

## TYPHOID FEVER

---

### GENERAL INFORMATION

#### Introduction

Typhoid fever and paratyphoid fever are bacterial infections known as "enteric" (intestinal) fevers. They are caused by *Salmonella enterica* (*S. enterica*) serovars Typhi and Paratyphi A, B, and C. Typhoid and paratyphoid A are the most important serovars. Worldwide, they cause 30 million cases of enteric fever annually, mainly in countries with a poor standard of hygiene. Moderately effective vaccines are available for typhoid, but not for paratyphoid fever.

#### Transmission

*S. enterica* is excreted in feces and urine. Infection occurs commonly through drinking or eating contaminated water or food. The bacteria are transmitted by person-to-person contact (especially through food handlers).

Gastric acid in the stomach is the body's first line of defense against *S. enterica*. The risk of contracting an enteric fever may be increased by vagotomy (surgical cutting of the vagus nerve to reduce acid secretion in the stomach) or by taking drugs that suppress gastric acid, such as antacids, H<sub>2</sub>-antagonists, and proton pump inhibitors.

#### Epidemiology

The enteric fevers are endemic in most of the developing world.

- Prevalence is highest in countries with warm climates and poor sanitary facilities for sewage disposal and water treatment.
- Transmission is greatest in the dry season and at the beginning of the rains, and is exacerbated by antibiotic resistance.
- Among travelers, paratyphoid A is as common as typhoid fever, perhaps because many travelers have been vaccinated against typhoid.

In highly industrialized countries, enteric fevers typically occur as sporadic or imported cases, and some countries are virtually free of typhoid. However, outbreaks have occurred in developed countries, for example, in Zermatt, Switzerland, a tourism destination whose water supply was contaminated in 1963.

#### Risk

Eating or drinking contaminated food or water is the main risk factor for infection.

- Risk is highest for travelers to southern Asia (e.g., India, Nepal, Pakistan, Bangladesh).
- Other areas of risk include East and Southeast Asia, the Caribbean, Central and South America, and sub-Saharan Africa.
- In any endemic country, even the most hygienic restaurant may be risky because of a healthy, silent typhoid carrier.

The risk of disease varies with the number of organisms ingested and the health of gastric acid secretion.

#### Symptoms

The incubation period is 1-3 weeks. Fever is the chief presenting symptom, leading gradually to abdominal pain and diarrhea. If typhoid is left untreated, fatal complications can occur. Typhoid and paratyphoid have the same symptoms but typhoid is the more dangerous of the 2 diseases.

## Need for Medical Assistance

Any traveler who develops fever on returning from the tropics should seek medical assistance. Gradual onset of prolonged fever with malaise and abdominal symptoms is suggestive of enteric fever.

## PREVENTION

**Non-Vaccine:** Food and beverage precautions should be observed to avoid contaminated food and drink, regardless of vaccination status. A large intake of bacteria can overwhelm even the best response to the vaccine.

- See *Food and Beverage Precautions*.

**Vaccine:** Typhoid vaccines are recommended for the majority of travelers to endemic countries.

- Two typhoid vaccines are available in the United States, a live oral vaccine and an inactivated (killed) injectable vaccine.
  - Typhoid vaccines are about 60-70% protective against typhoid in people living in endemic areas.
  - Protection may last longer with the oral vaccine.
- There are no paratyphoid vaccines available. However, oral typhoid vaccine may also offer some protection against paratyphoid B.

## Who Should Receive the Vaccine

Persons who should receive typhoid vaccine:

- travelers to developing or endemic countries, who are:
  - Long-stay travelers
  - Travelers with adventurous eating habits
  - Persons who travel outside pre-arranged, fixed itineraries (including common tourist packages), especially in rural areas
  - Travelers who visit relatives or friends (who may be less likely to eat safe foods)
  - Travelers to smaller cities, villages, and rural areas off the usual tourist itineraries, where food and beverage choices may be more limited
  - Travelers who have already had typhoid disease (Because typhoid is a bacterial infection, it does not confer long-term protection.)
- Persons with intimate exposure to a documented *S. typhi* carrier
- Microbiology laboratory technologists who work frequently with *S. typhi*

## Who Should Not Use the Vaccine

Persons who are moderately or severely ill usually should wait until they recover before getting this vaccine.

Persons who have had a severe allergic reaction to a previous dose of 1 of these vaccines should not receive that same vaccine.

**Oral vaccine** should not be given to:

- Children less than age 6 years
- Persons with altered immune status
- Persons with acute diarrhea or vomiting
- Travelers receiving certain antibiotics and antimalaria drugs (see "Timing" for information on taking oral typhoid and antimalarial drugs)
- Pregnant women unless the journey is necessary and the risk of contracting the disease is so substantial as to outweigh the theoretical risk to the fetus

**Injectable vaccine** should not be given to:

- Children less than age 2 years

The vaccine's effectiveness could be lowered in persons with immune disorders or those receiving treatment that lowers their immunity.

Persons with any bleeding disorder should discuss with their health provider their options for receiving the injectable vaccine, because it is given intramuscularly.

## Risks and Side Effects

**Oral vaccine:** Fewer side effects are experienced than with the injectable vaccine; side effects can include abdominal pain and cramps, vomiting, fever, headache, and rash or hives.

**Injectable vaccine:** The most common side effects are redness and tenderness at the injection site. Occasionally, fever, headache, influenza-like episodes, abdominal pain, vomiting, and diarrhea occur.

There is a rare chance that serious problems or even death could occur after receiving any medicine or vaccine. If a significant or unusual problem occurs after receiving the vaccine, the patient should call or visit the health care provider.

## Timing

Travelers who will receive other vaccines in addition to typhoid should allow at least 1 month before travel for scheduling the vaccines to achieve best results.

### Oral vaccine

**Primary series:** The primary series (4 doses) should be completed at least 1 week before arrival at high-risk areas.

- One dose (1 capsule) is taken every other day (days 0, 2, 4, and 6).
- Each dose should be taken 1 hour before a meal with cool or lukewarm water (no warmer than body temperature).
- The capsules should not be taken with milk or alcohol.
- Capsules should be kept refrigerated.

**Booster series** (4 doses) is recommended every 5 years under conditions of repeated or continuous exposure.

### Oral vaccine and medications and other vaccines

- The malaria drugs chloroquine, mefloquine, and Malarone (atovaquone/proguanil) can be taken at the same time as oral typhoid vaccine. Persons taking proguanil alone (a drug used alone in some countries to protect against malaria) should wait at least 10 days after the final dose of oral typhoid vaccine before beginning this drug.
- Anti-bacterial drugs should be avoided for 7 days *before the first dose* of oral typhoid vaccine and for 7 days *after the fourth dose*.
- Oral typhoid vaccine can be given at the same time as or at any time before or after other live vaccines and immune globulins.

### Injectable vaccine

**Primary vaccination** consists of a single intramuscular injection.

- This vaccine should be given at least 2 weeks before arrival at a high-risk area.

**A booster** (1 dose) is recommended every 2 years under conditions of repeated or continuous exposure.

### **Injectable vaccine and medications**

- The injectable vaccine can be given with other vaccines and drugs, including antibiotics or antimalarials.

---

© Shoreland, Inc. All rights reserved.