Guidelines for the control of shigellosis, including epidemics due to *Shigella dysenteriae* type 1

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Introduction

Shigellosis is an acute invasive enteric infection caused by bacteria belonging to the genus *Shigella*; it is clinically manifested by diarrhoea that is frequently bloody. Shigellosis is endemic in many developing countries and also occurs in epidemics causing considerable morbidity and mortality. Among the four species of *Shigella*, *Shigella dysenteriae* type 1 (Sd1) is especially important because it causes the most severe disease and may occur in large regional epidemics. Major obstacles to the control of shigellosis include the ease with which *Shigella* spreads from person to person and the rapidity with which it develops antimicrobial resistance.

These guidelines are intended to assist national health authorities, public health officers and health-care providers, including members of international agencies and nongovernmental organizations (NGO), in their efforts to control both endemic and epidemic shigellosis. The text describes the epidemiology, clinical features and management of the disease, and measures to prepare for and control epidemics caused by Sd1.

The following definitions apply to terms used in this document:

- **Bloody diarrhoea**. This is a clinical diagnosis that refers to any diarrhoeal episode in which the loose or watery stools contain visible red blood. This does not include episodes in which blood is present in streaks on the surface of formed stool, is detected only by microscopic examination or biochemical tests, or in which stools are black owing to the presence of digested blood (melena). Although bloody diarrhoea has numerous causes, this simple definition is widely used in community-based surveillance for shigellosis.
- **Dysentery**. This has the same meaning as bloody diarrhoea. Although clinical texts often use this term to describe the syndrome of bloody diarrhoea with fever, abdominal cramps, rectal pain and mucoid stools, these feature do not always accompany bloody diarrhoea, nor do they necessarily define its aetiology or determine appropriate treatment.
- **Bacillary dysentery.** This is dysentery caused by *Shigella*. The term is often used to distinguish shigellosis from amoebic dysentery, caused by *Entamoeba histolytic*a.
- **Invasive diarrhoea.** This refers to diarrhoea caused by bacterial pathogens, including *Shigella*, and some *Salmonella, E. coli* and *Campylobacter jejuni*, that invade the bowel mucosa, causing inflammation and tissue damage. When visible blood is present, the episode may also be termed dysentery or bloody diarrhoea.

Epidemiology

The organism

Shigella are Gram-negative, non-motile bacilli belonging to the family *Enterobacteriacae*. The genus *Shigella* includes four species: *S. dysenteriae, S. flexneri, S. boydii* and *S. sonnei*, also designated groups A, B, C and D, respectively. The first three species include multiple serotypes. S. *sonnei* and *S. boydii* usually cause relatively mild illness in which diarrhoea may be watery or bloody. *S. flexneri* is the chief cause of endemic shigellosis in developing countries. Immunity is serotype-specific.

Sd1, also known as the Shiga bacillus, differs from other *Shigella* in four important ways:

- it produces a potent cytotoxin (Shiga toxin);
- it causes illness that is more severe, more prolonged, and more frequently fatal than is illness caused by other *Shigella*;
- resistance to antimicrobials occurs more frequently than among other *Shigella*; and
- it causes large, often regional, epidemics, frequently with high attack rates and high case fatality rates.

TABLE 1. Species and serogroups of *Shigella*

Species	Serogroup	Serotypes
S. dysenteriae	A	1 - 15
S. flexneri	B	1 - 6 (with 15 subtypes)
S. boydii	C	1 - 18
S. sonnei	D	1

All species of *Shigella* cause acute bloody diarrhoea by invading and causing patchy destruction of the colonic epithelium. This leads to the formation of micro-ulcers and inflammatory exudates, and causes inflammatory cells (polymorphonuclear leucocytes, PMNs) and blood to appear in the stool. The diarrhoeal stool contains 10^6-10^8 *Shigellae* per gram. Once excreted, the organism is very sensitive to environmental conditions and dies rapidly, especially when dried or exposed to direct sunlight.

Disease burden

Endemic shigellosis

Shigellosis is endemic in most developing countries and is the most important cause of bloody diarrhoea worldwide. It is estimated to cause at least 80 million cases of bloody diarrhoea and 700,000 deaths each year. Ninety-nine percent of infections caused by *Shigella* occur in developing countries, and the majority of cases (~70%), and of deaths (~60%), occur among children less than five years of age. Probably less than one percent of cases are treated in hospital.

Epidemics caused by Sd1

Outbreaks of bloody diarrhoea due to Sd1 are most common in overcrowded, impoverished areas with poor sanitation, inadequate hygiene practices, and unsafe water supplies. Refugees and internally displaced persons are at especially high risk. In the past two decades major outbreaks have occurred in Africa, South Asia and Central America. Between 1993 and 1995, outbreaks were reported in several central and southern African countries. In 1994, an explosive outbreak among Rwandan refugees in Zaïre caused approximately 20,000 deaths during the first month alone. Between 1999 and 2003, outbreaks were reported in Sierra Leone, Liberia, Guinea, Senegal, Angola, the Central African Republic and the Democratic Republic of Congo. In 2000, outbreaks of bloody diarrhoea due to Sd1 that were resistant to fluoroquinolones occurred in India and Bangladesh. In Central America, the most recent large epidemic lasted from 1969 to 1973 and was responsible for more than 500,000 cases and 20,000 deaths.

The disease

Mode of transmission

Shigella are spread by direct contact with an infected person, or by eating contaminated food or drinking contaminated water. Flies may also transmit the organism. The low infective dose, as few as 200 viable organisms, facilitates person-to-person spread. Humans and a few primates are the only reservoir of *Shigella*.

Clinical presentation

After an incubation period of one to four days, patients typically present with diarrhoea characterized by the frequent passage of small liquid stools that contain visible blood, with or without mucus. Abdominal cramps and tenesmus (unproductive, painful straining) are common. Fever and anorexia are also common, but are not specific. Patients may, however, present only with acute watery diarrhoea without visible blood or mucus, and without the other symptoms described above, especially at the beginning of their illness. If dehydration occurs, it is usually moderate in degree.

Although most patients recover uneventfully within seven to ten days, serious complications may occur, including: metabolic abnormalities, sepsis, convulsions, rectal prolapse, toxic megacolon, intestinal perforation and haemolytic-uraemic syndrome.

Risk factors for severe disease and death

On average, severity of illness and risk of death are least with disease caused by *S. sonnei* and greatest with infection by Sd1. The case-fatality rate is estimated to be less than one percent among persons whose illness is not sufficiently severe to require treatment in hospital and are therefore treated as outpatients. However, case-fatality is as high as 15% among patients with Sd1 who require to be hospitalized, and is increased by delayed arrival and treatment with ineffective antimicrobials.

The disease is also most likely to be severe, and the risk of death greatest, among:

- infants, and adults older than 50 years;
- children who are not breastfed;
- children recovering from measles;
- malnourished children and adults; and
- any patient who develops dehydration, unconsciousness or hypo- or hyper thermia, or has a history of convulsion when first seen.

Diagnosis

Shigellosis cannot be distinguished reliably from other causes of bloody diarrhoea on the basis of clinical features alone nor in individual cases can illness caused by Sd1 be distinguished with certainty from that caused by other *Shigella* species.

Routine microscopy of fresh stool is a simple screening test to detect invasive bacterial diarrhoea. It is cheap, rapid and easy to perform, even in a peripheral health facility. The identification of numerous PMNs suggests a bacterial aetiology, but does not distinguish shigellosis from disease caused by other invasive bacteria, such as *Campylobacter jejuni*.

A definitive diagnosis of *Shigella* infection can only be made by isolating the organism from stool and serotyping the isolate. Culture is also required to determine antimicrobial sensitivity. Although sensitive molecular techniques to detect *Shigella*,

TABLE 2. Shigellosis: disease summary

Mode of transmission	
By direct contact By contaminated food or water	
Clinical presentation	**Diagnosis**
Simple watery diarrhoea or bloody diarrhoea; usually more severe with Sd1 Abdominal pain, tenesmus, fever, anorexia Dehydration may be mild or moderate	Bloody stool Microscopy of fresh stool to detect PMNs Confirm by culture and serotyping Differential diagnosis: *Campylobacter jejuni*, enteroinvasive *Escherichia coli*, *Schistosoma*, *Salmonella*, *Entamoeba histolytica*
Complications	**Risk factors for death**
Metabolic abnormalities Sepsis Encephalopathy Toxic megacolon Intestinal perforation Haemolytic-uraemic syndrome Rectal prolapse in children	Infants and adults older than 50 years Children not breastfed Malnourished children and adults Children with recent measles Patients dehydrated, unconscious, hypo- or hyperthermic, or with history of a convulsion

such as PCR, have been developed, they are not yet practical for routine use and they do not permit determination of antimicrobial sensitivity. Methods to detect *Shigella* in food and in the environment are not yet standardized.

Differential diagnosis

Enteritis caused by *Campylobacter jejuni*, enteroinvasive *Escherichia coli*, *Schistosoma*, *Salmonella* and *Entamoeba histolytica* can cause bloody diarrhoea and other symptoms that suggest shigellosis. Moreover, entero-haemorrhagic *E. coli* may cause epidemics of bloody diarrhoea. Outbreaks due to *E. coli* O157:H7 have been reported in Swaziland in 1992, as well as in Cameroon in 1997-1998. Culture-proven cases of bloody diarrhoea due to *E. coli* O157:H7 have been reported in Central African Republic, Côte d'Ivoire, Kenya and Nigeria, demonstrating the circulation of this pathogen in Africa. Identification of *E. coli* O157:H7 requires culture and serotyping in a qualified laboratory.

Direct microscopic examination of fresh stool should be used to diagnose, or rule out, infection with *Entamoeba histolytica* and *Schistosoma mansoni*. It should be noted, however, that finding cysts or non-haematophagous trophozoites of *Entamoeba histolytica* in a bloody stool does not indicate that it is the cause of illness. Asymptomatic infection with *Entamoeba histolytica* is frequent among healthy persons in developing countries.

Shigellosis and HIV/AIDS

Most countries with endemic and/or epidemic shigellosis also face a major burden of HIV/AIDS. Although data are limited, there is no suggestion of a significant interaction between HIV/AIDS and *Shigella* infection among adults or children.

Surveillance

Reporting cases and detecting outbreaks of bloody diarrhoea

Prompt detection and reporting of cases of bloody diarrhoea is the essential first step in the monitoring of endemic shigellosis and in the control of epidemic shigellosis, and also of outbreaks of dysentery caused by entero-haemorrhagic *E. coli*. The number of cases of bloody diarrhoea, and of deaths associated with bloody diarrhoea, should be determined and reported for two age groups: (i) under five years, and (ii) five years or older. Each health facility should designate a specific individual to be responsible for reporting all cases of, and deaths associated with, bloody diarrhoea. Reports should be provided each week to the district health officer responsible for monitoring the occurrence of cases and detecting outbreaks (annex 1). For surveillance and reporting purposes, the standard case definition of bloody diarrhoea or dysentery is "*diarrhoea with visible blood in the stool*".

Case definition for surveillance of bloody diarrhoea or dysentery: *"Diarrhoea with visible blood in the stool"*

Laboratory surveillance

At least one laboratory within the country should be able to isolate and identify *Shigella*, including Sd1, and perform antimicrobial susceptibility testing. This laboratory should train national and peripheral laboratory technicians in

appropriate methods for collection and transport of stool samples, and for isolation, serotyping and antimicrobial susceptibility testing of *Shigella*. It should also assist in strengthening systems for monitoring the quality of the laboratory services throughout the country. It is preferable to have one well-equipped laboratory with suitably trained staff to which specimens can be quickly and safely transported, than to have several that are inadequately equipped or in which staff are not well trained.

If there is no competent national laboratory, collaboration should be established with an international reference laboratory (see list in annex 2) to strengthen the national laboratory and to assist in isolation of *Shigella* from stool specimens.

The antimicrobial susceptibility of *Shigella* differs by geographic area and also changes over time. For this reason it is essential that antimicrobial susceptibility be regularly monitored so that treatment can be recommended that is effective against locally isolated *Shigella*. Testing should not include antimicrobials that are known to be ineffective for the treatment of shigellosis.

The national laboratory should establish a plan to collect and culture regularly stool specimens of untreated patients with bloody diarrhoea from representative areas of the country. If possible, samples should be from cases seen in the community as well as those treated in hospital. This is because antimicrobial resistance may be more frequent among *Shigella* isolated from patients treated in hospital, leading to over-estimation of the prevalence of resistance to some antimicrobials. Fresh stool samples should reach the laboratory within two hours. If this is not possible, specimens should be placed in Cary Blair (or buffered glycerol saline) transport medium at +4°C and reach the laboratory within 48 hours (annex 3). For seasonal epidemics, susceptibility testing should also be performed at the end of the epidemic season to determine the antibiotic policy for the following season (annexes 4 and 5).

Unless there is evidence that entero-haemorrhagic strains of *E. coli* are circulating in a region, surveillance for this organism should be limited to outbreaks of bloody diarrhoea.

TABLE 3. Collection and transport of stool samples, and testing antimicrobial sensitivity

Collection	Transport
Stool specimens of untreated patients Specimens from cases in the community and in hospital	Specimens to reach laboratory within two hours after collection Otherwise: place specimens in Cary Blair at +4°C and reach the laboratory within 48 hours
Do not test antimicrobials that are known to be ineffective for the treatment of shigellosis	

Prevention

Prevention of dysentery caused by *Shigella* relies primarily on measures that prevent spread of the organism within the community and from person to person. These include:

- hand-washing with soap,
- ensuring the availability of safe drinking water,
- safely disposing of human waste,
- breastfeeding of infants and young children,
- safe handling and processing of food, and
- control of flies.

These measures will not only reduce the incidence of shigellosis, but of other diarrhoeal diseases as well. In all cases, health education and the cooperation of the community in implementing control measures are essential.

Health education

Health education is the key to public awareness and cooperation. It should only promote the adoption of affordable and culturally acceptable measures that can be implemented and that have a high likelihood of preventing transmission of the disease. The public must be informed about how *Shigella,* and other organisms that cause diarrhoea, are transmitted and how transmission can be prevented. Public health messages should encourage all persons who develop bloody diarrhoea to report promptly to the nearest health facility for treatment.

Messages must be carefully prepared, taking into consideration local terminology and cultural sensitivities, traditions and beliefs, and be targeted to the appropriate populations, including caregivers, mothers, schoolchildren, street vendors, etc. Health professionals, health educators, teachers, community groups and religious leaders can help to spread the messages through local institutions, such as health facilities, schools, churches, mosques and markets, or during public gatherings, home visits and via the mass media. Posters, leaflets and dramas can also be used. Some examples of health education messages are given in annex 6.

Hand-washing

Hand-washing with soap is a simple and highly effective measure to prevent transmission of *Shigella*; it should be promoted in every household. Hand-washing using soap 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.

Soap is widely available and often produced locally at low cost. If soap is not available, ash or earth may be used to scrub the hands. Washed hands should not be dried with a soiled cloth.

Water supply

Shigella can contaminate water at all stages of distribution, from the source to the point of consumption. Measures to ensure safe drinking water, including safe transport and storage practices are, therefore, important for preventing spread of the organism.

Development of piped water systems or protected water sources should be a priority. Piped water must be properly chlorinated (see recommended chlorine levels in the annex 7). Leaking joints must be repaired and constant pressure maintained to prevent the entry of contaminated groundwater.

The use of surface water for drinking, such as water from a river, pond, or open well, should be discouraged. If surface water must be used, it should be disinfected before use by chlorination or boiling. The water source should be protected from contamination by people and animals. Defecation should not be allowed within 10 metres of the water source, and should be downhill, or downstream, from it; drainage ditches should be created to prevent storm water and other surface water from flowing into the water source; and wells should be equipped with a wellhead drainage apron and with a pulley, windlass, or pump. Other water sources should be used for bathing, washing and other general purposes.

If possible, families should store drinking water in a narrow-mouthed container with an opening that is too small to allow the insertion of a child's hand. The water should be obtained by pouring from the container's spout. If a container with a larger opening must be used, water should be obtained only by use of a long-handled dipper that is used exclusively for that purpose. Water containers should be kept away from small children and animals. All containers should be covered, and cleaned daily.

Disposal of human waste

Priority should be given to ensuring the safe disposal of human waste. Sanitary systems appropriate for local conditions should be constructed and carefully maintained with the cooperation of the community. Designs for latrine construction in various types of soil and different climatic conditions can be found elsewhere (Cholera and other epidemic diarrhoeal diseases control. Fact sheets on environmental sanitation. WHO/EDS/96.4). Also see annex 8 for instructions on making and maintaining a ventilated improved pit (VIP) latrine.

Health education messages should stress the need for proper use of latrines by everyone, including children. They should also stress the dangers of defecating on the ground or in, or near, the water supply. The disposal of children's excreta in latrines should be emphasized. If children defecate on the ground, the faeces should be picked up, using a scoop or shovel, and deposited in a latrine or buried.

Breastfeeding

Breastfeeding of infants and young children should be promoted. Infants and children who are breastfed have fewer episodes of diarrhoea or dysentery due to *Shigella*; when these do occur, they are less severe than in those who are not breastfed. This protection is greatest in infants who are exclusively breastfed until six months of age, but remains significant when breastmilk is given with other foods, even into the third year of life.

Food safety

Food can be contaminated by *Shigella* at all stages of production and preparation, including: during the growing period (by use of human fertilisers), in public places such as markets, during preparation at home or in restaurants, and when kept without refrigeration after being prepared.

Every country should have food safety legislation that defines appropriate measures for safe handling and processing of food. Environmental health workers should monitor food-handling practices, including methods used for fly control, and be given the authority to stop street sales or close restaurants when their inspections reveal unsanitary practices.

Individual food safety practices should also be emphasized. Health education for the general population should stress the following key messages concerning the preparation and consumption of food (see also in annex 9):

- Wash hands thoroughly with soap after defecation and before preparing or eating food;
- Do not eat raw food, except undamaged fruits and vegetables that are peeled and eaten immediately;
- Cook food until it is hot throughout;
- 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 separately from uncooked food and potentially contaminated utensils; and
- Protect food from flies by means of fly screens.

Vaccines

There is no WHO-recommended vaccine that is effective for preventing infection by *Shigella*. Several candidate vaccines, mostly against *S. flexneri*, are currently under development, but are unlikely to be licensed before several years.

Measles immunization can substantially reduce the incidence and severity of diarrhoeal diseases, including shigellosis. Every infant should be immunized against measles at the recommended age.

TABLE 4. Preventive measures

Hand-washing	**Human waste disposal**
Promote hand-washing with soap	Ensure the safe disposal of human waste
Water supply	**Food safety**
Increase access to safe drinking water Promote safe transport of water Promote safe storage practices	Establish and enforce measures for the safe handling and processing of food Promote individual food safety practices
Breastfeeding	**Health education**
Promote breastfeeding for infants and young children	Only promote affordable, relevant and culturally acceptable measures Encourage all persons with bloody diarrhoea to report to health facilities Prepare messages carefully for specific target groups

Management of patients with bloody diarrhoea

All cases of bloody diarrhoea should be treated promptly with an antimicrobial that is known to be effective against *Shigella*. This lessens the risk of serious complications and death, shortens the duration of symptoms, and hastens the elimination of *Shigella* from the stool. Other supportive measures used to treat acute diarrhoea, such as rehydration, feeding and zinc supplementation, should also be provided. Symptomatic treatment should be given for fever and pain.

Severe cases and other patients at increased risk of death should be referred to hospital or a specialized treatment centre. Because outpatients may also become severely ill or die, they must also be treated with an antimicrobial and reviewed after two days of treatment to ensure they are improving. Important signs of improvement are less fever, less blood in the stool, less frequent stools and improved appetite. If their illness is not improving within two days, or worsens, they should be hospitalized. Patients treated at home should be given clear instructions regarding disinfection of clothing, personal articles and their immediate environment.

An individual file should be created for each patient admitted to a health facility. This should remain with the patient until discharge. It should include information on the diagnosis, clinical symptoms on admission, and progress during hospitalization, including: treatment given, temperature pattern, number of stools per day, presence of blood in the stools, hydration status, and the cause of death, if relevant.

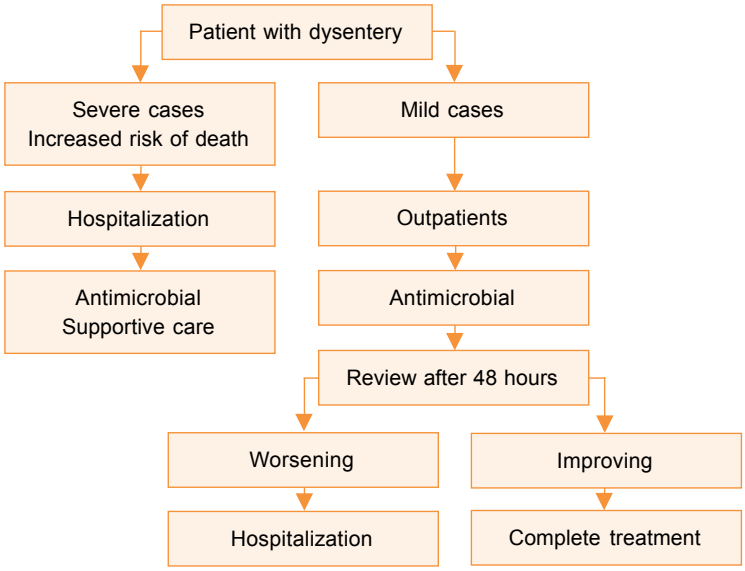
Health education messages should be provided to all patients.

Antimicrobial therapy

The choice of antimicrobial should, if possible, be based on recent susceptibility data from *Shigella* strains isolated in the area. If information on local strains is not available, data from nearby countries or from recent regional epidemics should be used. The selected antimicrobial should be:

- effective against local (or regional) *Shigella* strains, including Sd1;
- affordable; and
- available locally or rapidly obtainable; if local supply of the recommended antimicrobial is limited, it should be reserved for patients with severe disease or who belong to other groups at increased risk of death.

FIGURE 1. Management of shigellosis



Unfortunately, resistance of *Shigella* to ampicillin, co-trimoxazole and nalidixic acid has become widespread and these are no longer recommended. Ciprofloxacin, formerly used as a back up drug to treat shigellosis, is now the drug of choice for all patients with bloody diarrhoea, irrespective of their age (annex 10). Although quinolones have been reported to cause arthropathy in immature animals, the risk of joint damage in children appears to be minimal and is clearly outweighed by the value of these drugs for treatment of this potentially life-threatening disease.

Aside from ciprofloxacin and some other fluoroquinolones, pivmecillinam (amdinocillin pivoxil) and ceftriaxone are currently the only antimicrobials that are usually effective for treatment of multi-resistant strains of *Shigella* in all age groups. Azithromycin is also considered an alternative for treatment of adults. Use of these alternative drugs is, however, currently limited by their high cost (pivmecillinam, azithromycin), rapid development of resistance (azithromycin), their formulation (injectable for ceftriaxone, four times a day for pivmecillinam), and limited data on efficacy (ceftriaxone, azithromycin). They should only be used when local strains of *Shigella* are known to be resistant to ciprofloxacin.

TABLE 5. Antimicrobials for treatment of shigellosis

Antimicrobial	Treatment schedule in children in adults	Limitations
First line		
Ciprofloxacin	15 mg/kg 500 mg 2 times per day for 3 days, by mouth	
Second line		
Pivmecillinam	20 mg/kg 100 mg 4 times per day for 5 days, by mouth	- Cost - No pediatric formulation - 4 times per day dosing - Resistance emerging
Ceftriaxone	50-100 mg/kg - Once a day IM for 2 to 5 days	- Efficacy not validated - Must be injected
Azithromycin	6-20 mg/kg 1-1.5 g Once a day for 1 to 5 days, by mouth	- Cost - Efficacy not validated - MIC near serum concentration - Resistance emerges rapidly and spreads to other bacteria

When an effective antimicrobial is given, improvement should be evident within 48 hours. This includes fewer stools, less blood in the stools, less fever, and improved appetite. Failure to show such improvement should suggest possible antimicrobial resistance.

Antimicrobials that are **not** effective against Shigella and should **not** be used to treat patients with shigellosis include:

- Nalidixic acid has been the drug of choice for the last two decades, although its efficacy was generally considered poor, even against sensitive strains of *Shigella*. Resistance to nalidixic acid is now common in South Asia, and frequent in Eastern and Southern Africa. In addition, strains of *Shigella* resistant to nalidixic acid show some degree of cross-resistance to ciprofloxacin (the minimum inhibitory concentration is increased). Thus, widespread use of nalidixic acid may reduce the efficacy of ciprofloxacin. Finally, the cost of treatment with nalidixic acid is, in 2004, about three times that of ciprofloxacin. Information on the cost and ordering of ciprofloxacin can be found in the International Drug Price Indicator Guide (http://erc.msh.org/dmpguide/);
- Other agents used in the past and to which most *Shigella* are now resistant: ampicillin, chloramphenicol, co-trimoxazole, tetracycline; and
- Agents to which *Shigella* may be sensitive *in vitro*, but which penetrate poorly into the intestinal mucosa where *Shigella* must be killed: nitrofurans (nitrofurantoin, furazolidone), aminoglycosides given orally (gentamicin, kanamycin), first- and second-generation cephalosporins (cefazolin, cephalotin, cefaclor, cefoxitin), and amoxicillin.

TABLE 6. Antimicrobials that should **not** be used for treatment of infections with *Shigella*

Antimicrobials	Rationale for not using
Ampicillin, chloramphenicol, co-trimoxazole, tetracycline	- Used in the past; most *Shigella* are now resistant
Nitrofurans, aminoglycosides, first- and second-generation cephalosporins, amoxicillin	- Penetrate the intestinal mucosa poorly
Nalidixic acid	- Used in the past; most *Shigella* are now resistant - Use may increase resistance to ciprofloxacin

Rehydration, feeding and other supportive care

Optimal treatment of bloody diarrhoea caused by *Shigella* includes preventing or treating dehydration, continued feeding and other supportive measures, as described in WHO guidelines for the treatment of diarrhoea.

Preventing and treating dehydration

Bloody diarrhoea is sometimes associated with dehydration owing to the loss of water and electrolytes. The patient's state of hydration should be accurately and regularly assessed (see annex 11 for assessment and classification of dehydration). Patients with signs of dehydration are at increased risk of death and should be hospitalized to receive appropriate treatment.

Oral rehydration will correct or prevent dehydration in most patients and will, thus, avoid the need for intravenous therapy. Packets of Oral Rehydration Salts (ORS) can be used for all patients, including children. The ORS formulation recommended by WHO and UNICEF has been recently revised to contain lower concentrations of glucose and salts. If ORS packets are not available, a home-made oral rehydration solution may be prepared (see annex 12) or lightly salted rice water, green coconut water or even plain water may be given. To avoid dehydration, increased fluids should be given as soon as possible. All oral fluids, including ORS solution, should be prepared with the best available drinking water and stored safely.

Only a small proportion of patients require intravenous rehydration, usually at the beginning of the treatment. ORS solution should be given as soon as they can drink, even before intravenous therapy has been stopped. Ringer's lactate solution is the preferred fluid for intravenous rehydration, although caution must be taken in malnourished children owing to the risk of hypokalemia and hypoglycemia. Normal saline solution may also be used. Plain glucose solution is ineffective and should not be used.

Feeding

Continued feeding is imperative for all patients with bloody diarrhoea to accelerate recovery, and to prevent hypoglycemia and malnutrition. Frequent small meals with familiar foods, rich in energy and protein, should be provided. Children should be fed at least every four hours. Infants and children who breastfeed should continue to be breastfed as often, and for as long, as they want. Initially, food may be refused and nasogastric or intravenous administration of fluids may be required, but appetite usually improves after one to two days. Young children convalescing from bloody diarrhoea should be given an extra meal each day for at least two weeks to help them recover any weight lost during the illness. The caretakers of children with pre-existing malnutrition should be advised on appropriate feeding practices and the child should be monitored until steady weight gain has been documented. See the annex 13 for a summary of feeding practices during and after diarrhoea.

Other supportive measures

Fever should be controlled with anti-pyretic drugs (paracetamol or acetaminophen). This decreases the risk of convulsion and improves appetite. An analgesic may also be given for pain (e.g., paracetamol, acetaminophen).

Supplemental zinc is recommended for children up to five years of age. The daily dose is 20 mg of elemental zinc (as zinc sulfate, or zinc acetate or zinc gluconate) once daily for 10 to 14 days (10 mg per day for infants below six months). This has been shown to reduce the severity and duration of the illness and also to reduce the incidence and severity of diarrhoea in the following two to three months (annex 10).

TABLE 7. Supportive care

Rehydration	Feeding
- Oral rehydration is usually sufficient - Ringer's lactate solution is preferred for intravenous rehydration	- Continued feeding is imperative - Frequent small meals - An extra meal each day for at least two weeks for convalescent children

Other supportive care

- Anti-pyretic for fever
- Analgesic for pain
- Zinc supplementation for 10-14 days for children up to five years of age

Treatment of complications

Most patients improve within 48 hours and recover fully in 7-10 days without complications. Some, however, develop metabolic abnormalities, encephalopathy, toxic megacolon, intestinal perforation, haemolytic-uraemic syndrome (HUS) or rectal prolapse. Long-term complications include persistent diarrhoea and prolonged malnutrition, which in children may cause stunting and wasting.

Hypokalemia, hyponatremia and hypoglycemia

These metabolic abnormalities, which may be severe, are best prevented by continued feeding during the illness and by replacing diarrhoeal losses with ORS solution. Severe anorexia may, however, make this task difficult, and nasogastric or intravenous administration of fluids may be necessary. Potassium depletion and hypoglycemia may also occur when malnourished children are rehydrated intravenously with Ringer's lactate solution or normal saline, which provide little or no potassium, respectively.

Severe hyponatraemia (serum sodium < 120 mEq/l) should be treated by intravenous infusion of hypertonic saline solution (3%) (12 ml/kg over a 4-hour period) along with restriction of plain water until the abnormality is corrected. Severe hypoglycemia (blood glucose < 2.2 mmol/l) should be treated with intravenous infusion of dextrose (2.0 ml/kg of 25% glucose). Significant potassium depletion can be prevented by giving ORS solution (when indicated) or potassium-rich foods such as bananas, green coconut water or dark green leafy vegetables.

Convulsions

Children with shigellosis may have a single brief convulsion. If, however, convulsions are prolonged or repeated, anticonvulsant treatment should be given (IM paraldehyde, 0.2 ml/kg). Rectal paraldehyde or diazepam should be avoided. If convulsions are repeated, blood glucose should be determined to detect possible hypoglycemia. If this is not possible, treatment for possible hypoglycaemia should be given as described above.

Encephalopathy

Encephalopathy may be caused by recognized metabolic abnormalities, such as severe hypoglycaemia, but in most cases the cause is unknown. Patients may present with stupor or coma, or with other neurological symptoms, including a history of a recent seizure. Guidelines for treatment can be found in standard textbooks.

Toxic megacolon

Toxic megacolon develops when mucosal inflammation and ulceration occur throughout the colon causing ileus and severe colonic distension. Complications may include intestinal perforation and the haemolytic-uraemic syndrome. Treatment includes nasogastric suction and broad-spectrum antibiotics. The case fatality rate may be as high as 33%.

Haemolytic-uraemic syndrome

Haemolytic-uraemic syndrome (HUS) is a serious complication of infection with Sd1 or *E. coli* O157:H7; it includes haemolytic anaemia, thrombocytopenia and renal failure. HUS should be suspected when a patient with bloody diarrhoea has: (i) little or no urine output; (ii) an elevated blood urea nitrogen or serum creatinine; (iii) abnormal bleeding; (iv) a low haematocrit and red blood cell count; and (v) fragmented red blood cells and no or few platelets on a peripheral blood smear. Treatment of the anaemia requires blood transfusions. Renal failure is managed by restricting all fluids, including ORS solution, and potassium-rich foods. If kidney function does not recover, haemodialysis or peritoneal dialysis may be required.

Intestinal perforation

Intestinal perforation may be caused by ulceration or vasculitis that penetrates the wall of the colon. The result is peritonitis and sepsis. Surgery is required to divert the flow of intestinal contents. Broad-spectrum antibiotic treatment and intensive supportive care is required.

Rectal prolapse

In most cases, the rectal prolapse can be treated manually, by gently pushing the prolapsed rectum back through the anal opening using a surgical glove or a soft, warm, wet cloth. The affected person should be in a knee-chest position before applying pressure to allow gravity to help correct the prolapse. Alternatively, the rectal prolapse can be reduced by decreasing the oedema with compresses of a warm solution of saturated magnesium sulfate. The prolapse often recurs but usually disappears spontaneously after the diarrhoea stops. Surgical repair is seldom needed.

Preventing the spread of *Shigella* in health facilities

Patients with bloody diarrhoea who require treatment in a health facility should be kept in a designated diarrhoea ward or diarrhoea corner where they can be cared for separately from other patients. Basic hygiene and disinfection measures must also be enforced to reduce the risk of spread of *Shigella* to other patients and staff, specifically:

- soap and large quantities of water should be provided for hand-washing, preferably in easily accessible, highly visible locations;
- hands should be washed with soap or a dilute solution of chlorine (see below) before and after examining each patient;
- water and other supplies for patients with dysentery should be kept separately from the water and supplies for other patients;
- collection, transport and disposal of excreta should be organized separately from that for other patients; stools of patients with bloody diarrhoea should be disposed of in a specific, regularly disinfected, latrine;
- collection, transport, washing and disinfection of clothes and bedding should be frequent and exclusive to patients with bloody diarrhoea; porters and laundry staff should take appropriate measures to protect themselves against infection;
- movements of staff into and within the wards should be kept to a minimum;
- health workers who care for patients with bloody diarrhoea should not prepare or serve food; and
- only one relative should attend each patient.

All relevant measures must be practised by all persons in contact with patients who have bloody diarrhoea.

Solutions with three different concentrations of chlorine should be used for disinfection, depending upon the task (Table 8). If a chlorine solution is not available, chlorinated lime powder (bleaching powder), sodium hypochlorite solution (household bleach), 1-2% solution of phenol or "high-test hypochlorite" (HTH) may be used. Preparation and use of these solutions are described in the annex 14. Clothes may be washed thoroughly with soap and water, and then boiled or soaked in disinfectant solution. Drying of clothes in direct sunlight also helps to kill *Shigella*. Utensils may be washed with boiling water or a 0.2% chlorine solution. The washing of contaminated articles, particularly clothes, in rivers and ponds that are sources of drinking water, or near wells, should be prohibited.

TABLE 8. Chlorine solutions for disinfection

Chlorine content of disinfectant solution*	0.05%	0.2%	2%
Disinfection purposes	Hands Skin Clothes	Floor Beds Utensils Personal belongings	Dead bodies Excreta

* Do not use metallic a bucket for preparation or storage of chlorine solutions.

Sd1 outbreak preparedness and response

A national inter-ministerial coordinating committee or task-force for outbreak management should be developed that plans and coordinates the preparation for, and response to, outbreaks of communicable diseases, including bloody diarrhoea. The committee's objective should be to ensure rapid implementation of effective control measures when an outbreak is detected. The committee should include representatives from the Ministry of Health and other relevant ministries (water and sanitation, education, information, home affairs, police, transportation, etc.), UN agencies (WHO, UNHCR, UNICEF), NGOs, clinicians and epidemiologists. It may also be appropriate to establish similar committees at sub-national levels. At the local level, committees should include representatives of the community (annex 15).

When preparing for a possible outbreak, a specific function of the committee should be to:

- create a comprehensive plan for epidemic preparedness in collaboration with local and international organizations.

During an outbreak, the duties of the committee are to:

- supervise, monitor and evaluate control activities;
- coordinate the efforts of various governmental sectors, and local and international partners;
- collect information on bloody diarrhoea cases and deaths and share all information on the epidemiological situation with all partners;
- procure, store and distribute essential supplies and equipment;
- organize a single central recording system for all incoming supplies and their distribution and share information on the availability of supplies with all partners;
- ensure that all drugs and supplies are appropriate and correspond to the needs as estimated from the analysis of the epidemiological situation; and
- organize training sessions.

Sd1 outbreak preparedness

A well-developed plan for a rapid and coordinated response is critical when preparing for a possible epidemic of bloody diarrhoea due to Sd1. The plan should include:

- preparing a national treatment policy,
- training of health professionals,
- developing and maintaining a stockpile of emergency supplies, and
- maintaining an effective alert system, including methods and resources to confirm an outbreak.

National treatment policy

A national policy for the treatment of bloody diarrhoea during an epidemic of Sd1 should provide clear guidance on:

- selecting and using an antimicrobial that is effective against Sd1;
- the use of ORS solution and IV fluids to prevent or treat dehydration;
- continued feeding and other essential supportive care;
- providing follow up and referral for persons at increased risk of serious morbidity and death; and
- treatment of the most important complications.

The national treatment policy should be developed by the National Committee in coordination with all partners that would be involved in preparation for, and response to, outbreaks. The policy should be widely distributed.

Training health professionals

Health care workers in the area affected by the outbreak should be thoroughly trained or given refresher training on the management of patients with bloody diarrhoea according to the national treatment policy. WHO can provide training materials that emphasize hands-on practice in assessing and treating patients with dysentery (Epidemic diarrhoeal disease preparedness and response. Training and practice. WHO/EMC/DIS/97.3 and 97.4)

Workers responsible for disease surveillance should receive refresher training on surveillance procedures, including the case definition of dysentery, on-site stool examination, and collection and transport of stool samples for culture.

Laboratory technicians at both the peripheral and national levels should receive regular refresher training on microscopic examination of stool samples, transport of specimens for culture, techniques for isolation and serotyping of *Shigella*, and procedures for determining the antimicrobial sensitivity of *Shigella*.

Stockpiling emergency supplies

During an epidemic, health facilities must have rapid access to adequate quantities of essential supplies, including appropriate antimicrobials, ORS packets and IV fluids. Reserve stocks, sufficient to treat the first cases, should be kept at local health facilities. Larger stocks (to treat 100 to 200 cases) should be kept at district or provincial sites, and an emergency stock to face an influx of at least 1000 cases should be maintained at a central distribution point (see annex 16 for a list of the supplies needed to manage 100 patients).

Essential laboratory supplies should also be readily available to local health facilities. These include a small stock of Cary Blair transport medium in tubes (stored at room temperature), sterile swabs, and insulated boxes with cold packs. The designated reference laboratory should maintain a permanent stock of these supplies and also of the materials required to isolate, serotype and test the *in vitro* antimicrobial susceptibility of *Shigella* isolates (see the list of required laboratory supplies in the annex 17).

The stockpiles described above are in addition to the supplies needed to meet normal demands. They should, however, be used in rotation with routine supplies to avoid their becoming outdated. If supplies of reliable quality can be obtained locally, they should be used in preference to imported supplies.

Alert and confirmation of an outbreak

An outbreak of shigellosis should be suspected, and a field investigation conducted, whenever the routine surveillance system reports cases of, or deaths due to, bloody diarrhoea that exceed the number expected for the location and the reporting period. An outbreak may also be suspected when a laboratory reports an increase in the number of bloody stool specimens received for culture. In communities and defined populations, such as refugee camps, where Sd1 has not been present a single isolation of Sd1 should raise concern about a possible impending outbreak.

When a field investigation is initiated, the urgent need is to confirm that there is an outbreak of dysentery, and to identify the causative organism and determine its antimicrobial susceptibility. The number of cases and deaths of bloody diarrhoea should be collected retrospectively from health facility registers to assess the magnitude of the outbreak. Stool specimens should be collected from 10-20 untreated cases and delivered to the reference laboratory as described on page 5, in the section on Surveillance.

In a true outbreak of Sd1, a majority of dysenteric stool specimens will yield Sd1 when cultured, especially at the beginning of the outbreak. In contrast, isolation of Sd1 from a small proportion of specimens, together with frequent isolation of other enteric pathogens, may be encountered when shigellosis is endemic. The isolation rate for Sd1 will also be low, even during an outbreak, if techniques for specimen collection or transport are sub-optimal, or laboratory methods used to isolate or identify the *Shigella* are inadequate. If Sd1 are not identified from an outbreak of dysentery, stool samples should be cultured for entero-haemorrhagic *E. coli* O157:H7 either locally or by a regional WHO reference laboratory (see annex 2). Procedures for collection of stool specimens, identification of Sd1 and determining antimicrobial susceptibility are described in annexes 4 and 5.

When an outbreak of shigellosis due to Sd1 is confirmed, local, provincial and national health authorities should be immediately informed so that appropriate control measures can be started. The report should state the number of patients affected, their ages, the date of onset of the outbreak, the locations affected, the number of stools cultured, the number that yielded Sd1, and the antimicrobial susceptibility of the Sd1 isolates. Reports of outbreaks should also be shared with neighbouring countries, as dysentery epidemics do not respect national borders. The local WHO representative and other appropriate authorities should also be informed. In addition, international notification of epidemic bloody diarrhoea may be required in accordance with the International Health Regulations of 2005 (WHA 58/55).

Response to an Sd1 outbreak

During a confirmed Sd1 outbreak, all patients with diarrhoea who report seeing blood in their stool, or for whom a health worker sees blood in the stool, should be considered to have dysentery, to be infected with Sd1, and to require treatment.

TABLE 9. Sd1 outbreak preparedness

National treatment policy for:	Emergency stock piles of:
- Antimicrobial effective against Sd1 - Treatment of dehydration - Supportive care - Treatment of complications	- Antimicrobials, ORS and IV fluids at local health facilities, at district or provincial sites, at a central distribution point - Laboratory material to take and transport specimens, and to isolate, serotype and test strains at reference laboratory
Training	**Coordinating committees**
- Of health care workers on surveillance, patient management, treatment policy - Of lab technicians on specimen examination, transportation, isolation and serotyping techniques, antimicrobial susceptibility testing	- To be created in advance at national, regional and local levels - To plan and coordinate the preparation for, and response to, outbreaks - To include representatives from the ministry of health and other relevant ministries, UN agencies, NGOs, clinicians, epidemiologists, lab technicians, and representatives of the community
Alert and confirmation of the outbreak	
- Alert authorities if number of cases or deaths of acute simple or bloody diarrhoea are greater than expected for the location and season - In non-endemic regions and in refugee camps, alert authorities if a single strain of Sd1 is isolated - Investigate to confirm the diagnosis, identify the organism and test its antimicrobial susceptibility - Collect data from registers to assess the magnitude of the outbreak - Inform health authorities immediately	

Patient care

All patients considered to be infected with Sd1 should be treated as described in the section on Management of patients with bloody diarrhoea (page 11). During large outbreaks, temporary treatment centres may have to be created and additional staff recruited to cope with the influx of patients. In health facilities, methods of patient triage, ward organization, infection control, and patient monitoring must be reviewed and strictly implemented to prevent spread of the infection by the health services (see page 11).

Routine preventive measures

The preventive measures described above (see page 7) should be reviewed and reinforced during outbreaks. Additional measures may also be required.

Health education and community mobilization

Health education and community awareness should be reinforced. Community mobilization that involves local leaders should begin as soon as an outbreak is detected. Social mobilization teams can be used to cover the affected area, each team having at least one member from the community. Teams may also include paramedical staff, health educators, water and sanitation technicians and community health workers.

Team members should be trained in the delivery of simple health education messages about the safe use of water, personal hygiene (latrine use, hand-washing, food handling) and disinfection practices. Messages should also encourage all persons who develop bloody diarrhoea to report immediately to the nearest health facility. The teams may also help by ensuring safe practices at funerals and following the progress of patients treated at home.

Water

Ensure access to safe drinking water in sufficient quantity. Monitor the bacteriological quality of drinking water and reduce access to potentially contaminated water sources or protect them from contamination. If sufficient safe drinking-water cannot be obtained locally, drinking-water may be supplied by tankers or transported in drums and stored in bladders, provided it is adequately chlorinated and a regular supply can be ensured. The trucking of water is, however, expensive and difficult to sustain. It is usually considered a short-term measure until a local supply can be established. If the safety of drinking water is uncertain, it should be chlorinated in the home (see annex 9) or boiled. Heating water until it starts to boil vigorously is sufficient to kill *Shigella* and other bacterial pathogens.

A total of 20 litres of water (including drinking water) per person per day should be available. Water used for purposes other than drinking need not be disinfected and should be stored separately from drinking water (annex 7).

Latrines

Additional latrines may need to be built to ensure safe disposal of faeces. Some emergency situations may require building simple collective pit latrines or installing temporary latrines. In all cases, latrines must be kept clean. Daily disinfection of the floor of the latrines with a 0.2% chlorine solution is advised. If possible, hand-washing stations should be established near the latrines (annex 8).

Food safety and hand-washing

Procedures for safe handling and processing of food must be vigorously promoted. Families should have easy access to soap, and hand-washing must be encouraged. If necessary, soap distribution may be organized. As a measure to control flies, streets and public places, especially markets, should be regularly cleaned, and the waste collection system should be improved. In some instances, it may be necessary to close markets and to stop street sales of cooked foods (annex 9).

Specific preventive measures for epidemics

Additional prevention measures will help to reduce the transmission of *Shigella* and the spread of the outbreak.

Funerals

Funerals of persons who die with diarrhoea, whether bloody or not, should be held quickly and close to the place of death. Attendance at funerals should be limited to the minimum that is acceptable to the population. Strict measures of

hygiene and disinfection are essential. Procedures for safe handling of the body (annex 18) must be followed in health facilities and are strongly encouraged at home. The washing of dead bodies and the preparation and distribution of food during funerals should be discouraged. If washing must be done, it should be by designated persons who have been instructed in hygienic practices. Safe drinking water, and clean water and soap for hand-washing, should be available during the ceremony. Having a trained health worker at the funeral can help to ensure that these rules are followed.

Community gatherings and pilgrimages

During an epidemic it is best to discourage events that involve the gathering or movement of many people, such as fairs, pilgrimages or other cultural events. If these must take place, care should be taken to ensure access to sufficient quantities of safe drinking water and to provide for safe disposal of human waste. Water may be stored in tankers, drums or bladders and plastic glasses may be distributed for personal use. Temporary latrines that are cleaned and disinfected at least daily may also be required.

Epidemiological and laboratory surveillance

Epidemiological surveillance

After an outbreak has been detected, continued surveillance is required to monitor its progress so that appropriate control measures can be developed or revised. This may require that the existing surveillance system be strengthened.

Daily analysis of outbreak data is recommended at all levels of the surveillance system. Daily summaries should be prepared by local health authorities that include the number of cases and deaths due to bloody diarrhoea in patients less than five years, or five years and older, and their place of residence. This information should be forwarded daily to provincial authorities and from them to the national level. An example of a data collection form is given in the annex 19.

Laboratory surveillance

After Sd1 has been confirmed as the cause of an outbreak, there is no need to collect stool specimens from all cases. It is important, however, to monitor the antimicrobial susceptibility of Sd1 at regular intervals during the epidemic because resistance can develop very rapidly, even during the course of a single outbreak. An appropriate plan would be to collect and test stool specimens from 20 to 30 untreated patients every month. This procedure will also provide evidence during the outbreak as to whether Sd1 is still the predominant cause of episodes of dysentery.

Epidemiological and laboratory surveillance data should be shared regularly with national and international partners during meetings of the national coordinating committee, or by periodic epidemiological situation bulletins.

Ineffective control measures

Chemoprophylaxis

Giving an antimicrobial to individuals or to an entire community to prevent infection with Sd1 dysentery is never indicated. It is not effective, can hasten the emergence of resistant strains, and diverts attention and resources from other, more effective, control measures.

"Antidiarrhoeal" drugs

Intestinal motility inhibitors such as loperamide, diphenoxylate, and paregoric should never be used in the treatment of shigellosis. Their efficacy is doubtful and they may cause severe adverse effects.

Travel and trade restrictions

Restrictions on the movement of persons or goods by establishing a "cordon sanitaire", quarantine or embargo, are not recommended to prevent the spread of Sd1. This is because:

- persons with asymptomatic or mild infection cannot be detected; they may still travel, legally or illegally, and spread infection,
- imposing travel and trade restrictions diverts resources from other, more effective, control measures, and
- the prospect of having travel or trade restrictions imposed may be seen as a threat to the local economy and, thus, discourage reporting of information concerning the outbreak.

TABLE 10. Response to an Sd1 outbreak

Patient care	**Prevention measures**
- Treat all cases with an antimicrobial (ciprofloxacin) - Hospitalize at least severe cases and patients at increased risk of death - Hospitalize patients in specific wards - Organize specialized treatment centres if major influx of cases - Implement strictly infection control measures in health facilities - Re-examine outpatients after 48 hours of treatment - Provide other supportive care (rehydration, food, treatment of fever and pain, treatment of complications)	- Reinforce and/or adapt classical prevention measures - Provide water of good quality and in sufficient quantity - Intensify the construction of latrines - Ensure food safety and hand-washing with soap - Control funerals practices - Ensure access to safe-drinking water and the safe disposal of human waste for groups gathering for ceremonies
Community mobilization	**Ineffective control measures**
- Reinforce health education messages and community awareness - Organize intense community mobilization - Create multiple social mobilization teams - Deliver simple and targeted messages	- Chemoprophylaxis - “Antidiarrhoeal” drugs - Travel and trade restrictions
Surveillance	

Epidemiological surveillance:
- Case definition is “diarrhoea with visible blood in the stool”
- Create admission registers in hospitals
- Report cases and deaths per day of bloody diarrhoea in < 5 and > 5 years
	Laboratory surveillance:
	- Take specimens from 20 to 30 patients each month:
	  - To test antimicrobial susceptibility
	  - To check if Sd1 is still circulating

After an outbreak

Careful clinical surveillance should be continued to ensure that sporadic cases of shigellosis are promptly detected and treated. Efforts to improve personal and domestic hygiene, water supplies and sanitation to help prevent a recurrence of the epidemic should also be continued.

Routine laboratory examinations of food and water are not likely to be helpful. The experience gained during the epidemic should be used to strengthen activities to control all endemic acute diarrhoea, including shigellosis, and help prevent further epidemics.

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Template for Investigation Report

ANNEX 1

A brief report presenting the findings of the field investigation of an outbreak should be written and shared with partners without delay after the investigation has ended.

The report should include the following:

Introduction

- General context (social, political, climate, etc.)
- Accessibility of the area affected, including during the rainy season
- History of Sd1 outbreaks in the area affected, or in neighbouring regions

Investigation

- Objectives
- Field visits
- Interviews with health staff
- Review of health facility registers
- Patient examinations
- Collection of stool specimens from untreated cases
- Analysis of stool samples

Results

- Date of onset of the first case
- Number of cases
- Age and sex distribution of cases
- Number of deaths and case fatality rate
- Geographical distribution of cases
- Distribution of cases per day or per week since the beginning: epidemic curve
- Organism isolated and its antimicrobial susceptibility pattern
- Partners operating locally in the domain of water, sanitation and health care
- Human and material resources immediately available or that could be mobilized on short notice locally

Discussion

- Discuss the main findings and the limitations of the field investigation (areas not visited or partners not met due to lack of time, quality of the data collected, etc.).
- Discuss the risk of spread of the outbreak.
- Discuss the potential consequences of the outbreak.

Recommendations

- Give clear and practical recommendations regarding control measures to be undertaken.
- Provide advice on the need for additional resources (human, material, financial) to help control the outbreak.

Some International Reference Laboratories

ANNEX 2

The following laboratories have facilities for isolating and identifying *Shigella*. The centre should be consulted before samples or strains are sent.

WHO collaborating centre for research, training and control of diarrhoeal diseases.
International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B)
G.P.O. Box 128, Dhaka 1000
Dhaka 1212
Bangladesh
Phone: +(880-2) 8811751
Fax: +(880-2) 882 3116, 882 6050, 881 2530, 881 1568
Email: info@icddrb.org

WHO collaborating centre for diarrhoeal diseases research and training.
National Institute of Cholera and Enteric Diseases (NICED)
P-33, CIT Road Scheme XM
Beliaghata
P.O. Box 177
Kolkata 700 010
India
Phone: 350-1176, 3537519
Fax : 350-5066/353-2524
Email: niced@cal2.vsnl.net.in

Foodborne and Diarrhoeal Diseases Branch
Division of Bacterial and Mycotic Diseases
Centers for Disease Control and Prevention
1600 Clifton Road, MS A-38
Atlanta, GA 30333
USA
Phone: 1 404 639 3331
Fax: 1 404 639 3970

National Reference Centre for *Escherichia coli* and *Shigella*
Unité de Biodiversité des Bactéries Pathogènes Émergentes
Institut Pasteur
28, rue du Docteur Roux
75724 Paris Cedex 15
France
Tel : 33 1 45 68 87 39
Fax : 33 (1) 45 68 88 37
Email: colishig@pasteur.fr

National Microbiology Laboratory Public Health Agency of Canada
Bacteriology and Enteric Diseases Program
1015 Arlington Street
Winnipeg, Manitoba,
Canada R3E 3R2
Tel: 204-789-2131
Fax: 204-789-2142
Email: lai_king_ng@phac-aspc.gc.ca

Specimen Collection and Transport Methods

ANNEX 3

Specimens that cannot be cultured within two hours of collection should be placed in transport medium and refrigerated immediately. Unlike some organisms, *Shigella* will die, even in transport media, if they are not refrigerated.

Selection of transport media

The most reliable, currently available transport medium is Cary-Blair. This is a semi-solid medium useful for the preservation and transport of specimens for *Shigella*, as well as *Escherichia coli*, *Salmonella*, *Vibrio cholerae*, *Vibrio para-haemolyticus*, and *Yersinia enterocolitica*. It is stable when stored in tightly sealed containers. It can be kept at room temperature for 18 months or longer under proper conditions of storage, provided there is no loss of volume and no evidence of contamination or colour change. Other transport media that are similar to Cary-Blair are Amies and Stuart transport media.

Selection of cases for bacteriologic sampling

When an outbreak of dysentery occurs, laboratory analysis of a small number of adequately collected clinical specimens is sufficient to provide the diagnosis. The key is to collect the specimens properly and to transport them rapidly to a fully equipped clinical laboratory. This permits rapid diagnosis of outbreaks at low cost. 10-20 cases should be selected for sampling at each investigation site. Cases should meet all of the following criteria:

- currently having bloody diarrhoea
- onset of illness less than four days before sampling
- have not received antibiotic treatment for this illness
- consent to give a specimen

Collection of specimens

Collect a fresh stool including portions with blood and/or mucus. Place stool in a leak proof sterile screw capped container. Do not let stool dry out.

If specimen cannot reach the laboratory within two hours, place it in Cary-Blair transport medium.

If patient is not able to pass stool, collect a sample with a sterile rectal swab. Place the swab in Cary-Blair transport medium and seal the tube so it cannot leak.

Safely dispose of all contaminated materials.

Labelling of specimens

Use the attached Stool Specimen Data Sheet to record information on each case. Assign sample identification numbers to collected specimens in consecutive order to match entries on the data sheet.

Always include the sample identification number on the specimen container. Write the identification number on the frosted portion of the specimen tube using an indelible marker pen. If no frosted area is present, apply a piece of first aid tape to the container and write the number on it.

Transport of specimens

Specimens must be refrigerated after collection until they reach the laboratory. If the specimens will arrive at the laboratory within two days, they can be refrigerated at 4°C. If the laboratory is nearby, specimens may be hand carried in an insulated box with ice packs. *Shigella* and other pathogens can still be recovered from refrigerated samples up to seven days after collection, although the yield decreases after the first two days. Refrigeration during transport can be achieved for up to 36 hours by shipping in a well insulated box with frozen refrigerant packs or wet ice.

If it is not possible for specimens to reach a laboratory within two days, they can be frozen, although this will decrease the number of organisms present and the likelihood of isolating the pathogen. They should be frozen as soon as possible after collection and held at –20°C. Freezing at conventional freezer temperatures (-5° to 0°C) is not acceptable, as it allows thawing and refreezing, which will quickly reduce the number of organisms present. Frozen specimens should be shipped with dry ice, observing the following precautions:

- Protect the specimens from direct contact with dry ice, as intense cold can crack the glass tubes.
- Protect the specimens from carbon dioxide by sealing the screw caps with electrical tape or by sealing the tubes in a plastic bag.
- Ensure that the container is at least one-third full of dry ice. If specimens are shipped by air and more than 2 kg of dry ice is used, special arrangements may be necessary with the air carrier.

The shipping arrangements should be determined before specimens are collected. Within-country shipping may be by ground or by air. To ship longer distances (e.g. to a reference laboratory or WHO Collaborating Centre), overnight express airmail is ideal. As wet ice in the box will not last more than 36 hours, advance arrangements should be made for immediate pickup at the receiving airport. When shipped, include in the package a stool specimen data sheet and communicate the following information immediately to the receiving laboratory: the air bill number, the flight number, and the times and dates of departure and arrival of the flight. Address the package clearly, including the name and telephone number of the receiving laboratory. Write in large letters: EMERGENCY MEDICAL SPECIMENS; CALL ADDRESSEE ON ARRIVAL; HOLD REFRIGERATED.

Contents of transport kit

- Reinforced cooler suitable for shipping
- 120 tubes of Cary-Blair transport medium
- 250 sterile rectal swabs
- 1-3 freezable cool-packs
- 1 indelible laboratory marker
- 1 roll of first aid tape (for labelling tubes)
- 12 stool specimen data sheets

STOOL SPECIMEN DATA SHEET

Country: _____ Province: _____
Area/Zone: _____ Village/Town: _____

No.	Date of collection	Name	Age (yr)	Sex (M/F)	Bloody stool (Yes/No)	Taken antibiotics (Yes/No)*
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

* If antibiotics were taken, list type of antibiotic, dose and number of days taken

Collected by: Name _____
Title _____

Transmit results to: Name _____
Address _____
Phone/Fax/Telex _____

Laboratory Identification of *Shigella*

ANNEX 4

Enrichment

No enrichment medium is suitable for *Shigella.*

Direct inoculation of agar plates

Inoculate a general purpose plating medium of low selectivity and one of moderate or high selectivity. MacConkey agar is recommended as a medium of low selectivity. MacConkey agar with 1 microg/ml of potassium tellurite has been reported to be particularly useful for *S. dysenteriae* type 1. Xylose-lysine-desoxycholate (XLD) agar is recommended as a medium of moderate or high selectivity for isolation of *Shigella*. Desoxycholate citrate agar (DCA) is a suitable alternative.

Use a moderate inoculum (two or three loopfuls of faecal suspension). Incubate plates at 35-37°C for 18-24 hours.

Do not use salmonella-shigella (SS) agar, as it often inhibits growth of Sd1.

Each new batch of medium should be controlled for quality before routine use by inoculating it with known reference strains and observing their growth and colony characteristics.

Identification of colonies on plating media

Colonies suspicious for *Shigella* will appear as follows:

MacConkey agar:	convex, colourless, 2-3 mm
XLD agar :	red, smooth, 1-2 mm
DCA agar :	colourless, translucent, 2-3 mm

Mark the bottom of the Petri plate to identify well-separated colonies of typical appearance that will be transferred from each of the plating media for further testing.

Whenever possible a person experienced with the identification of *Shigella* should train laboratory workers who are not familiar with its identification.

Inoculation of Kligler iron agar (KIA)

Pick three characteristic colonies from the plating media and inoculate into KIA as follows: stab the butt and then streak the slant with a zig-zag configuration. Pay attention to proper labelling of the tubes. If screw-cap KIA tubes are used, make sure that the caps are loose. Incubate at 37°C overnight. On the following morning, examine the reactions in the KIA tubes. Tubes suspicious for *Shigella* will have an acid (yellow) butt and an alkaline (red) slant. They will not produce gas (no bubbles

or cracks in the agar) and will not produce hydrogen sulfide (no black along the stab line).

Triple sugar iron agar (TSI) can also be used for the identification of *Shigella.* It will give the same reactions as KIA.

Serological tests of cultures suspected of being *Shigella*

Agglutination tests are carried out on a clean glass slide. Use a straight wire to remove a portion of the growth from the surface of the KIA slant and emulsify in a 3 mm loopful of physiological saline. Mix thoroughly by tilting back and forth for about 30 seconds and then examine carefully to ensure that the suspension is smooth and does not show clumping due to auto-agglutination. If clumping occurs, the culture is rough and cannot be serotyped. If the suspension is smooth (turbid and free-flowing), add one loopful of antiserum, mix well using the loop, and observe for agglutination over a period of 60 seconds against a dark background. If the reaction is positive, clumping will appear within 30 seconds to one minute. Interpret the agglutination tests as shown below:

If agglutination occurs with *group A*, report:	*Shigella dysenteriae*
Test with *S. dysenteriae* type 1 antiserum. If positive, report:	*S. dysenteriae* type 1
If agglutination occurs with *group B*, report:	*Shigella flexneri*
If agglutination occurs with *group C*, report:	*Shigella boydii*
If agglutination occurs with *group D*, report:	*Shigella sonnei*

Antimicrobial Susceptibility Testing of *Shigella*

ANNEX 5

Procedure for the disc diffusion test

Media: Use one of the media recommended by the manufacturer of the discs. If these media are not easily obtainable, one of the commercially available media (e.g. Mueller-Hinton medium, DST agar, Sensitest agar, Iso-sensitest agar, Wellcotest, Sulphonamide-Antagonist-Free medium) may be tested to see whether there are major differences in the inhibition zones as compared with the recommended media. This will allow inhibition zones to be interpreted using guidelines recommended by the manufacturer.

Quality control – size of inhibition zones for control strains

Antimicrobial	Disc potency (µg)	Zone diameter of inhibition (mm) *S. aureus* (ATCC 25923)	*E. coli* (ATCC 25922)
Ceftriaxone	30	22-28	29-35
Fluoroquinolone (Ciprofloxacin)	5	22-30	30-40
Azithromycin	15	21-26	none
Pivmecillinam (Mecillinam)	10	none	23-29 24-30

The medium should be poured into Petri dishes with an agar depth of 4 mm or more (25 ml in a 9 cm plate). Dry the plates before use. Store unused plates for not more than two weeks in the refrigerator, preferably in a sealed plastic bag. Take care that they do not become too dry.

Nutrient broth: Any nutrient broth that is available in the laboratory can be used, e.g. trypticase soy broth (for preparation, see below.) The broth should be distributed in 3-5 ml quantities and sterilized by autoclaving.

Inoculum for the indirect susceptibility test

The indirect susceptibility test should be used for faecal bacteria. This requires that *Shigella* are inoculated from a pure culture. For most disc methods semi-confluent growth is recommended, and it is essential to use a standardized inoculum

in order to perform a reliable susceptibility test. Use the inoculation method recommended by the manufacturer of the discs or tablets you are using. One of the following is usually recommended:

Kirby-Bauer inoculum:

- Make a turbidity standard by adding 0.5 ml of 1.175% (w/v) barium chloride dihydrate ($BaCl_2.2H_2O$) solution to 99.5 ml of 1% sulphuric acid. The turbidity standard solution should be placed in a tube identical to the one used for the broth sample. It can be stored in the dark at room temperature (22-25°C) for six months, provided it is sealed to prevent evaporation.
- Touch 5-10 colonies of similar appearance with a loop and transfer to a tube of broth, or transfer a loopful of confluent growth of a pure culture to a tube of broth.
- After incubation at 35°C for four to six hours, compare the broth culture with the turbidity standard. This comparison can be made more easily if the tubes are viewed against a background of white paper with print of various sizes on it. Adjust by diluting the broth culture with sterile broth or saline.
- Inoculate the plates by dipping a sterile cotton swab into the inoculum. Remove excess inoculum by pressing and rotating the swab firmly against the side of the tube above the level of the liquid. Streak the swab over the entire surface of the medium three times, rotating the plate through an angle of 60° after each application. Finally, apply the swab all round the edge of the agar surface. Leave the inoculum to dry for a few minutes at room temperature with the lid closed.

This method of inoculation should give nearly confluent growth.

Inoculum according to bacterial species:

- If broth is used, overnight cultures of entero-bacteria should be diluted about 10^{-4} (1:10000).
- When plates are used, prepare the suspension as follows: dip a 0.01-ml loop into five colonies, transfer to 1 ml saline, dip another 0.01-ml loop in this suspension, transfer to 1 ml saline, and finally dip a third 0.01-ml loop in this suspension and transfer to 5 ml saline. Mix the suspension well. Flood the plates.

This method of inoculation should give semi-confluent growth.

Choice of antimicrobial

For *Shigella*, the most appropriate antimicrobials are: ciprofloxacin (or another fluoroquinolone), pivmecillinam, ceftriaxone and azithromycin.

Procedure for use of antimicrobial discs

Any commercially available discs or tablets with the proper potency can be used. The disc potency recommended in WHO guidelines is shown in the table on the previous page. Avoid using discs with different potencies, as these can give misleading results.

Storage: Stocks of antimicrobial discs should preferably be kept at –20°C. The freezer compartment of a home refrigerator is convenient. A small working supply of discs can be kept in the refrigerator at 4°C for up to one month. On removal from the refrigerator, the containers should be left unopened at room temperature for about one hour. If a disc-dispensing apparatus is used, it should have a tight-fitting cover and be stored in the refrigerator. It should also be allowed to warm to room temperature before opening. Antimicrobial tablets (except carbenicillin) are stable for at least four years at room temperature.

Application of antimicrobials: The antimicrobial discs or tablets may be placed on the inoculated plates in zones properly divided and marked on the back of the plate, using either a pair of sterile forceps, an antimicrobial disc dispenser, or a sterile needle tip.

Not more than seven discs (one in the centre, six 15 mm from the edge of the plate) should be placed on a plate.

Incubation: The plates should be placed in an incubator at 35°C within 30 minutes of their preparation. Do not incubate in an atmosphere of carbon dioxide.

Measurement of inhibition zones

After overnight incubation the diameter of each inhibition zone (including the diameter of the disc) is measured and recorded in mm. The measurements can be made with a ruler on the under-surface of the plate without opening the lid. If the medium is opaque, the zone can be measured by means of a pair of calipers.

The end-point of inhibition is judged by the naked eye at the edge of the clear zone where growth starts. With sulfonamides and sulfamethoxazole-trimethoprim, however, slight growth occurs within the inhibition zone; such growth should be ignored.

Interpretation of zone sizes

The result of the susceptibility test, as reported to the clinician, classifies the microorganism in one of three categories:

- Susceptible (S): A microbe is classified as "susceptible" to a drug when the infection caused by it is likely to respond to treatment with this drug, at the usual dosage.
- Intermediate (I): The susceptibility of an organism is classified as "intermediate" when the infection is likely to respond to unusually high doses of the drug, or when the organism is located in a part of the body where the drug is concentrated (urine, bile, intestinal lumen, local application). The intermediate classification also acts as a *buffer zone* between 'susceptible' and 'resistant' and compensates for small technical differences in the performance of the procedure.
- Resistant (R): This classification implies that the infection is not likely to respond to the antimicrobial, irrespective of the dosage or of the location of the infection.

Standard method: This is performed with as high a degree of standardization as possible (medium, inoculum, etc.). This implies that for each antimicrobial one inhibition zone always corresponds to one MIC-value. Moreover, by means of a regression line and fixed MIC-breakpoints between S, I, and R, it is possible to translate the inhibition zone of the organism tested into S, I, or R according to the recommendations of the manufacturer.

Day-to-day controls

All susceptibility tests are very sensitive to small variations in media, inoculum, incubation, temperature, etc. In order to perform a reliable test it is of the utmost importance to include control strains in the test every day.

The following control strains should be included daily: *Staphylococcus aureus* (ATCC 25923) and *E. coli* (ATCC 25922).

These control strains can be obtained from the American Type Culture Collection[1] or other national culture collections. They are provided in the form of pellets of desiccated pure cultures. Cultures for day-to-day use should be grown on slants of nutrient agar (trypticase soy agar is convenient) and stored in the refrigerator. They should be sub-cultured onto fresh slants every two weeks. The control strains are treated, and the inhibition zones are recorded, exactly as are the other pure cultures investigated by the susceptibility test.

When the procedure is correctly performed, the zone sizes shown by the control organisms should fall within the range of diameters given in the above table. The limits that can be tolerated in the test have been determined in a collaborative study involving a large number of reputable laboratories, and reflect the degree of accuracy than can be routinely obtained by a good clinical laboratory. When results fall regularly outside this range, they should be regarded as evidence that one or more technical errors have been introduced into the test or that the reagents are at fault. Each reagent, and each step in the test, must be investigated until the cause of the error has been eliminated and appropriate results are consistently obtained.

Grossly aberrant results that cannot be explained by technical errors in the procedure may indicate contamination or sudden changes in the susceptibility or growth characteristics of the control strain. If this occurs, a fresh control strain should be obtained from a reliable source.

[1] Major collections of type cultures:

1. American Type Culture Collection (ATCC), 12301 Parkland Drive, Rockville, MD 20852, USA
2. National Collection of Type Cultures (NCTC), Central Public Health Laboratory, Colindale Avenue, London NW9 5HT, United Kingdom

Health Education Messages

ANNEX 6

PERSONAL HYGIENE

Wash your hands

- Wash your hands with soap, ashes or lime:
  - Before you prepare or serve food.
  - Before you eat or feed your children.
  - After you use the toilet or latrine, or clean up your children.
- Use plenty of clean water.
- Wash all parts of your hands - front, back, between the fingers, under the nails.

- Use a toilet or latrine. If you don't have one - build one.
- Keep the toilet or latrine clean.
- Dispose of babies' faeces in the toilet or latrine (or bury them).

FOOD

Cook it, peel it or leave it

- Cook raw food thoroughly.
- Eat cooked foods immediately, while they are still hot.
- Store cooked food carefully in a refrigerator.
- Reheat cooked food thoroughly.
- Avoid contact between raw and cooked food.
- Eat raw fruits only when they have been freshly peeled, such as oranges and bananas.
- Wash your dishes and utensils with soap and water.
- Wash your cutting board especially well with soap and water.

DRINKING-WATER

Boil or chlorinate your drinking water

- Boil, or add chlorine to, the water before drinking.
- Store drinking water in a clean container with a small opening or a cover.
- Use it within 24 hours.
- Pour the water from the container - do not dip a cup into the container.

SOURCES OF DRINKING-WATER

- Do not defecate in or near a source of drinking water.
- Do not wash yourself, your clothes or your pots and utensils in the source of drinking water.
- Cover open wells when not in use.
- Hang up the buckets used to collect water when not in use - do not leave them on a dirty surface.

Making Water Safe for Drinking

ANNEX 7

Even if it looks clean, water can contain dysentery germs.

Water for drinking can be made safe in two ways:

- Boil it to kill dysentery germs.
- Chlorinate it.

To make water safe for drinking by chlorination, prepare a **stock solution** of chlorine (at 1% concentration by weight of available chlorine). For this purpose, add to 1 litre of water:

- 15 grams of calcium hypochlorite (70%)

or

- 33 grams of chlorinated lime at 30% active chlorine ("bleaching powder")

or

- 250 ml of sodium hypochlorite (5%)

or

- 110 ml of sodium hypochlorite (10%)

If products with these concentrations of chlorine are not available, adjust the amount used according to the available concentrations.

Store the stock solution in a cool place in a closed container that does not admit light. The stock solution must be used no later than one month after it is made.

Use the stock solution to make water safe
by adding three drops (or 0.6 ml) of the stock solution to each litre of water.

Mix well and allow the chlorinated water to stand for at least 30 minutes before using it. The residual chlorine level after 30 minutes should be between 0.2 and 0.5 mg/litre.

If the water is turbid (not clear, with a lot of suspended solid matter):

- filter it before chlorination,

or

- bring it to a boil, instead of treating it by chlorination.

Recommended free chlorine levels in water distribution systems in areas affected by epidemic dysentery

The minimum levels of free residual chlorine necessary for safe water are:

- at all points in a piped water system — 0.2 - 0.5 mg/litre
- at stand-posts and wells — 1.0 mg/litre
- in tanker trucks, at filling — 1.5 mg/litre

Regular monitoring is required to ensure that these minimum levels of chlorine are maintained.

Building a VIP Latrine

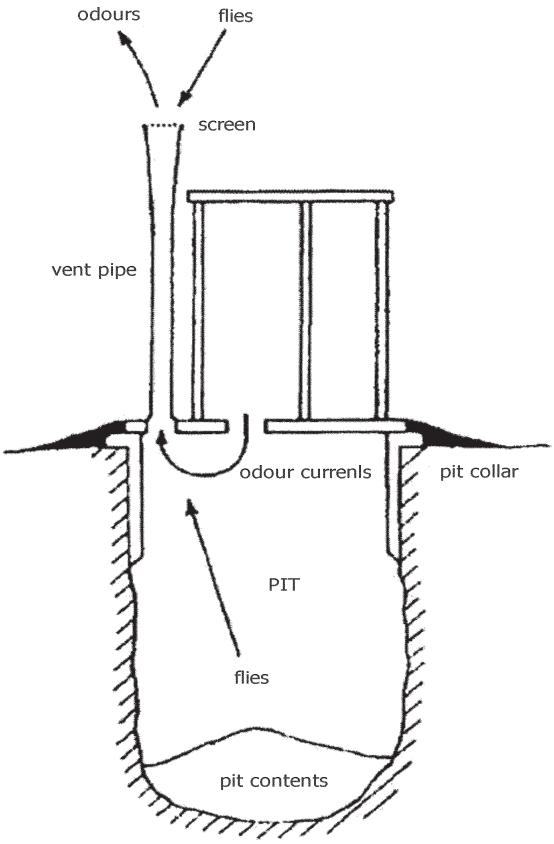
ANNEX 8

A *ventilated improved pit latrine* is a practical means of disposing of human excreta and may be a good solution for use in rural areas.

The latrine must be constructed at least 30 metres from wells or other sources of drinking-water and, where possible, at least six metres from houses. It should not be located uphill from a water source or dug in marshy soil.

A latrine pit 2 m deep with an opening 1 m x 1 m can be used by a family of five for two to four years. (This assumes an accumulation rate of between 60 and 100 litres per person per year). To keep bad odours and flies to a minimum, ventilation is provided by an external vertical vent (diameter of about 150 mm), topped by a fly screen. The edges of the pit should be raised above ground level to prevent rain or other water from draining into it. The latrine should have a concrete or wooden slab that reaches the walls of the superstructure. Where possible, concrete reinforced with 3 mm wire laid 100 mm apart in a grid formation should be used because of its durability and resistance. The slab should have a second hole behind the defecation hole with a diameter of about 225 mm to fix the ventilation pipe. Construct a superstructure of brick, stone, wood, plastic sheeting etc, but preferably using local materials. Little or no light should enter the pit from the superstructure so that when flies leave the pit they are attracted to the light coming from the ventilation pipe and not that coming from inside the superstructure. Do not use a cover on the defecation hole, as this prevents the circulation of air. Fit a roof to the superstructure with the slope carrying rainwater towards the back. The ventilation pipe should extend 50 cm above the highest part of the roof.

The slabs and floor should be washed daily and disinfected regularly with cresol or bleaching powder. After the pit is loaded to two-thirds of its capacity (1.3 metres height), it should be filled with soil and compacted, and a new pit should be dug.



Source: Fact Sheets on Environmental Sanitation. Cholera and other Epidemic Diarrhoeal Diseases Control. Geneva, 1996. WHO/EOS/96.4

Rules for Safe Preparation of Food

ANNEX 9

1. Keep hands and cooking surfaces clean

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

2. Separate raw and cooked food

- 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.

3. Cook food thoroughly

- 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.
- Reheat cooked food thoroughly.

4. Keep food stored at safe temperatures

- Do not leave cooked food at room temperature more than two hours.
- Refrigerate promptly all cooked and perishable food (preferably below 5°C).
- Keep cooked food piping hot (more than 60°C) until it is served.
- Do not store food too long even in the refrigerator.
- Do not thaw frozen food at room temperature.

5. Use water and raw ingredients that are safe

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

Source: Five keys to safer food. Food safety. WHO/SDE/PHE/FOS/01.1

Treatment Regimens for Ciprofloxacin and Zinc

ANNEX 10

Ciprofloxacin	Children			Adults
	15 mg / kg, twice a day for 3 days			500 mg, twice a day for 3 days
	< 1 year	1 – 4 years	5 - 15 years	
Tablets 500mg	¼ tablet 2 times a day for 3 days	½ tablet 2 times a day for 3 days	1 tablet 2 times a day for 3 days	1 tablet 2 times a day for 3 days
Tablets 250mg	½ tablet 2 times a day for 3 days	1 tablet 2 times a day for 3 days	2 tablets 2 times a day for 3 days	2 tablets 2 times a day for 3 days

Zinc	< 6 months of age	> 6 months of age
	10 mg / day, 14 days	20 mg / day, 14 days
Tablets 20mg	½ tablet per day for 14 days	1 tablet per day for 14 days

Classification and Treatment of Dehydration

ANNEX 11

If the patient has the following signs:	If the patient has two or more of the following signs:	If the patient has two or more of the following signs:
Well, alert Normal eyes Drinks normally, not thirsty Skin pinch[c] goes back quickly	Restless, irritable Sunken[b] eyes Thirsty, drinks eagerly Skin pinch[c] goes back slowly	Lethargic[a] or unconscious Sunken[b] eyes Drinks poorly, or not able to drink Skin pinch[c] goes back very slowly
No signs of dehydration	Some dehydration	Some dehydration

Treat the dehydration - Monitor frequently the hydration status

Treatment plan A	Treatment plan B	Treatment plan C
Give ORS solution	Give ORS solution	Give IV fluids (Ringer lactate)
After each stool:	In the first 4 hours:	Children < 1 year: 100 ml/kg in 6 hours Start rapidly: 30 ml/kg within the first hour and then slow down
< 24 months: 50-100 ml (1/4-1/2 cup)	< 4 months, < 5 kg: 200-400 ml	Children > 1 year and adults: 100 ml/kg in 3 hours Start rapidly: 30 ml/kg within the first 30 min and then slow down
between 2 and 9 years: 100-200 ml (1/2-1 cup)	4-11 months, 5-7.9 kg: 400-600 ml	
> 10 years: as much as wanted	12-23 months, 8-10.9 kg: 600-800 ml	
	2-4 years, 11-15.9 kg: 800-1200 ml	
	5-14 years, 16-29.9 kg: 1200-2200 ml	
	> 15 years, > 30 kg: 2200-4000 ml	

[a] Being lethargic and sleepy are *not* the same. A lethargic child is not simply asleep: the child's mental state is dull and the child cannot be fully awakened; the child may appear to be drifting into unconsciousness.

[b] In some infants and children the eyes normally appear somewhat sunken. It is helpful to ask the mother if the child's eyes are normal or more sunken than usual.

[c] The skin pinch is less useful in infants or children with marasmus or kwashiorkor, or obese children.

Preparation of Home Made Oral Rehydration Solution

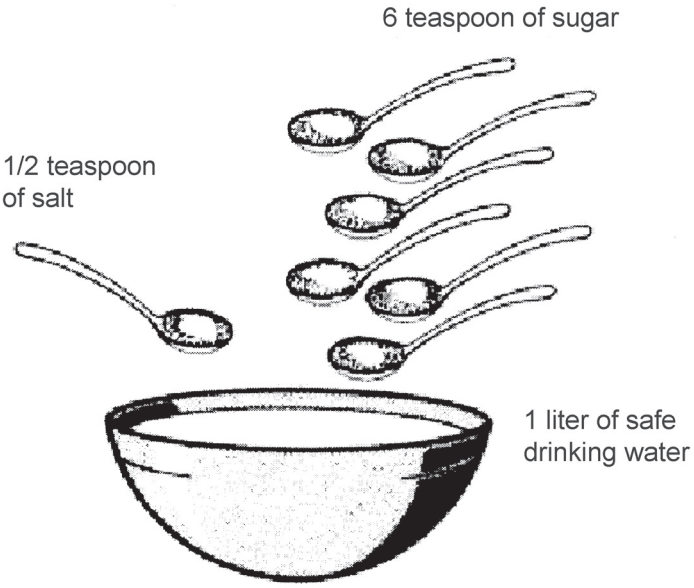
ANNEX 12

Ingredients:

- Half a teaspoon of salt (2.5 grams)
- Six level teaspoons of sugar (30 grams)
- One litre of safe drinking water

Preparation Method:

- Stir the mixture until the salt and sugar dissolve



Feeding Practices During and After Diarrhoea

ANNEX 13

General guidelines

Encourage the child to eat during the entire illness

During and after illness, feed the child as follows:

Up to age 6 months

- Breastfeed as often as the child wants, day and night.
- For children taking other milk, give appropriate milk as often as the child wants by cup. Increase the breastfeed while gradually reducing the other milk over several days. Give the additional milk by cup, not by bottle
- If the child is fed on other milk alone, give this as often as the child wants by cup, not by bottle.

6 months up to 12 months

- Breastfeed as often as the child wants.
- Give foods three times a day if breastfed or five times a day if not breastfed

12 months up to 2 years

- Breastfeed as often as the child wants
- Give food five times a day

Above 2 years

- Give family foods: three meals + two additional feeds.

Preparation of Disinfecting Solutions

ANNEX 14

	TO MAKE:		
Starting with:	**Solution at 0.05%**	**Solution at 0.2%**	**Solution at 2%**
Calcium hypochlorite at 70% active chlorine (“HTH”, “high-test hypo-chlorite”)	7g or ½ tablespoon in 10 litres of water	30g or 2 tablespoons in 10 litres of water	30g or 2 tablespoons in 1 litre of water
Chlorinated lime at 30% active chlorine (“bleaching powder”)	16g or 1 tablespoon in 10 litres of water	66g or 4 tablespoons in 10 litres of water	66g or 4 tablespoons in 1 litre of water
Sodium hypochlorite solution at 5% active chlorine (“household bleach”)	100ml or 7 tablespoons in 10 litres of water	450ml or 30 tablespoons in 10 litres of water	450ml or 30 tablespoons in 1 litre of water
Use for disinfection of:	Hands Skin Clothes	Floor Utensils Beds Personal belongings	Excreta Corpses

Measurements used: 1 tablespoon = 15 ml

Check List for Epidemic Control

ANNEX 15

Confirming an Outbreak Of Sd1	
	Checked / Notes
Suspect an outbreak of shigellosis when:	
■ Number of cases or deaths of acute simple or bloody diarrhoea is greater than expected, given the place and the period.	
■ Laboratories report an increase in number of stool specimens submitted or in the proportion of stool specimens with blood.	
■ In non-endemic regions and in refugee camps, isolation of a single strain of Sd1.	
Field investigation:	
■ Confirm the diagnosis:	
- Collect stool specimens.	
- Process specimens within two hours or use transport medium (at +4°C).	
- Identify the causative organism and determine its antimicrobial susceptibility.	
■ Most of the organisms identified must be Sd1.	
■ If Sd1 is not identified, culture stool specimens for entero-haemorrhagic *E. coli* O157:H7.	
When an outbreak of shigellosis due to Sd1 is confirmed:	
■ Inform local, provincial and national health authorities.	
■ Write a brief report (number of cases, ages, date of onset of the outbreak, location(s), organism isolated and its antimicrobial susceptibility pattern).	
■ Inform neighbouring countries and local WHO office.	

Control Measures	
	Checked / Notes
National and local coordinating committees for outbreak management:	
■ To be re-activated without delay (or created if one does not exist)	
■ Daily meetings during the outbreak	
■ At least at local level	
■ Members: representatives from the Ministry of Health and other relevant ministries (water and sanitation, education, information, home affairs / police, transportation, etc.), from UN agencies (WHO, UNHCR, UNICEF), from NGOs, as well as clinicians, epidemiologists, lab technicians and representatives of the community	
■ Plan and coordinate the response to outbreaks: monitor the epidemiological situation, procure supplies and equipment from external agencies; ensure that all drugs and materials are appropriate and correspond to the needs; organize training sessions.	
■ Share information on the epidemiological situation and availability of supplies with all partners.	
Reinforce usual preventive measures:	
■ Water:	
- Ensure at least 20 litres per person per day of safe drinking water.	
- Organize delivery by truck if no other source of supply is possible.	
- Monitor the bacteriological quality of drinking water.	
- Reduce access to potentially contaminated water sources or protect sources from contamination.	
- Chlorinate or boil drinking water at home if its safety is uncertain.	
- Store drinking water at home in a separate sealed or covered container.	
■ Latrines:	
- Intensify and assist latrine construction activities.	
- In some emergency situations, build collective and/or temporary latrines.	
- Disinfect daily soil of existing or new structures with a 0.2% chlorine solution.	

Control Measures (continued)	
	Checked / Notes
■ Food:	
- Ensure that food handling and processing procedures are safe.	
- Ensure that all families have easy access to soap or organize soap distribution.	
- Reinforce measures of cleaning of streets and public places.	
- Reinforce the system of waste collection.	
- If safe food handling and processing in markets cannot be ensured, close markets and stop street sales of cooked food products.	
Additional prevention measures:	
■ Funerals:	
- Implement strict hygiene and disinfection measures during all funeral procedures.	
- Discourage the washing of dead bodies and the preparation and distribution of food during funerals. If this must be done, ensure trained persons are in charge.	
- Reduce funeral gatherings to the minimum size acceptable.	
- Make safe drinking water, and clean water and soap for hand-washing, available for the ceremony.	
■ Gatherings:	
- Ensure access to sufficient quantities of chlorinated water.	
- Ensure safe disposal of human waste.	
- Disinfect latrines regularly.	
Health education and community mobilization:	
- Reinforce health education messages and community awareness of safe practices.	
- Ensure intense community mobilization that involves key members of the community.	
- Create multiple social mobilization teams: organize briefing / training of team members.	
- Deliver simple health education messages that are targeted to the appropriate audience.	
- Focus on the use safe of water, personal hygiene (latrines, hand-washing, food handling) and disinfection practices.	
- Encourage all persons who develop bloody diarrhoea to seek treatment promptly at the nearest health facility.	

Control Measures (continued)	
	Checked / Notes
Epidemiological and laboratory surveillance:	
■ Epidemiological surveillance:	
- Use the standard case definition of dysentery: diarrhoea with visible blood in the stool.	
- Report aggregated figures daily: number of cases and deaths from dysentery in under five years and five years and older age groups and their place of origin.	
- Analyze daily the epidemiological data at all levels of the surveillance system.	
■ Laboratory surveillance:	
- There is no need to take stool specimens from all cases after Sd1 has been identified as the cause of the outbreak.	
- Take specimens every month from 20 to 30 patients to monitor Sd1 circulation and changes in antimicrobial susceptibility patterns of Sd1.	
- Share surveillance data regularly with all national and international partners.	
Ineffective control measures:	
■ Mass or individual chemoprophylaxis	
■ "Antidiarrhoeal" drugs	
■ Travel and/or trade restrictions (Cordon sanitaire)	

Patient Care	
	Checked / Notes
General measures:	
■ Consider all patients presenting with diarrhoea with visible blood in the stool to be infected with Sd1.	
■ Treat all cases promptly with an effective antimicrobial.	
■ Hospitalize in a separate treatment area at least severe cases and patients at increased risk of death (infants, children who are not breastfed, malnourished children and adults, adults 50 years of age and older, any patient with dehydration, unconsciousness, hypo or hyperthermia, or a history of convulsion when first seen).	
■ Review patients treated at home after 48 hours.	
Patient isolation - infection control:	
■ Separate dysentery patients from other patients.	
■ Set up specific locations ("diarrhoea wards" or "diarrhoea corners") within health facilities.	
■ Use admission registers to record for each patient: name, age, gender, address, date of onset of symptoms, date of admission, clinical diagnosis, laboratory diagnosis, treatment given, date of discharge and outcome.	
■ Restrict and control movements into and within the treatment area.	
■ Enforce isolation, hygiene and disinfection measures within the wards:	
- Provide plenty of water and soap for hand-washing.	
- Wash hands with soap or chlorine solution before and after examining each patient.	
- Ensure that those caring for patients do not prepare or serve food.	
- Ensure that only one relative attends each patient.	
- Dispose of stools of patients in a designated, regularly disinfected, latrine.	
- Wash and disinfect the clothes and bed linen of dysentery patients frequently and separately.	

Patient Care (continued)	
	Checked / Notes
Antimicrobials - rehydration - supportive care (feeding):	
■ Antimicrobials:	
- Use an antimicrobial to which local Sd1 are sensitive, usually a fluoroquinolone (ciprofloxacin, norfloxacin, enoxacin), otherwise pivmecillinam, azithromycin or ceftriaxone.	
- If the supply of antimicrobials is insufficient to treat all patients:	
- Take measures urgently to obtain a sufficient supply. - Reserve the available supply for inpatient treatment of severe cases and for patients at high-risk of death.	
■ Rehydration:	
- Assess regularly the patient's state of hydration.	
- If available, prepare oral rehydration solution using ORS packets.	
- In case ORS packets are not available, use a home made oral rehydration solution or at least rice water, green coconut water or even plain water.	
- Use Ringer's lactate solution as the preferred fluid for intravenous rehydration (normal saline solution may be used but not glucose solution).	
- If intravenous rehydration is used, give ORS solution as soon as the patient can drink.	
■ Feeding:	
- Provide zinc supplementation	
- Ensure provision of food for all patients.	
- Give frequent small meals with familiar foods, rich in energy and protein.	
- Continue breastfeeding in infants and young children.	
- Give children convalescing from dysentery an extra meal each day for at least two weeks.	
- Monitor nutritional status of malnourished children after discharge until consistent weight gain is established.	

List of Supplies Needed for the Management of 100 Patients

ANNEX 16

Rehydration supplies	
ORS packets (1 litre size)	200
Ringer's lactate bags, 1 litre, with giving sets	20
Scalp vein sets	5
Adults IV giving sets	10
Antibiotics	
Ciprofloxacin, 500mg[1]	600
Other treatment supplies	
Zinc tablets (20 mg)	1400
Large water dispenser with tap (marked at 5-10 litres)	1
1 litre bottles for ORS solution	5
0.5 litre bottles for ORS solution	5
Tumblers, 200 ml	10
Teaspoons	5
Cotton wool, kg	5
Adhesive tape, reels	3
Hand soap, kg	20
Bars of soap for washing clothes	100
1-litre bottle of cleaning solution (2% chlorine or 1-2% phenol)	2

Assumptions:

- All patients are treated for three days with ciprofloxacin
- All patients are treated with zinc for 10 to 14 days
- 20% of cases are children under five years old
- 20% of cases will have dehydration requiring ORS
- 10% of cases will have dehydration requiring IV fluids
- Each person (patients and care givers) will be given 200 grams of soap
- Each family will be given a bar of soap for washing clothes and bed linens of the ill person

[1] Unless there is evidence that another antimicrobial would be more effective. In that case ensure sufficient supply to treat 100 patients for the recommended duration of therapy.

List of Supplies for Laboratory Identification of Sd1 During an Outbreak

ANNEX 17

Rectal swabs	100
XLD medium	3 x 100 g
MacConkey agar	3 x 100 g
Kligler agar	2 x 100 g
Mueller Hinton agar	2 x 100 g
Diagnostic antisera: Polyvalent: Monovalent:	 *S. dysenteriae* (group A) *S. flexneri* (group B) *S. boydii* (group C) *S. sonnei* (group D) *S. dysenteriae* type 1
Disposable Petri dishes (9 cm)	200
Test tubes (13 x 100 mm)	200
Disposable Bijou bottles	200
Antibiotic discs for susceptibility tests (50 of each):	Pivmecillinam Ciprofloxacin (or other fluoroquinolones) Ceftriaxone Azithromycin
Control strains (susceptible and resistant)	

Funeral Precautions

ANNEX 18

Funerals for patients who die of shigellosis can contribute to the spread of the disease within the community, especially among persons who have direct contact with the corpse.

Corpses must be disinfected with a 2% chlorine solution. Fill the mouth and anus with cotton wool soaked in the chlorine solution. Bandage the head to keep the mouth shut. Persons preparing the corpse must wear gloves, apron and mask. Corpse-carriers must wear gloves.

Before and during the funeral ceremony, physical contact between the family and the corpse should be avoided. If this is not possible, make sure family members wash their hands with soap after touching the corpse. Make clean water and soap available for the ceremony.

The number of persons attending the funeral gathering should be reduced to the minimum acceptable. If a funeral feast is organized, the preparation and distribution of food should be avoided. However, if food must be provided, persons who prepare or handle it should not touch the corpse at any time. Meticulous hand-washing with soap and clean water is essential before food is prepared and handled.

A designated health worker present at the funeral gathering should provide advice on hygienic practices.

Daily Report Form and Hospital Admission Register

ANNEX 19

DYSENTERY OUTBREAK MORBIDITY AND MORTALITY REPORT FORM

DAILY REPORT

Area: _____ Estimated population: _____

Date: _____

Name of the person filling this form: _____

Every morning, fill the table below with the total number of new cases and deaths from acute bloody diarrhoea as well as acute watery diarrhoea diagnosed during the preceding 24 hours. Report by age group: "under five" and "five and above". Report only **new** cases. Don't report re-attendances. If no case was diagnosed during the last 24 hours, report "0" (zero) in the corresponding cell (don't leave the cell blank).

The case definition of dysentery is *diarrhoea with visible blood in the stool*

During the course of the outbreak, all patients presenting with diarrhoea with visible red blood in the stool or reporting visible red blood in the stool must be considered as dysentery cases.

		Total number among		
		< 5 years (1)	> 5 years (2)	all ages (1) + (2)
Acute bloody diarrhoea	New cases			
	Deaths			
Acute watery diarrhoea	New cases			
	Deaths			

Name	**Age** in years	**Gender** M/F	**Address**	**Date of onset of symptoms**	**Clinical diagnosis** Dysentery Watery diarrhoea Other	**Results of laboratory analysis** Positive Negative Not done	**Treatment given**	**Date of discharge**	**Outcome** Cure Death Absconded