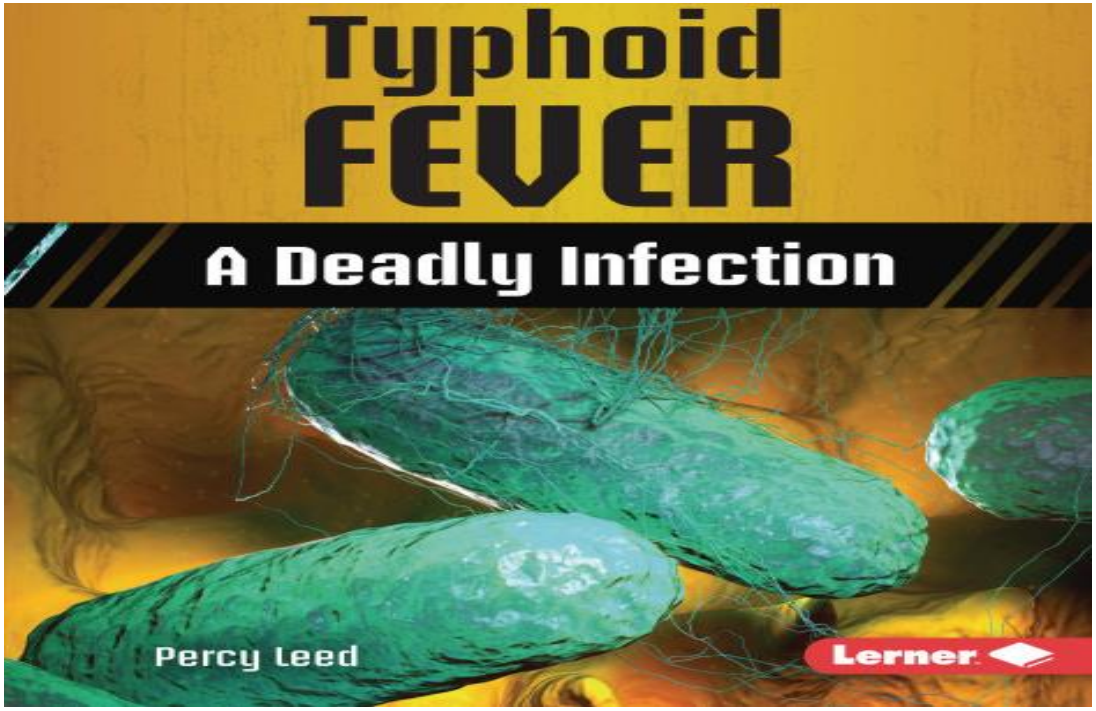
EPIDEMIOLOGY OF ENTERIC (TYPHOID) FEVER AND PARATYPHOID FEVER-2023



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CASE DEFINITION
Salmonella Typhi infection

Clinical for Public Health Surveillance:

One or more of the following:

- Fever
- Diarrhea
- Abdominal pain
- Constipation
- Anorexia
- Relative bradycardia.

CASE DEFINITIONS AND FINAL CLASSIFICATION

SUSPECTED CASE OF TYPHOID OR PARATYPHOID FEVER FOR CASE FINDING

- Fever for at least <u>three out of seven</u> consecutive days in an endemic area or following travel from an endemic area
- OR Fever for at <u>least three out of seven</u> consecutive days within 28 days of being in household contact with a confirmed case of typhoid or paratyphoid fever

- CONFIRMED CASES

Typhoid fever: Laboratory confirmation by

- **Culture**
- Molecular methods of S. Typhi or detection of S. Typhi DNA .

Laboratory Criteria for Case Classification:

- *Confirmatory laboratory evidence:*

Isolation of *S.* Typhi from a clinical specimen.

- *Presumptive laboratory evidence:*

Detection of *S.* Typhi in a clinical specimen using a culture-independent diagnostic test (CIDT).

Note: Serologic testing should not be utilized for case classification.=Widal test

Relapse of typhoid or paratyphoid fever:

- Laboratory confirmation of S. Typhi or S. Paratyphi from a normally sterile site within one month of completing an appropriate course of antimicrobial treatment and resolution of symptoms.

CHRONIC CARRIERS TYPES

- Presumptive carrier:

Evidence of shedding of Salmonella spp. (positive stool culture or PCR) of an <u>unknown duration.</u>

Definitive carrier

- Evidence of shedding of Salmonella spp. (positive stool culture or PCR) at least 12 months **after** finishing an appropriate course of antibiotics treatment .

OR » Two positive stool samples 12 months apart

Convalescent carrier:

Evidence of shedding Salmonella spp. (positive stool culture or PCR)

1–12 months after finishing an appropriate course of antimicrobial treatment and the resolution of symptoms following a laboratory-confirmed episode of acute disease

LABORATORY ANALYSIS

- There is no definitive test for typhoid or paratyphoid fever.
- The initial diagnosis is made clinically.
- Presentation is often confused with malaria,
- Typhoid fever and paratyphoid fever should be suspected in a person with a history of travel to an endemic who is not responding to antimalarial medication

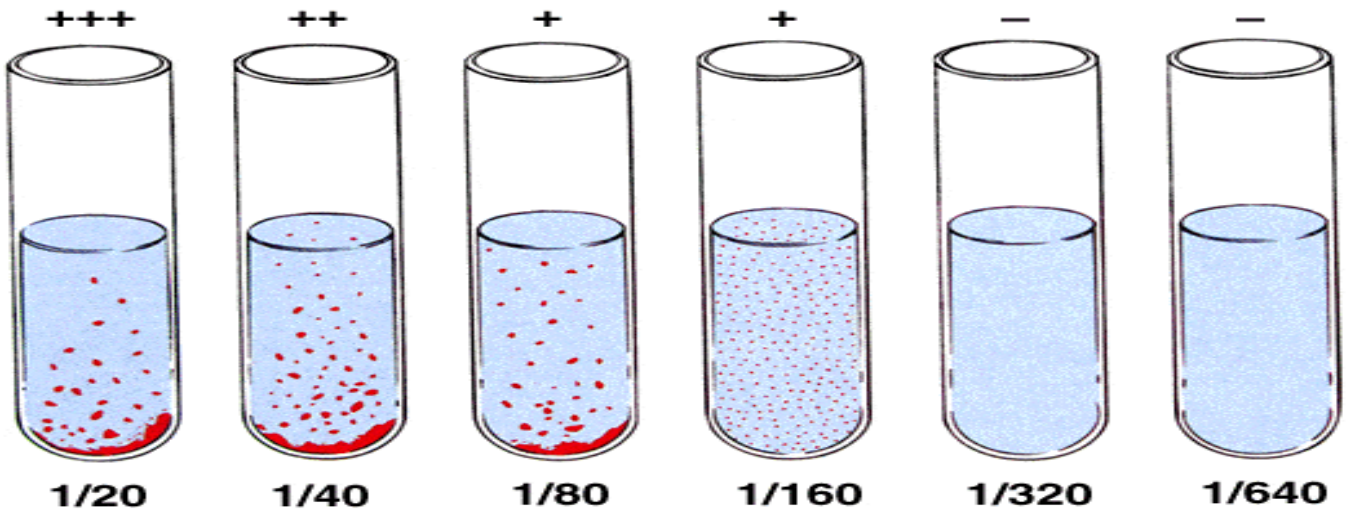
Testing currently available

- Blood culture: positive in approximately half the cases (multiple cultures may be required).
- Bone-marrow culture: increases the diagnostic yield to about 80% and is unaffected by prior or concurrent antibiotic use.
- Stool or Urine culture: Not usually, positive during the early acute phase of the disease (first week of illness) but is used to determine if a person is a typhoid carrier.
- Culture of bile (collected from a bile-stained duodenal string): used with blood culture resulting in 90% diagnostic yield in children with enteric fever.

- Newer serologic assays are more sensitive and specific than the **Widal test** but are not an adequate substitute for blood, stool, or bone marrow **culture.**
  - Vi antibody: found to be very high in chronic *S. typhi* carriers and has been used as a screening technique to identify carriers among food handlers, **but stool cultures are necessary to remove food handling restrictions.**

Widal test

A serology test for antibodies to O and H antigens of *Salmonella*; unreliable but is used in developing countries because of its low cost.



EPIDEMIOLOGY

- Enteric fever has become rare in developed nations.
- however, there are an estimated 27 million cases of enteric fever, with 200,000–600,000 deaths annually

- **The annual incidence is highest (>100 cases/100,000 population) in south-central and South east Asia**
- **Medium (10–100 cases/100,000) in the rest of Asia, Africa, Latin America.**
- **low in other parts of the world**

WHO Estimate

Infects roughly 21.6 million people each year

WHO Estimate

Kills 216000-600000 people each year

Iraq-Epidemiology

- Typhoid fever, a waterborne and foodborne disease, is **endemic** in Iraq.
- Hot weather and the frequent interruptions of electricity and water supply during the summer months have resulted in increased incidence.
- As a result, numerous interventions were implemented to prevent and control outbreaks.
- In 2007, 2008, 2009 and 2010, a total of

36 208, 58 247, 49 113 and 49 139 suspected cases of typhoid fever were reported, respectively.

Risk factors

- contaminated water or ice
- Flood
- Food and drinks purchased from street
- Raw fruits and vegetables grown in Fields fertilized with sewage.
- Ill household contacts,
- lack of hand washing and toilet access,
- evidence of prior *Helicobacter pylori infection (an association probably* related to chronically reduced gastric acidity).

Causative agent

- Typhoid is caused by *Salmonella typhi*.
- *It is readily killed* on heating to 60°C for 15 minutes or on boiling.
- It can survive in ice for considerable time and for some days in fresh or salt water. In can withstand drying, hence dust and dry excreta or soiled clothes also play a part in the spread.
- It survives very long in oysters and shellfish and can multiply freely in milk and butter without changing their taste or appearance.
- It can survive in ripened cheese and lives in sewage or sewage contaminated water for sufficient time.

Transmission

- Most commonly, food-borne or waterborne transmission results from fecal contamination by ill
- asymptomatic chronic carriers.
- Sexual transmission .
- Health care workers occasionally acquire enteric fever after exposure to infected patients or during processing of clinical specimens and cultures.

- **Occurrence:-**

  Worldwide.

  (multiple resistant strains in Asia and Middle East)

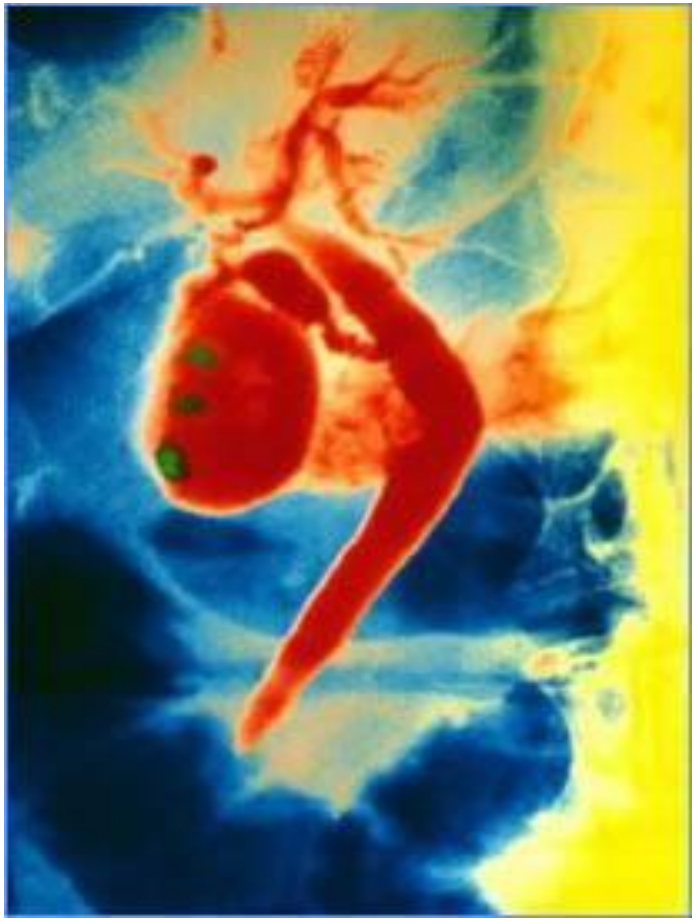
Age group :

- Typhoid fever may occur at any age but it is considered to be a disease mainly of children and young adults.
- In endemic areas, the highest incidence seen in children aged 5–19 **years.**

Gender and race :

- Typhoid fever cases are more commonly seen in males than in females.
- On the contrary, **females** have a special predilection to become **chronic carriers.**

  as hide the bacteria in gall bladder



Socio-economic factors :

- It is a disease of poverty as it is often associated with inadequate sanitation facilities and unsafe water supplies.

Environmental factors

- Though the cases are observed through out the year,
- The peak incidence of typhoid fever is reported during **July - September.**

Social factors :

- pollution of drinking water supplies,
- open air defecation and urination
- low standards of food and personal hygiene, and health ignorance.

Nutritional status :Malnutrition may enhance the susceptibility to typhoid fever by altering the intestinal flora or other host defenses.

Incubation period : Usually 8-14 days but it may be as short as 3 days or as long as 21 days depending upon the dose of the inoculums.

- Reservoir of infection : Man is the only known reservoir of infection - cases or carriers.
- Period of communicability: A case is infectious as long as the bacilli pass in stool or urine.
- About 10% of untreated typhoid fever patients discharge bacilli for 3 months after onset of symptoms.
- 2%–5% become permanent carriers.

TIPS

- A person should be declared non infective only when three weekly stool cultures are negative.
- Fecal carriers excrete around 1011 organisms per gram of stool.
- Female carriers are **three times** more common than male carriers.

- Anatomical abnormalities in biliary tract favor the carrier state.
- Gallstones are particularly favorable sites for salmonellae to reside.
- The organisms can easily go in and out of the stones.
- Organisms in the gallbladder are not affected by Chloramphenicol even in inhibitory concentrations.

TREATMENT

Management: Antibiotics

- Antibiotic Resistance is increasing
  (to Fluoroquinolone)

- **Infection acquired outside Asia**
  - Ciprofloxacin :(500 mg orally) every 12 hours for 7-10 days
  - Levofloxacin (750 mg orally) every 24 hours for 7-10 days

Management: Antibiotics

- **Infection acquired in Asia**
  - Ceftriaxone 1 g IV/IM every 12 hours for 7-14 days OR
  - Azithromycin 1 g orally day 1, then 500 mg orally daily for 5-7 days
    - Consider using Azithromycin combined WITH Ceftriaxone in ill hospitalized patients
- **Alternative antibiotics (resistance is common)**
  - Chloramphenicol 500 mg IV or oral every 6 hours for 14 days
- **Additional measures**
  - Consider adding Dexamethasone in seriously ill patients

Control of Typhoid fever

MEASURES DIRECTED TO RESERVOIR

a) **Case detection and treatment**

b) Isolation

c)Disinfection of stools and urine

d)Detection & treatment of carriers

MEASURES AT ROUTES OF TRANSMISSION

a) **Water sanitation**

b) Food sanitation

c) Excreta disposal

d) Fly control

MEASURES FOR SUSCEPTIBLES

a) immunoprophylaxis

b)health education

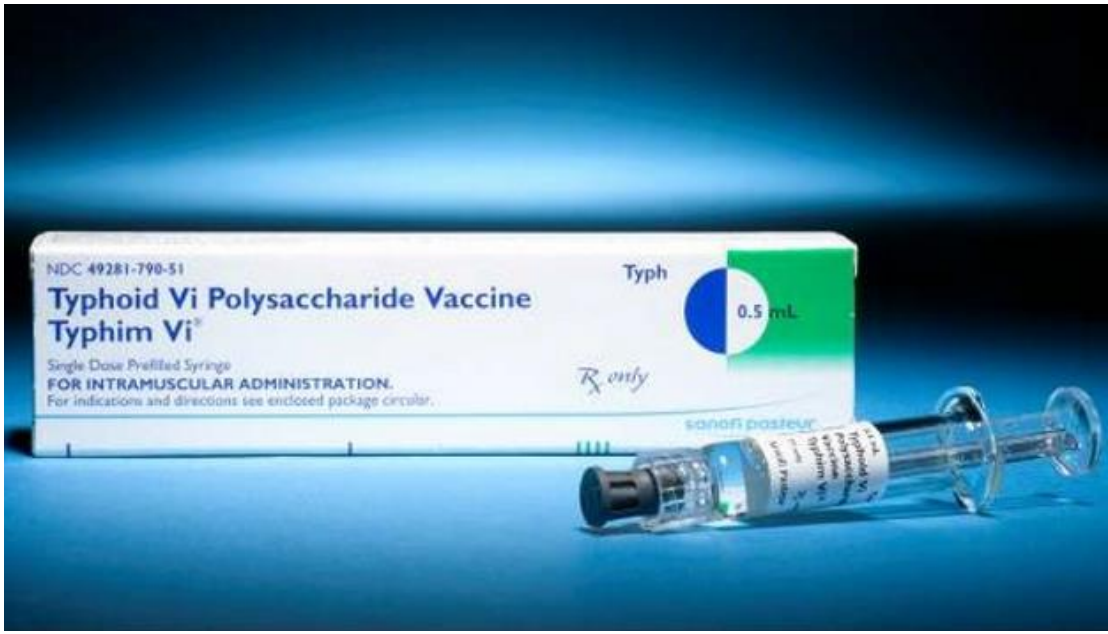
TYPHOID VACCINES

Typhoid conjugate vaccine (TCV)

- **WHO recommends the introduction of typhoid conjugate vaccine-2018 (TCV) for infants and children over six months of age in typhoid-endemic countries**
- **The vaccine has long-lasting immunity, requires only one dose .**

Injectable Typhim -Vi

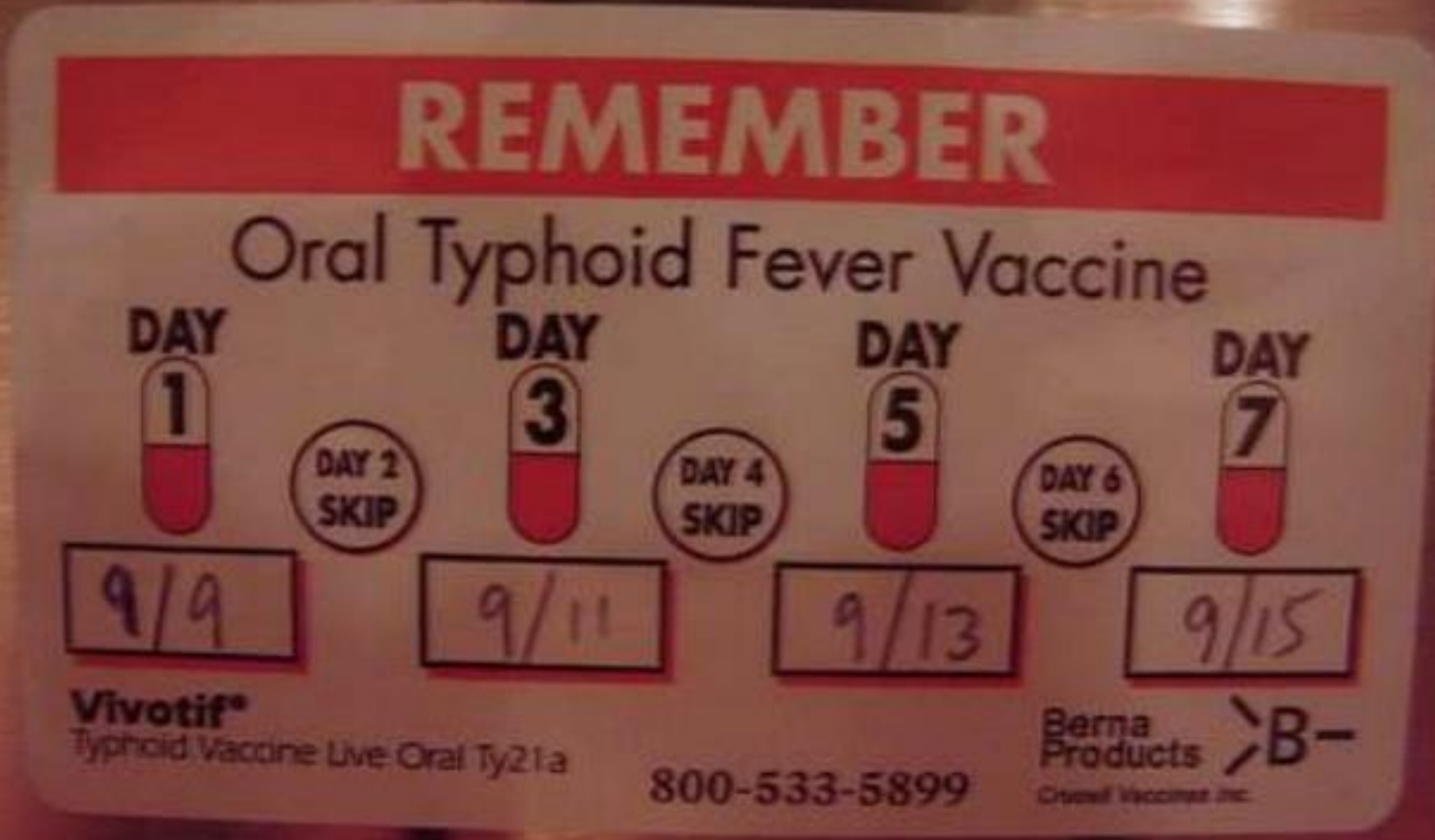
1. This single-dose injectable typhoid vaccine, from the bacterial capsule of S. typhi strain of Vi CPS. with a booster every 2 years
2. This vaccine is recommended for use in children over 2 years of age.
3. Sub-cutaneous or intramuscular injection
4. Efficacy : 64% -72%



Typhoral=Ty21a

1. This is a live-attenuated-bacteria vaccine .
2. The efficacy rate of the oral typhoid vaccine ranges from 50-80%
3. *Not* recommended for use in children younger than 6 years of age.
4. The course consists of one capsule orally, taken an hour before food with a glass of water or milk on alternating days, as 4 capsules
5. No antibiotic should be taken during this period
6. Immunity starts 2-3 weeks after administration and lasts for 3 years
7. A booster dose after 3 years

Ty21a—Oral live attenuated vaccine



Indications for Vaccination

1. Travelers going to endemic areas who will be staying for a prolonged period of time,
2. Persons with intimate exposure to a documented *S. typhi* carrier
3. Microbiology laboratory technologists who work frequently with *S. typhi*
4. Immigrants
5. Military personnel

The following recommendations will help ensure safety while travelling

- Ensure food is properly cooked and still hot when served.
- Avoid raw milk and products made from raw milk. Drink only pasteurized or boiled milk.
- Avoid ice unless it is made from safe water.
- When the safety of drinking water is questionable, boil it or if this is not possible, disinfect it with a reliable, slow-release disinfectant agent (usually available at pharmacies).
- Wash hands thoroughly and frequently using soap, in particular after contact with pets or farm animals, or after having been to the toilet.
- Wash fruits and vegetables carefully, particularly if they are eaten raw. If possible, vegetables and fruits should be peeled.

References

- Typhoid Fever & Paratyphoid Fever (*Salmonella* serotype Typhi and *Salmonella* serotype Paratyphi) 2021
- Control of Communicable Diseases Manual, 21st Edition
- 21st Edition***HARRISON'S** PRINCIPLE OF INTERNAL MEDICINE
- **https://cdn.who.int/media/docs/default-source/immunization/vpd_surveillance/vpd-surveillance-standards-publication/who-surveillancevaccinepreventable-21-typhoid-r2.pdf?sfvrsn=993904a6_10&download=true**

THANK YOU