, shigella DNA with polymerase chain reaction analysis may be available for diagnostic testing.

The first line of treatment is replacement of fluid and electrolyte losses, preferably with oral rehydration. Most infections caused by *S sonnei* are mild and resolve within 48 to 72 hours. Empiric antibiotic treatment is indicated for patients who are very ill with suspected bacteremia and patients who are immunocompromised. Treatment, once the diagnosis is confirmed by culture, may be indicated in patients who remain symptomatic and are in daycare settings, live in long-term facilities, or are involved in food handling because antibiotics reduce fecal excretion and may shorten duration of symptoms. For many patients, symptoms have resolved by the time the stool culture has identified shigella, and in these patients treatment is unlikely to be warranted.

The choice of which antibiotic to administer is another treatment question. A 2010 Cochrane review of 16 randomized controlled trials evaluating antibiotics for

shigella dysentery found all classes of antibiotics had similar efficacy, and the authors were not able to identify a superior class of antibiotics. In the United States, the 2010 National Antimicrobial Resistance Monitoring System found 41% of *Shigella* species resistant to ampicillin, 48% resistant to trimethoprim-sulfamethoxazole, 2% resistant to ciprofloxacin, and less than 1% resistant to ceftriaxone. Antibiotic resistance in outbreaks has been reported to be much higher. Arvelo et al found 90% of the *Shigella* strains involved in a large daycare center–associated outbreak resistant to both ampicillin and trimethoprim-sulfamethoxazole. Knowing regional resistance patterns and the susceptibility pattern of the pathogen once available is essential to guide therapy.

Patients with strains susceptible to ampicillin or trimethoprim-sulfamethoxazole may be treated for 5 days. Amoxicillin is less effective because of its rapid absorption from the intestine and should not be used. Patients with unknown susceptibility or known resistance to ampicillin and trimethoprim-sulfamethoxazole may be treated with 5 days of azithromycin, cefixime, or a ciprofloxacin. Azithromycin does not have standard guidelines for interpreting susceptibility testing for shigella, which may allow resistance to the drug to develop unnoticed with increased use. The first reported outbreak in the United States of a *S sonnei* strain with decreased susceptibility to azithromycin was recently reported. Although ciprofloxacin is not approved for use by the US Food and Drug Administration in patients younger than 18 years, it can be considered if susceptibility patterns indicate it is the best agent and treatment is imperative. Patients requiring parenteral therapy may be prescribed ceftriaxone, and a 2-day course may be all that is needed if there is a good clinical response and no infection beyond the gastrointestinal tract. Medications that inhibit intestinal peristalsis may prolong symptoms and increase potential complications, and therefore are contraindicated.

Comments: Although shigella remains an important pathogen in the United States, it is a cause of significant morbidity and potential mortality from a global health perspective. Mortality rates have been found to be 1 million associated deaths worldwide, with 60% of deaths in children younger than 5 years. Mortality rates are high in children who are severely dehydrated, malnourished, human immunodeficiency virus positive, or recovering from measles. Treatment with vitamin A or zinc may improve resolution in children at risk for malnutrition in addition to continued oral rehydration and enhancing protein intake as soon as possible.

In the United States, shigella infections are important considerations in schools and daycare centers where infection may spread quickly. Control measures include scheduled hand washing of children attendees, thorough hand washing by staff, and no diaper changing in staff who are food handlers. Shigella infections should be reported to the local health department so control measures can be initiated in case of outbreaks.

Janet Serwint, MD
Consulting Editor, In Brief

Parent Resources From the AAP at HealthyChildren.org

- http://www.healthychildren.org/English/health-issues/conditions/abdominal/Pages/Shigella-Infections.aspx (English only)

Answer Key for June 2014 Issue:
Influenza and Parainfluenza Viral Infections in Children: 1. B; 2. E; 3. C; 4. B; 5. C.
Noncontraceptive Use of Contraceptive Agents: 1. E; 2. B; 3. A; 4. E; 5. B.
Gastrointestinal Bleeding: 1. B; 2. D; 3. C; 4. A; 5. C.

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