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***Shigella* species**

*Shigella* spp. are bacteria that cause shigellosis, also known as bacillary dysentery. They are a highly infectious organism, with foodborne outbreaks often involving infected food handlers. Unlike other common foodborne pathogens, humans are the only natural hosts of *Shigella* spp.

**Description of the organism**

*Shigella* spp. are Gram-negative, non-spore forming rod-shaped bacteria and are members of the family Enterobacteriaceae. The genus *Shigella* is divided into four species based on their O antigen type and biochemical characteristics: *S. dysenteriae* (comprising 15 serotypes), *S. flexneri* (comprising 14 serotypes), *S. boydii* (comprising 20 serotypes) and *S. sonnei* (1 serotype) .

The most severe form of shigellosis is caused by *S. dysenteriae* serotype 1. *S. sonnei* causes the mildest form of disease, while *S. flexneri* and *S. boydii* can cause either severe or mild illness .

**Growth and survival characteristics**

The growth and survival of *Shigella* spp. in foods is influenced by a number of factors such as temperature, pH, salt content . For example, survival of *S. flexneri* has been shown to increase with: decreasing temperature, increasing pH, and decreasing NaCl concentration .

The temperature range for growth of *Shigella* spp. Rapid inactivation occurs at temperatures around 65°C. In contrast, under frozen (-20°C) or refrigerated (4°C) conditions *Shigella* spp. can survive for extended periods of time . *Shigella* spp. grow in a pH range of 5–9 demonstrated that *S. flexneri* is tolerant to acid and can survive at pH 4 for 5 days in broth when incubated at 28°C. *Shigella* spp. are better able to survive lower pH conditions at reduced temperatures, with *S. flexneri* and *S. sonnei* able to survive for 14 days in tomato juice (pH 3.9–4.1) and apple juice (pH 3.3–3.4) stored at 7°. *S. flexneri* is salt tolerant and is able to grow in media containing 7% NaCl at 28°C . It is sensitive to organic acids typically used to preserve food. For example, lactic acid has been demonstrated to be effective at inhibiting *S. flexneri* growth, followed in order by acetic acid.*Shigella* spp. have been shown to survive on various surfaces. *S. sonnei* has been isolated and cultured from fingers several hours after hand contamination .

**Symptoms of disease**

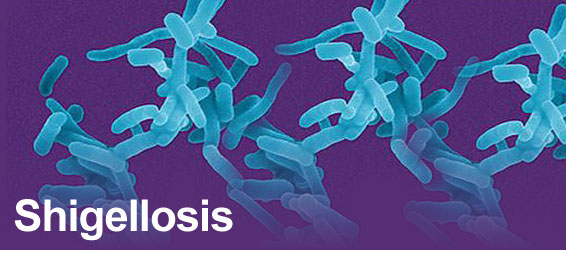
The clinical symptoms of shigellosis range from mild diarrhoea to severe dysentery, depending on the *Shigella* serotype causing infection, dose and the immunity and age of the host. The incubation period is 1–7 days (usually 3 days) and symptoms typically last for 1–2 weeks . Initial symptoms include watery diarrhoea, fever and fatigue. In more severe cases, as is the case for *S. dysenteriae* serotype 1 infection, patients can develop dysentery (characterised by frequent, painful stools containing blood and mucus), abdominal cramps, nausea and vomiting . All *Shigella* spp. can cause acute bloody diarrhoea .

**Mode of transmission**

*Shigella* spp. are transmitted by the faecal-oral route by either person-to-person contact, or consumption of contaminated food or water . Contaminated water is another vehicle for transmission of *Shigella* spp. This can occur due to treated contaminated water being used for drinking and food preparation, seepage of sewage through the earth, or faecal contamination of recreational water .

**Virulence and infectivity**

Once ingested, *Shigella* spp. must survive the acidic environment of the stomach and invade the epithelial cells of the colon to enable infection. *Shigella* spp. multiply inside the colonic epithelial cells and spread to adjacent cells, leading to the death of the infected cells. The colon becomes inflamed and ulcerated and the dead mucoid cells are shed, resulting in the bloody mucoid diarrhoea often characteristic of *Shigella* infection .

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