

A microscopic image showing several purple, rod-shaped bacteria with fine, hair-like structures (flagella) extending from their surfaces. The bacteria are set against a dark background, and the word "Shigella" is overlaid in white text.

# Shigella

# *Shigella dysenteriae* appearance

- **Gram-negative** rods with rounded ends
- **nonmotile**
- **non-spore-forming**



[www.bacteria.cz](http://www.bacteria.cz)



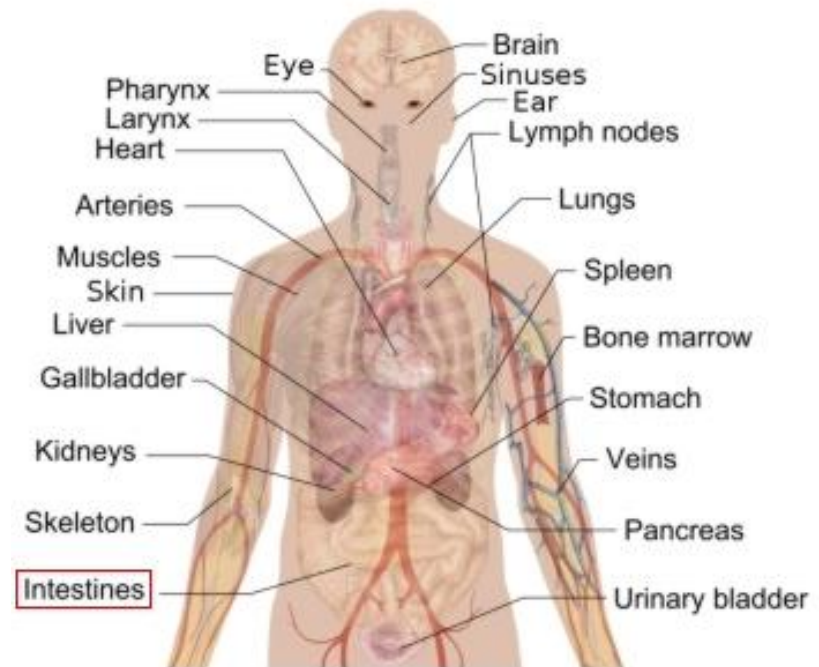
Hen-N.

*Shigella dysenteriae*

# Infections caused by *Shigella dysenteriae*

*S. dysenteriae*, spread by contaminated water and food, causes **the most severe dysentery** because of its potent and deadly **Shiga toxin**. Contamination is often caused by bacteria on unwashed hands during food preparation, or soiled hands reaching the mouth. The most commonly observed signs associated with *Shigella* dysentery include colitis, malnutrition, rectal prolapse, tenesmus, reactive arthritis, and central nervous system problems. Further, *S. dysenteriae* is associated with the development of hemolytic uremic syndrome, which includes anemia, thrombocytopenia, and renal failure

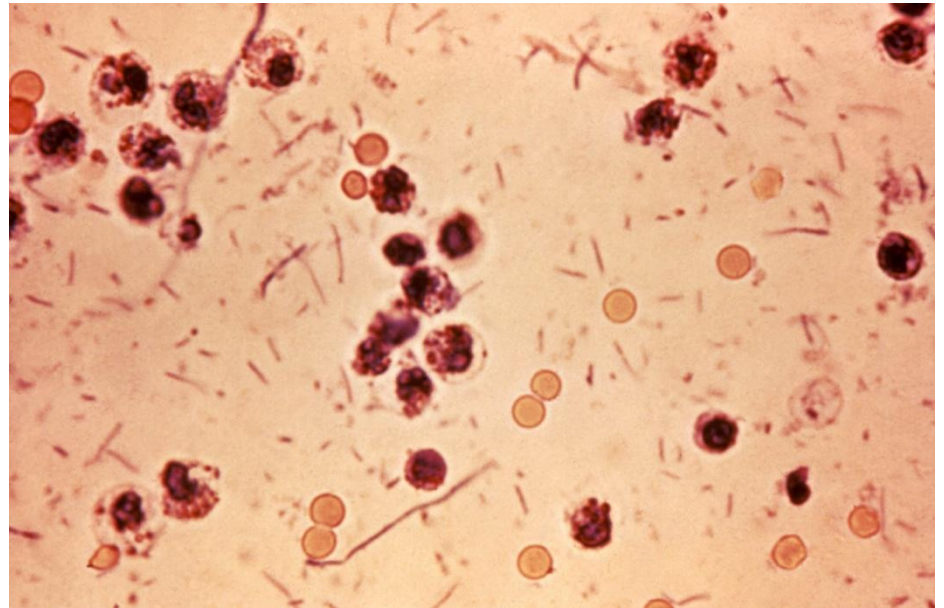
*Shigella dysenteriae*  
INFECTIONS



Hägström, Mikael. "Medical gallery of Mikael Häggström 2014"

# What is shigellosis?

- Shigellosis is an infectious disease caused by a group of bacteria called *Shigella*. There are 4 types of *Shigella*:
- *Shigella sonnei* (the most common species in the United States)
- *Shigella flexneri*
- *Shigella boydii*
- *Shigella dysenteriae*





# Who is at risk for shigellosis?

- Young children
- Gay, bisexual, and other men who have sex with men
- HIV-infected persons
- Traditionally observant Jewish communities
- Travelers

# What are the symptoms of shigellosis?

- Symptoms begin 1-2 days after exposure and usually last 5-7 days. Most people recover completely, although bowel movements may take months to become regular. Once a person has shigellosis, they are not likely to get the same type for years. However, they are still susceptible to other types. Symptoms include:
  - Diarrhea (occasionally bloody)
  - Fever
  - Abdominal pain
  - Tenesmus (painful sensations of needing to pass stools even when bowls are empty)

- Shigellosis can be passed from direct contact with someone infected, or from doorknobs and toilet handles that they have touched.
- Most cases are spread through families and where people are in close contact, such as schools and work places.
- This infection can also be passed on during anal sex.



# *Shigella* infections treatment

Persons with mild infections usually recover quickly without antibiotic treatment. However, appropriate antibiotic treatment may shorten the duration of illness and decrease the spread of infection. Antibiotic treatment is recommended for patients with severe disease, bloody diarrhea, or compromised immune systems (CDC).

ampicillin

trimethoprim-sulfamethoxazole

**Resistance** to these traditional first-line drugs **is common**.

fluoroquinolones

ceftriaxone

azithromycin



# Pathogenicity factors.

## 1. Toxins:

- endotoxin - lipopolysaccharidoprotein complex, which acts on the nervous and vascular systems of the human body;
- exotoxin (Shiga toxin) possesses cytotoxic (it breaks the synthesis of protein on ribosomes); enterotoxic; neurotoxic action.

2. Enzymes of aggression: hyaluronidase; fibrinolysin; mucinase; plasmacoagulase; neuraminidase.

3. Structural and biochemical components of cells: microcapsule; drank; proteins of the outer membrane, capable of binding to the receptors of epithelial cells and inducing them to "induced endocytosis".

Genes encoding virulence are located in chromosomes and in plasmids: genes encoding the property to attach to epithelial cells; genes that ensure the destruction of cell membranes. In the case where the genes that determine the ability to penetrate cells are on plasmids, they can be easily transmitted



# Cultural properties



Shigella - facultative anaerobes, temperature optimum for growth 37 ° C, at a temperature above 45 ° C do not grow, the optimal pH of the medium is 6.7-7.2.

Colonies on dense media - round, convex, translucent, in the case of dissociation, R-shaped rough colonies are formed (Ploskirev's medium for producing isolated colonies)

Growth on the medium in the form of uniform opacity, rough forms form a precipitate.

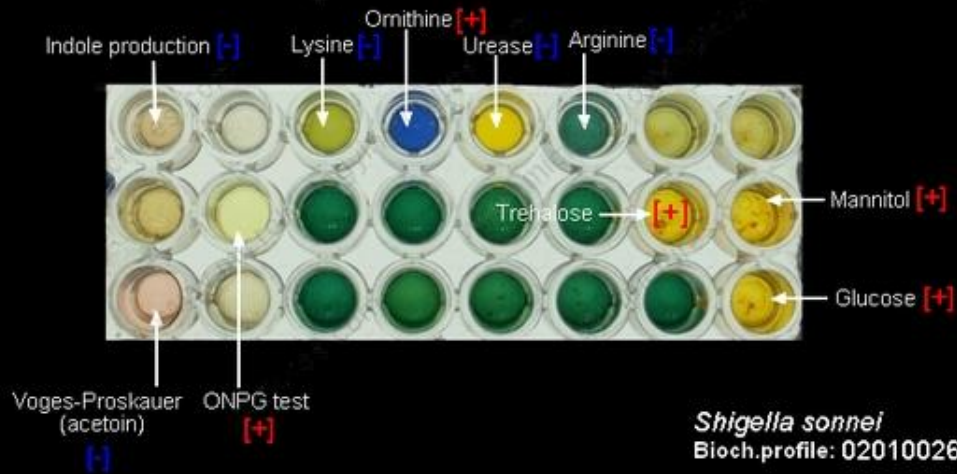
# Biochemical properties

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After inoculation:



After 24 hours, 37°C:



Shigella have less enzymatic activity than other enterobacteria. Carbohydrates they ferment with the formation of acid.

An important feature that makes it possible to differentiate shigella is their relation to mannitol: *S. dysenteriae* does not ferment mannitol, representatives of groups B, C, D are mannitol-positive. The most biochemically active are *S. sonnei*, which slowly (within 2 days) can ferment lactose.

# Triple sugar iron agar (TSI) medium

The TSI agar contains three sugars: **lactose**, **sucrose**, and **glucose**, as well as a pH-sensitive dye such as phenol red, sodium thiosulfate, ferrous sulfate, or ferrous ammonium sulfate. Due to the organism's fermentation of glucose in the absence of oxygen, an acid is produced, changing the dye from red to yellow early on in the experiment. However, after all glucose has been consumed by the *Shigella* bacteria, they will begin to use oxygen in their catabolic reaction, leading to the formation of alkaline end-products, thereby changing the phenol-red dye back to a red color in the region of the slant.

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CDC/ M.M. Galton

*Shigella* sp.  
on triple sugar iron agar (TSI) medium

Test tube 1 only contained the agar medium, hence was uninoculated. Test tube 2, contained medium that was inoculated with *Shigella* sp. bacteria. Test tube 3 contained medium inoculated with *Providencia* sp. bacteria. Test tube 4 contained medium inoculated with *Pseudomonas* sp. bacteria.

# Serology

Usually in *Salmonella*, *Shigella* and *E.coli* the final detection is by serotyping using agglutination Ag+Ab test.

