## SHIGELLOSIS

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<th>Animal Group(s) Affected</th>
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<td>Humans and non-human primates; occasionally dogs.</td>
<td>Fecal-oral; via direct contact with infected animals; or indirectly via food, water or inanimate objects contaminated and contact with shedding animals</td>
<td>Diarrhea or dysentery with potentially blood and/or mucus; abdominal cramps; tenesmus; and pyrexia. Asymptomatic carriers are possible.</td>
<td>Generally self-limiting disease. Complication due to bacteremia is possible, mainly in immuno-compromised individuals, that result in arthritis, neuritis, vulvo-vaginitis, chronic colitis, conjunctivitis; eventually death.</td>
<td>Oral rehydration, symptomatic care and, for severe infections, appropriate antibiotics.</td>
<td>Proper sanitation; reduction of stress; and isolation of potential carriers.</td>
<td>High zoonotic potential.</td>
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**Fact Sheet Reviewed by:** Maria J. Pons; Katherine Heiman; Colin Basler; Tom Alvarado

**Susceptible animal groups:** Primates (humans and non-human) are natural hosts. Reports of infection in dogs have been made.

**Causative organism:** Family: Enterobacteriaceae; genus: *Shigella*; four species: *Shigella dysenteriae* – serogroup A; *Shigella flexneri* – serogroup B; *Shigella boydii* – serogroup C; *Shigella sonnei* – serogroup D. Infection and transmission occurs mainly via fecal-oral route through contaminated food, water or direct contact; in humans, person-to-person transmission is the most common route. Arthropods, such as houseflies can function as mechanical vectors. Serovars are of antigenetic difference; serotyping and subtyping via pulsed-field gel electrophoresis is important in epidemiologic investigations. *Shigella* are able to invade intestinal mucosa cells, but this varies by strain; cytotoxins may also be produced.

**Zoonotic potential:** High.

**Distribution:** Worldwide.

**Incubation period:** 1-6 days.

**Clinical signs:** Pyrexia, headache, abdominal cramps, and severe painful diarrhea that is watery, and potentially mucoid, purulent or hemorrhagic. The presentation is usually self-limiting within 10 days. However, in its more severe form, other signs can present such as dehydration and neurological signs. Bacteremia has potential complications of arthritis, neuritis, vulvovaginitis, chronic colitis, conjunctivitis, iritis, hemolytic uremic syndrome, or death. *Shigella* infection affects T-lymphocyte activity and therefore...
alters immune response. It also stimulates protective local IgA secretion supporting the integrity of intestinal epithelial cells. Gingivitis has been reported in macaques.

**Post mortem, gross, or histologic findings:** Most common findings during gross necropsy: signs of dehydration, gastroenteritis, enteritis, hepatomegaly, splenomegaly, military white foci in the liver, and mesenteric lymphadenopathy. After development of septicemia, submucosal and subserosal petechial hemorrhages in multiple organs, muscular necrosis - typically involving myocardial, nephropathy, polyserositis, synovitis are commonly found. Histopathologic findings include multifocal necrotic hepatitis, necrosis of cryptic or surface enterocytes in lower small intestines, sometimes in cecum and colon, depending on bacterial species involved.

**Diagnosis:** Culture of fresh fecal material is still the most commonly used diagnostic tool. Selective media are used for identification of *Shigella* sp. Such media are: MacConkey, *Salmonella-Shigella* Agar (S-S), Xylose-Lysin-Desoxycholate (XLD), Lysine iron agar. In cases of small samples and bacterial overgrowth, transfer of cultured sample to enrichment media, such as Gram-negative broth, is recommended. Serological and immunohistochemical methods can be used to identify *Shigella* species and serotypes involved in disease process. These methods are essential when a *Shigella* infection is suspected, and when isolation of live organisms by culturing is not possible. ELISA and similar modified assays for antibody reactions against *Shigella* types in individuals. Serological examinations valid for identification of acute or subacute infected individuals, but chronic carriers are often seronegative. A variety of PCR assays is researched and used to recover *Shigella* DNA in live material or inert surfaces. PCR is also used for further classification of *Shigella* serovars.

**Material required for laboratory analysis:** For culture, feces, organ tissue, and whole blood are recommended. For ELISA and other serologic assays, feces, organ tissue, serum, food, milk, and water may be used. Tissue, feces, whole blood, soil, or processed food can be used for PCR testing.

**Relevant diagnostic laboratories:** Any laboratory that is set up for culture methods can be used for first screening for *Shigella*.

**Treatment:** Mild infections are self-limiting and are only treated with supportive care, such as rehydration, electrolyte and analgesic treatment. Antibiotics should be used only in cases of severe acute and life-threatening infection, when a subsequent bacteremia is anticipated, mainly in immunocompromized and young individuals. The choice of antibiotics should be based on an antibiogram of the culture and presentation of the patient.

Although appropriate antibiotic treatment may shorten the duration of illness and decrease the spread of infection, it is recommended only for patients with severe disease, bloody diarrhea, or compromised immune systems. Resistance to traditional first-line drugs like ampicillin and trimethoprim-sulfamethoxazole is common, and resistance to some of antibiotics is increasing globally. Antibiotic susceptibility testing can help guide appropriate therapy. When susceptibility is unknown or when an ampicillin or trimethoprim-sulfamethoxazole resistant strain is isolated, choices for therapy include fluoroquinolones, ceftriaxone, and azithromycin. Antidiarrheal agents such as loperamide (Imodium) or diphenoxylate with atropine (Lomotil) can make the illness worse and should be avoided.

**Prevention and control:** Asymptomatic carriers make eradication and control of shigellosis difficult. Preventative control programs should include a good sanitation protocol, animal collection management. Feeding additives to introduce competitive bacteria through food or to influence the local pH values and mucosal integrity, such as probiotics, plant extracts and essential oils with antimicrobial activity seems to be beneficial in controlling *Shigella* infections. Immunization with live attenuated *Shigella* strains or using outer membrane protein A structure is showing promising results. All persons involved in animal care, dealing with and processing and preparing food and feed need to be properly educated in sanitation and potential risks of contamination of the animal collection or the food chain with *Shigella*. High sanitation standards and low-
stress impact to the animals are key elements in the control of *Shigella* infections.

**Suggested disinfectant for housing facilities:** Most commonly used disinfectants, such as diluted hypochlorite (bleach), and quaternary ammonium based products are effective against *Shigella*.

**Notification:** Reportable disease in humans; most states require that local health departments report outbreaks to their state health department. States report voluntarily to CDC.

**Measures required under the Animal Disease Surveillance Plan:** Culture and serotyping of *Shigella* of any animals potentially in contact with infected animals and asymptomatic carrier in a collection with shigellosis outbreak. Any potential sources, such as introduced animals, care personnel, feed and water sources and any potentially contaminated inert surfaces need to be cultured and potentially serologically and immunohistochemically investigated.

**Measures required for introducing animals to infected animal:** Regular quarantine in a clean environment; reduce access to potential vectors, and host animals; separate tools and personnel for quarantined animals; fecal examination and culture as preshipment evaluation and quarantine examination before introduction.

**Conditions for restoring disease-free status after an outbreak:** Quarantine of whole collection. Isolation of sick and potentially infected animals. Testing of any potentially contaminated feed, water, surface and also healthy animals before giving access to previously contaminated area. Multiple cultures of potentially infected animals necessary due to inconsistent shedding of bacteria.

**Experts who may be consulted:**

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**References:**


