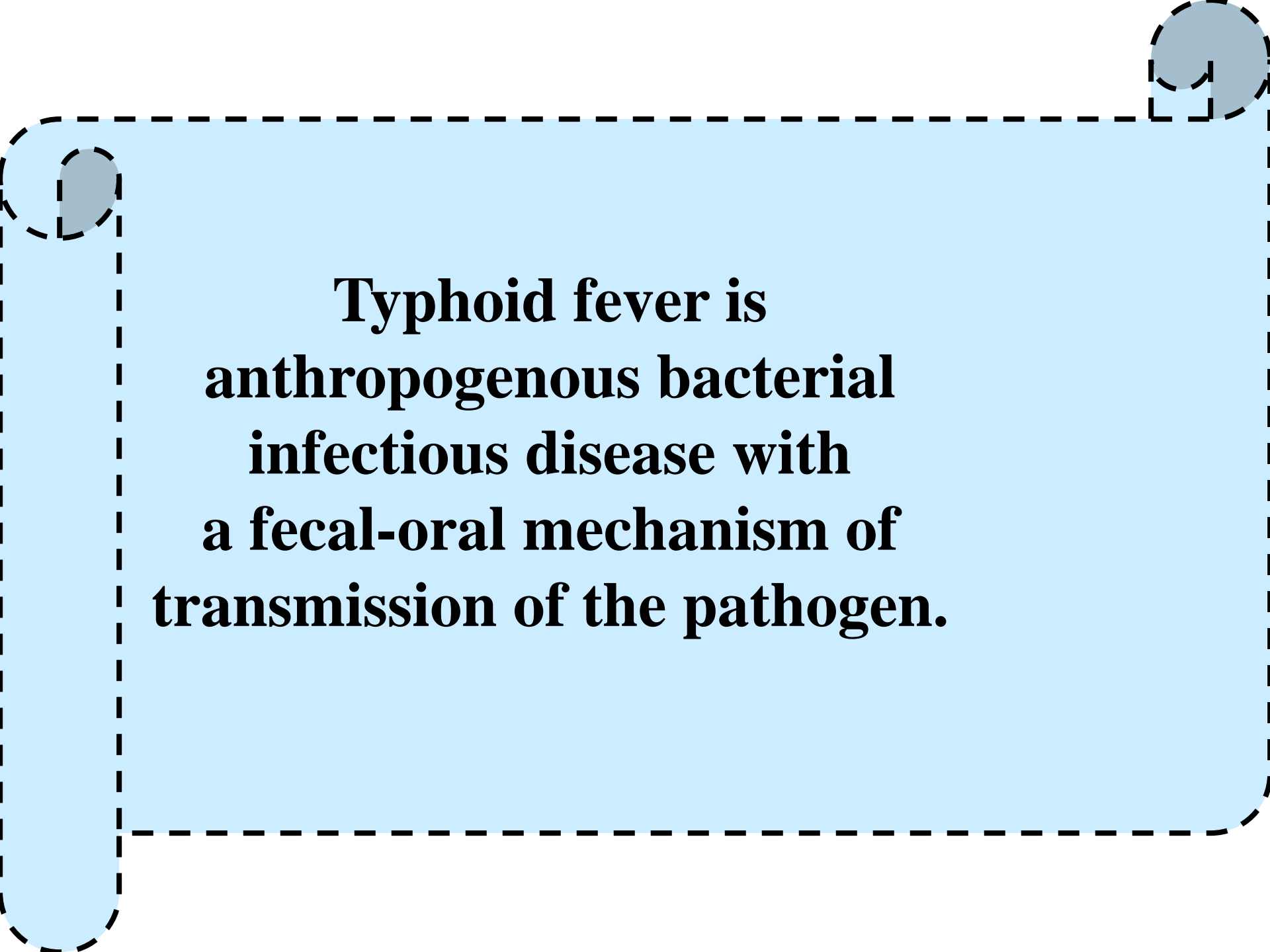


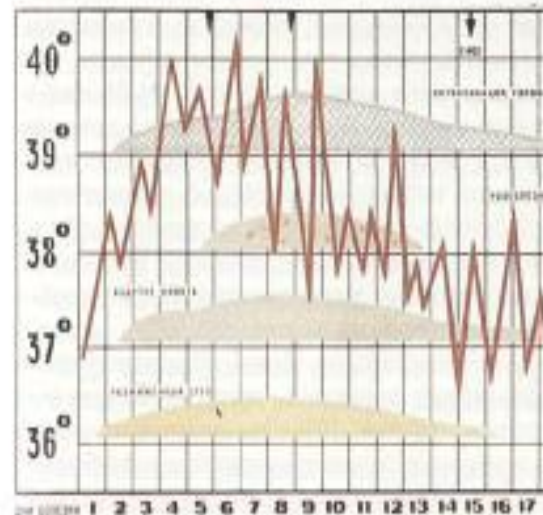
TYPHOID FEVER





Typhoid fever is anthropogenous bacterial infectious disease with a fecal-oral mechanism of transmission of the pathogen.

**Characterized by
bacteremia,
universal defeat
reticuloendothelial system,
cyclic course,
fever,
rash,
hepatolienne syndrome,
ulcerative lesion
small intestine.**



History

Name of the disease

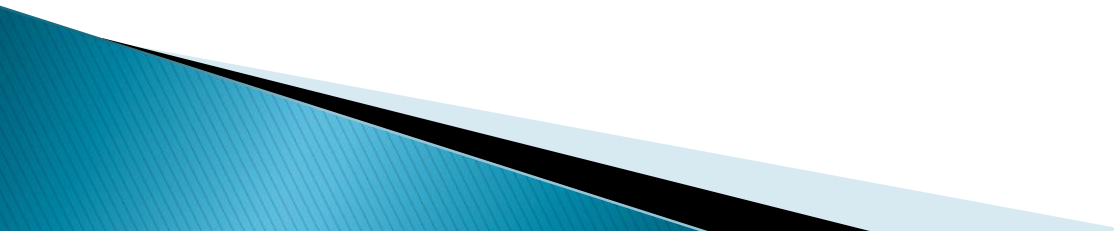
**-Greg. typhos - smoke, fog-
and a description of the clinical
course are given**

Hippocrates in 460-377 years. BC.



The first descriptions of typhoid fever as an independent disease were made at the beginning of the XIX century by Bretonnea and Charle Louis. *S. typhi* was opened by Bronich (Krakow) in 1874

**At present, the incidence of typhoid fever is registered in almost all countries of the world;
it varies widely:
from 0,5-0,6 in economically developed countries
up to 30-70 cases per 100 000 population
and higher in developing countries**

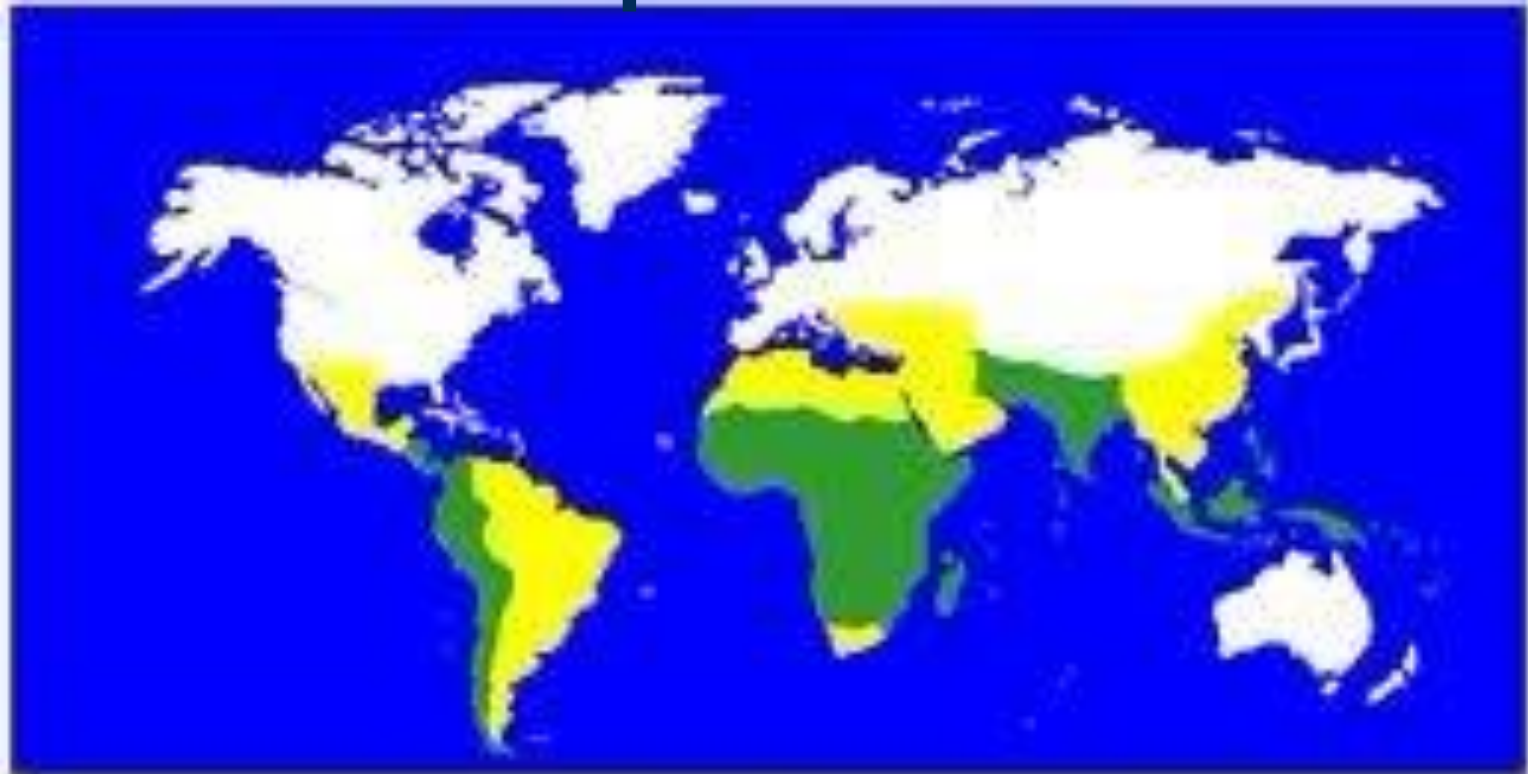




**Every year in the world it
is registered
about 20 million cases of
typhoid fever
and about 800 thousand
deaths**

The disease occurs in all climatic zones and parts of the world. However, it is more prevalent in countries with a hot climate and a low level of public sanitation.

The spread of the epidemic the process



High endemicity



Medium endemicity



Sporadic outbreaks

Etiology.

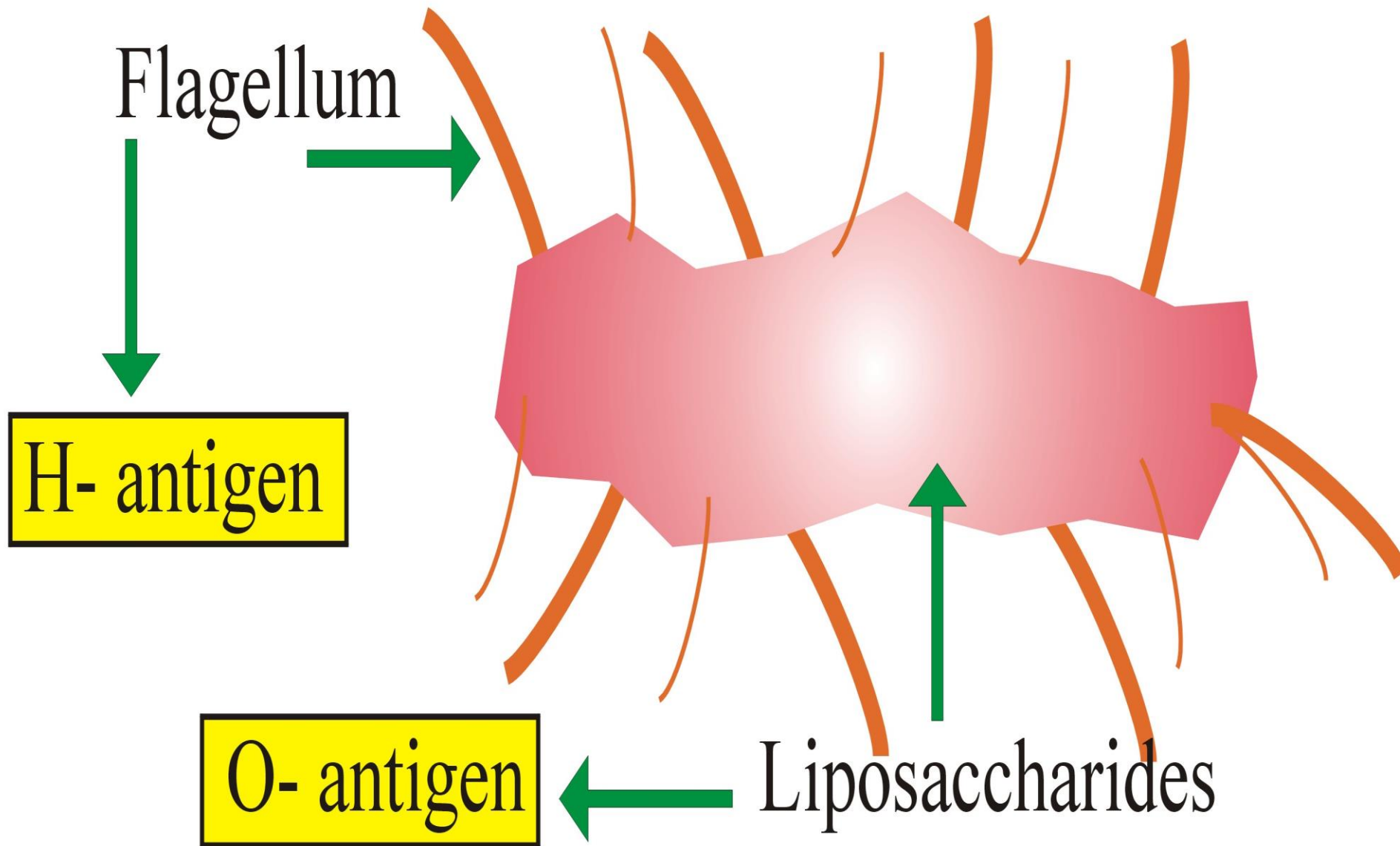
The causative agent of the disease *Salmonella typhi* belongs to the family *Enterobacteriaceae* to the genus **Salmonella**, the species **Salmonella enterica**, subspecies **enterica**, serovar **typhi** and serological **group D**, morphologically not different from other **Salmonella** family of intestinal bacteria.

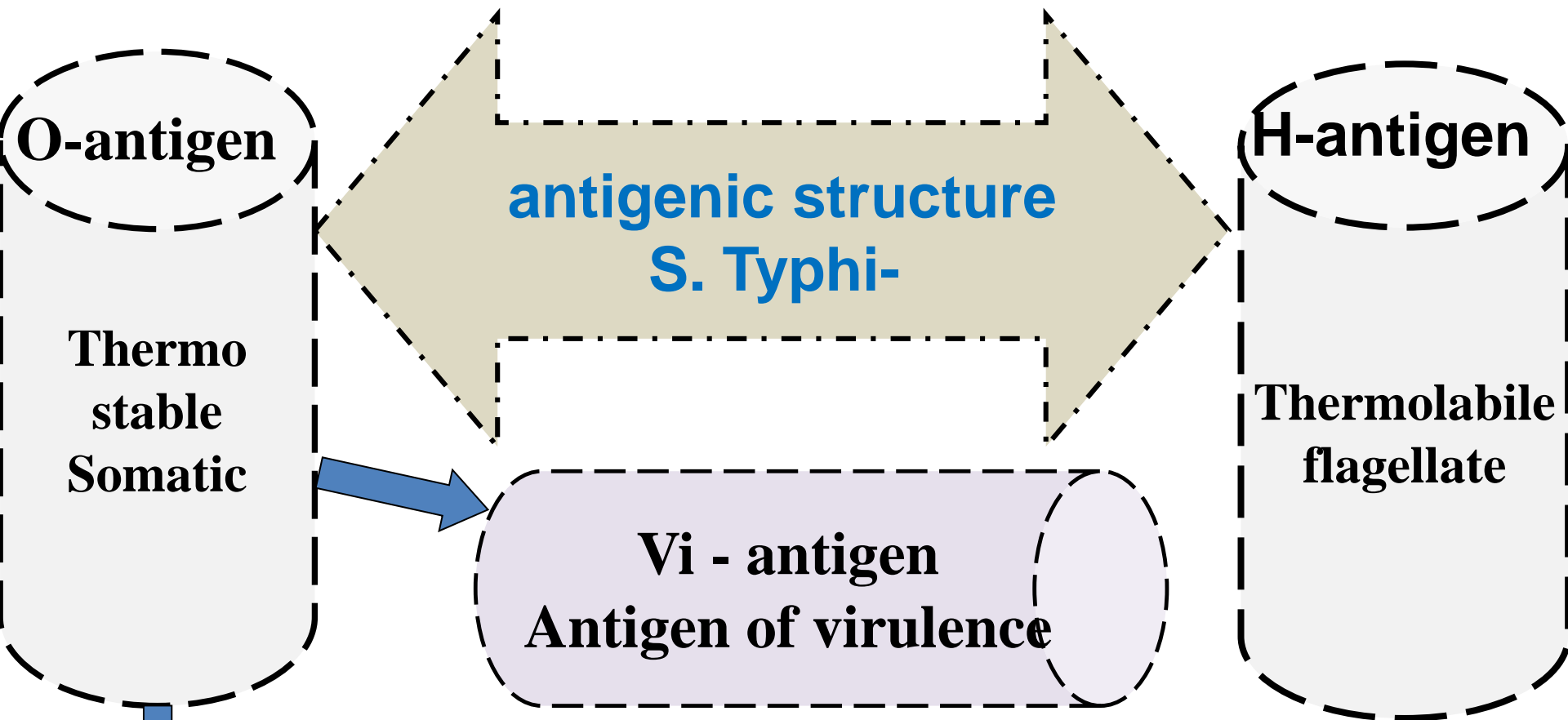




**This is
an aerobic,
gram-negative,
rod-shaped bacterium.
Dispute and capsules
do not form.**

**When the
microorganism is
destroyed, endotoxin is
released, which is heat-
stable, characterized by
high specificity,
expressed by toxic
properties.**





According to the Kaufman-White classification, salmonella typhi belongs to group D, which is characterized by the presence of IX and XII O-antigens in this salmonella group

**IX и XII O-
антигены**

Depending on the number and location of Vi-antigen, there are 3 variants of cultures:

- 1) The **V**-form contains the Vi-antigen covering the O-complex, colonies of such cultures are opaque and not agglutinated by O-serum;**
- 2) **W**-form does not contain Vi-antigen, colonies are transparent, the culture is well agglutinated by O-serum;**
- 3) The **VW**-form has a nested location of the Vi-antigen and is agglutinated by O- and Vi-sera.**

S. typhi are moderately stable in the external environment

in soil, water can persist up to 1-5 months,



on vegetables and fruits - 5-10 days,



in oil, cheese, meat, bread - 1-3 months;



In the ice up to 60 days



At a temperature of 56 ° C perish for 45-60 minutes,

at 60 ° C - after 30 minutes,

at boiling - for some seconds. Destroy from the effects of conventional disinfecting solutions of phenol, lysol, bleach and chloramine in a few minutes.

The presence in the water of active chlorine in a dose of 0.5-1.0 mg / l provides reliable disinfection of water against typhoid-infected salmonella.

Epidemiology.

Typhoid fever belongs to the group of intestinal infections and is anthroponosis.

The only source and reservoir of infection is a human.

From the body of a sick person, the causative agent of typhoid fever is released into the external environment mainly with feces and urine.

Intensive excretion of the pathogen from the patient begins on the 7th day after the onset of the disease and reaches the greatest degree at the 2-3rd week of the disease, when the bacteria are excreted by

**feces,
urine,
saliva,
are detected in the sweat,
milk.**

In most cases, the bacterial release lasts no more than 3 months (acute bacterial excretion), but 3-5% form chronic bacterial secretion.



The source of infection is most often chronic bacterial carriers of the pathogen of typhoid fever, which, while remaining practically healthy, secrete salmonella for a long time (years and even decades).

Also represent the danger of a person with mild and atypical forms of the disease, as they do not always exclude themselves in time, visit public places, continue to perform official duties, including on food and water supply facilities.

The mechanism of transmission of pathogens is **fecal-oral. Infection of people occurs with the use of infected water or food.**

The contact-household way of transmission of *S. typhi* is rare, mainly among children.

Water flashes occur when sewage water is contaminated with sewage, technical malfunction of water supply, sewerage systems and structures, as well as due to a violation of the water treatment regime.



Food outbreaks of typhoid fever occur mainly with the use of infected milk and dairy products (as well as cold meat snacks). In food, salmonella typhi is able to multiply and accumulate in large quantities (especially in milk during hot seasons or when stored outside the refrigerator). With milk flashes, there is a shorter incubation period, the disease is more severe than in the waterway of infection and with significant lethality.



Risk factors

- Worldwide, children are at greatest risk of getting the disease
- Work in or travel to endemic area
- Have close contact with someone who is infected or has recently been infected with typhoid fever
- Weak immune system such as use of corticosteroids or diseases such as HIV/AIDS
- Drinking water contaminated by sewage that contains *S. typhi*



Pathogenesis.

Developed as far back as 1924-1934. Sh. Ashar and V. Laverne, the phase theory of the pathogenesis of typhoid fever has survived as a whole up to the present time.

On its basis, the following links of pathogenesis are distinguished:

- ▶ the introduction of an agent into the body,**
- ▶ development of lymphadenitis,**
- ▶ bacteremia,**
- ▶ intoxication,**
- ▶ parenchymal diffusion,**
- ▶ isolation of the pathogen from the body,**
- ▶ the formation of immunity and restoration of homeostasis.**

Pathogenesis.

♦ **The phase of implantation** involves the entry of a microbe into the mouth, where it is already possible to insert into the lymphatic formations (since salmonellae are tropic to the lymphatic system).

♦ **phase of lymphangitis and lymphadenitis:** microbes penetrate into the lymphatic formations of the small intestine (Peyer's plaques and solitary follicles), where they multiply.

◆ **Phase excretion of the pathogen from the body.**

◆ **The phase of formation of immunity - the phase is allocated artificially.**

Both cellular and humoral immunity is important (it is the leading one), in some people, due to the inferiority of the body's immune system, clinical recovery occurs, but the causative agent persists (bacteriocarrier, some call it the chronic form of typhoid infection, although there is no clinic)

Ingestion of contaminated food or water



***Salmonella* bacteria**

Invade small intestine and enter the bloodstream



Carried by white blood cells in the liver, spleen, and bone marrow




Multiply and reenter the bloodstream



Bacteria invade the gallbladder, biliary system, and the lymphatic tissue of the bowel and multiply in high numbers



Then pass into the intestinal tract and can be identified for diagnosis in cultures from the stool tested in the laboratory



As a result of the bactericidal action of the blood, a part of the microbes perishes with the release of endotoxin

The same process occurs in the lymph nodes

Circulating in the blood of endotoxin causes intoxication of the organism of different intensity.

```
graph TD; A[Endotoxin] --> B[has a pronounced neurotropic effect]; B --> C[toxic lesions of nerve centers]; C --> D[with the development of the processes of inhibition in them]; D --> A;
```

Endotoxin

**has a
pronounced
neurotropic
effect**

**with the
development of
the processes
of inhibition in
them**

**toxic lesions of
nerve centers**

Clinically, it is characterized by infectious-toxic encephalopathy, which manifests itself in a peculiar inhibition of the patients, fogging of consciousness. In the severe course of the disease, it is most pronounced and is called the typhoid condition
(status typhosus).

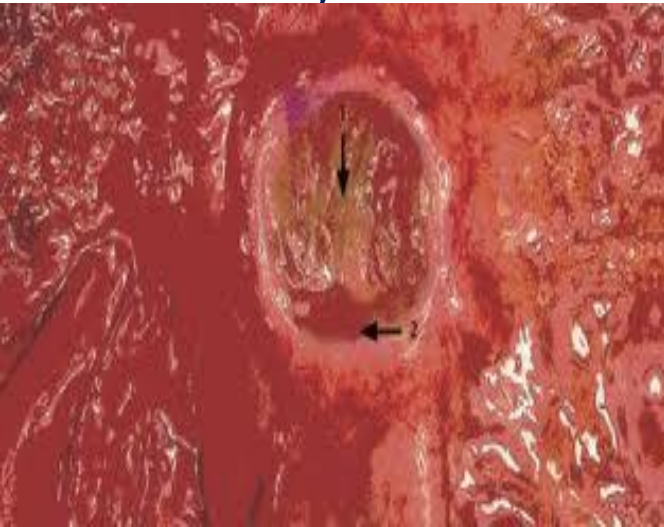





Endotoxin also acts on the sympathetic nerve endings of the celiac nerve (at the site of excretion) and on the vegetative ganglia, which leads to trophic and vascular disorders in the mucosa and lymphatic formations of the small intestine.

As a result, there are intestinal ulcers, there is flatulence, sometimes diarrhea.

The endotoxin of *S. typhi* also affects the bone marrow, which is manifested by leukopenia.




In severe disease, an infectious-toxic shock can develop. In this case, there is a violation of the tone of peripheral vessels (arterioles and sphincters of postcapillary venules). There is a deposit of blood in the peripheral channel, the outlet of its liquid part into the extravasal space. First, a relative and then absolute hypovolemia develops with a decrease in the venous influx to the heart. Increases in hypoxia, metabolic acidosis, violations of water-electrolyte balance



Postinfectious immunity in typhoid fever is strictly specific and can last for a long time (15-20 years).

However, at present, there are observations of recurrent abdominal typhoid infections at relatively short intervals (1.5-2 years), which is most often associated with impaired immunogenesis as a result of antibiotic therapy.



**The cyclic course of typhoid fever can
manifest itself
five periods of pathogenetic changes
in the small intestine, and sometimes
the colon is affected.**

Clinical classification of typhoid fever

I. By the nature of the current:

1) typical forms;
2) atypical forms
(erased,
abortive,
outpatient,
rare:
pneumotif,
meningothypus,
nephrotiph,
colocation,
typhoid gastroenteritis
and etc.).

II. Duration Current:

1) acute;
2) recurrent.

III By the severity of the current:

- 1) mild,
- 2) moderate;
- 3) severe.

IV. By availability complications:

- 1) without complications;
- 2) complicated:
 - a) specific complications (intestinal bleeding, intestinal perforation, infectious-toxic shock);
 - b) nonspecific complications (pneumonia, parotitis, cholecystitis, thrombophlebitis, otitis, etc.).

clinic

**The incubation period is from 3 to 30 days
(an average of 10-14 days)**

**The period of growth of clinical
symptoms-5-7 days**

The peak period is 7-14 days

The period of extinction is 14-21 days

**The period of convalescence -
after 21-28 days of illness**



Rose spots



Aches and pains



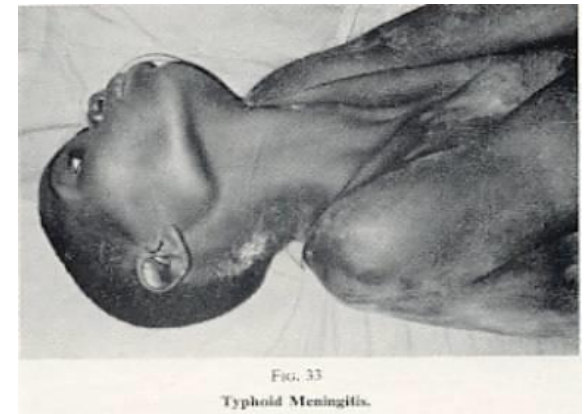
High fever



Diarrhea



Chest congestion



Typhoid Meningitis

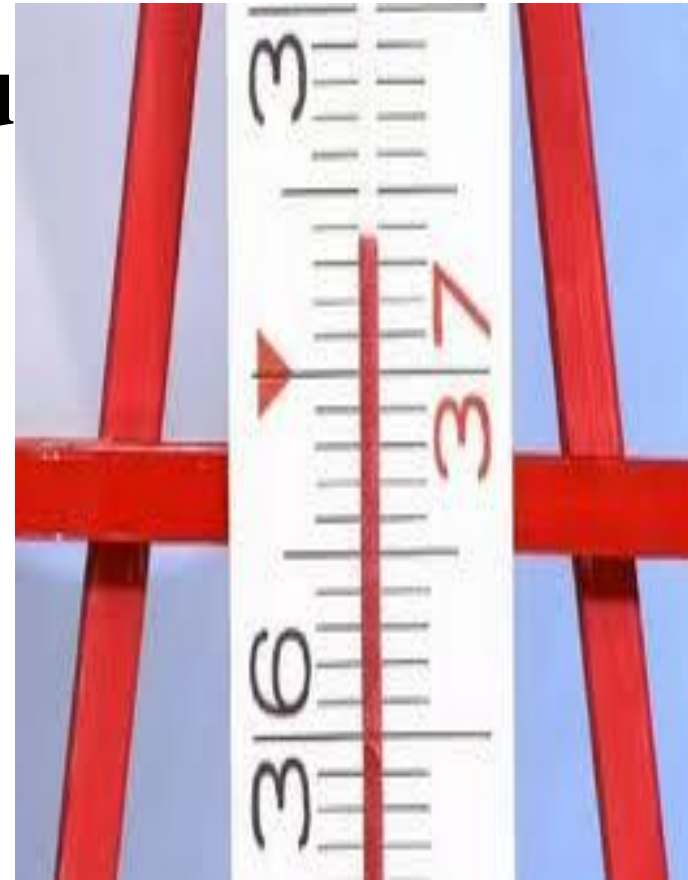
In typical cases of typhoid fever, the disease begins gradually, sometimes it is even difficult to determine the date of onset of the disease.

Patients develop pronounced general weakness, fast fatiguability, adynamia, moderate headache, there may be chills.



With each passing day these phenomena increase, the body temperature rises and by the 4th-7th day of the disease it reaches a maximum.

Intoxication increases, headache and adynamia intensify, appetite decreases or disappears, sleep is disturbed (sleepiness during the day, insomnia at night). The stool is usually detained, there is flatulence. By the 7th-9th day the disease is fully developed.



When examining a patient during the initial period of the disease, the symptoms of general intoxication are revealed primarily without distinct signs of organ damage.

There is a retardation of patients, they are inactive, prefer to lie with their eyes closed, the questions are answered not immediately, monosyllabically.

The face is pale, rarely slightly hyperemic, conjunctivitis and herpes rash usually does not happen.

Skin is dry, hot.

In some cases, it is possible hyperemia of the mucous membrane of the throat.



The tongue is usually dry, overlaid with a grayish-brown coating, thickened (there are tooth marks on the edges), the tip and edges of the tongue are free of plaque.





The abdomen is moderately inflated. Sometimes there is a shortening of percussion sound in the right iliac region (Padalka symptom). At palpation, rough rumbling of the cecum and an increase in pain sensitivity, soreness and infiltration are determined here (the Obraztsov-Gaussman symptom).

Stenberg's cross symptom is painfulness when palpating the abdomen along an oblique line from above and from the left to the bottom and to the right is the line of attachment of the mesentery of the small intestine. A positive symptom is also a sign of mesenteric lymphadenitis.

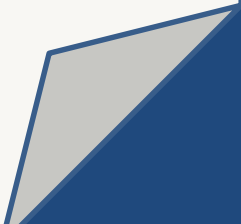
Sometimes typhoid fever begins in the form of acute gastroenteritis or enteritis without pronounced general intoxication, when in the early days disturbing nausea, vomiting, loose stools without pathological impurities (diarrhea with faeces purgae or constipation), diffuse pain in the abdomen, and subsequently appear characteristic symptoms of the disease.



From the 3rd-5th day of illness, the spleen is enlarged, and by the end of the first week, an increase in the liver can be detected.



By the 7th-8th day of the disease, a period of height begins, when a number of characteristic signs appear that facilitate clinical diagnosis. Significant increase in intoxication is manifested in severe inhibition of patients, darkening of consciousness (infectious-toxic encephalopathy).



On the skin on the 8-12th day of the disease there is a characteristic roseoseous exanthema. Elements of the rash are usually few, they are localized on the skin of the upper abdominal and lower thorax. Roses are monomorphic with clear boundaries, somewhat higher than the level of the skin (roseola elevata). Roseola, have the appearance of pink spots the size of a pinhead or a little more, disappear when pressed. Elements exist from a few hours to 3-5 days. In the place of roseola remains hardly noticeable pigmentation.



During the resolution period, the appearance of elements of charnail (crystallina miliaria) and yellow staining of the skin of the palms and feet (symptom of Phillipovich) is possible.

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In the period of extinction of the main clinical manifestations, the body temperature decreases lytically, and then normalizes. Decrease and subsequently disappear the phenomenon of general intoxication, headache. There is an appetite, the tongue is cleared, the sizes of a liver and a lien decrease.

The period of convalescence begins after the normalization of body temperature and lasts 2-3 weeks, depending on the severity of the disease.

As a rule, at this time are preserved increased fatigue and vascular lability.

Abortive forms

characterized by the onset and development of more or less characteristic signs of the disease, but with a rapid (after 5-7 days, sometimes in 2-3 days), often critical, a decrease in temperature, the disappearance of symptoms and the transition to the stage of recovery.

Atypical forms of typhoid fever. These include

Erased forms of the disease

characterized by short-term subfebrile fever, mild symptoms of intoxication and the absence of many characteristic features. Body temperature throughout the course of the disease does not exceed 38°C , intoxication is insignificant, there is no bradycardia, flatulence, there is no rash.

Hemogram

In the first 2-3 days is characterized by moderate leukocytosis, and from the 4th to the 5th day, leukopenia is determined with a shift to the left to the young and myelocytes. Aneosinophilia is observed, relative lymphocytosis and thrombocytopenia.

ESR moderately increased.

The degree of leukopenia depends on the severity of the disease.

Leukocytosis in the early days usually remains undetected.

Fever lasts only 5-7 days (sometimes 2-3 days) even without the use of antibiotics. The acute onset of the disease is more common (in 60-80% of patients), as well as an increase in lymph nodes. Difficulties in diagnostics are also atypical current cases, for example, typhoid fever with a clinical picture of acute gastroenteritis and short-term fever (1-3 days).



The results of laboratory research have also changed. So, almost half of the patients have normocytosis, eosinophils remain in the blood, serological reactions can remain negative throughout the whole illness. In recent years, there was not a single disease with prevalence of organ pathology (pneumothypoid, meningotif, nephrotiph).



recurrent typhoid fever

By recurrence of typhoid fever should be understood any increase in temperature to febrile figures in the period of convalescence when there is no complication or concomitant disease.

Relapses of typhoid fever occur in 8-12% of cases and significantly increase duration of bacterial excretion.

Most often relapses are observed on 2-3 a week of apyrexia. Less often there are late relapses, up to 90 days from the moment of temperature normalization.



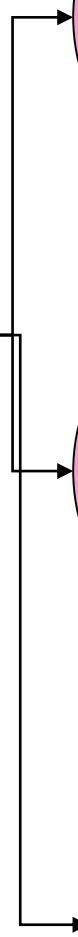
REASONS FOR RECURRENCE:

- **Preserving the pathogen in the body**
- **Inadequate immune system response**

- 1. Neuropsychic trauma**
- 2. Overcooling and overheating**
- 3. Exhaustion**
- 4. Hypovitaminosis**
- 5. Layering of intercurrent diseases**
- 6. Inadequate treatment**



COMPLICATIONS



Intestinal bleeding

Perforation of the intestine

Infectious-toxic shock

DIAGNOSTICS

CLINICAL DATA

Prolonged fever

Headache

"typhoid status"

Characteristic changes in the tongue

Flatulence

Roseolous rash

Hepatosplenomegaly

Laboratory data

**Hemoculture
Urinoculture
coproculture
Biliculture
Vidal's reaction
diagnostic titer -
1/200
indirect hemoagglutination reaction**



Serodiagnosis of Typhoid

No.	Methods	Time Consuming
1	Widal test by Rapid Slide (Screening) test	1 min
2	Widal test by Tube Agglutination test	2-4 hours
3	Typhidot Tests (IgG/IgM rapid test) by Chromatography	15 minutes
4	Tubex TF	10 minutes
5	ELISA (Enzyme-Linked ImmunoSorbent Assay) (IgG/ IgM)	45 minutes – 2 hours
6	ECL (ElectroChemiluminescent immunoassays) (IgG/ IgM)	45 minutes – 2 hours
7	PCR (Polymerase Chain Reaction)	7-10 days

The rapid slide test is widely used in private laboratory and hospitals in Hawler. PCR an excellent tool for the early diagnosis of typhoid, due to its very high sensitivity and specificity.

Widal test

" A test involving agglutination of typhoid bacilli when they are mixed with serum containing typhoid antibodies from an individual having typhoid fever; used to detect the presence of Salmonella typhi and S. paratyphi."

Limitations of Widal test:

- The Widal test has a very low specificity, less sensitive, confusing and difficult to interpret for the diagnosis of typhoid fever, because cross-agglutinating antibodies remaining from past infections with related salmonella serotypes give **false-positive results**.
- Furthermore, in areas where fever due to infectious causes is a common occurrence. So **false positive reactions** may occur as a result of non-typhoid.
- In spite of several limitation many Physicians depend on Widal Test.

DIFFERENTIAL DIAGNOSTICS

Flu

Typhoid-like form of salmonellosis

Paratyphles A and B typhus

Brill's disease

yersiniosis

brucellosis

Infectious mononucleosis

leptospirosis

fever

tularemia

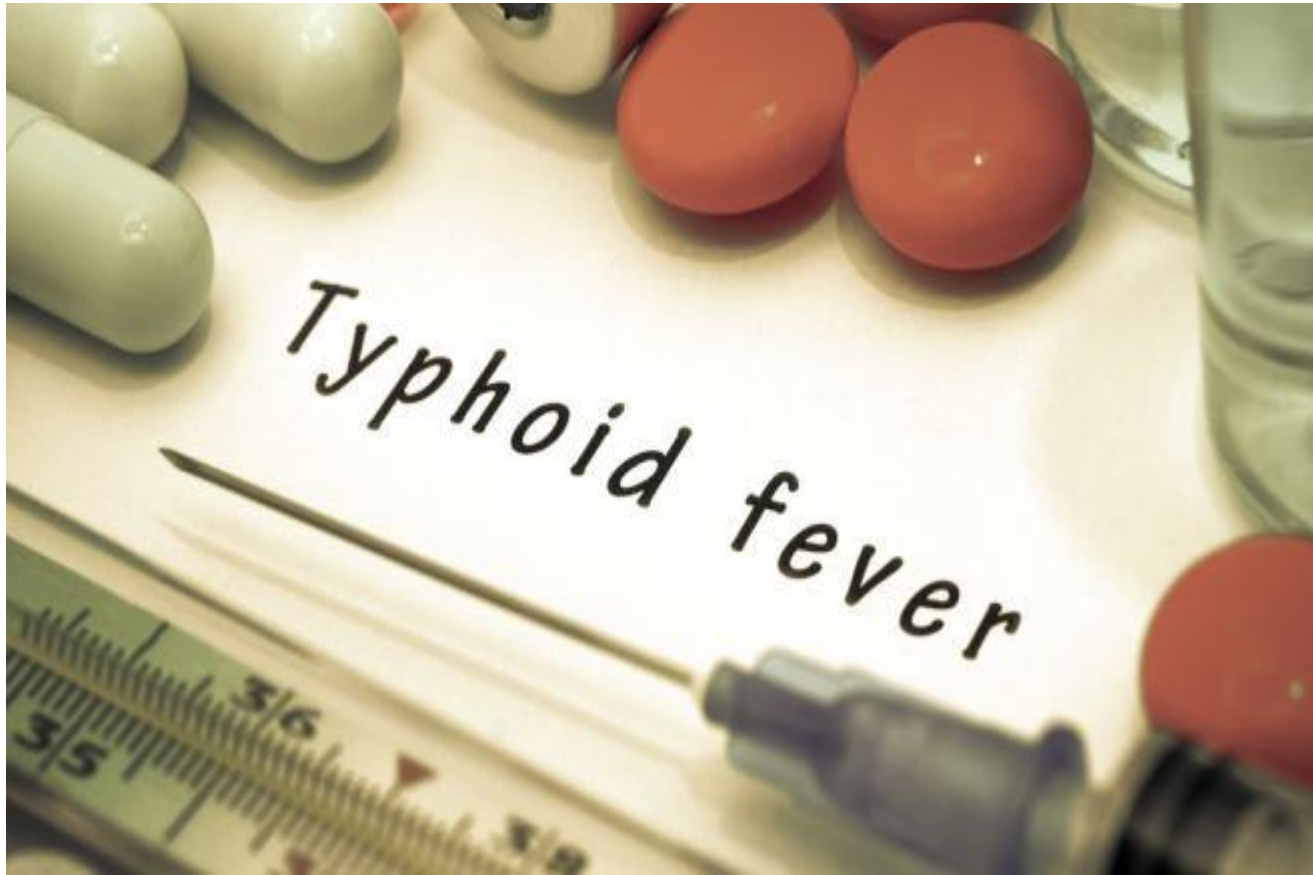
appendicitis

lymphogranulomatosis.

Treatment

Consultations

- **An infectious disease specialist or surgeon should be consulted.**



Diet

- **Fluids and electrolytes should be monitored and replaced diligently.**
- **Oral nutrition with a soft digestible diet is preferable in the absence of abdominal distension or ileus.**

Activity

- **No specific limitations on activity are indicated.**
- **Rest is helpful, but mobility should be maintained if tolerable.**
- **The patient should be encouraged to stay home from work until recovery.**



Diet During Typhoid

Medication

Antibiotics

- **Antibiotics, such as fluoroquinolone, ciprofloxacin**
- **ceftriaxone, azithromycin,**
used to treat typhoid fever.

- **Prompt treatment of the disease**
with antibiotics reduces the
case-fatality rate
to approximately
1%.

Prophylaxis



Wash your hands.



Avoid drinking untreated water.



Avoid raw fruits and vegetables



Choose hot foods.



Prevention

Two main typhoid fever prevention strategies:

1. Vaccination

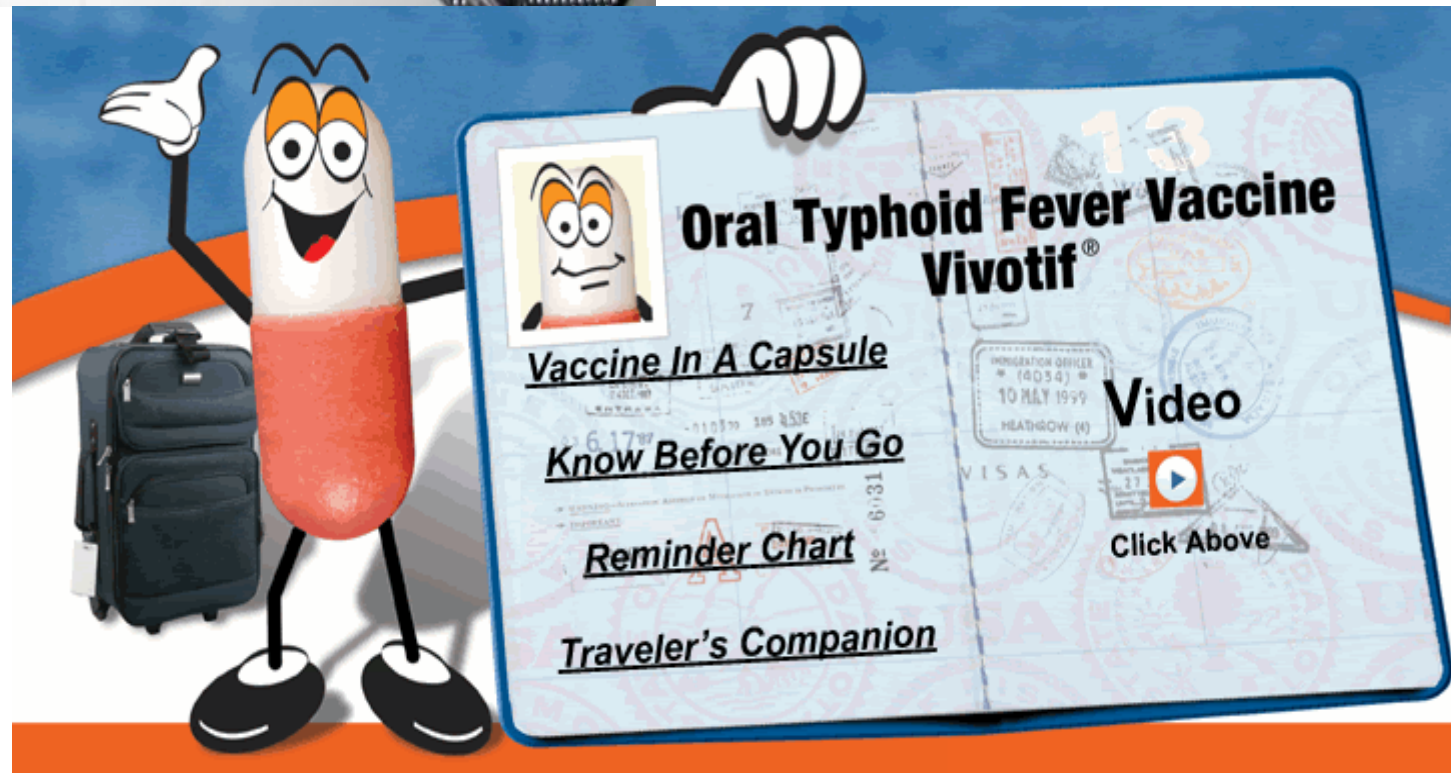
First type of vaccine:


- Contains killed *Salmonella typhi* bacteria.
- Administered by a shot.



Second type of vaccine:

- Contains a live but weakened strain of the *Salmonella* bacteria that causes typhoid fever.
- Taken by mouth.



- 
- ✓ **Be vaccinated against typhoid while traveling to a country where typhoid is common.**
 - ✓ **Need to complete your vaccination at least one week before travel.**
 - ✓ **Typhoid vaccines lose their effectiveness after several years so check with your doctor to see if it is time for a booster vaccination.**

2. Avoid risky food and drinks

- **Buy bottled drinking water or bring it to a rolling boil for one minute before drinking it.**
- **Ask for drinks without ice, unless the ice is made from bottled or boiled water. Avoid Popsicles and flavored ices.**
- **Eat food that have been thoroughly cooked and that are still hot and steaming.**
- **Avoid raw vegetables and food that cannot be peeled like lettuce.**
- **When eat raw fruit and vegetables that can be peeled, peel yourself. Don't eat the peelings.**
- **Avoid foods and beverages from street vendors.**