

## Salmonellosis (Non-Typhoid)



### Case Definition

**Confirmed case:** Isolation of *Salmonella* species (except *S. typhi*) from any site, regardless of symptoms.

**Clinical case:** Person with compatible clinical symptoms (see below), epidemiologically linked to a confirmed case.

### Reporting Requirements

- All positive laboratory tests are reportable by laboratory.
- All cases are reportable by attending health care professional.

### Clinical Presentation/Natural History

A bacterial disease commonly manifested by an acute enterocolitis, with sudden onset of headache, abdominal pain, diarrhea, nausea and sometimes vomiting. Dehydration, especially among infants or in the elderly, may be severe. Fever is almost always present. Anorexia and diarrhea often persist for several days. Infection may begin as acute enterocolitis and develop into septicemia or focal infection. Deaths are uncommon, except in the very young, the very old, the debilitated and the immunosuppressed.

### Etiology

*Salmonella* species – gram-negative enteric bacillus. According to a new proposed nomenclature, all human pathogens are regarded as serovars within subspecies I of *S. enterica*. There are more than 2,000 known serotypes, but in most areas, a small number account for the majority of confirmed cases.

### Epidemiology

**Reservoir and Source:** The reservoir includes a wide range of domestic and wild animals, including poultry, swine, cattle, owls, hedgehogs, rodents and pets such as iguanas, tortoises, turtles, terrapins, chicks, dogs and cats. Humans can also serve as reservoirs, e.g., patients with salmonellosis, convalescent carriers, and mild or unrecognized

cases. Chronic carriers are rare in humans but prevalent in animals and birds. The sources are feces of infected animals or persons, or food derived from infected animals that has been inadvertently contaminated by their fecal material during preparation.

**Transmission:** By ingestion of the organisms in food derived from infected animals or contaminated by feces on an infected animal or person. Fecal-oral transmission is also important, especially when diarrhea is present (infants and stool incontinent adults pose a greater risk of transmission than do asymptomatic carriers).

Potentially contaminated food sources include raw and undercooked eggs and egg products, raw milk and raw milk products, contaminated water, and raw or undercooked meat, meat products, poultry and poultry products. In addition, pet turtles, iguanas and chicks, and unsterilized pharmaceuticals of animal origin are potential sources of these bacteria. Some outbreaks have been traced to consumption of raw fruits and vegetables that were contaminated during slicing. Infection is transmitted to farm animals by feeds and fertilizers prepared from contaminated meat scraps, fish meal and bones.

Epidemics are usually traced to foods such as processed meat products, inadequately cooked poultry and poultry products; uncooked or lightly cooked foods containing eggs and egg products, raw milk and dairy products, including dried milk; and foods contaminated with feces by an infected food handler. Epidemics may also be traced to foods such as meat and poultry products that have been processed or prepared with contaminated utensils or on work surfaces or tables contaminated in previous use.

### Occurrence:

**General:** Worldwide. Salmonellosis is classified as a foodborne disease because contaminated food, mainly of animal origin, is the predominant mode of transmission. Only a

small proportion of cases are recognized clinically, and in industrialized countries as few as 1% of clinical cases are estimated to be reported. The incidence rate of infection is highest in infants and young children. About 60-80% of all cases occur sporadically. However, large outbreaks in hospitals, institutions for children, restaurants and nursing homes are not uncommon and usually arise from food contaminated at its source, or less often, during handling by an ill person or a carrier. It is estimated that about 1.4 million cases of salmonellosis occur annually in the USA, of which 40,000 are culture-confirmed and reported. Approximately 5,500 cases of salmonellosis are reported in Canada each year, but this is considered a significant underestimate of actual cases, probably by at least an order of magnitude.

**Manitoba:** In total, 191 cases of salmonellosis were reported in Manitoba in the year 2000. The most common sub-types included *S. typhimurium* (25%); *S. enteritidis* (22%) and *S. heidelberg* (16%). Cases were evenly distributed among males and females. The age distribution showed peaks of infection in young children (one to nine years), adults 30-49 years and older adults (60 years or greater). The monthly distribution of cases showed peaks in March (11%) and August (13%). Age-standardized rates across regional health authorities indicated South Eastman, Brandon and Central as having the highest infection rates in Manitoba.

**Incubation Period:** Six to 72 hours, usually about 12-36 hours.

**Susceptibility and Resistance:** Susceptibility is general, and is usually increased by achlorhydria, antacid therapy, therapy with proton pump inhibitors or H<sub>2</sub> receptor blockers, GI surgery, prior or current antibiotic therapy, neoplastic disease, immunosuppressive therapy and other debilitating conditions, including malnutrition. Severity of the disease is related to the serotype, the number of organisms ingested and host factors. *Salmonella* septicemia is more common in

immunocompromised individuals, including HIV infected persons and the elderly.

**Period of Communicability:** Throughout the course of infection, usually several days to several weeks. A temporary carrier state occasionally continues for months, especially in infants. Antibiotic therapy probably does not reduce the period of communicability.

## Diagnosis

Isolation of *Salmonella* from feces, rectal swabs, or samples of other body fluids. Specimens should be collected over several days since excretion of the organisms may be intermittent. Serologic tests are not useful in diagnosis.

Carriers are defined as persons whose feces still contain the bacterium more than 12 months after the onset of initial illness.

## Key Investigations

- Culture symptomatic contacts.
- Investigate food, water and milk supplies for potential contamination.
- Take history of exposure to pets that may harbour *Salmonella*.

## Control

### Management of Cases:

- Patients must be advised of the importance and effectiveness of hand-washing with soap and water after defecation.
- Contact precautions should be used for hospitalized children and adults who have poor hygiene or incontinence which cannot be contained. Otherwise, routine infection control precautions are adequate.
- Symptomatic infected persons should not handle foods or provide care of children, elderly people, or hospitalized, immunocompromised or institutionalized persons until symptoms have resolved. Exclusion of asymptomatic infected individuals is indicated for those whose hygiene practices are suspect or who have been linked as the source for other cases. In such cases, two consecutive stool specimens (collected 24 hours

apart) which are free of *Salmonella* are required. If antibiotics have been given, the initial culture should be taken at least 48 hours after the last dose.

- Carriers pose special problems in management. They must be advised to be especially scrupulous in their hand-washing after defecation, particularly if they handle food.
- Education should be provided on personal and food hygiene.
- In communities with a modern and adequate sewage disposal system, feces can be discharged directly into sewers.
- Treatment is symptomatic (rehydration and electrolyte replacement). Antibiotics may lead to the development of more resistant strains or more severe infections. Antimicrobial agents are therefore usually contraindicated. However, they are recommended for use in the very young (under two months), the elderly, the debilitated, persons infected with HIV, or persons with extra-intestinal infection, such as septicemia. In adults, cotrimoxazole or a quinolone may be used, and in children cotrimoxazole or amoxicillin, but antimicrobial resistance may necessitate the selection of other agents. Infectious disease consultation is recommended.

## Management of Contacts:

- The search for unrecognized mild cases and convalescent carriers among contacts may be unproductive and seldom contributes to the control of an outbreak. Screening of asymptomatic contacts in the course of an investigation is necessary only for food handlers, hospital attendants, and other situations where the spread of infection is particularly likely.
- Symptomatic contacts should be managed as cases and should be excluded from food handling and the care of children or patients until diarrhea ceases. As with cases, where hygiene practices are suspect or where individuals are linked as sources to other cases, these exclusions should continue until two consecutive stool specimens (collected 24 hours apart) are free of *Salmonella*.

## Management of Outbreaks:

Management of outbreaks is co-ordinated by local public health jurisdictions. The nature of outbreak investigations will depend upon the number of cases, the likely source of contamination and other issues. A few guidelines for outbreak investigation follow:

- By quick review of reported cases, determine time and place of exposure and the population at risk; obtain a complete listing of the foods served; embargo, under refrigeration, all foods still available. The prominent clinical features, coupled with an estimate of the incubation period, provide useful leads as to the most probable etiologic agent.
- Collect specimens of feces for laboratory examination and send to CPL; alert the laboratory to suspected etiologic agents and assign an outbreak code. Interview a representative sample of those exposed. Compare the attack rates for specific food items eaten and not eaten; the implicated food items will usually have the highest attack rates.
- Enquire about the origin of the implicated food and the manner of its preparation and storage before serving. Look for possible sources of contamination and periods of inadequate refrigeration and heating that would permit growth of *Salmonella*. Submit any leftover suspected foods promptly for laboratory examination.

## Preventive Measures:

- Education in personal hygiene – especially good hand-washing.
- Sanitary disposal of feces.
- Provision of safe and adequate water supplies.
- Provision of hand-washing facilities.
- Cleanliness in preparation and handling of food and milk, including refrigerating prepared foods in small containers, thoroughly cooking all foodstuffs derived from animal sources, particularly poultry, pork, egg products and meat dishes; avoiding recontamination within the kitchen after cooking is completed; and

## Communicable Disease Management Protocol

maintaining a sanitary kitchen and protecting prepared foods against rodent and insect contamination.

- Educate the public to avoid consuming raw or incompletely cooked eggs, as in eggs cooked “over easy” or “sunny side up,” in egnogs or homemade ice cream, and using dirty or cracked eggs.
- Pasteurized or irradiated egg products should be used to prepare dishes in which eggs would otherwise be pooled before cooking or when the dish containing eggs is not subsequently cooked.
- Exclude individuals with diarrhea from food handling and from care of hospitalized patients, the elderly and children.
- Recognize the risk of *Salmonella* infection in pets. Chicks, ducklings and turtles are particularly dangerous pets for small children.
- Inspect for sanitation and adequately supervise abattoirs, food processing plants, feed blending mills, egg grading stations and butcher shops.
- Encourage breastfeeding for infants.