Cholera Clinical Guidelines

OAHPP Rounds
January 11, 2011
Vanessa G. Allen MD FRCPC
Medical Microbiologist
Overview

• Cholera clinical guidelines
  – Development and review process
  – Content
    • Reference for diagnosis, management and prevention
• Ongoing scientific questions
  – Origin of strain
  – Role of antibiotic treatment
  – Vaccination strategy
January 12, 2010: Haiti Earthquake

Thousands of people are feared dead after a massive earthquake measuring 7.0 on the Richter scale hit the impoverished Caribbean island of Haiti. Extensive damage has been reported in the capital, Port-au-Prince.

Quake epicentre 15km south west of capital at depth of 10,000m

Sources: USGS | © Graphic News
EARTHQUAKE-AFFECTED AREAS AND POPULATION MOVEMENT IN HAITI

Haiti Earthquake
200,000 killed (GoH)
300,000 injured (GoH)
800,000 to 1,000,000 displaced
2,000,000 in need of food assistance
3,000,000 affected

All figures are approximate. Commune population figures are as of 2003.
Sources: OCHA (01.28.10), GoH/HSI

Population Movement
Source: OCHA 02.08.10
*Population movements indicated include only individuals utilizing GoH provided transportation and do not include people leaving Port au Prince utilizing private means of transport.

Port-au-Prince
Commune population: 704,776
Metro area pop. est. estimate: Over 2,000,000

West

Nippes 30,000

Petit Goâve*
15% destroyed
Commune population: 117,506

Léogâne*
80-90% destroyed
Commune pop. est.: 154,180

Jacoil*
50-60% destroyed
Commune population: 117,946

Grand-Goâve

Carrefour*
40-50% destroyed
Commune population: 373,916

Grezier*
40-50% destroyed
Commune population: 25,947

The numbers and values used on this map are not exact; population estimates are calculated

Ontario’s Public Health Agency
Agency for Health Protection and Promotion
Agence de protection et de promotion de la santé

www.oahpp.ca
Water and Sanitation Infrastructure in Haiti

Damon Winter/The New York Times
October 20, 2010: Cholera Outbreak

Cholera Outbreak Kills 150 in Haiti

A cholera victim lay in the morgue at a hospital in St.-Marc, Haiti, on Friday. The hospital was crowded with people awaiting care.

By DONALD G. McNEIL, JR.
Published: October 22, 2010
Cholera Outbreak: Current Status

- **Haiti**
  - Cases to January 1, 2011 (MSPP/PAHO)
    - Cholera cases: 171,304
    - Hospitalized: 95,039
    - Deaths: 3,651

Source: Cholera Health Cluster Bulletin #13

- **International cases**
  - Cases to Dec. 18, 2010 (MMWR)
    - Dominican Republic
      - 59 laboratory confirmed cases
      - 3 of these imported
    - Florida
      - 5 cases,
      - All in travelers from Haiti

Source: MMWR December 24, 2010 / 59(50);1637-1641
Clinical Guideline Development

- Developed by OAHPP at the request of the CMOH’s Office
- Similar to guidelines developed for
  - Non-typhoidal *Salmonella* species
  - *Cyclospora cayetanensis*
  - *E coli* O157
  - *Listeria monocytogenes*
- Peer reviewed by 10 infectious disease, tropical medicine and public health physicians
- Additional feedback regarding style, length and usability from family and ER physicians
**Vibrio cholerae**

- Curved gram negative bacilli, single flagella
- 200+ serogroups
  - Strains with pandemic potential include O1 and O139
- 3 serotypes of O1
  - Inaba, Ogawa, Hikojima
- 2 biotypes of O1
  - Classical and El Tor

- Waterborne organism
  - Transmission
  - **Very** rare person to person transmission
- Has not been known to be in the Caribbean for the last 100 years
Cholera Toxin

- Binds to ganglioside receptors
- Activates adenylate cyclase
- Increased production of cAMP
- Excretion of Cl-
  (secondary osmosis of Na+ and H2O)
The 7th Pandemic of Cholera

South America, 1991-1994

- 100,000 cases
- >10,000 deaths

Lam C, et al. Volume 16, Number 7–July 2010
Tauxe RV et al. EID Vol. 1, No. 4 — October-December 1995
Epidemiology of *Vibrio cholerae*

Notified cholera cases to WHO, 2004 - 2007

In 2009
WHO annual estimates
3 million to 5 million cases
100,000 to 130,000 deaths

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. United Nations maps represent approximate border lines for which there may not yet be full agreement.

Map Production: Public Health Mapping and GIS
World Health Organization
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Recent International Outbreaks of Cholera Worldwide
Clinical Manifestations of Cholera

• Asymptomatic
  – El Tor ratio of asymptomatic to symptomatic ~20:1
  – can shed *Vibrio cholerae* in stools for 7-14 days

• Symptomatic
  – Incubation period 12-96 hours (0.5-5 days)
  – Symptoms
    • Watery diarrhea or “rice water” stools (up to 0.5-1 liter per hour)
    • Vomiting
    • Dehydration
    • Electrolyte abnormalities, hypotension, renal failure
    • Fever is rare (less than 5%).
  – Mild to moderate cases may be indistinguishable from other infectious forms of diarrhea
Microbiological Diagnosis of *Vibrio cholerae* in Ontario

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<tr>
<td></td>
<td>Stool specimens will be forwarded from these laboratories to the OAHPP Public Health Laboratories (PHL) for testing.</td>
</tr>
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<td>Other bacterial, viral and parasitic causes of acute diarrhea should be considered. Testing should be performed as per routine practice.</td>
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Laboratory Methods for Diagnosing *Vibrio cholerae*

- Thiosulfate Citrate Bile Acid Sucrose Agar
- String test
Who Should be Evaluated for Cholera in Ontario

- Traveler returning from an endemic area
- Watery diarrhea within 5 days of return
  - Some may have diarrhea indistinguishable from other causes
Rehydration
The Cornerstone of Management of Cholera

• Early rehydration and electrolyte replacement
  – Mortality can fall from 10-50% to < 1%
• Mild to moderate disease
  – Oral rehydration salts
• Severe dehydration
  – IV replacement with Ringer’s lactate
  – Rapid replacement followed by ongoing maintenance

Intravenous solutions

<table>
<thead>
<tr>
<th></th>
<th>Ringer’s Lactate Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best</td>
<td>Normal saline*</td>
</tr>
<tr>
<td>Acceptable*</td>
<td>Normal saline*</td>
</tr>
<tr>
<td>Unacceptable</td>
<td>Plain glucose (dextrose) solution</td>
</tr>
</tbody>
</table>
Antimicrobial Therapy for Cholera

- Secondary to rehydration therapy
- RCT
  - 243 children in Pakistan, with severe cholera
  - 1964-66

### TABLE 2

<table>
<thead>
<tr>
<th></th>
<th>No antibiotic</th>
<th>Tetracycline</th>
<th>Chloramphenicol</th>
<th>Streptomycin</th>
<th>Paromomycin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cases</td>
<td>50</td>
<td>103</td>
<td>47</td>
<td>23</td>
<td>15</td>
</tr>
<tr>
<td>Duration (days)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days of positive culture (Mean (Range))</td>
<td>7.9 (0-33.8)</td>
<td>3.8 (0-14.3)</td>
<td>5.9 (0-29.9)</td>
<td>6.6 (1.8-13.9)</td>
<td>6.4 (0-29.0)</td>
</tr>
<tr>
<td>Bacteriological relapses</td>
<td>8 (16%)</td>
<td>19 (18%)</td>
<td>11 (26%)</td>
<td>10 (44%)</td>
<td>5 (33%)</td>
</tr>
</tbody>
</table>

**Decreased**

1) duration of diarrhea (from 4 to 2 days on average)
2) stool volume
3) intravenous fluid requirements
4) clinical relapses
Antibiotic Susceptibility of Haiti strain of *Vibrio cholerae*

- Strains of *Vibrio cholerae* identified in Haiti in October and November 2010
- Susceptible to:  
  - Tetracycline  
  - Azithromycin
- Resistant to:  
  - Sulfisoxazole  
  - Nalidixic acid
- Reduced susceptibility to:  
  - Ciprofloxacin
Reccomended Antibiotic Treatment for Cholera related to the Haiti 2010-2011 Outbreak

<table>
<thead>
<tr>
<th>Patient population</th>
<th>Recommended antimicrobials (First line)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non pregnant adults</td>
<td>Doxycycline 300 mg PO x 1 dose</td>
</tr>
<tr>
<td>Pregnant women</td>
<td>Azithromycin 1gm PO x 1 dose</td>
</tr>
<tr>
<td>Children</td>
<td>Azithromycin: 20 mg/kg X 1 dose or</td>
</tr>
<tr>
<td>(oral suspension recommended for children less than 12 months/children unable to swallow pills)</td>
<td>Erythromycin: 12.5 mg/kg QID x 3 days</td>
</tr>
</tbody>
</table>

Role of Zinc Supplementation

• Randomized controlled trial in Bangladesh
  – Zinc supplementation associated with decreased duration and severity of diarrhea in children
  – If severe cholera is suspected, zinc supplementation with 10-30 mg per day for 5-7 days may be considered
• Unknown zinc nutritional status in our context
Infection Control Recommendations

- *Vibrio cholerae* is spread primarily by contaminated water and food sources.
- Access to clean water and modern sanitation systems mitigate ongoing transmission of cholera infections in Ontario.
- Very rare for cholera to spread directly from person to person.
- Recommend isolation using contact precautions until the diarrhea has resolved.
- When possible, hospitalized individuals with diarrhea possibly due to cholera should not share toilet facilities with other patients.
COMMUNICABLE DISEASE REPORTING

TO REPORT A DISEASE CONTACT:
Communicable Disease Surveillance Unit, 277 Victoria Street,
10th Floor, Toronto, ON M5B 1W2
Phone: 416-392-7411 After Hours: 416-690-2142 Fax: 416-392-0047

Timely reporting of communicable diseases is essential for their control. If you suspect or have confirmation of the following specified Reportable Communicable Diseases or their etiologic agents, (as per Ontario Filled 559/91 and amendments under the Health Protection and Promotion Act) please report them to the local Medical Officer of Health:

- Acute rheumatogenous synovitis (ARS)
- Amebiasis
- Anthrax
- *Bacillary dysentery
- *Brucellosis
- *Cholera
- *Cholera vibrio-associated disease (CVAAD) outbreaks in public hospitals
- *Cyclosporiasis
- Cytomegalovirus infection, congenital
- *Diphtheria
- *Enteric fever, including:
  1. Primary and 2. Post-infectious
  3. Vaccine infection
  4. Subacute sclerosing panencephalitis
  5. Unspecified
- *Food poisoning, all causes
- *Gastroenteritis, institutional outbreaks
- *Giardiasis, except asymptomatic cases
- Giemassa
- *Hepatitis B virus and C virus
  1. *Hepatitis A
  2. Hepatitis B
  3. Hepatitis C
  4. Hepatitis E (Delta hepatitis)
- Hepatitis A, E, and C
- *Herpes zoster
- *Influenza
- *Lassa fever
- *Legionellosis
- *Listeriosis
- *Lyme Disease
- *Malaria
- *Measles
- *Meningitis, acute
  1. *Bacterial
  2. Viral
  3. Other
- *Meningococcal disease, invasive
- Mumps
- *Mumps
- *Mumps
- *Nipah virus
- *Non-L Tibetan
- *Listeriosis
- *Rubella
- *Rubella
- *Sarcoma oncogenic virus (SREV)
- *Severe Acute Respiratory Syndrome (SARS)
- *Shigellosis
- *Smallpox
- *Streptococcal infections, Gp A
  - Invasive
  - Streptococcal infections, Gp B and C
  - Streptococcal pneumonia, invasive
- *Tuberculosis
- *Typhoid Fever
- *Typhus, typhoid fever
- *Untreated typhoid fever
- *Untreated typhus fever
- *Untreated typhus fever
- *West Nile Virus disease, including:
  i. West Nile fever
  ii. West Nile encephalitis
  iii. West Nile meningitis
- *Yersiniosis

Note: Diseases marked * (and influenza in institutions) should be reported immediately to the Medical Officer of Health by telephone. Other diseases can be reported by the next working day by fax, phone or mail.

September 2020

www.oahpp.ca
Information for Travelers to Cholera Endemic Regions

Public Health Agency of Canada

Prevention

- Practise safe food and water precautions.
- Wash your hands often.
- Higher risk travellers should consult a health care provider to discuss the benefits of getting vaccinated.

Treatment

The most important treatment is rehydration. Carry oral rehydration salts while travelling.

In severe cases, antibiotics can help shorten the duration of illness.

Additional considerations for travelers (CDC):

- Prescription antibiotic
- Water purification tablets
- Oral rehydration salts

Indications for Cholera Vaccination

• Vaccination is recommended for travelers to endemic regions with a high risk of exposure
  – Humanitarian relief workers
  – Travelers visiting areas of high risk with limited access to clean water and food
• Debatable role during outbreaks
  – More to follow
Vaccination Options for Cholera

• Dukoral
  – Killed whole-cell *V. cholerae* O1 with purified recombinant B-subunit of cholera toxoid (WC/rBS) sold as Dukoral™
  – Overall efficacy of 64-90% against infection with *Vibrio cholerae* O1 El Tor
  – Requires 2 doses of vaccine administered 1-6 weeks days apart (3 for children less than 6
  – Requires 10-14 days after vaccination before attaining full immunity
  – Protection against cholera with this oral vaccine is estimated to be 6 months to 2 years
  – This vaccine is not protective against *V. cholerae* O139
Other Vaccination Options for Cholera

- **Mutacol®**
  - An attenuated live oral genetically modified *V. cholerae* O1 vaccine (CVD 103-HgR)
  - Health Canada approved
  - Not widely available

- **Shanchol**
  - Does not require a buffer, 1 dollar per dose
  - Trial in Kolkata, which enrolled nearly 70,000 people,
    - 67 percent protection for at least two years
  - Pending WHO prequalification and provides longer-term protection against *V. cholerae* O1 and O139 in children under five years of age
Scientific Questions about the Cholera Epidemic in Haiti

• Origin of cholera in Haiti
• Role of vaccination
Origin of Cholera in Haiti

- Cholera has not been seen in Haiti for at least 100 years
- Introduction of Vibrio cholerae in Haiti in October 2010

- Two leading hypotheses
  1) Imported from UN workers who were working near the Arbonite rover
  2) Environmental and sanitary conditions lead to spread of already existing strain
As cholera returns to Haiti, blame is unhelpful

Lancet ID, December 2010 Editorial

Officials in Haiti Defend Focus on Cholera Outbreak, Not Its Origins

by RANDAL C. ARCHIBOLD
Published: November 17, 2010

MEXICO CITY — Medical authorities in Haiti defended their decision Tuesday not to focus on finding the origins of a cholera outbreak that has killed more than 1,000 people and stoked violent demonstrations against United Nations peacekeepers, whom many people blame for introducing the disease.

Protests that began Monday and carried into Tuesday in some places left two people dead as demonstrators directed their ire at the peacekeepers, a 12,000-strong, multinational force that arrived in Haiti in 2004 in response to political conflict.

8 December 2010 Last updated at 10:48 ET

Haiti cholera outbreak: Nepal troops not tested

None of Nepal's soldiers serving with UN peacekeepers in Haiti was tested for cholera before they went, the Nepalese army's chief medical officer says.

Brig Gen Dr Kishore Rana told the BBC the UN did not require such a test unless a soldier had cholera symptoms.

Earlier on Wednesday, a Nepalese army spokesman rejected a report suggesting the Haiti epidemic had originated from its soldiers.

Cholera has killed more than 2,000 Haitians, prompting anti-UN protests.
Evidence of Imported Strain of *Vibrio cholerae* in Haiti
Role of Vaccination in the Management of Cholera Outbreaks

Currently, PAHO does not recommend use of cholera vaccination in Haiti as an emergency response, but recognizes that the use of this vaccine may be advisable in the future. At the current stage, all efforts need to be directed at minimizing the number of cases and deaths. The emphasis of preventive strategies is on ensuring clean water, promoting good personal hygiene, and food handling practices, including hand washing and avoiding defecation in open areas.

Read full document
Given the recent large and prolonged outbreaks of cholera (for example, in Angola and Zimbabwe), reactive vaccination could be considered by local health authorities as an additional control measure, depending on the local infrastructure and following a thorough investigation of the current and historical epidemiological situation, and clear identification of geographical areas to be targeted.
Use of Cholera Vaccination During Outbreaks

- Outbreak in Micronesia 2000
  - Used attenuated vaccine

Table 1. Cholera incidence rates, all ages, Pohnpei

<table>
<thead>
<tr>
<th></th>
<th>Cases (registered from September)</th>
<th>Non-cases (from September)</th>
<th>Total</th>
<th>Incidence rate (per 100,000 person-months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccinated</td>
<td>50</td>
<td>14,537</td>
<td>14,587</td>
<td>114</td>
</tr>
<tr>
<td>Not vaccinated</td>
<td>294</td>
<td>17,297</td>
<td>17,591</td>
<td>557</td>
</tr>
<tr>
<td>Total</td>
<td>344</td>
<td>31,834</td>
<td>32,178</td>
<td>356</td>
</tr>
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</table>
Questions about the Utility of Clinical Guidelines

• To address specific needs within Ontario
  – Specific outbreaks
  – Different diagnostic and management approaches
  – Vs abundance of information
• Clinical utility vs added value
  – Longer document with key messages
• Need for ongoing feedback
Clinical Presentation
Cholera infection can be either symptomatic or asymptomatic. Asymptomatic persons infected with cholera can shed *Vibrio cholerae* in stools for 7-14 days after infection. Those who will develop symptoms do so within 5 days of exposure: symptoms include watery diarrhea or “rice water” stools (up to 0.5-1 liter per hour), vomiting, and dehydration. Fever is rare (less than 5%). Mild to moderate cases may be indistinguishable from other infectious forms of diarrhea. Severe cases of cholera may present with electrolyte abnormalities, hypotension, and renal failure.1

Microbiological Diagnosis of *Vibrio cholerae* in Ontario

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Management of *Vibrio cholerae* infection

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<tr>
<th>Medical evaluation</th>
<th>Travelers returning from regions with known cholera should present immediately to a medical evaluation if they have onset of watery diarrhea &lt; 5 days after their return.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluid and electrolyte replacement</td>
<td>Mortality from cholera can be reduced from 10-50% to less than 1% with appropriate fluid and electrolyte replacement. Fluid and electrolyte therapy is the cornerstone of cholera therapy, and will save lives if given rapidly and in adequate volume to replace and maintain losses. For full details of appropriate fluid and electrolyte replacement therapy for cholera, including 1) using oral rehydration therapy in mild to moderate cases and 2) intravenous replacement in severe dehydration, refer to the WHO guidelines, <a href="https://www.who.int/cholera/clinicalmanagement">https://www.who.int/cholera/clinicalmanagement</a> accessed November 27, 2010.</td>
</tr>
</tbody>
</table>

Cholera: Information for Clinicians
December 1, 2010

Cholera: Information for Clinicians
December 1, 2010
Antimicrobials

Antimicrobial therapy is of secondary priority to ensuring fluid and electrolyte replacement, and is indicated for severe cholera disease only. Antibiotics should not be prescribed for asymptomatic cholera infections.

In severe cholera, antimicrobial treatment is associated with decreases in the following: (1) duration of diarrhea (from 4 to 2 days on average), (2) stool volume, (3) intravenous fluid requirements, and (4) clinical relapse. 6

The initial strains of Vibrio cholerae identified in Haiti in October and November 2010 are susceptible to trimethoprim (a proxy for doxycycline) and azithromycin, resistant to sulfooxazole and nalidixic acid, and show reduced susceptibility to ciprofloxacin.7

Recommended empiric therapy for individuals suspected to have severe cholera returning from Haiti as of November 27, 2010 is:

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<td>Pregnant women</td>
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</tr>
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</table>
| Children (total suspension recommended for children less than 12 months children unable to swallow pills) | Azithromycin: 20 mg/kg X 1 dose 7
|                        | Azithromycin: 12.5 mg/kg QID x 3 days 7 |


Antimicrobial therapy must be given in accordance with individual clinical circumstances. 8

Other medications

Antimotility agents, antacids and antidiarrheics are not recommended in the treatment of cholera.

Zinc supplementation has been associated with decreased duration and severity of diarrhea in children infected with cholera in a randomized controlled trial in Bangladesh. If severe cholera is suspected, zinc supplementation with 10 mg per day for 5-7 days may be considered.

Infection control recommendations

Vibrio cholerae is spread primarily by contaminated water and food sources. Access to clean water and modern sanitation systems mitigate ongoing transmission of cholera infections in Ontario.

While it is very rare for cholera to be spread directly from person to person, patients hospitalized with severe cholera should be cared for in isolation using contact precautions until the diarrhea has resolved.9

When possible, hospitalized individuals with diarrhea possibly due to cholera should not share toilet facilities with other patients.

Public health reporting

All suspected and confirmed cases of cholera must be reported to the local health unit and the Ontario Health Protection and promotion act.

Information for travelers to regions with cholera activity


Cholera vaccination is recommended for travelers to endemic regions with a high risk of exposure such as humanitarian relief workers, and travelers visiting areas of high risk with limited access to clean water and food.7 Two oral cholera vaccines targeted to F. cholerae O1: serogroup are available in Canada: 1) killed whole-cell, F. cholerae O1 with purified recombinant B-subunit of cholera toxin (WC CVS B) sold as Dukoral;7 and 2) an attenuated oral genetically modified F. cholerae O1 vaccine (CVD 103-HgR) sold as Mutacel.8 Studies of WC CVS B have demonstrated overall efficacy of 64-90% against infection with Vibrio cholerae O1 El Tor. In adults, the WC CVS B vaccine (Dukoral)7 requires 2 doses of vaccine administered 1-6 weeks apart, and in children aged 2 to 6 years 3 doses must be administered 1-6 weeks apart. Full immunity is not attained until 10-14 days after completing the vaccination series, and protection against cholera is estimated to be 6 months to 2 years. This vaccine is not protective against F. cholerae O39, and is not approved for children less than 2 years old.

If travelling to a cholera endemic area, consultation with a healthcare professional experienced in travel medicine is advised.

References


This document was developed by the Ontario Agency for Health Protection and Promotion (OAHPP). OAHPP provides scientific and technical advice to Ontario’s provincial government and health care providers. OAHPP’s work is guided by thorough evidence and best practice documents to enhance the quality and effectiveness of the actions advocating for health improvements. This document is intended to assist physicians in clinical decision making by describing a range of generally accepted approaches for diagnosis and management. This document should not be transmitted elsewhere or utilized as the basis of any health service or other measure reasonably anticipated achieving the same results. The ultimate judgment regarding care of a particular patient must be made by the physician in light of the individual circumstances presented to the patient. OAHPP is not responsible for the realism of the use or accuracy of this document.

Cholera Information for Clinicians

December 1, 2010
Compare to Non-typhoidal Salmonella Guidelines

Non-typhoidal Salmonella (NTS) Infection: Information for Clinicians

Background:
Salmonella spp. are gram-negative bacteria that are among the most common causes of bacterial gastroenteritis and foodborne illness. Salmonella serotypes are generally distinguished into two broad classes.

1) Salmonella Typhi and Salmonella Paratyphi: S. Typhi and S. Paratyphi are associated with human fever, a typhoid illness requiring antibiotic treatment in all hosts. The resistance of S. Typhi is innate or acquired (sickler) bacteria, with disease spread from human to human either directly or via fecal contamination of food or water.

2) Non-typhoidal Salmonella (NTS): NTS usually cause a self-limited acute gastroenteritis in healthy hosts. There are over 2,500 NTS serotypes, the most common are Salmonella Enteritidis, S. Typhimurium and S. Heidelberg, and are primarily transmitted to humans directly or indirectly from animal sources. NTS are found worldwide in domestic and wild animals (including birds and amphibians), and are primarily a foodborne illness (most often from chicken or eggs).

This document addresses the clinical presentation, diagnosis and treatment of NTS infection.

Epidemiology:
The incidence of NTS infection in Ontario is estimated to be 1.8% per 100,000 in 2008. Similar rates were reported in the United States in 2007, with an incidence of NTS infection of 14.86 per 100,000 population (FoodNet). Transmission of NTS to humans can occur by many routes, including consumption of infected food or water (especially eggs, poultry, seafood, raw veal and dairy products), contamination of fresh produce (e.g., bean sprouts) that has been contaminated with animal waste, contact with animals or their environment (e.g., natural and contaminated water). Cases may be sporadic, or associated with foodborne outbreaks.

Clinical Presentation:
Acute gastroenteritis is the most common presentation of NTS infection. Typical symptoms include non-bloody diarrhea, nausea, and/or vomiting. Fever, abdominal cramps, bloody diarrhea may also be reported. Asymptomatic carriage can occur in as many as 4-5% of healthy hosts (Salmonella). Two to eight percent of NTS infections are associated with bacteremia, and are not always preceded by gastroenteritis. Risk factors for NTS infection include immunocompromised (including HIV, malignancy, chemotherapy, immunosuppressive therapy) and extremes of age (<3 months and greater than 50 years old). Risk factors are not apparent in up to one-third of cases of NTS bacteremia (Maddon N. 2011). Extraintestinal local infections (e.g., arthritis, meningitis, perianal) occur in 5-10% of those with bacteremia.

Diagnosis:
Non-typhoidal Salmonella infection is diagnosed by culture. If acute gastroenteritis is suspected, stool specimens should be collected in the appropriate sized transport media (e.g., Cary-Blair) and sent to a local laboratory for testing. If NTS bacteremia is suspected, two sets of blood cultures should be collected and sent to a local laboratory for testing. Serology is not available to diagnose NTS infection.

Recommended treatment of non-typhoidal Salmonella infection:

<table>
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<tr>
<th>Clinical Presentation</th>
<th>Immune status</th>
<th>Risk Factors</th>
<th>Treatment</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>Acute diarrhea</td>
<td>Immunocompetent</td>
<td>None</td>
<td>Supports including isolation</td>
<td>Studies suggest that there is no change in duration of symptoms with the use of antibiotics in the treatment of NTS in these circumstances. Treatment has been associated with prolonged bowel disorder and increased risk of relapse.</td>
</tr>
<tr>
<td>Age ≤ 3 months or &gt; 60 years</td>
<td>Immunocompetent</td>
<td>Severe underlying conditions (prematurity, valvular heart disease, severe allergy, diabetes)</td>
<td>May consider antimicrobial therapy</td>
<td>If antibiotics are prescribed, empiric choices should be received when susceptibility is available. Initial choices for adults with normal renal function include:</td>
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<td></td>
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<td>Trimethoprim-sulfamethoxazole 1 DS sub PO BID</td>
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For uncomplicated presentations, duration of therapy is usually 5-7 days.

For pediatric patients, refer to 2006 IDSA guidelines:

http://www.cdc.gov/ncidod/dhfs/bioterrorism/guidelines.html

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*Please note: All laboratories will perform susceptibility testing on NTS isolated from blood or a culture of a normally sterile site. Antibiotic susceptibility testing performed routinely on isolates of NTS in the OAHPP public health laboratories (PHL) unless specifically asked for the patient is not recommended. If resistance is being considered for NTS isolated from the blood or normally sterile site, please contact the OAHPP PHL at 416 525-0000 to ensure that the antibiotic susceptibility will be performed.
Additional considerations:

Additional consideration should be given in follow-up of individuals infected with NTS who work or live in high-risk environments (such as food handlers, daycare workers, and those who live or work closely with immunocompromised). Please consult with your local public health unit for details about work restrictions and need for follow-up cultures.

References:


Thank You