

Guidelines for the diagnosis, management, and prevention of typhoid fever [2010]

Ministry of Health Fiji Islands

DRAFT – for endorsement



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Preface

This guideline was produced at the request of the Ministry of Health typhoid fever taskforce. After ciprofloxacin became the drug of choice for treatment of typhoid fever, it was necessary to update the national guidelines. All recommendations in this guideline are based on existing international guidelines, including the WHO typhoid fever guidelines, Heymann's Control of Communicable Diseases Manual, Mandell's Principles of Infectious Diseases textbook, and leading publications such as Parry's review article on typhoid fever in the New England Journal. See the references in the back of this guideline for a complete list. Whenever additional questions arose, international experts were consulted.

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Summary

Typhoid fever is common in Fiji. It is difficult to diagnose in any patient, but especially in young children. The disease usually presents with high fever for several days, severe headache, weakness, and loss of appetite. When treatment is delayed, there is a high risk of death. Laboratory tests for typhoid fever (blood- and stool culture) take time and have a high rate of false-negative results.

Suspected typhoid fever is defined as:

1. Fever (temperature of 38 °C or higher) of unknown origin lasting 3 days or longer in anyone residing in, or visiting, Fiji; *or*
2. Any patient with a fever (38 °C or higher) who lives in or has visited an area where there is an ongoing outbreak of typhoid fever, or who is in any other way linked to an active case of typhoid fever.

Treatment

All suspected cases of typhoid fever should be treated with antibiotics and they must complete the entire course even if laboratory tests are negative. Ciprofloxacin is the most effective treatment, and this is now the treatment of choice in Fiji for patients of all ages. It is given twice per day for 5 days,. Alternative drugs are chloramphenicol, amoxicillin, and cotrimoxazole; but these are less effective than ciprofloxacin, and they must be given for at least 2 weeks. To prevent antibiotic resistance, cipro should only be used for treatment of confirmed or suspected typhoid fever. Patients must be explained the importance of finishing the entire course of treatment, even when they already feel better. Patients with severe disease should immediately be referred to the nearest hospital.

Prevention

People get infected by ingestion of food or water contaminated by stool or urine of patients and carriers, or by direct personal contact with patients and carriers. Hand washing with soap is the most effective preventive measure. Other preventive measures are to avoid drinking unsafe water or to treat unsafe water by boiling or with chlorine. People should have access to adequate sanitary facilities, such as ventilated latrines. Uncooked foods (especially shellfish) are a risk; cooked food should be eaten while it's hot. Grog (yaqona) is a risk unless it is made using safe water and after washing hands with soap. Mothers should continue to breastfeed their children throughout infancy.

1. Introduction

The incidence of typhoid fever in Fiji is among the highest in the world. The disease is difficult to diagnose. Untreated typhoid fever has a high mortality. It is estimated that for every case treated for typhoid fever in Fiji, there are 7 cases that remain undetected in the community.¹) . This means that typhoid may be an important cause of unexplained illness and death.

The disease is caused by *Salmonella enterica* subspecies *enterica*, serovar Typhi. In shorthand it is often called *Salmonella* Typhi, or *S. Typhi*. These bacteria are only

found in humans. Paratyphoid fever is a rarer and milder form caused by *Salmonella* Paratyphi A or B. This disease will not be discussed.

In endemic areas such as Fiji, typhoid fever is common in children.² In addition, children under 5 years of age are at highest risk of severe complications and death. Typhoid fever in Fiji occurs mainly in rural areas and urban squatter settlements. Approximately 95% of reported cases are in indigenous Fijians, although outbreaks and cases also occur among the Indo-Fijian population.

2. Transmission of typhoid fever

The disease is only carried by humans; animals are not hosts or reservoirs of infection. People get infected by ingestion of food or water contaminated by stool or urine of patients and carriers, or by direct contact with patients and carriers.

Patients are infectious to others from the first week of illness until recovery. Untreated patients can excrete *S. Typhi* for several weeks or months (convalescent carriers); 2%–5% become permanent carriers. Depending on the antibiotic used, between 1% and 6% of treated cases can also carry and shed the bacteria for some period after completion of treatment. If the full course of antibiotics is not taken, then the rate of carriage will be higher.

Typhoid fever is often transmitted by drinking water from rivers and creeks that are used as a toilet by others, or that are contaminated by runoff from open excreta disposal and urination or latrines or sewer chambers, for example after a flooding, cyclone, Tsunami or other natural disasters.

Risky foods are uncooked shellfish from sewage-contaminated water, raw fruit, vegetables fertilized by human manure and eaten raw, contaminated milk/milk products (usually through hands of carriers and missed cases) and possibly kava. Flies are vehicles for transmission so may infect foods, especially if latrines are not covered or an open environment is used for defecation and urination by infected people.

3. Incubation period

The time between infection and start of illness usually is 1 to 2 weeks but can vary from 3 days to over 60 days.

4. Clinical features of typhoid fever

4.1. Signs and symptoms

Typhoid fever is notoriously difficult to diagnose on clinical grounds, especially in young children. The clinical picture varies from mild gastroenteritis with low-grade fever to severe clinical disease. Patients typically present to a hospital at the end of their first week of illness.

Typhoid fever is characterized by:

- Fever lasting several days (99%)
- Marked headache (50%-90%)
- General weakness

- Abdominal pain and tenderness
- Loss of appetite.
- Nausea and vomiting (35%)
- It may present with constipation or with diarrhoea; in small children, diarrhoea is more common.

All these signs and symptoms are non-specific and that is why typhoid fever often is not recognized. Cases of typhoid fever may be confused with influenza, leptospirosis, dengue, and other viral illness, with the risk that they do not get antibiotic treatment.

Less frequent signs and symptoms include:

- Relative bradycardia: the heart rate is slow for someone with a fever
- Enlarged spleen and or liver
- Non-productive cough in the early stage of the illness, complications present as bronchitis, pneumonia or pulmonary infarct
- Rose spots on the trunk in 25% of white-skinned patients, appear in crops on 6th day of illness and disappear after few hours (fade on pressure).
- Non-sweating fevers
- Mental dullness, confusion
- Slight deafness
- Parotitis
- Myocarditis
- Encephalitis, meningitis
- Chronic osteomyelitis, suppurative arthritis

The most common serious complications are intestinal haemorrhage or perforation (about 1% of cases), especially late in untreated cases. These are the most common causes of death in typhoid fever. Severe forms with altered mental status have been associated with high case-fatality rates.

The case-fatality rate of untreated typhoid fever can be as high as 10%–20% but prompt antibiotic treatment can lower this to less than 1%. Depending on the antimicrobials used, 15%–20% of patients may experience relapse usually within one to six weeks.

4.2. General laboratory findings

Low white blood cell counts occur in 16% to 46% of patients. Liver function tests (alkaline phosphatase, transaminases) and bilirubin may be elevated. Urinalysis frequently shows proteinuria, pyuria, and casts. Glomerulonephritis with red cell casts occasionally occur. Coagulation abnormalities indicating mild disseminated intravascular coagulation are common, but the syndrome rarely is clinically apparent. Chest X-rays sometimes reveal infiltrates (2%–11%).

4.3. Laboratory diagnosis

Unfortunately, laboratory tests for typhoid fever have a low sensitivity (meaning they often give false-negative results). This means that suspected typhoid patients should be treated with antibiotics, and the treatment should be completed, even if laboratory tests come back negative.

Blood culture is the diagnostic mainstay for typhoid fever, but the sensitivity is less than 50% (Figure 1).³ This

sensitivity will be even lower after the first week of illness. 5–10 mL of blood should be used for 1 or 2 culture bottles. There is a 29% decrease in positive cultures per mL as less blood is cultured. It is important that the blood sample is collected before the patient is treated. Treatment with antibiotics will significantly lower the sensitivity. Any delay in transporting the sample to the laboratory will also decrease the sensitivity.

Urine and stool culture can be used after the first week, but these are generally less sensitive than blood culture (Figure 1). Bone marrow culture, although very sensitive, is rarely done.

In spite of the limited usefulness of diagnostic tests for patient management, it is still very important to request blood and stool culture for confirmation and, most

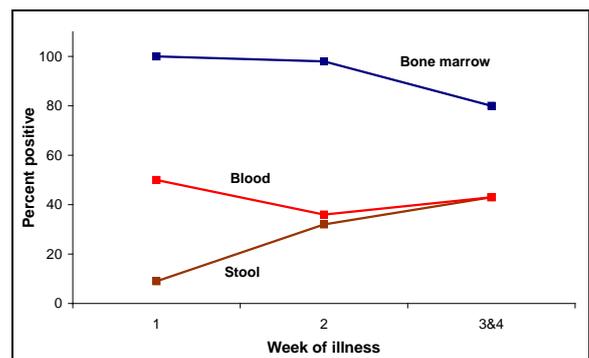


Figure 1: Sensitivity of culture methods for typhoid fever. From: Gilman, Lancet 1975.

importantly, to monitor possible development of antibiotic resistance of the bacteria. Stool culture is also done for monitoring carrier status, although the sensitivity is, again, quite low.

The Widal test is an old serological test, which is not useful because of the very low sensitivity and specificity. The Widal test should not be used any longer as a diagnostic test. Newer serological and rapid tests have been developed but have shown disappointing results. PCR (polymerase chain reaction) has only been used in experimental settings.

5. Asymptomatic and chronic carriers

A carrier state may follow acute illness or mild or even subclinical infections. These convalescent carriers can shed the bacteria through stool or urine but they don't have symptoms of the disease.

Chronic carriers are persons who carry the bacteria for more than a year. The chronic carrier state is most common (2%–5%) among persons infected during middle age, especially women; carriers frequently have gallstones, with *S. Typhi* located in the gallbladder.

Patients can become chronic carriers if they are not treated with effective antibiotics or if they don't finish the entire course of antibiotic treatment. The risk of carriage after treatment is much lower in patients treated with ciprofloxacin or third generation cephalosporins than if they are treated with chloramphenicol, amoxicillin, or

cotrimoxazole. This is one reason why ciprofloxacin is the recommended treatment of choice.

Mass screening of healthy people to find carriers is not recommended. They only shed the bacteria intermittently, and at low concentrations. This means that stool culture is often false negative. Therefore, mass stool sample screening will fail to identify most carriers. See also the discussion on carriers in outbreak situations, under heading 10.4.

Administration of 750 mg of ciprofloxacin twice daily (adults) for 28 days provides successful treatment of carriers in 80% of cases. Carriers with gall- or kidney stones should have these removed.

6. Clinical case definitions

Suspected typhoid fever:

1. Fever (temperature of 38 °C or higher) of unknown origin* lasting 3 days or longer; and at least one of the following: severe headache; or abdominal pain; or diarrhoea; or constipation.
2. During typhoid fever outbreaks: Any person with a fever (38 °C or higher) of unknown origin* in an area where there is an ongoing outbreak of typhoid fever, or who is in any other way linked to an active case of typhoid fever.

* Exclude patients who have another obvious cause of fever, for example urinary tract infection, otitis media, influenza, dengue, or leptospirosis.

In addition, a doctor may suspect typhoid fever on other clinical grounds.

Everyone with suspected typhoid fever should be treated with antibiotics, even before results of lab tests are known. They must complete the entire course even if laboratory tests are negative. Stool and blood culture samples should be collected from all suspected cases, except during outbreaks that have already been confirmed, if the number of samples might overwhelm the lab.

Confirmed typhoid fever:

Any suspected case with a blood or stool culture positive for *S. Typhi*.

Asymptomatic carrier:

Any person who sheds *S. Typhi* in stool or urine without having symptoms.

7. Treatment

7.1. General guidelines

The majority of patients with typhoid fever can be managed at home under medical supervision until they no longer have symptoms. Very sick patients should be managed in the hospital for supportive care, close monitoring of complications, and, if necessary, IV antibiotics.

Ciprofloxacin is the most effective treatment for typhoid fever.^{4, 5, 6} It has the lowest clinical failure rate, results in

a faster recovery, has the lowest relapse rate, and the lowest carrier rate. In response to an outbreak of typhoid fever in 2010, the Minister for Health approved ciprofloxacin as the drug of choice for treatment of typhoid fever in all age groups, except in pregnant women, for inpatients as well as outpatients. For pregnant women,

Table 1: Recommended treatment of uncomplicated cases of typhoid fever.

	Antibiotic	Daily dose mg/kg	Duration (days)
Optimal treatment	Ciprofloxacin	15	5
Alternative treatment	Chloramphenicol	50-75	14-21
	Amoxicillin	75-100	14
	Cotrimoxazole	8-40	14

Based on WHO guideline for diagnosis, treatment and prevention of typhoid fever 2003.

amoxicillin or a 3rd generation cephalosporin is preferable.

Duration of ciprofloxacin treatment is 5 days or until the patient is free of symptoms, whichever is longer (Table 1). For simplified dosing based on average weight for age⁷ see Table 2.

Table 2: Simplified dosing of ciprofloxacin

Age group	Dose *	Days
Children under 2 years	7.5 mg/kg twice a day	5
Children 2 to 7 years	125 mg (½ tablet of 250 mg or ¼ tablet of 500 mg) twice a day	5
Children 8 to 11 years	250 mg (1 tablet of 250 mg or ½ tablet of 500 mg) twice a day	5
Adults and children 12 years and older	500 mg (2 tablets of 250 mg or 1 tablet of 500 mg) twice a day	5

* Optimal dose 15 mg/kg per day; maximum dose 30 mg/kg per day. Paediatric dosing estimates were based on US growth charts for children.

To prevent development of antibiotic resistance, ciprofloxacin should only be used for patients with confirmed or suspected typhoid fever. It should not be used for treatment of mild diarrhoea without fever or blood. Regardless of which antibiotic is prescribed, patients must be explained the importance of finishing the entire course of treatment, even when they feel better. Every effort should be made to make sure that the patient takes the entire course. Ideally, the treatment should be directly observed (DOT).

7.2. Severe cases

Table 3 lists the recommended treatment of severe cases of typhoid fever. The third generation cephalosporins (e.g. ceftriaxone) and azithromycin are as effective as ciprofloxacin. However, these are more expensive and should be reserved for treatment of severe patients and/or patients who don't respond to ciprofloxacin treatment. Patients with intestinal perforation need intensive care as well as surgical intervention. Early intervention is crucial as morbidity/mortality rates increase with delayed surgery after perforation.

Table 3: Treatment of severe and drug resistant typhoid fever cases

	Antibiotic	Daily dose mg/kg	Duration (days)
Treatment for severe typhoid	Ciprofloxacin IV or oral	15	10-14
	Ceftriaxone IV	60	10-14
Multidrug resistance	Azithromycin	8-10	7

Based on WHO guideline for diagnosis, treatment and prevention of typhoid fever 2003.

High-dose corticosteroid treatment, in combination with antibiotic treatment and supportive care, reduces mortality in critically ill patients.

7.3. Stool testing after recovery

Depending on the antibiotic used, 15% to 20% of patients may experience a relapse, and 1% to 6% may continue to shed the bacteria without having symptoms. This happens more often with chloramphenicol, amoxicillin, and cotrimoxazole than with ciprofloxacin.

To establish clearance of *S Typhi* from the body, 3 consecutive stool samples can be taken, after recovery, at least 24 hours apart, starting at least 48 hours after the last dose of antibiotic. If any of these samples are positive for *S Typhi*, the patient should be re-started on a full course of antibiotic treatment, with rigorous supervision to ensure completion of the entire course. Carriers and patients with a relapse should also be checked for gallstones or urinary tract stones and these should be removed.

Patients should not prepare food for others until clearance is documented. It is extremely important they are educated about prevention methods (see under Prevention and control).

7.4. Uncooperative patients

Absconded patients and those who refuse treatment are a threat of infection in their community and should therefore be found so that treatment can be completed. They should be explained the importance of taking the entire course of antibiotic.

7.5. Relapse

If a patient gets ill again soon after being treated, it is important to find out why. The patient should be carefully

interviewed to know the exact onset date of the new fever, whether they have taken the entire course of treatment, and if there are recent cases of typhoid fever in his/her vicinity. The patient should be re-examined and blood and stool needs to be tested again to confirm that it really is typhoid fever. Isolates should also be tested for antimicrobial susceptibility.

Failure to complete the entire course of antibiotics probably is the most common reason for a relapse, especially if the fever returns soon after completion of treatment (for example within a week). If the illness is still circulating in the patient's community, then it is also possible that he/she was re-infected. This is also more likely if the onset of fever is several weeks or months after the end of treatment.

If treatment failure is suspected (i.e. a relapse of the illness in spite of taking the full course of antibiotics), then the patient should be referred for evaluation and treatment. It is important that suspected antimicrobial resistance is lab-confirmed and reported to the FCDC.

8. Prevention and control

The population should be encouraged to seek medical care if they have a fever that lasts more than 2 days. Patients with symptoms of typhoid fever must be educated not to prepare food for others. All patients should be educated about ways to avoid infecting others and preventing further infections.

- Hand washing with soap is the most effective preventive measure. People should wash their hands with soap after each toilet visit and before preparing a meal or drink and before eating. Educate patients, their families, and the public about the importance of hand washing with soap.
- Public water supplies should be protected, purified, and chlorinated.
- Rainwater, if collected correctly, is usually safe, however one must ensure that tanks are covered and that hands are not dipped in it. ,
- Water from rivers or creeks should not be drunk. If unavoidable, it should be treated before drinking:
 1. Bring to a rolling boil (no need to boil longer), *or*
 2. Filter through a cloth; or let settle overnight and pour into another container to get rid of the dirt at the bottom; then treat with chlorine: add 2 drops of household bleach (e.g. Janola) per litre; let stand for at least 30 min.Once water has been boiled or chlorinated, it should be carefully stored in a container from which it can be poured through a spigot or tap to prevent re-contamination through dipping of hands or objects.
- Use meticulous/scrupulous cleanliness in food preparation and handling; cooked food should be eaten while it's hot. Boil shellfish for at least 10 minutes before serving.
- When preparing yaqona (grog), use safe water (see above) and wash hands with soap before handling it. Areas where Yaqona and other crops are harvested

- should be protected from contamination by human waste.
- Mothers should breastfeed their children throughout infancy. If the infant is not breastfed, all milk and water used for infant feeding must be boiled. Hands must be thoroughly washed with soap before the baby milk is prepared.
- Dispose of human waste safely and maintain fly-proof latrines.

All cases of typhoid fever should be investigated to determine if there are more cases in his/her household or village; an attempt should be made to determine the source of the infection.

9. Reporting

Every single case (suspected and confirmed) should be reported on a routine basis by clinicians and the laboratory. Reports of laboratory confirmed cases should be forwarded weekly via email to the NACD and to the respective DMO. The NACD will in turn forward the analysed data to the DSPH, the laboratories, health centres/hospitals, DMO on a monthly basis and through the CD bulletin.

Outbreaks of typhoid fever (2 or more cases who are linked or from the same area) should be immediately reported to the SDMO, DMO and National Adviser Communicable Disease Control and should be investigated to determine the source of infection and also risk of ongoing transmission.

10. Management of a typhoid fever outbreak

If there is a sudden increase in the number of cases or when 2 or more suspected or confirmed cases of typhoid fever are identified within 1 month in a new area/village, this should be immediately reported and an outbreak investigation should begin with the following steps:

- ✓ Confirm the outbreak, i.e.
 - confirm the diagnosis: review patient charts and interview the patients about their symptoms
 - check the results of diagnostic laboratory tests and/or arrange testing of stool and blood samples
 - confirm the number of cases
- ✓ Make an adjustable case definition: define who should be counted as part of the outbreak
 - Time - Date of onset of illness between when to when
 - Place - residence, school, or work
 - Person - Symptoms and lab results (the standard definitions of suspected and confirmed cases can be used for this); age and gender.
- ✓ Identify additional cases and obtain information.
 - Cases should be interviewed to identify possible links to specific foods, water supply and potential sources of infection, for example, a funeral event, restaurant, or school.
- ✓ Start a line-listing (a summary table of basic information about time, person, and place pertaining to the case and the outbreak)

- ✓ Describe data collected by time (onset of symptoms), place, person
- ✓ An environmental investigation should begin early.
- ✓ Apply control measures
- ✓ Establish and strengthen communication channels between health facilities, field officers and management and also with national level
- ✓ Communicate results to the community and other professionals

These steps do not always occur exactly in this order. For example, applying control measures should begin as soon as possible (often, more general measures until the investigation suggests more specific measures to take); communication should also be an ongoing process.

Expert advice should be sought if you identify an outbreak of typhoid fever.

Explosive outbreaks from a single source sometimes occur in Fiji. There have been large outbreaks after mass gatherings, or due to eating raw shellfish from a contaminated river. In 2009, a large outbreak occurred at a school as a result of a clogged toilet. Therefore, an investigation should always be done and, if a (suspected) source is found, specific control measures should be taken.

However, the incubation time of typhoid is long. This means that by the time an outbreak is detected and investigated, there often is already transmission in the community through multiple routes. Therefore, in addition to finding and stopping the source of the outbreak, it will also be necessary to take broader control measures, including treating cases and carriers, hand hygiene, food hygiene, water safety, and sanitation health education.

10.1. Environmental investigation

The aim of an environmental investigation is to find possible sources of infection such as a contaminated water supply. The general state of the water supply and the sanitary facilities should be inspected, for example:

- Is the drinking water source protected from contamination? If not, is the water treated correctly with chlorine?
- Are toilets working properly? Are pit toilets covered? Are latrines located where they cannot contaminate the water supply?

Water testing should focus on finding general indications of contamination, i.e. testing for faecal coliforms or by using the H₂S test (a rapid test that gives a black colour if bacteria are present in water). It is very difficult to specifically find the *S. Typhi* bacteria in environmental samples, and therefore this is not generally useful.

Heavy rainstorms, cyclones, and other natural disasters can cause runoff from dirty soil or from overflowing pit toilets. This can contaminate rivers and creeks used for drinking water collection. In addition, storms may damage drinking water facilities. As a result, there often is an increase in cases of typhoid fever and diarrhoeal diseases after storms. The environmental investigation should take recent weather patterns into account.

10.2. Control measures

The most important activity is to inform the population about ways to prevent the disease:

- Hand-washing with soap and water after each toilet visit and before preparing or eating food or drink and before preparing or drinking grog. Make sure that soap is available.
- Drinking safe water. Explain how to make it safe by collecting rain water, by boiling, or by treating with chlorine (household bleach)
- Safe disposal of stool
- Clean and functioning latrines/toilets

People should get clear messages on effective food hygiene, like the 'Five keys to food safety':

- Keep clean
- Separate raw and cooked food
- Cook thoroughly
- Keep food at safe temperatures
- Use safe water

Any problems found with water supply or toilet facilities should be corrected immediately.

If the investigation points to a suspected food or water source, then this should be corrected. People should be told not to eat the implicated food or to treat or boil the water.

10.3. Suspected cases

Anyone with suspected typhoid fever should be treated. They should be explained the importance of finishing the full course of antibiotics, because of the risk that otherwise they can become carriers and infect others. They should be educated about personal and food hygiene.

10.4. Asymptomatic or chronic carriers

See also under heading 5: Asymptomatic and chronic carriers.

The investigation may point to likely asymptomatic carriers, for example people who have prepared food that made everyone ill. Such people should be interviewed to see if they have had an illness that could have been typhoid fever. They should also be examined for gall stones or urinary tract stones.

It is recommended that household contacts of confirmed cases and suspected carriers are tested. Three stool samples should be taken at least 24 hours apart and cultured. A negative result does not necessarily mean that the person is not a carrier. If suspicion remains and tests are negative they need to be repeated at a later date and/or the suspected carrier should be treated.

Carriers should be treated for 28 days with ciprofloxacin. If they have gall or urinary stones then these should be removed.

Mass stool sample screening to find asymptomatic carriers in the community is not recommended. This is labour- and resource intensive, and the sensitivity of stool culture

in asymptomatic carriers is low. It is even lower if the samples are stored or transported for long periods.

10.5. Management of contacts

Close contacts should be told about the symptoms of typhoid fever and be advised to go to the health centre if they develop symptoms. They should be educated about hand- and food hygiene.

Healthy household contacts of confirmed cases should have their stool cultured (3x with at least 24 hours between) if this is at all practical (see section on stool storage and transport). If any of the samples are positive, they should be treated with 28 days of ciprofloxacin. However, a negative stool culture result does not prove that the person is not a carrier: Stool culture will only detect a small proportion of carriers.

Antibiotic prophylaxis for healthy contacts is not recommended.

10.6. Vaccination against typhoid fever

Vaccination of high-risk populations is considered a promising strategy for the control of typhoid fever. A parenteral vaccine containing the single dose polysaccharide Vi antigen is available in Fiji for high-risk populations and outbreaks. It can be given to anyone aged 2 years or older. An oral, live vaccine using *S. Typhi* strain Ty21a (requiring 3 or 4 doses, 2 days apart) is available in other countries but not Fiji. The oral vaccine can be given to anyone aged 5 years or older. Booster doses every 3 to 5 years according to vaccine type are desirable for both types of vaccine.

The vaccine is safe and protection begins 7 days after administration. Expert advice should be sought if vaccine is to be considered as a control measure. Basic prevention methods remain the most important measures to avoid infection.

10.7. Spraying or fogging

Spraying or fogging with disinfectants or insecticides is not useful so such practices should be discontinued. Instead, focus on education, hygiene, sanitation and safe water.

10.8. Awareness for health care workers

Training of health workers on the prevention, treatment and control of typhoid fever should be implemented every year in each subdivision. This will help in keeping typhoid fever as an important diagnosis in all cases of fever of unknown origin.

11. Specimen collection and transport

11.1. General

- Blood and other specimens for laboratory evaluation should be collected with gloved hands and placed in leak- and spill-proof containers for transport.

- Containers should be checked for exterior contamination and disinfected with hypochlorite solution (bleach) if necessary.
- The identity of the patient from whom the specimen is taken is crucial. (Ensure that the correct name is on the specimen container and the request slip.) Request slips must be legible and contain surname, first name, date of birth, gender, date of sample collection, and clinical details of the affected person. They should also include the requesting person's name, address and telephone number, the tests requested, and addresses of all persons who are to receive reports.
- All specimens must be placed in sealed plastic bags. (The request form should not be in the same compartment part of the bag as the specimen container as this may cause contamination of the request form.)

If you have any questions about the appropriate specimen or test for a particular investigation, please contact the laboratory to discuss the appropriate approach.

11.2. Blood samples

- Blood collected for culture must be carried out with the strictest adherence to aseptic technique. Normally a culture set containing two bottles, one for aerobic and one for anaerobic are each inoculated with 5 - 10 ml of blood. The bottles should not be expired.
- Special attention to the venepuncture technique to minimize contamination:
 - Clean skin with 70% alcohol and let dry.
 - Collect 10-15 ml of blood.
 - Swab top of culture bottles with 70% alcohol
 - Use fresh needles and inject at least 5 ml in each culture bottle.
- Each sample should be clearly labeled with the name and date of birth of the patient.
- Inoculated blood culture bottles should be transported to laboratories at room temperature, preferably 28 to 37 °C, within 24 hours. Storage and transportation at lower temperature will decrease sensitivity.

11.3. Stool samples

- Stool specimens should be collected from patients preferably during the first 3 weeks of illness, or from suspected asymptomatic carriers.
- Specimens should be as fresh as possible and, ideally, reach the laboratory on the day of collection. It is important to place the specimen in a tube of transport media (Cary Blair works well) and hold it at cool temperature as soon as possible after collection. The yield is much higher if the specimens are treated well.
- Patients should be instructed to pass stool into a clean wide-mouthed receptacle such as an ice-cream container (or onto paper or plastic wrap) and to avoid contamination with urine. The container should be clean and need not be sterile.
- A specimen at least the size of a thumbnail is then transferred with a spatula or spoon into a specimen container that has been labelled with the patient's

- name. The specimen container should be firmly secured and placed in a sealed plastic bag with a completed request slip attached.
- It's best to transport the specimen to the lab immediately, but if this is not possible, specimens can be stored in the refrigerator overnight (or for up to two days) at 4°C. Do not freeze stool samples.
- Place specimen containers in sealed plastic bags in an insulated container (Esky) containing frozen icepacks. Do not use ice cubes.
- Use 2 or 3 sheets of paper (newspaper) to create a barrier between ice packs and specimen.
- Keep the specimen container upright to reduce the risk of leakage and cross-contamination of other specimens. Seal all containers well.
- Keep chilled but not frozen and deliver them to the laboratory as soon as possible.
- Label the insulated container clearly with the address and telephone numbers of the laboratory and the submitting authority.

11.4. Transport

- The laboratory should be notified of impending specimen delivery and by what means, and the approximate time of arrival.
- If possible, the sample should be sent directly to the laboratory. If this is not possible then a laboratory staff member should be informed to collect the container once it gets to the delivery depot.

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