

SALMONELLOSIS

Bioterrorism Agent Profiles for Health Care Workers

Causative Agent: Several distinct bacteria within the genus *Salmonella* cause diarrheal illness, sometimes with septicemia. *Salmonella enteritidis* has more than 2000 different serotypes and is responsible for many of the foodborne gastrointestinal illnesses commonly found in man and animals. *Salmonella typhi* causes typhoid fever.

Routes of Exposure: Oral - consumption of contaminated food or water

Infective Dose & Infectivity: The infective dose is unknown but the LD₅₀ has been reported to be 10 million organisms. The infectivity of *Salmonella* is moderate. A carrier state occurs and is more common among female and elderly patients. It may persist for months to years.

Incubation Period: The incubation can be from 6 to 72 hours, but it usually ranges from 12 to 36 hours.

Clinical Effects: *Salmonella* gastroenteritis typically manifests as nausea, vomiting, abdominal cramps, and diarrhea, which is sometimes bloody. Weakness, chills, and fever may also be present, although there is a wide variability in the severity of symptoms seen. The typhoidal syndrome includes a high spiking fever, abdominal cramps, diarrhea, abdominal distention, septicemia, enlarged spleen, and occasional meningeal signs.

Lethality: The mortality rate of salmonellosis is low to moderate (<1% for most serotypes).

Transmissibility: The fecal-oral route is the most common mode of person-to-person transmission. There is no known transmission by the inhalational or dermal routes.

Primary Contamination & Methods of Dissemination:

In a terrorist attack, salmonellosis would most likely occur due to intentional contamination of food or water supplies.

Secondary Contamination & Persistence of Organism: Secondary transmission can result from exposure to the stool of patients with overt disease and from chronic carriers. Diarrheal fluids are highly infective. Greater than 50% of patients stop excreting nontyphoidal *Salmonella* within five weeks after infection and 90% are culture negative within nine weeks.

Decontamination & Isolation:

Patients – No decontamination necessary. Patients can be treated with standard precautions, with contact precautions for diapered or incontinent patients. Hand washing is of particular importance

Bioterrorism Agent Profiles for Health Care Workers – Salmonellosis
(continued from previous page)

Equipment & other objects – 0.5% hypochlorite solution (one part household bleach and nine parts water), other disinfectants, and/or soap and water are effective for environmental decontamination.

Laboratory testing: The stool, blood, and ingested food can be cultured. The best clinical predictor of a positive stool culture for *Salmonella* is the combination of diarrhea persisting for more than 24 hours, fever, and either blood in the stool or abdominal pain with nausea or vomiting.

Therapeutic Treatment: For uncomplicated cases, rehydration may be all that is required. Oral or intravenous routes for rehydration can be used depending on the individual patient's circumstances. Antibiotics are not ordinarily used since they prolong fecal shedding, but they should be considered in infants, the elderly, and those with underlying illnesses. All bacteremic patients should receive antibiotics.

Strains from developing countries are often resistant to many antibiotics, but are usually susceptible to fluoroquinolones (such as ciprofloxacin or levofloxacin) or third generation antibiotics (such as cefotaxime or ceftriaxone). More narrow antibiotics (such as ampicillin, amoxicillin, and trimethprim-sulfamethoxazole) are alternative choices when the strain is known to be susceptible.

Prophylactic Treatment: A typhoid vaccine exists. It is recommended for travelers to areas where there is a risk of exposure to *Salmonella typhi*, people living in typhoid-endemic areas outside the United States, persons who have continued household contact with a documented typhoid fever carrier, and laboratory workers with frequent contact with *S. typhi*. No prophylaxis is recommended for nontyphoidal *Salmonella* infections.

Differential Diagnosis: *Shigella*, *Campylobacter*, *Yersinia enterocolitica*, and bacterial food poisoning may show similar signs and symptoms.

References:

Chin J. Control of Communicable Diseases Manual, Seventeenth Edition, American Public Health Association; 2000.

American Academy of Pediatrics. *Salmonella*. In: Pickering LK, ed. *Red Book: 2003 Report of the Committee on Infectious Diseases*. 26 ed. Elk Grove Village, IL: American Academy of Pediatrics; 2003: 541-547.

For more information call (602) 364-3289

Frequently Asked Questions About Salmonellosis

What is salmonellosis?

Salmonellosis is an infection with bacteria called *Salmonella*. Most persons infected with *Salmonella* develop diarrhea, fever, and abdominal cramps 12 to 72 hours after infection. The illness usually lasts 4 to 7 days, and most persons recover without treatment. However, in some persons the diarrhea may be so severe that the patient needs to be hospitalized. In severe cases, *Salmonella* infection may spread from the intestines to the blood stream and other body sites, causing life-threatening illnesses. The elderly, infants, and those with impaired immune systems are more likely to have a severe illness.

What sort of germ is *Salmonella*?

The *Salmonella* germ is a group of bacteria that can cause diarrhea in humans. They are microscopic living creatures that are found in the stools of animal and people. There are many different kinds of *Salmonella* bacteria. *Salmonella* serotype Typhimurium and *Salmonella* serotype Enteritidis are the most common in the United States.

How can *Salmonella* infections be diagnosed?

Many different kinds of illnesses can cause diarrhea, fever, or abdominal cramps. *Salmonella* can be cultured from stool, blood, or other body fluids. Once *Salmonella* has been identified, further testing can determine its specific type, and which antibiotics could be used to treat it.

How can *Salmonella* infections be treated?

Salmonella diarrhea usually resolves in 5-7 days without antibiotics. Persons with severe diarrhea will require rehydration with oral or intravenous fluids. Antibiotics do not shorten the course of most *Salmonella* diarrhea infections, but can contribute to the development of resistant bacteria. However, antibiotics should be considered for certain patients, including people with weak immune systems, infants, and those with serious underlying health problems. Unfortunately, *Salmonella* are becoming more resistant to antibiotics, due to the frequent use of antibiotics to promote growth in food animals.

Are there long-term consequences to a *Salmonella* infection?

Persons with diarrhea usually recover completely, although it may be several months before their bowel habits are entirely normal. Rarely, *Salmonella* can spread to bones, joints, or the brain.

A very small number of persons who are infected with *Salmonella*, will go on to develop pains in their joints, irritation of the eyes, and painful urination. This is called Reiter's syndrome. It can last for months or years, and can lead to chronic arthritis. Antibiotic treatment does not make a difference in whether or not the person later develops this kind of arthritis.

How do people catch *Salmonella*?

Salmonella live in the intestinal tracts of humans, animals, and birds. *Salmonella* are usually transmitted to humans by when they eat foods contaminated with animal feces. Contaminated foods usually look and smell normal. Foods at higher risk are of animal origin, such as beef, poultry, milk, or eggs. However, all foods may become contaminated, including vegetables. Although many raw foods of animal origin are frequently contaminated, thorough cooking kills *Salmonella*. Food may become contaminated when an infected food

Frequently Asked Questions About Salmonellosis

(continued from previous page)

handler does not wash his hands after using the bathroom.

Salmonella may also be found in the feces of some pets, especially those with diarrhea. People can become infected if they do not wash their hands after contact with these animals. Reptiles are particularly likely to harbor *Salmonella*. People should always wash their hands immediately after handling a reptile, even if the reptile seems healthy.

What can a person do to prevent this illness?

There is no vaccine to prevent salmonellosis. People should not eat raw or undercooked eggs, poultry, or meat, and they should not drink raw milk or other unpasteurized dairy products. The source of *Salmonella*-infected food may not always be apparent. For example, raw eggs may be used in some foods such as homemade hollandaise sauce, Caesar and other salad dressings, tiramisu, homemade ice cream, homemade mayonnaise, cookie dough, and frostings. Poultry and meat should be well cooked (not pink in the middle). Produce should be thoroughly washed before eating.

Cross-contamination of foods should be avoided. Uncooked meats should be kept separate from produce, cooked foods, and ready-to-eat foods. Hands, cutting boards, counters, knives, and other utensils should be washed thoroughly after handling uncooked foods. Hand should be washed before handling any food, and in between handling different food items.

People should wash their hands after contact with animal feces. Since reptiles are particularly likely to have *Salmonella*, everyone should immediately wash their hands after handling reptiles. Reptiles (including turtles) are not appropriate pets for small children and should not be in the same house as an infant.

How common is salmonellosis?

Every year, approximately 40,000 cases of salmonellosis are reported in the United States. Because many milder cases are not diagnosed or reported, the actual number of infections may be much greater. Young children, the elderly, and the immunocompromised are the most likely to have severe infections. It is estimated that 600 persons die each year with acute salmonellosis.

What else is being done to prevent salmonellosis?

State and local public health departments stay informed about cases of salmonellosis. Clinical laboratories send isolates of *Salmonella* to the State Public Health Laboratory for more specific testing. If many similar cases of *Salmonella* occur at the same time, it may mean that a restaurant or other food source has a problem that needs intervention by the public health department.

Pasteurization of milk and treating municipal water supplies reduce the risk of *Salmonella* infection. In 1975, the sale of small turtles was halted in this country to prevent *Salmonella* infections. Improvements in farm animal hygiene, in slaughter practices, in food harvesting, and in packing operations have helped prevent salmonellosis. Food industry workers are taught food safety. Restaurant inspections look for food handling errors that could lead to outbreaks. Future efforts may include meat irradiation reduce *Salmonella* contamination of raw meat.

What is the government doing about salmonellosis?

The Centers for Disease Control and Prevention (CDC) monitors the frequency of *Salmonella* infections in the country and assists the local and State Health Departments to investigate outbreaks and devise control measures. CDC also conducts research to better identify specific types of *Salmonella*. The Food and Drug Administration (FDA) inspects imported foods, milk pasteurization plants, promotes better food preparation techniques in restaurants and food processing plants, and regulates the sale of turtles. The FDA also regulates the use of specific antibiotics to promote growth in food animals. The US Department of

Frequently Asked Questions About Salmonellosis

(continued from previous page)

Agriculture monitors the health of food animals, inspects egg pasteurization plants, and is responsible for the quality of slaughtered and processed meat. The US Environmental Protection Agency regulates and monitors the safety of our drinking water supplies.

How can I learn more about this and other public health problems?

You can discuss any medical concerns you may have with your doctor or other health care provider. Your local Health Department can provide more information about this and other health in your area. Information is available on the website of the Arizona Department of Health Services at www.azdhs.gov, and on the website of the Centers for Disease Control and Prevention at www.cdc.gov.

What can I do to prevent salmonellosis?

- Cook poultry, ground beef, and eggs thoroughly before eating.
- Do not eat or drink foods containing raw eggs, or raw unpasteurized milk.
- If you are served undercooked meat, poultry or eggs in a restaurant, don't hesitate to send it back to the kitchen for further cooking.
- Always wash your hands before handling any food
- Wash hands, kitchen work surfaces, and utensils with soap and water immediately after they have been in contact with raw meat or poultry.
- Be particularly careful with foods prepared for infants, the elderly, and the immunocompromised.
- Wash hands with soap after handling reptiles or birds, or after contact with pet feces.
- Avoid direct or even indirect contact between infants or immunocompromised persons and reptiles (turtles, iguanas, other lizards, snakes).
- Drinking pasteurized milk prevents salmonellosis and many other health problems.

For more information call (602) 364-3289