

Guidelines for the Management of Typhoid Fever

July 2011



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Preface

A resurgence of Typhoid fever was recorded in Zimbabwe in January 2010. The risk factors for Typhoid are similar to those of cholera and other epidemic prone diarrhoeal diseases and are mainly related to access to safe water, the functionality of sanitation systems as well as food safety.

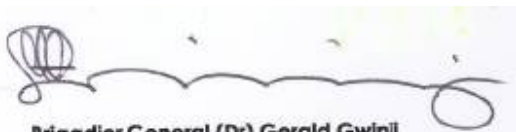
An outbreak of Typhoid occurred in the city of Harare against the backdrop of a challenged sewage reticulation system, limited access to safe water mainly affecting two densely populated suburbs of Harare, Mabvuku and Tafara.

Like other epidemic prone diarrhoeal diseases, Typhoid is notified officially to the Ministry of Health and Child Welfare on a weekly basis through the Rapid Disease Notification System; and daily updates are required during outbreaks. This is important as it will enable the Ministry to follow the evolution of the outbreak and guide the adoption of appropriate management strategies.

During the outbreak, challenges were reported in diagnosis and confirmation of Typhoid, as well as in public health management. Given the continued vulnerability of Zimbabwe to outbreaks of diarrhoeal diseases including Typhoid, it became important for all healthcare workers to be informed on the correct detection and management of typhoid. This will enable them to better inform communities, raising awareness of these waterborne diseases as well as improve their own competencies towards these. It is for this reason that I have commissioned the production of these typhoid management guidelines to ensure that technical standards for management are available to all health workers.

This document provides technical guidance to all health providers on how to successfully control Typhoid fever.

I am grateful to the city of Harare health department and all who contributed resources and technical guidance for the development of these national Typhoid management guidelines and to the people of Mabvuku-Tafara whose experience of Typhoid provided a learning experience that these guidelines are based on.



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These guidelines are mainly based on the following documents:

- WHO (2005) Field Guideline on control of communicable diseases
- WHO (2007) Background document:
- *The diagnosis, treatment and prevention of Typhoid Fever and on the experience of Typhoid management in City of Harare*

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Guidelines for the Investigation and Management of Typhoid Fever

1. Epidemiology

Typhoid fever is caused by *Salmonella typhi*, a Gram-negative bacterium. A very similar but often less severe disease is caused by the *Salmonella* serotype *paratyphi* A. In most countries in which these diseases have been studied, the ratio of disease caused by *S. typhi* to that caused by *S. paratyphi* is about 10:1.

Typhoid fever remains a global health problem for *Salmonella typhi*. It is difficult to estimate the real burden of typhoid fever in the world because the clinical picture is confused with many other febrile infections, and the disease is underestimated because of the lack of laboratory resources in most areas in developing countries. As a result, many cases remain under-diagnosed. In both endemic areas and in large outbreaks, most cases of typhoid fever are seen in those aged 3–19 years.

Humans are the only natural host and reservoir. The infection is transmitted by ingestion of faecally contaminated food or water. The highest incidence occurs where water supplies serving a large population are faecally contaminated. The incubation period is usually 8–14 days, but may range from 3 days up to 2 months. Some 2–5% of infected people become chronic carriers who harbour *S. typhi* in the gall bladder. Chronic carriers are greatly involved in the spread of the disease. Many mild and atypical infections occur and relapses are common. Patients infected with HIV are at a significantly increased risk of severe disease due to *S. typhi* and *S. paratyphi*.

Susceptibility

Susceptibility is general. Susceptibility is increased in individuals with gastric achlorhydria and HIV positive people. Specific immunity follows recovery from clinical disease and/or active immunization.

Period of Communicability

The disease is communicable for as long as the infected person excretes *S. typhi* in their excreta, usually after the 1st week of illness through convalescence. Approximately 10% of untreated cases will excrete *S. typhi* for 3 months and between 2-5% of all cases become chronic carriers.

Mode(s) of Transmission

Mode of transmission is person-to-person, usually via the faecal-oral route. Faecally contaminated drinking water is a commonly identified vehicle. *S. typhi* may also be found in urine and vomitus and, in some situations, these could contaminate food or water. Shellfish grown in sewage-contaminated water are potential vehicles, as are vegetables. Flies can mechanically transfer the organism to food, where the bacteria then multiply to achieve an infective dose.

The inoculum size and the type of vehicle in which the organisms are ingested greatly influence both the attack rate and the incubation period. In volunteers who ingested 10⁹ and 10⁸ pathogenic *S. typhi* in 45 ml of skimmed milk, clinical illness appeared in 98% and 89% respectively. Doses of 10⁵ caused typhoid fever in 28% to 55% of volunteers, whereas none of 14 persons who ingested 10³ organisms developed clinical illness.

Clinical features

The clinical presentation of typhoid fever varies from a mild illness with low grade fever, malaise and dry cough to a severe clinical picture with abdominal discomfort, altered mental status and multiple complications.

Clinical diagnosis is difficult. In the absence of laboratory confirmation, any case of fever of at least 38 °C for 3 or more days is considered suspect if the epidemiological context is suggestive. Depending on the clinical setting and quality of available medical care, some 5–10% of typhoid patients may develop serious complications, the most frequent being intestinal haemorrhage or peritonitis due to intestinal perforation.

The severity and outcome of the infection is influenced by many factors including; duration of illness before the initiation of treatment, the choice of antimicrobial treatment, age, previous exposure or vaccination history, the virulence of the bacterial strain, the quantity of inoculums ingested, host factors (e.g. AIDS or other causes of immune-suppression) and whether the individual was taking other medications such as H2 blockers or antacids to diminish gastric acid. Patients who are infected with HIV are at significantly increased risk of clinical infection with *S. typhi* and *S. paratyphi* (1). See Annex 1 for a table showing incidence and various manifestations of untreated typhoid fever.

Acute non-complicated disease

Acute typhoid fever is characterized by prolonged fever, disturbances of bowel function (constipation in adults, diarrhoea in children), headache, malaise and anorexia. Bronchitic cough is common in the early stage of the illness. During the period of fever, up to 25% of patients show a rash or rose spots, on the chest, abdomen and back.

Complicated disease

Acute typhoid fever may be severe, with up to 10% of patients developing serious complications. Intestinal perforation has also been reported in up to 3% of hospitalized cases. Abdominal discomfort, the symptoms and signs of intestinal perforation and peritonitis, are other complications. Altered mental status in typhoid patients has been associated with a high case-fatality rate. Such patients generally have delirium and may progress to coma.

Other rarely reported complications include: Typhoid meningitis, encephalomyelitis, Guillain-Barre syndrome, cranial or peripheral neuritis, and psychotic symptoms. Other serious complications documented with typhoid fever include haemorrhages (causing rapid death in some patients), Hepatitis, myocarditis, pneumonia, disseminated intravascular coagulation, thrombocytopenia and haemolytic uremic syndrome. In the pre-antibiotic era, which had a different clinical picture, if patients did not die with peritonitis or intestinal haemorrhage, 15% of typhoid fever cases died with prolonged persistent fever and diseases for no clear reason. Patients may also experience genitourinary tract manifestations or relapse, and/or a chronic carrier state may develop.

Carrier state

1-5% of patients, depending on age, become chronic carriers harbouring *S.typhi* in the gallbladder.

Standard case definitions/classifications of Typhoid fever

Confirmed case	<ul style="list-style-type: none"> • A patient with persistent fever (38 °C or more) lasting 3 or more days, with laboratory-confirmed <i>S. typhi</i> organisms (blood, bone marrow, bowel fluid) • A clinical compatible case that is laboratory confirmed
Probable case	<ul style="list-style-type: none"> • A patient with persistent fever (38 °C or more) lasting 3 or more days, with a positive sero-diagnosis or antigen detection test but no <i>S. typhi isolation</i> • A clinical compatible case that is epidemiologically linked to a confirmed case in an outbreak
Chronic Carrier	<ul style="list-style-type: none"> • An individual excreting <i>S. typhi</i> in the stool or urine for longer than one year after the onset of acute typhoid fever; • Short-term carriers also exist, but their epidemiological role is not as important as that of chronic carriers. • Some patients excreting <i>S. typhi</i> have no history of typhoid fever

2. Laboratory analysis

In Zimbabwe, Blood culture samples and stool/rectal swab have been used to culture for isolation of *S typhi*. Bone marrow aspirate is a very painful sample to collect though the yield is high. Guidelines for specimen handling for this organism are important for optimal recovery of the bacteria. More on laboratory Standard Operational Procedures (SOPs) may be found in Annex 2.

Isolates

Submission of *Salmonella* isolates to the National Microbiology Reference Laboratory (NMRL) is required by law.

- Specimens: Stool for culture.
- Collection: Use an enteric kit (bottle with a Cary-Blair medium (0.16% agar))
- Amount: Marble size (3-10 gram sample; preferred over rectal swabs)
- Call the laboratory for information on other specimen types and correct specimen collection.

Note

- Blood culture is usually positive in only half the cases.
- Stool culture is not usually positive during the acute phase of the disease.
- Bone-marrow culture increases the diagnostic yield to about 80% of cases.
- The Widal test, a serologic assay for detecting antibodies to the O and H antigens of *Salmonella*, is unreliable but is still used in some areas because of its low cost. The most widely used is blood and stool culture.

Collect both blood and stool specimens for each patient for testing.

Specimen transportation

For blood culture it is essential to inoculate media at the time of drawing blood. For other specimens it is advisable to make the time of transportation to the laboratory as short as possible. It is more important to process the specimens quickly than to keep them cold. Once they have been inoculated, blood culture bottles should not be kept cold. They should be incubated at 37°C or, in tropical countries, left at room temperature, before being processed in the laboratory.

Blood

The volume of blood cultured is one of the most important factors in the isolation of *S. typhi* from typhoid patients: 10-15 ml should be taken from schoolchildren and adults in order to achieve optimal isolation rates; 2-4 ml are required from toddlers and preschool children (13, 17). Blood should be drawn by means of a sterile technique of venous puncture and should be inoculated immediately into a blood culture bottle with the syringe that has been used for collection.

In order to assist the interpretation of negative results the volume of blood collected should be carefully recorded. The blood culture bottle should then be transported to the main laboratory at ambient temperature (15°C to 40°C) as indicated above. Blood cultures should not be stored or transported at low temperatures. If the ambient temperature is below 15°C it is advisable to transport blood cultures in an incubator. Blood culture bottles should be transported to the referral laboratory at ambient temperature.

Serum

For serological purposes, 1 to 3 ml of blood should be inoculated into a tube without anticoagulant. A second sample, if possible, should be collected at the convalescent stage, at least 5 days later. After clotting has occurred the serum should be separated and stored in aliquots of 200 µl at +4°C. Testing can take place immediately or storage can continue for a week without affecting the antibody titre. The serum should be frozen at -20°C if longer-term storage is required.

Stool

Stool can be collected from acutely ill patients and they are especially useful for the diagnosis of typhoid carriers. The isolation of *S. typhi* from stool is suggestive of typhoid fever. However, the clinical condition of the patient should be considered. Stool specimens should be collected in a sterile wide-mouthed plastic container. The likelihood of obtaining positive results increases with the quantity of stool collected. Specimens should preferably be processed within two hours after collection. If there is a delay, the specimens should be stored in a refrigerator at 4°C or in a cool box with freezer packs, and should be transported to the laboratory in a cool box. Stool culture may increase the yield of culture-positive results by up to 5% in acute typhoid fever. If a stool sample cannot be obtained, rectal swabs inoculated into Carry Blair transport medium can be used but these are less successful.

Diagnosis

- The definitive diagnosis of typhoid fever depends on the isolation of *S. typhi* organisms from the blood or bone marrow or stool.
- The classical Widal test measuring agglutinating antibody titres against *S. typhi* in serum has only moderate sensitivity and specificity. It can be negative in up to 30% of culture-proven cases of typhoid fever and can be falsely positive in many circumstances.

Action and alert threshold

The alert threshold for typhoid is 1 case. The action threshold is **5 suspected cases per 50,000 population**

3. Control measures

A. Education

Educate community members, notably the most vulnerable who include food handlers and people in group settings such as day care/Crèche staff and attendees; closed institutions like boarding schools residential homes for the elderly, orphanages and prisons. These are encouraged to do the following:

- Practice hand washing with soap and running water before food preparation and eating, after using the toilet, handling soiled diapers, bed linen, etc., and maintain a high standard of personal hygiene in general.
- Maintain rigorous standards of cleanliness in food preparation and handling of food, especially salads and other cold-serve foods.
- Make sure to properly refrigerate food where possible.
- Report all deaths due to diarrhoeal diseases to health workers.

Health education Messages for communities

- Eat foods that have been thoroughly cooked and that are still hot and steaming.
- Ensure that cooked food is covered to protect it from flies.
- Avoid raw vegetables and fruits that cannot be peeled. Vegetables like lettuce are easily contaminated and are very hard to wash well.
- When you eat raw fruit or vegetables that can be peeled, peel them yourself. (Wash your hands with soap first.) Do not eat the peelings.
- Avoid foods and beverages from street vendors. It is difficult for food to be kept clean on the street, and many travellers get sick from food bought from street vendors.
- Treat all drinking water by bringing it to a rolling boil for 1 minute or using Aqua-tablettes /jik or other household water treatment products before you drink it.
- Ask for drinks without ice unless the ice is made from boiled or chlorine treated water.
- Avoid flavoured ices and juice because they may have been made with contaminated water.

B. Prophylaxis

Immunization is not routinely recommended in Zimbabwe except for travellers to areas where Typhoid is endemic. Two vaccines are currently available: Ty21a (oral vaccine) and ViCPS (parenteral/intra muscular vaccine). Neither the polysaccharide vaccine nor the Ty21a vaccine is licensed for children under 2 years of age. The Ty21a vaccine should not be used in patients receiving antimicrobials. For the single dose parenteral vaccine, efficacy is reached 14-20 days after injection and coverage lasts for about 3 years. The oral vaccine's efficacy is reached 10 days after the third dose (taken in capsular or liquid form every other day); coverage lasts for 3 years.

Mass vaccination may be an adjunct for the control of typhoid fever during a sustained, high-incidence epidemic, in displaced settings particularly when access to well-functioning medical services is not possible or in the case of a multidrug-resistant strain. Other issues to be considered include surveillance data on the outbreak, cold chain and EPI capacity. If the involved community cannot be fully vaccinated, children aged 2–19 years should be given priority. Typhoid immunization is not 100% effective, and typhoid fever could still occur.

C. Environmental Health Measures

If the case(s) appear to be endemic or locally acquired, ask about exposures to the following during the incubation period (one month prior to onset of symptoms):

- Commercial food-service facilities including milk vending
- Grocery stores and markets
- Day care facilities
- Sanitation and water sources condition

Each food-service facility determined to be a possible source of infection should be inspected by a local Environmental Health Officer/practitioner within 24 hours of notification by the communicable disease investigation team. If particular food items are recalled by the case(s), conduct a review or collect a list of ingredients for the item and review the steps involved in preparation of the item.

If a case is associated with a day-care facility, ask about symptoms among staff members and other children at the facility. Also inquire about any international travel among day care/Crèche staff and attendees within the two months prior to the onset of the known case.

D. Epidemiological Investigation

Determine the most probable source of infection by inquiring about recent (within one incubation period) exposure to:

- Person(s) with similar symptoms (e.g. household members, sexual partners, day care-age children)
- Food consumed at home, restaurants, parties, during travel, etc., that may have been contaminated, undercooked or improperly stored; obtain the name and location of restaurant(s), food store(s), bakery(ies); inquire about group meals (e.g., receptions, meetings, conventions).
- Possibly contaminated water.
- Travel (especially to areas or countries where typhoid fever is endemic).
- Visitors (especially from areas or countries where typhoid fever is endemic).

If the source is known or suspected, expand the investigation as appropriate. Such investigation may include inspecting restaurants, calling or visiting child care facilities, or obtaining the names and telephone numbers of guests who attended group events to determine if others are ill.

Following reports of suspected cases of Typhoid convene a meeting of the Rapid Response Team (RRT). The RRT typically consists of a clinician (Medical Officer, Clinical Officer or Nurse); Environmental Health Officer, Laboratory Scientist and a Health Promotion Officer, with any

one of the team designated as the team leader. Either the Medical officer or the Environmental health officer will be the designated epidemiologist, depending on their skills in this area. Should the need arise, a logistician/administrator, infection control/community nurse maybe co-opted to this enhance the functionality of this group. Usually other cadres of the health executive will be part of the Epidemic Preparedness and Response committee which the RRT reports to; therefore their contributions will be made directly there following the initial investigation.

RRT responsibilities

1. Use current case definition to confirm diagnosis with the medical provider.
2. Conduct a case investigation to identify potential source of infection.
3. Conduct contact investigation to identify additional cases.
4. Identify whether the source of infection is a major public health concern.
5. Initiate control and prevention measures to prevent spread of disease.
6. Complete and report all information requested on the T1 and the Typhoid Fever investigation form.
7. As appropriate, use notification letter(s) and the disease fact sheet to notify the case, contacts and other individuals or groups.

Standard case investigations and control methods

Case Investigation

When the Ministry of Health & Child Welfare is notified of an unconfirmed typhoid fever, the case is reported as "suspect" in T1 (see sample T1 form in Annex 3). Appropriate samples should be taken and sent to the National Microbiology Reference Laboratory.

Additional case investigation is only required for cases that are laboratory confirmed or are epidemiologically linked to a confirmed case in an outbreak

1. Contact the medical provider who ordered testing of the case and obtain the following information. (This includes records for hospitalized patients)
Identify if the patient was ill with symptoms of typhoid fever
 - If yes, record onset date of illness
 - Record symptoms: fever, abdominal pain, headache, or other (specify)
 - Examine the laboratory testing that was done; noting type of specimen that grew *Salmonella typhi* and date it was first isolated
 - Examine antibiotic sensitivity testing and note any resistance to: Ampicillin, Chloramphenicol, Trimethoprim-sulfamethoxazole or Fluoroquinolones (such as Ciprofloxacin or Ofloxacin) and Azithromycin
 - Collect case's demographic data and contact information (birth date, province, district, ward, sex, occupation, address, contact phone number(s))
 - Record the patients' history of typhoid vaccine within the five years before illness onset; including the type of vaccine and year received
 - Record hospitalizations: location, admission and discharge dates
 - Record outcomes: recovered or date of death
2. Interview the case or proxy to determine source and risk factors
 - focus on incubation period 30 days prior to illness onset
 - Travel history
 - Identify if the case was possibly exposed to a typhoid carrier, and if the carrier' status was previously known
 - Water source/state and state of sanitation
 - Collect information from case for the Contact Investigation (See Annex)

3. Collect information on the case's food history focusing on a period of 2 weeks before illness onset
 - Use the investigation form as a guide,
 - focus on the food history section (verify any raw shellfish, fruit or vegetable consumption) and
 - ask about restaurant exposures.
4. Investigate epi-links among cases (clusters, household, co-workers, etc). Highly suspected local sources of *S. typhi* should be investigated for example contaminated fish ponds and dairy products.

Contact Investigation

1. Consider the following contact types during a contact investigation:
 - General: Household, close contacts and sexual partners of a case.
 - Day care/Crèche: All employee direct caregivers and enrolled roommates of a case.
 - School: Close contacts of a case with evidence of transmission in the school setting.
 - Food Service contacts:
 - Co-workers who work the same shift as the infected food handler.
 - Patrons of the establishment of an infected food handler if
 - the food handler worked while infectious,
 - had poor personal hygiene, and
 - had the opportunity to have bare-hand contact with ready-to-eat food.
2. Create a household contact roster. Include visitors within the incubation period.
 - Name, address, relationship, occupation, dates of contact
 - History of typhoid or exposure or similar illness; if so, where and when
 - Identify those persons involved in special situations (food handler, day care, etc.)
3. If case's travel occurred in a group, investigate travel companions

Isolation, Work and Day care Restrictions

Most people may return to work or school when they have recovered from the fever as long as they carefully wash their hands after using the toilet. The exceptions are food handlers, caretakers of patients or the elderly and day care situations

E. Reporting Requirements

T1 form will be used to capture the first 5 cases and then the line list if more cases are being reported. Weekly reporting for Typhoid required as it is a notifiable disease. During outbreaks, daily (including zero) reporting must be made to the Health Information Unit, MOHCW.

F. Case Management

More than 90% of patients can be managed at home with oral antimicrobial, minimal nursing care, and close medical follow-up for complications or failure to respond to therapy. However, the emergence of multidrug-resistant strains in many parts of the world has reduced the choice of effective antimicrobial available in many areas. Antimicrobial susceptibility testing is crucial as a guide to clinical management

There is need to use culture and sensitivity tests to guide the choice of antibiotics. The available evidence suggests that the fluoroquinolones (Ciprofloxacin) are the optimal choice for the treatment of typhoid fever in age groups². However, in areas where the bacterium is still fully sensitive to traditional first-line drugs (Chloramphenicol, Ampicillin,

²Issue of cut off of children , and pregnant women to be followed up (contraindications)

Amoxicillin or *Trimethoprim–Sulfamethoxazole*) and fluoroquinolones are not available or affordable, these drugs do remain appropriate for the treatment of typhoid fever.

Supportive measures are important in the management of typhoid fever, such as oral or intravenous hydration, antipyretics, appropriate nutrition and blood transfusions, if indicated. Electrolyte imbalance, anaemia and thrombocytopenia need to be corrected.

Antimicrobial therapy for treatment of Typhoid fever

Optimal Therapy				Alternative Effective Drugs		
Susceptibility	Antibiotic	Daily dose mg/kg	Days	Antibiotic	Daily dose mg/kg	Days
Mild disease						
Fully sensitive	Ciprofloxacin or Ofloxacin	15	5 -7	Chloramphenicol Amoxicillin Cotrimoxazole	50 -75 75 – 100 8 - 40	14 – 21 14 14
Multi drug resistant	As above or Cefixime	15 15 – 20	7 - 14 7 - 14	Azythromycin Cefixime	8 – 10 15 - 20	7 7 - 14
Quinolone resistance	Azythromycin Rocephin	8 – 10 75	7 10 - 14	Cefixime	20	7 - 14
Severe illness						
Fully sensitive	Ciprofloxacin or Ofloxacin	15	10 - `14	Chloramphenicol Amoxicillin Cotrimoxazole	100 100 8 – 40	14 – 21 14 14
Multi drug resistant	As above or Cefixime	15 15 – 20	10 - 14 10 – 14	Rocephine Cefotaxime	75 80	10 - 14 10– 14
Quinolone resistance	Rocephine Cefotaxime Azythromycin	75 80 8 – 10	10 – 14 10 – 14 10 – 14	Fluoroquinolone	20	7 - 14

Dehydration is uncommon in Typhoid fever; however, electrolyte imbalance, hypoglycaemia and hypokalaemia and hyponatremia frequently occur and need to be corrected using appropriate electrolyte solution. Maintenance IV fluids may also be required. In cases where intestinal perforation is suspected parenteral nutrition may be required. In cases of moderate to severe dehydration, follow the guideline for treatment of dehydration.

Laboratory monitoring is important especially serial full blood count, urea, electrolytes, blood sugar/glucose. Liver function tests may be done where appropriate.

Typhoid fever patients with neurological complications characterized by delirium, obtundation or stupor should be immediately evaluated for meningitis by examination of the cerebrospinal fluid. If the findings are normal and typhoid fever is suspected, adults and children should immediately be treated with high-dose intravenous dexamethasone in addition to antimicrobials. Dexamethasone, given in an initial dose of 3 mg/kg body weight by slow intravenous infusion over 30 minutes, followed 6 hours later by 1 mg per kg body weight every 6 hours for a total of eight doses, can reduce mortality by approximately 80–90% in these high-risk patients. Dexamethasone, given in a lower dose, is not effective. High-dose steroid treatment need not await the results of typhoid blood cultures if other causes of severe disease are unlikely.

After confirmation of the first ten cases, epidemiologically link the rest of the cases. At intervals of three to four weeks during the course of the outbreak, collect samples from five to ten patients for sensitivity testing and confirmation of the pathogen. At the end of the outbreak, collect samples from five to ten patients to confirm the end of the outbreak. From the experience of managing typhoid in Harare city (February to May 2010) there was no added value seen in testing of contact's samples.

Advice on handling Typhoid fever carriers

A. Treatment of Carriers

An individual is considered to be a chronic carrier if he or she is asymptomatic and continues to have positive stool or rectal swab cultures for *S. typhi* a year following recovery from acute illness.

- **Ciprofloxacin** 750 mg BD x 4/52
Ciprofloxacin is not recommended for pregnant women. It can be used among children if the benefits outweigh the potential harms

OR

- Cholecystectomy if lithiasis is present
- Treat schistosomiasis if present
- Vi (virulence) antibody test useful to screen carriers

Guidance on carriers

An individual is considered to be a chronic carrier if he or she is asymptomatic and continues to have positive stool or rectal swab cultures for *S. typhi* a year following recovery from acute illness.

Ciprofloxacin 750 mg BD x 4/52

Ciprofloxacin is not recommended for pregnant women. It can be used among children if the benefits outweigh the potential harms.

In addition, the following may be done:

- Cholecystectomy if Lithiasis is present
- Treat schistosomiasis if present
- Vi (virulence) antibody test useful to screen carriers

B. Handling of carriers

A carrier of *S. Typhi* may not attend a child care facility and may not participate in occupations involving food handling, patient care, or care of young children or elderly persons.

The Health Officer can grant approval for readmission of the carrier to a school or child care facility based on:

- The behaviour, neurological development and physical condition of the carrier;
- The precautions that may be taken to minimize or eliminate the danger of transmission;
- The susceptibility to typhoid fever of those likely to be exposed to the carrier in the school or child care facility;
- Precedents in the practice of public health.

The contacts of a chronic carrier may not participate in any of the occupations stated above until 2 consecutive negative stool specimens, taken at least 24 hours apart, are submitted.

- Initiate and maintain a complete file of all pertinent information on the carrier. Issue written instructions to the carrier concerning the restrictions upon and responsibilities of the carrier. The carrier shall abide with the restriction stated above and notify the Health Officer at once of any change in address or occupation.
- Release the carrier from supervision only after 3 consecutive stool specimens are negative; these specimens should be taken 1 month apart and at least 48 hours after antibiotic treatment.
- Contact the carrier at intervals of no longer than one year to verify the carrier's occupation and address and to determine if all instructions are being followed.

- Forward a report immediately to Epidemiology and Disease Control Programme if a carrier relocates outside the Health Officer's jurisdiction for referral to the health official of the proper jurisdiction.

A case may not attend a child care facility and may not participate in occupations involving food handling, direct patient care, or care of young children or elderly persons until 3 consecutive stool specimens are *Salmonella*-free; these specimens should be collected not less than 24 hours apart and not sooner than 48 hours after discontinuation of antibiotics

- A case may be released from supervision only after 3 consecutive negative stool specimens are submitted; these specimens should be collected at least 24 hours apart, at least 48 hours after discontinuation of antibiotics, and at least 1 month after onset of illness.
- If any of the clearance specimens are positive, at least 3 consecutive negative stool specimens at one-month intervals within the 12 months following onset shall be required for release from supervision.
- If a person continues to excrete *S. Typhi* at 12 months, he/she should be considered a chronic carrier of *S. Typhi* and followed as such.
- A household, sexual and other close contact of a case may not participate in any of the above stated occupations until 2 consecutive negative stool specimens, taken at least 24

Environmental Measures

If a commercial food service facility, day care centre/Crèche or public water supply is implicated in transmission the following activities should be coordinated:

- Inspection of the facility
- Collection of food, drink or water samples and stool specimens for testing.
- Possible detailed investigations of any suspect food products and their sources.

Education

- Provide information on transmission, incubation period and symptoms.
- Provide basic instruction to cases and potentially exposed contacts about:
 - The importance of personal hygiene, emphasize hand washing and the proper cleaning of fingernails;
 - The proper disposal of faeces, urine and fomites;
 - The importance of seeking medical care should contacts develop symptoms or if the case's symptoms worsen and/or return.
- Use the sample messages and Typhoid fact sheet in the annex to assist with health education.

Managing special situations

A. Investigating suspected outbreaks

A single suspected case should be treated as a public health emergency until the possibility of additional cases and an unidentified contaminated source has been ruled out.

A foodborne disease outbreak is defined in the following ways:

- Two or more individuals (from different households) who experience similar illness after eating a common food or in a common place
- An unexplained, unexpected increase of a similar illness in which food is a likely source

A waterborne disease outbreak is defined as an incident in which two or more persons experience a similar illness after consumption or use of water intended for drinking, and epidemiologic evidence implicates the water as the source of the illness.

Outbreaks may be recorded as unexplained, unexpected increases cases that are clustered in person, place, or time.

B. Where a Food Handler or Restaurant is implicated

For one case, proceed with the following activities (coordinating with the environmental health personnel and health authority, as necessary):

- Conduct an environmental evaluation of the facility, interview the operator and review worker attendance records to identify employees with any illness suggestive of typhoid within the past month.
- Employees with a suspicious history within the past month must submit a single stool specimen for culture; symptomatic employees should obviously be excluded until disease status is ascertained.
- Ask about any complaints of illness from patrons during the past month.
- Review previous facility inspection reports and consider the personal hygiene of infected workers to determine the risk of transmission to patrons.

C. Where a case is associated with childcare

For one case, proceed with the following activities (coordinating with the environmental health personnel, child welfare and health authority, as necessary):

- Interview the operator and check attendance records to identify suspect cases that may have occurred during the previous month.
- If other potential cases are identified, complete a sanitary inspection.
- Instruct the operator and other staff in proper methods for food handling and hand washing, especially after changing diapers.
- Instruct the operator to notify the health department immediately if new cases of illness similar to typhoid fever occur. (Symptoms of *S. typhi* infection may be mild to severe and can include fever, headache, loss of appetite, constipation or diarrhoea, and non-productive cough.)
- Call or visit once each week for four weeks after onset of the last case to verify that surveillance and appropriate hygienic measures are being carried out.

D. If a public Gathering Implicated

- Determine if anyone who prepared food for the gathering had any symptoms suggestive of typhoid at any time during the previous month
- Find out if any other food handlers or attendees became ill within four weeks after the gathering
- Enforce restrictions for attendees or their household contacts that are food handlers
- Collect stool specimens for culture from any food handlers with suggestive histories if a food establishment or distributor is implicated as the source of infection.

C. Chronic Carriers

Presumptive and confirmed carriers are subject to certain restrictions that are enforced by the local health authority according to the Public Health Act 15:09.

These restrictions are itemized in the Typhoid Fever Carrier Agreement. This agreement, which is signed by carrier, provides that the carrier will:

- Not work as a food handler or provide personal care in day care or residential care facilities.
- Notify the health officer at once of any change in address or occupation;
- Notify the health officer at once of any suggestive illness among household members or other personal contacts.
- Provide specimens for culture as required by the local health officer.

Chronic carriers should be supervised by the local health department with contact made at intervals of no longer than a year to ensure that all instructions are being followed. Chronic carriers may be released from their agreement when three consecutive, negative cultures are obtained.

D. When intentional contamination is suspected

S. typhi is considered a category B bioterrorism agent in that it is a food and water safety threat. If the natural aetiology cannot be readily established by a prompt and vigorous investigation, the situation should be considered to be a bioterrorist act until proven otherwise.

If suspected:

- Notify local law enforcement and state public health officials
- Implement "Chain of Custody" procedures for all samples collected, as they will be considered evidence in a criminal investigation
- Work to define population at risk which is essential to guide response activities. Public health authorities will play the lead role in this effort, but must consult with law enforcement, emergency response and other professionals in the process. The definition may have to be re-evaluated and redefined at various steps in the investigation and response
- Once the mechanism and scope of delivery has been defined, identify symptomatic and asymptomatic individuals among the exposed and recommend treatment and/or chemoprophylaxis
- Establish and maintain a detailed line listing of cases, suspect cases, exposed, and potentially exposed individuals with accurate identifying and locating information as well as appropriate epidemiological information.

Safety Considerations

- Food and water are the most likely mechanism of delivery
- No isolation or quarantine measures are indicated beyond standard enteric precautions.

Annex 1: Incidence and Timing of Various Manifestations of Untreated Typhoid Fever

	Incubation	Week 1	Week 2	Week 3	Week 4	Post
Systemic					Recovery phase or death (15% of untreated cases)	10-20% relapse; 3-4% chronic carriers; long-term neurologic sequelae (extremely rare); gallbladder cancer (RR=167; carriers)
Step ladder fever pattern or insidious onset fever		Very common	Very common			
Acute high fever		Very rare				
Chills		Almost all				
Rigors		Uncommon				
Anorexia		Almost all				
Diaphoresis (rose spots on the trunk)		Very common				
Neurologic					Typhoid state (common)	
Malaise		Almost all	Almost all			
Insomnia			Very common			
Confusion/delirium		Common	Very common			
Psychosis		Very rare	Common			
Catatonia		Very rare				
Frontal headache (usually mild)		Very common				
Meningeal signs		Rare	Rare			
Parkinsonism		Very rare				
Ear, nose, and throat						
Coated tongue		Very common				
Sore throat						
Pulmonary						
Mild cough		Common				
Bronchitic cough		Uncommon				
Rales		Common			Common (basal)	
Pneumonia		Rare (lobar)	Rare			
Cardiovascular						
Dicrotic pulse		Rare	Common			
Myocarditis		Rare				
Pericarditis		Extremely rare				
Thrombophlebitis				Very rare		
Gastrointestinal						
Constipation		Very common	Common			
Diarrhoea		Rare	Common (pea soup)			

	Incubation	Week 1	Week 2	Week 3	Week 4	Post
Bloating		Very common				
Diffuse mild abdominal pain		Very common				
Sharp right lower quadrant pain		Rare				
Gastrointestinal hemorrhage		Very rare; usually trace	Very common			
intestinal perforation				Rare		
Hepatosplenomegaly		Common				
Jaundice		Common				
Gallbladder pain		Very rare				
Urogenital						
Urinary retention		Common				
Haematuria		Rare				
Renal pain		Rare				
Musculoskeletal						
Myalgias	Very rare					
Arthralgias	Very rare					
Rheumatologic						
Arthritis (large joint)	Extremely rare					
Dermatologic						
Rose spots		Rare				
Miscellaneous						
Abscess (anywhere)		Extremely rare	Extremely rare	Extremely rare		

Explanation of terms used in the table

- Very common: Symptoms occur in well over half of cases (approximately 65%-95%)
- Very rare: Symptoms occur in less than 5% of cases
- Almost all: Symptoms occur in almost all cases
- Common: Symptoms occur in 35%-65% of cases
- Rare: Symptoms occur in 5%-35% of cases
- Blank cells: No mention of the symptom at that phase was found in the literature
- Extremely rare: Symptoms have been described in occasional case reports.

Typhoid state: A severe febrile state during which a patient may pass into a condition of extreme prostration, eyes open but apparently unconscious of anything. The tongue is tremulous, dry, brown or black and cracked, the lips and teeth tend to become covered with sores unless sedulously cleaned, the pulse is very rapid and feeble and the breathing shallow. There is low, muttering delirium going on constantly and the patient may keep on picking at the bed-clothes or make passes in the air as if catching flies. These jerky movements of muscles especially of the hands and feet is called subsultus tendinum. The bowels and bladder are likely to be emptied involuntarily and the patient slips further down the bed.

Bronchial cough: A bronchial cough can quickly be identified by complaints of a tight feeling in the person's chest and wheezing. The person with bronchitis may also not be able to breathe deeply and breathing may be difficult or painful even while lying down or at rest.

Annex 2: Laboratory Standard Operating Procedures for *Salmonella Typhi*

1. Purpose

This Standard Operating Procedure (SOP) describes the laboratory processing and identification of *Salmonella typhi* from clinical specimens.

2. Scope

This procedure applies to National Microbiology Reference Laboratory or other designated lab when investigating and identifying *Salmonella typhi* from clinical specimens.

3. Responsibility: Medical Laboratory Scientist (MLSc)

4. Preferred specimens

4. 1. Blood culture- volume 10-15 ml adults, 2-4 ml children in a ratio of 1:10 culture media

4. 2. Bone marrow or anatomical lesion can also be collected in blood culture media
(NB. Blood culture bottles should not be kept cold but left at RT or at 37°C)

5.3 Bulk stool from acute patients in sterile/clean wide mouthed plastic containers- or rectal swabs inoculated in Cary Blair transport media

Specimen to be transported in cold boxes at 4-8°C

**Preference of specimen in that order*

5. Description of cultures

5. 1. Culturing

5. 1. 1. Inoculate blood specimen onto MacConkey, Chocolate and Blood agar

5. 1. 2. Inoculate 1g stool specimen into 10ml selenite F broth and onto MacConkey/XLD

5. 1. 3. Inoculate urine onto CLED and spun urine sediment into selenite F broth

5. 1. 4. Incubate plates and selenite broth at 37°C for 24hours

5. 1. 5. Look for non lactose fermenting colonies on agar plates

5. 1. 6. Subculture selenite broth onto CLED/XLD and incubate as above.

- Examine plates for non lactose fermenting colonies

5. 2. Biochemical tests

5. 2. 1. Perform the following biochemical tests on suspected colonies:

- Indole, Urea, Oxidase Citrate, Motility, Kligler iron agar,
- (*Salmonella typhi* is negative for Indole, Urea, Oxidase, Citrate and positive for Motility and gives an alkaline slant/acid but no gas on Kligler iron agar)

5. 2. 2. Perform sugar fermentation test with Manite Dulcitol, Glucose Lactose and Sucrose

- (*S. typhi* ferments Glucose and manite/manitol)

5. 2. 3. Perform serological testing on reactive colonies in 6.2.1 and 6.2.2 above using slide agglutination with the following antisera:

- antigen: Poly O, 9, 12, Vi,
- H antigen: Poly H, d,
- (*S.typhi* reacts positively with all the above)

5. 2. 4. Antimicrobial susceptibility testing

Perform sensitivity testing with the following recommended drugs:

- Ciprofloxacin, Ceftriazone, Chloramphenicol, Ampicillin, Cotrimoxazole, Tetracycline, Nalidixic Acid using standardized method (CLSI volume 23)

6. Performance Indicators

Number of *S. typhi* isolated from clinical specimens

7. Records

Patient's results

Laboratory register/specimen logbook

8. Appendices/attachments

- Identification chart for *S. Typhi*

9. References

- The diagnosis, treatment and prevention of typhoid fever W.H.O/V&B/03.07
- Performance Standards for Antimicrobial Disk Susceptibility Tests; Approved standard 9th ed, 2006

Summary chart of identification features for *S. typhi*

	Glucose (GAS)	Mannite	Dulcitate	Sucrose	Lactose	Urea
<i>S. typhi</i>	+ (-)	+	-	-	-	-
<i>Salmonella</i> spp	+ (+)	+ +	-	-	-	-

NB: Isolates of suspected *Salmonella typhi* should be sent to the National Microbiology Reference laboratory –**swift no 113588** -for confirmation and Quality Control

From: ----- Name of clinic/hospital/area	TO MOH DMO PMD City: ----- District: ----- Province: -----
--	--

I hereby notify to you that the under-mentioned person ----- is suffering
 ----- from
 has died

Diagnosis -----

Confirmed by laboratory test: ----- Yes No

Type of test -----

Date of onset: -----

Date of admission/Detention: ----- case number -----

Name: -----
 (First name) (Surname)

Age: ----- Date of birth: ----- Sex: -----

Identification particulars: -----

Physical address on admission/disease detection: -----

Length of stay (at the above address): -----

Communal land: ----- Chief/Chairman -----

Headman/Ward: ----- Kraal/Village: -----

Nearest dip-tank/school: -----

Next of kin: -----

Usual residential address if different from above: -----

Name and address of employee/school: -----

Give physical addresses of places visited during last month and length of stay

Place of probable infection: ----- Date of onset: -----

Probable source of infection: ----- Date of probable infection: -----

Transferred to: ----- Date of transfer: -----

Notifying officer: ----- Title: -----
 (in capitals)

Date: ----- Signature: -----

Instructions for completing the T1 notification of infectious diseases

For all levels of care T1 is the form for notification of Infectious Disease. The list of notifiable diseases is as follows:

- Anthrax
- Cholera
- Diphtheria
- Hepatitis (all forms)
- Meningococcal Meningitis
- Plague
- Poliomyelitis
- Rabies
- **Typhoid**
- Typhus
- Viral Haemorrhagic fever
- Yellow fever

TB (Tuberculosis) and Leprosy are also notifiable, but they continue to be notified on TB Form 4 and TB Form B for TB, and the Leprosy form for leprosy.

Purpose

It has been found necessary to notify the above diseases because:

1. the way in which they spread needs closer monitoring if they are to be controlled
2. It is important that the Provincial Medical Director (PMD) knows what action has been taken to control the spreading of the diseases
3. It is a statutory requirement that Zimbabwe reports cases and deaths from these diseases to the World Health Organization (WHO)

Who fills in the T1 form?

Any health worker who comes in contact with any of the notifiable diseases should complete the T1 Form in triplicate.

When to fill in the T1 form?

All suspected and laboratory confirmed cases of the above should be notified immediately to the District Medical Officer (DMO) by the fastest means possible (telephone, cell phone, sms, email if available). The notifying health worker should then complete a T1 form in triplicate.

How to fill in the T1 form?

T1 forms are provided in 150 page pads. They are filled out in triplicate. Use good quality carbon paper each time an entry is being made, so that all the copies are clear enough to read.

Most entries on T1 are self explanatory, but a few notes may be useful

1. **CAPITAL LETTERS** should be used on all entries made
2. **Double-wording:** Whenever alternatives are given for example ("suffering from" or "has died" or confirmed by laboratory test" or "suspected cases") the incorrect words should be carefully crossed out, or the appropriated box should be ticked
3. **Age and/or Date of Birth:** it is important to record the date of birth as well as the age to confirm that the age is accurate because in many cases these do not match. If the age is not known, the estimated age should be given
4. **Physical address:** This refers to the geographical area where the person lives; not the postal address (which could be local shop or school).

Annex 4: Checklist for setting up a treatment Camp (if needed)

Province: District:

Health facility/location Date:

Water and sanitation	Yes	No	Comments
Adequate space			
Water Supply quantity			
Water Supply quality			
Free residual chlorine test			
Accessibility			
Facilities for disposal of stool			
Hand washing facilities			
Solid waste management			
Liquid waste management			
Drainage of site			
Communication			
Infrastructure, equipment and supplies			
1. <u>Entry</u> <ul style="list-style-type: none"> • Foot bath (as necessary) • Controlled entry • Disinfectant area (spray pumps) 			
2. <u>Screening</u> <ul style="list-style-type: none"> • Triaging • Observation facilities 			
3. <u>Wards</u> <ul style="list-style-type: none"> • Foot bath • Water facilities • Drainage • Hospital beds & linen • Buckets • Accessibility to toilets and water • Water disposal 			
4. <u>Storage</u> <ul style="list-style-type: none"> • Drug supplies/medical supplies • Disinfectants • Protective clothing 			
5. <u>Kitchen</u> <ul style="list-style-type: none"> • Provisions • Utensils • Cooking facilities • Fuel • Working surfaces • Fly baits • Hand washing facilities • Food bins • Solid waste management facilities • Scullery (washing facilities) 			

6. <u>Staff office</u>			
<ul style="list-style-type: none"> • Tables and chairs • Registers • Stationery • Plans and Spot map • Line list • List of staff and Roster • Programming • Cleaning schedules • Disinfection schedules • Investigation tools • Treatment protocols 			
7. <u>Staff room/accommodation</u>			
<ul style="list-style-type: none"> • Beds & Linen • Lighting • Tents • Mosquito nets • Ablution facilities 			
8. <u>Mortuary (Temporary)</u>			
<ul style="list-style-type: none"> • Stand alone tents • Protective clothing • Body bags • Disinfectants e.g. chloride of lime 			
9. <u>Waste Management</u>			
<ul style="list-style-type: none"> • Incinerators • Refuse pit • Soak away pit • Sharps containers/boxes disposal • Fuel • Picks and shovels 			
Documentation			
Cleaning schedule			
Fly control schedule			
Infection control procedures			
Operational procedures			
Roles definition and duty roster			
EPR plan			
Line list(s)			
Daily reports			
Other comments			

* A treatment centre maybe set up at the discretion of the EPR or disease management committee. As typhoid patients are not often admitted (except for severe cases), this decision will need to be reached by consensus after confirmation of an outbreak

Annex 5: Funeral Guidelines for formidable epidemic diseases

In terms of the Provisions of the Public Health Act, Chapter 15:09. (Sections 33-34)

For funerals of people who have died of any disease that can cause an epidemic in a community, a designated health worker should be present to supervise the funeral.

Handling of the Body at Health Centres

- Wear protective clothing, (gloves, apron, gumboots, mask etc.)
- Disinfect corpse with a 2% chlorine solution in a well ventilated area. It is a strong solution and should not be inhaled. (This is only effective for a short time; therefore the family should bury the deceased as soon as possible, preferably within 24 hours of the death).
- Plug the mouth and anus with cotton wool soaked with 2% chlorine solution.
- Bandage the head so that the mouth remains shut.
- Wrap the body carefully and put in a body bag. If not available, the body can be wrapped in plastic sheeting or a cloth sheet soaked in 2% chlorine.
- Disinfect all surfaces that have been in contact with the body with 0.2% chlorine solution
- Wash hands thoroughly with 0.05% chlorine solution or soap.
- Take time to explain to relatives the importance of the above body procedures carried out on the deceased.

Handling of the body within communities

If possible, physical contact with the corpse should be minimized or avoided, but if you have to handle the body the following should be done:-

- **Do not handle the corpse without protection**, such as gloves (or alternatives like plastic).
- Do not empty the intestines of the corpse
- Prepare a 0.2% chlorine solution (or jik) or boiling water to disinfect dead person's clothing and bedding.
- Dip/soak the dead person's clothing and bedding in the boiling water or disinfectant for 10 minutes and then rinse with clean water (chlorine may bleach the clothes).
- Avoid putting your hands into your mouth, touching your face, food, or utensils after touching the corpse.
- Wash your hands thoroughly using soap/ash under running water.

The Funeral Procedure

- The funeral should be held as close as possible to where the person died
- Bury the dead as soon as possible, preferably within 24 hours of the death
- The grave should be at least 50m away from a water source and be at least 6 feet (1.5m) deep
- Ensure that there is no hand shaking done at the funeral
- All mourners should wash hands thoroughly with soap/ash and under clean running water.
- All corpse carriers should wear hand protection e.g. gloves
- Ensure that all material used i.e. gloves, are properly disposed off (burn, bury or dump into a pit latrine)

Food Matters at the Funeral

- **Do not prepare food**
- **Do not eat food at the funeral. Except** for household cooking to feed **immediate family members** of the deceased
- Persons preparing food for immediate family members should :
 - Wash their hands thoroughly before preparing food and frequently during food preparation
 - Use clean water for cooking
 - Wash all fruits and vegetables in safe boiled or chlorinated water
 - Cook food thoroughly and avoid re-heating
 - Serve food while hot discouraging sharing of utensils
 - Discard left-overs in refuse pit or bin.

After the Burial

- Do not distribute soiled clothing before it has been disinfected
- The entire homestead should be disinfected with the help of the health worker or such person. It is crucial to explain to the household that spraying of chlorine is done to disinfect and that it is not poison. Use a 0.2% chlorine solution for the purpose of household spraying
- Hygiene education messages should be passed to all mourners
- Disinfect vehicle used to transport the corpse, using a 0.2% chlorine solution
Be aware that if the inside of the vehicle is not plastic or similar, there may be effects (chlorine residue) on the material.

Annex 6: Steps in Hand washing

Purpose: To protect the patient, staff and care givers from cross infection

Responsibility: Clinician, Environmental health practitioner, care giver

Steps in hand washing

The hands are washed for a minimum of 10-15 seconds with soap (plain or antimicrobial) and running water (tap or run to waste method)

- Remove jewellery (rings, bracelets) and watches before washing hands,
- Ensure that the nails are clipped short (do not wear artificial nails),
- Roll the sleeves up to the elbow.
- Wet the hands and wrists, keeping hands and wrists lower than the elbows (permit the water to flow to the fingertips, avoiding arm contamination).
- Apply soap (plain or antimicrobial or ash) and lather thoroughly.
- Use firm, circular motions to wash the hands and arms up to the wrists, covering all areas including palms, back of the hands, fingers, between fingers and lateral side of the fifth finger, knuckles, and wrists.
- Rub for minimum of 10-15 seconds.
- Repeat the process if the hands are very soiled.
- Clean under the fingernails.
- Rinse hands thoroughly, keeping the hands lower than the forearms.
- If running water is not available, use a bucket and pitcher.
- Do not dip your hands into a bowl to rinse, as this re-contaminates them.
- Collect used water in a basin and discard in a sink, drain or toilet.
- Dry hands thoroughly with disposable paper towel or napkins, or air dry them.
- Discard the paper towel in an appropriate container without touching the bin lids with hand.
- Use a paper towel, or your elbow/foot to turn off the faucet to prevent re-contamination.

Using antiseptics, hand rubs gels or alcohol swabs for hand antisepsis

- Apply the product to the palm of one hand. The volume needed to apply varies by product.
- Rub hands together, covering all surfaces of hands and fingers, until hands are dry.
- Do not rinse.
- Note: When there is visible soiling of hands, they should first be washed with soap and water before using waterless hand rubs, gels or alcohol swabs.
- If soap and water are unavailable, hands should first be cleansed with detergent-containing towellettes, before using the alcohol-based hand rub, gel or swab.

Note: In situations where soap is not available, ash can be used for washing hands

Annex 7: Typhoid fact sheet

What is Typhoid?

Typhoid is caused by an infection with a bacteria called *Salmonella Typhi*. Most typhoid infections are acquired after eating contaminated food or water. The bacteria that causes typhoid is a unique human strain of *Salmonella* called *Salmonella typhi*.

What are the symptoms?

People infected with typhoid may experience mild or severe symptoms. The symptoms of typhoid may include:

- Fever, headache, general discomfort, lack of appetite, and a dry cough
- The heartbeat slows and the spleen enlarges
- Some people get a rose coloured rash on the trunk of the body
- Constipation or diarrhoea may occur
- Symptoms start 1 to 3 weeks after infection
- Some people do not have any symptoms.

Typhoid carriers are not uncommon. The carrier stage varies from a number of days to years. Only about 3 percent of cases go on to become lifelong carriers and this tends to occur more often in adults than in children

How is it spread?

Typhoid bacteria is passed in faeces and sometimes through the urine of infected people. Most people get typhoid fever by eating or drinking food or water that has been contaminated by faeces of people with the disease, including those who do not have any symptoms. Raw fruits and vegetables, milk and fish are the types of foods most often associated with the illness

Who is at risk?

Household contacts, or people who have travelled with a person infected with typhoid, will be screened for typhoid by their local public health unit. Contacts should be aware of the symptoms of typhoid and should see their general practitioner if they develop symptoms

How is it prevented?

- Avoid uncooked foods, including fruit unless it can be peeled
- Avoid untreated water, including ice
- Drink beverages from sealed containers
- Wash hands thoroughly with soap after going to the toilet and before eating or handling food
- Avoid eating from street vendors
- Ensure food is thoroughly cooked and eaten whilst hot
- Cover food
- Fly control and proper waste disposal

Vaccination as a preventive method is not recommended in Zimbabwe

Everyone can be infected with typhoid, however there is a vaccine available and travellers to countries where typhoid is common should be vaccinated. This is currently not the case with Zimbabwe.

People infected with typhoid, or exposed to someone infected with typhoid, **MUST NOT** be permitted to work if their work involves food handling or caring for children, patients or the elderly, and should not prepare food for others. A number of stool tests will be required to assess when you are no longer infected with typhoid. Your local public health unit will advise you when will be able to return to work.

As typhoid can be carried on the hands it is very important to always wash hands thoroughly after using the toilet and before handling food. Hands should be washed with soap and water for at least 15 seconds, rinsed and dried well.

How is it diagnosed?

To diagnose typhoid, your medical practitioner or local hospital will send a blood and/or stool sample to a laboratory for testing.

How is it treated?

People with typhoid will need antibiotics for treatment and some may require hospitalisation. Some people may never have symptoms but may be carriers of typhoid and will require antibiotic treatment. It is important to finish the entire course of antibiotics.

What is the public health response?

1. All health practitioners including laboratories must notify cases of Typhoid to the MOHCW
2. Public health officials will interview the doctor and or patient (or carers) to find out how the infection occurred
3. The MOHCW is responsible for the environmental investigation of food handlers with typhoid
4. Typhoid is passed in the faeces of infected people, only people with active diarrhoea who are unable to control their bowel motion habits (infants, certain handicapped individuals) should be isolated
5. Your local public health unit can advise further regarding exclusions from work and school. People excluded from work (health care workers, food handlers and persons in other sensitive settings) will need to have a number of stool tests done before they are allowed to return to work. They are also required to carefully wash hands after toilet visits.

Annex 9: Sample messages for community education

A. Improving hand-washing practices

Hand-washing with soap is the most effective way to prevent transmission of some organisms causing infectious diseases. For that reason, promote hand-washing in every family. Hand-washing is particularly important after defecation, after cleaning a child who has defecated, after disposing of a child's stool, before preparing or handling food and before eating.

Hand-washing should be practiced. If possible, water for washing should be stored separately from drinking-water. During an epidemic, soap should be provided to those without it. If soap is not available, ash or earth can be used to scrub the hands.

- Do not dry washed hands with dirty cloths.
- Air-dry wet hands.
- Avoid handshaking especially at large gatherings like funerals.

Message

ARE YOU PROTECTED FROM typhoid?

Washing your hands protects yourself and others from the disease

Always wash hands:

- after defecation
- after cleaning a child who has defecated
- after disposing of a child's stool
- before and after eating
- before preparing or handling food.

Message

ARE YOU READY FOR HAND-WASHING?

Do you have

- Clean water and Soap (or if you do not have soap, use ash or earth to scrub your hands)
- Clean cloth for drying or air dry for two minutes.

B. Safe handling of food

Encourage the following food safety practices:

- Wash fruits and vegetables with clean running water before eating, eat immediately after washing
- Cook food thoroughly and eat whilst hot
- Eat food while it is still hot, or reheat it thoroughly before eating
- Wash and thoroughly dry all cooking and serving utensils after use
- Keep cooked food and clean utensils separate from uncooked foods and potentially contaminated utensils
- Wash hands thoroughly with soap before handling food
- Protect food from flies by means of fly screens

Message

DO YOU PREPARE AND CONSUME FOOD SAFELY?

Cooking kills germs

- Thoroughly cook all meats, fish and vegetables
- Eat cooked meats, fish and vegetables while they are hot.

Washing protects from disease

- Wash your hands before preparing or serving food
- Wash your dishes and utensils with soap and water
- Wash your *cutting board* especially well with soap.

Peeling protects from disease

- Only eat fruits that have been freshly peeled (such as bananas and oranges)

KEEP IT CLEAN: COOK IT, PEEL IT, OR LEAVE IT.

C. Safe disposal of human waste

High priority should be given to ensuring the safe disposal of human waste at all time, and especially during epidemics of diarrhoea. Sanitary systems appropriate for local conditions should be constructed with the cooperation of the community.

Community messages should emphasize:

- Everyone should use latrines properly, including children
- Dispose of children's excreta in a latrine or bury in a hole.
- Avoid defecating on the ground, or in or near a water supply.

When large groups of people congregate—as for fairs, funerals, or religious festivals—, ensure the safe disposal of human waste. If there is no latrine, designate areas for defecation and provide a shovel to bury the excreta.

Message

ARE YOU PROTECTED FROM Typhoid?

DO YOU USE A TOILET OR LATRINE?

Germs that cause intestinal disease live in faeces. Even a person who is healthy might have germs causing typhoid, dysentery etc.

- Always use a toilet or latrine. If you don't have one – build one!
- Keep the toilet or latrine *clean*
- Wash your hands with soap (or ash) and clean water after using the toilet or latrine.

KEEP IT CLEAN: USE A TOILET OR LATRINE

C. Clean drinking water

1. Community drinking water supply and storage

- *Piped water:*
 - To maintain safety of and properly chlorinate piped water
 - To prevent entry of contaminated groundwater into pipes, repair leaking joints and maintain constant pressure in the system
- *Closed wells:* Equip with a well-head, drainage apron, and with a pulley, windlass, or pump
- *Trucked in water:* If locally available water is likely to be contaminated, drinking water should be supplied by tankers or transported in drums, if it is adequately chlorinated and a regular supply can be ensured. The trucking of water, however, is expensive and difficult to sustain; it is usually considered a short-term measure until a local supply can be established.

2. Home drinking water storage and treatment

When the safety of the drinking water is uncertain, it should be chlorinated in the home or boiled. To prevent contamination of drinking water, families should store drinking water using one of the following types of containers:

- *Covered containers* that are cleaned daily and kept away from children and animals. Water should be removed from the containers using a long-handled dipper, kept especially for this purpose
- *Narrow-mouthed containers* with an opening too small to allow the insertion of a hand. Water should be removed by pouring from the opening or by a spigot
- Water used for bathing, washing and other purposes other than drinking need not be treated and should be stored separately from drinking water.

E. Safe disposal of bodies

The body fluids of persons who die due to diarrhoea are still infectious. The nearest health facility should be contacted to carry out a supervised burial if the death is suspected to be due to any diarrhoeal disease.

Annex 9: Typhoid investigation form

Investigating officer:

Name of patient:

Province/City **District/Suburb**

Ward **Village**

Age **Sex: Male** **Female**..... (tick appropriate)

Religion: Traditional Christian..... (Indicate denomination) Moslem

Others (specify)

Date seen: Date of onset:

Date of interview.....

1. What signs and symptoms did the patient present with?

Diarrhoea	<input type="checkbox"/>	Vomiting	<input type="checkbox"/>
Non-productive cough	<input type="checkbox"/>	Body weakness	<input type="checkbox"/>
Sustained fever	<input type="checkbox"/>	Abdominal cramps	<input type="checkbox"/>
Headache	<input type="checkbox"/>	Constipation	<input type="checkbox"/>

Others (specify)

2. How many other people residing with the patient had similar symptoms during the past 14 days?

Date of onset	Name	Age	signs and symptoms	Comments
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

3. How many people closely interacted with the patient in the past 14 days outside his/her residence?

Name	Age	signs and symptoms	Comments
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

3. Did the patient receive treatment at home? Yes..... No.....
If yes go to question 5, if no, directly to question 6

5. What type of treatment was administered? Please specify

.....
.....
.....

6. Did the patient seek medical treatment? Yes..... No..... (If yes, please specify where (and go to question 7)

.....
.....

If no, why? (go to question 8)

.....
.....
.....

7. After how long did the patient seek treatment? Tick appropriate

	Tick
within 12 hours	
24 hours	
36 Hours	
>36 hours	
Other specify	

7b. Treatment given at the health facility (or treatment centre):

Oral fluids..... IV fluids Ciprofloxacin..... Amoxicillin..... AmpicillinChloramphenicol

Other: Specify:

7C: Outcome: admitted..... improved..... died

8. Did the patient:

- Visit anybody suffering from similar symptoms? Yes..... No.....
- Receive any visitors with similar symptoms? Yes..... No.....
- Take care of a patient with similar symptoms? Yes..... No.....
- Participate in preparation of a body for burial for a person who had died recently Yes..... No.....

If the answer to the above questions is yes, please indicate when and where, describing symptoms of the illness that the person suffered prior to their death below

.....

8b. Did the patient visit a gathering prior to illness (funeral, religious or any other)? Yes..... No.....`

If yes, when and where?

8c. Did the patient travel to any area with reported similar cases prior to illness? Yes..... No.....

If yes, where? When?.....

Place visited	Date Visited	Date returned to place of residence
---------------	--------------	-------------------------------------

_____	_____	_____
_____	_____	_____

8d. History of eating in a particular place outside home within past 14 days:

YesNo If Yes, specify:

Indicate the type of foods eaten during the last 14 days

Food	Date eaten	Source of food
_____	_____	_____
_____	_____	_____
_____	_____	_____

8e. Which foods did you eat at home during the past 14 days prior to illness? (Specify whether hot or cold)

Food	Hot	Cold	Source
Fish	_____	_____	_____
Milk	_____	_____	_____
Mangoes	_____	_____	_____
Sadza	_____	_____	_____
Rice	_____	_____	_____
Salad	_____	_____	_____
apples	_____	_____	_____
cucumbers	_____	_____	_____

9. Did the patient visit any places after onset of diseases?

Place visited	Date Visited	Date returned to place of residence
_____	_____	_____
_____	_____	_____

10a. What is your usual source of water for household use? Please specify

.....

10b. How far is your usual water source? 500m-1km:..... 2-4km:..... >5km

11. What type of containers do you use:

- to collect water?
- to store water?

11b. How often are the water containers cleaned and how?

Daily: Every two days: weekly:

12. How does the household prepare its drinking water?

Boiling: Chlorination: filtration: Others (specify): None:

12b. Availability of household chlorination chemical e.g. aquatabs, jik, etc

13. Do you have a functional toilet in the home? Yes..... No.....

If Yes, what is the state of the toilet? clean..... dirty

14. Does your household have adequate facility for hand washing after latrine use? Yes No.....

15. When do you wash your hands? (Circle the appropriate answer)

- | | | |
|----------------------------------|-----------|---------|
| 15. a. After going to the toilet | Yes | No..... |
| 15. b. Before eating | Yes | No..... |
| 15. c. After changing nappies | Yes | No..... |
| 15. d. Before handling food | Yes..... | No..... |

16. How do you wash your hands?

Using soap & water Using water only Using ash and water

Others (specify): (ash, alcohol rubs, etc)

17. Availability of soap for hand washing YesNo.....

Annex 10: Five key steps to safer food

Keep clean

How?

Wash your hands before handling food and often during food preparation
 Wash your hands after going to toilet
 Wash and sanitize all surfaces and equipment used for food preparation
 Protect kitchen areas and food from insects, pests and other animals

Why?

While most micro organisms do not cause disease, dangerous micro organisms are widely found in soil, water, animals and people. These micro organisms are carried on hands, wiping cloths and utensils, especially cutting boards and the slightest contact can transfer them to food and cause food borne diseases.

Separate raw and cooked food

How?

Separate raw meat, poultry and seafood from other foods
 Use separate equipment and utensils such as knives and cutting boards for handling raw foods
 Store food in containers to avoid contact between raw and prepared foods

Why:

Raw food, especially meat, poultry and seafood and their juices, can contain dangerous micro organisms which may be transferred onto other foods during food preparation and storage.

Cook thoroughly

How?

Cook food thoroughly, especially meat, poultry, eggs and seafood
 Bring foods like soups and stews to boiling to make sure that they have reached 70°C. For meat and poultry, make sure that juices are clear, not pink, ideally, use a thermometer.

Why?

Proper cooking kills almost all dangerous micro organisms. Studies have shown that cooking food to a temperature of 70°C can help ensure it is safe for consumption. Foods that require special attention include minces meats, rolled roasts, large joints of meat and whole poultry.



Keep food at safe temperatures

How?

Do not leave cooked food at room temperature for more than 2 hours.
 Refrigerate promptly all cooked and perishable food (preferably below 5°C)
 Keep cooked food piping hot (more than 60°C) prior to serving
 Do not store food too long even in the refrigerator
 Do not thaw frozen food at room temperature.

Why?

Micro-organisms can multiply very quickly if food is stored at room temperature. By holding at temperature below 5°C or above 60°C, the growth of micro organisms is slowed down or stopped. Some dangerous micro organisms still grow below 5°C.

Use safe water and raw materials

How?

Use safe water or treat it to make it safe
 Select fresh and wholesome foods
 Choose foods processed for safety, such as pasteurised milk
 Wash fruits and vegetables, especially if eaten raw
 Do not use food beyond its expiry date.

Why?

Raw materials, including water and ice, may be contaminated with dangerous micro organisms and chemicals. Toxic chemicals may be formed in damaged and mouldy foods. Care in selection of raw materials and simple measures such as washing and peeling may reduce the risk.

Annex 11: Typhoid fever Patient admission and follow up form

Patient admission and follow up form			
Name:	Date of admission:	Time of admission:	
Address:.....			
Age:	Weight:	Temperature:	Date of onset:
High temperature:..... Length of time:		Last bowel motion:.....	
Description of diarrhoea aspect <input type="checkbox"/> Watery <input type="checkbox"/> Bloody <input type="checkbox"/> Pea-soup like <input type="checkbox"/> Other (specify)			

Initial evaluation

Pulse:	<input type="checkbox"/> Present	<input type="checkbox"/> None	<input type="checkbox"/> Weak/rapid
Condition	<input type="checkbox"/> Well/alert	<input type="checkbox"/> Delirium <input type="checkbox"/> Irritable	<input type="checkbox"/> Lethargic/unconscious
Acute high fever	<input type="checkbox"/> 37 <input type="checkbox"/> 38 <input type="checkbox"/> 39 °C <input type="checkbox"/> 40 <input type="checkbox"/> >40°C	Coated tongue <input type="checkbox"/> Yes <input type="checkbox"/> No	Location of abdominal pains Upper <input type="checkbox"/> lower quadrant
Acute high fever	With chills without rigors <input type="checkbox"/> Without chills <input type="checkbox"/>	Gastro-intestinal bleeding <input type="checkbox"/> Yes <input type="checkbox"/> No	Mild cough <input type="checkbox"/> Yes <input type="checkbox"/> No
Anorexia <input type="checkbox"/> Yes <input type="checkbox"/> No	Constipation <input type="checkbox"/> Yes <input type="checkbox"/> No	Skin rash (rose spots on the trunk) <input type="checkbox"/> Yes <input type="checkbox"/> No	Hepatosplenomegaly <input type="checkbox"/> Yes <input type="checkbox"/> No
Jaundice <input type="checkbox"/> Yes <input type="checkbox"/> No	Urinary retention <input type="checkbox"/> Yes <input type="checkbox"/> No	Abdominal pains <input type="checkbox"/> Yes <input type="checkbox"/> No	Diffused mild abdominal pain <input type="checkbox"/> Right lower quadrant abdominal pain <input type="checkbox"/>

Follow-up monitoring

Optimal Therapy				Alternative Effective Drugs		
Susceptibility	Antibiotic	Daily dose mg/kg	Days	Antibiotic	Daily dose mg/kg	Days
Fully sensitive	Ciprofloxacin or Ofloxacin	15	5-7	Chloramphenicol Amoxicillin Cotrimoxazole	50-75 75-100 8-40	14-21 14 14
Multi drug resistant	As above or Cefixime	15 15-20	7-14 7-14	Azythromycin Cefixime	8-10 15-20	7 7-14
Quinolone resistance	Azythromycin Rocephin	8-10 75	7 10-14	Cefixime	20	7-14
Fully sensitive	Ciprofloxacin or Ofloxacin	15	10-14	Chloramphenicol Amoxicillin Cotrimoxazole	100 100 8-40	14-21 14 14
Multi drug resistant	As above or Cefixime	15 15-20	10-14 10-14	Rocephine Cefotaxime	75 80	10-14 10-14
Quinolone resistance	Rocephine Cefotaxime	75 80	10-14 10-14	Fluoroquinolone	20	7-14

Date of discharge: ----- Cured Defaulted Transferred Died

If died, probable cause and time of death: -----

Annex 12: Line list – Reporting from health facility to district and for use during outbreaks

Line list of cases

Province:-----

District:-----

Health Facility:-----

Case No	Out/ In patient	Name	Physical Address	Sex	Age	Date seen	Date of onset	Signs and Symptoms	Treatment given	Specimen Taken	Lab Result	Outcome & date A-Discharged, D-dead	Place of death	Comments

Note:

- Line list to include all community deaths with information on where they occurred and a brief history
- Comments to include information on re-admitted cases, possibility of co-morbidities and if a child is unaccompanied at either admission or exit

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