NON-TYPHOIDAL Salmonella INFECTION SURVEILLANCE PROTOCOL

Public Health Action

- 1. Educate providers and the public about transmission and prevention of nontyphoidal *Salmonella*.
- 2. Educate providers and laboratories to report non-typhoidal *Salmonella* infections from any site to the local health department in the patient's county of residence within one week of diagnosis.
- 3. Educate laboratories to submit all non-typhoidal *Salmonella* isolates to the Office of Laboratory Services for serotyping and pulsed field gel electrophoresis (PFGE).
- 4. Conduct an appropriate investigation as follows:
 - a. For sporadic cases: Complete the Supplemental Enteric Disease Case Report Follow-up Form and attach it to the yellow card. Laboratory results, including antimicrobial susceptibilities, should also be attached. Use of the Supplemental Enteric Disease Case Report Follow-up Form will prompt the local health department to complete an appropriate investigation, to include:
 1) a three-day food history; 2) history of exposure to animals, including reptiles, during the incubation period; 3) identification of high-risk persons or symptomatic individuals for further investigation; and 4) identification of specific behaviors that may be associated with Salmonella infection. Use an incubation period of six to 72 hours.
 - b. For small outbreaks (three or more epi-linked cases): Do not wait for serotype results to begin the epidemiological investigation as in 4a above. Consider using a slightly longer incubation period, such as six to 96 hours in some cases of non-typhoidal salmonellosis; consult the Infectious Disease Epidemiology Program (IDEP) at 1-800-423-1271. Take special care to assure that isolates are rapidly sent to the OLS for serotyping and PFGE.
 - c. For large outbreaks (five or more epi-linked cases): Consult IDEP immediately at 1-800-423-1271. Take special care to assure that isolates are rapidly sent to OLS for serotyping and PFGE.
 - d. *For extra-intestinal infection:* Take special care to assure that isolates are sent to OLS. Document a general investigation using the Supplemental Enteric Disease Case Report Follow-up Form as a guide, and use an incubation period of three to four weeks. Replace the "Open-ended Food History" with a usual 24-hour food history.
- 5. Identify other cases including probable cases (symptomatic persons who are epidemiologically linked to a culture-confirmed case), and investigate completely as in 4 above.
- 6. Identify household contacts or close contacts of culture-confirmed cases. Culture the stools of any household or close contacts who are involved in food handling, direct patient care, or care of young children or the elderly in institutional settings.

- 7. If the case works or attends a day care facility:
 - a. Interview the manager/operator and check attendee records to identify suspect cases that occurred within the past month.
 - b. Provide educational information to the manager/operator and staff regarding proper food handling and hand washing, especially after changing diapers.
 - c. Collect stool samples from all symptomatic staff members and children or attendees who have been ill in the previous two months.
 - d. Do a sanitary inspection if there are any other suspected cases.
 - e. Instruct the manager/operator to notify the local health department if new cases of diarrhea occur. Call or visit once a week for two weeks to verify surveillance and if appropriate hygienic measures are being carried out.
 - f. Exclude symptomatic individuals who are involved in direct care of infants.
 - g. Exclude asymptomatic employees with questionable hygienic habits.
 - h. Exclude symptomatic attendees.
- 8. If the case is a food handler:
 - a. Conduct a sanitary inspection of the facility. Interview the manager/operator and check attendee records to identify suspect cases that occurred the previous month. Ask if there have been any complaints from any patrons during the past month.
 - b. Collect stool samples from all symptomatic individuals who have been ill the previous month.
 - c. Exclude symptomatic individuals who are involved in food handling. Exclude asymptomatic individuals with questionable hygienic habits.
 - d. Excluded food handlers should only return to work after two consecutive negative stool cultures are collected 24 hours apart. If antibiotics are given, the initial culture should be taken at least 48 hours after the last dose.
- 9. If the case works at a health care or residential care facility:
 - a. Identify any abnormal incidence of diarrheal illness within the past month. If so, identify any common source outbreaks or sources of exposure.
 - b. Conduct a sanitary inspection of the facility.
 - c. Exclude symptomatic individuals who are involved with the elderly, immunocompromised, and institutionalized patients until two negative stool samples are taken 24 hours apart and at least 48 hours after the last dose of antibiotics are taken.

Disease Prevention Objectives

Reduce the risk of disease through the education of the general public to:

- a. Practice good hand washing as a primary means of preventing person-toperson transmission.
- b. Practice proper food handling, including thorough cooking of eggs, meat, and poultry, washing of fruits and vegetables prior to consumption, and avoidance of cross-contamination.
- c. Avoid unsafe foods such as unpasteurized milk, cheese, juice, and cider.
- d. Practice proper handling of animals, including reptiles.
- e. Maintain foods at the proper temperature prior to serving.

Disease Control Objectives

Reduce the risk of secondary cases by:

- a. Determining whether the infected individual is employed as a food handler, health care worker, or daycare worker and excluding appropriately to prevent further transmission of illness.
- b. Identifying infected household contacts who are involved in food handling, direct patient care, or care of children or elderly people in institutional settings; and managing appropriately to prevent further transmission.
- c. Identifying symptomatic epidemiologically linked persons and investigating as probable cases of *Salmonella*.
- d. Identifying and investigating outbreaks at the earliest possible time so that control measures can be instituted rapidly.

Surveillance Objectives

- 1. Determine the incidence of salmonellosis in West Virginia.
- 2. Identify demographic characteristics of persons with salmonellosis.
- 3. Identify behavioral risk factors associated with salmonellosis.
- 4. Facilitate outbreak identification and investigation by obtaining serotype and pulsed field gel electrophoresis on all isolates.
- 5. Determine the antimicrobial resistance profile of non-typhoidal *Salmonella* isolates in West Virginia.

Public Health Significance

While most cases of non-typhoidal *Salmonella* are sporadic, this bacteria can cause large and dramatic outbreaks due to contamination of commercial food products. Multistate, and even international outbreaks, have been described with this pathogen. Smaller clusters occur frequently due to person-to-person transmission, contamination of foods during preparation or handling, or temperature abuse of foods. Outbreaks are most commonly reported from foods of animal origin; however, large outbreaks have also been associated with tomatoes, cantaloupes, sprouts, grain products, and even non-chlorinated public water supplies. Approximately 40,000 cases of salmonellosis are reported to CDC out of an estimated 1.4 million cases occurring in the United States every year. An estimated 1,000 persons die from salmonellosis every year in the U.S.

Clinical Description

Non-typhoidal Salmonella Gastroenteritis

Infection with non-typhoidal *Salmonella* almost always results in an acute self-limited gastroenteritis that is completely indistinguishable from other causes of gastroenteritis caused by other bacterial pathogens. In most cases, diarrhea is moderate in severity and without blood. Fever, abdominal cramping, nausea, vomiting, and chills are

frequently reported. Headache, myalgias, and other systemic symptoms may also occur.

Diarrhea usually lasts three to seven days. After resolution of acute symptoms, mean duration of carriage of non-typhoidal *Salmonella* strains in the stool is four to five weeks. Some studies suggest that antimicrobial therapy may increase the duration of carriage.

Mortality from non-typhoidal *Salmonella* is estimated at 0.4% of outbreak-associated cases; however, the case-fatality rate in hospitals and nursing homes is 70-fold higher.

Bacteremia and Vascular Infection

Any *Salmonella* serotype can cause bacteremia. Bacteremia occurs in about 1-4% of immunocompetent individuals with non-typhoidal salmonellosis; and in a much higher proportion of individuals with AIDS. *Salmonella* may infect the heart (endocarditis) or atherosclerotic plaque or aneurysms. When a vascular site is infected, blood cultures may be repeatedly positive for *Salmonella*.

Extra-intestinal Infection

In addition to intra-vascular sites, *Salmonella* can set up an infection almost anywhere in the body. Common sites include bones and joints, the central nervous system, lungs, spleen, urinary system, genital sites, including testes or ovaries, the hepatobiliary system, etc.

Chronic Carriage

After resolution of non-typhoidal salmonellosis, mean duration of carriage in the stool is four to five weeks. Long-term (> one year) carriage occurs in about one percent of persons with non-typhoidal salmonellosis. Long-term carriage is more frequent in older women and in persons with biliary abnormalities or concurrent *Schistosoma* infection.

Etiologic Agent

The pathogen is a gram-negative bacteria in the family Enterobacteriaciae. Based on genetic similarity, all *Salmonella* are classified in a single species: *S. choleraesuis. Salmonella* are further subdivided into seven subgroups or subspecies. The seven subspecies can be further serotyped into 2,300 serovars. Serotypes have enormous epidemiological importance, and so for simplicity are often used as the species name (though this is not taxonomically correct).

In addition, a new strain of *Salmonella typhimurium* (DT 104) has emerged with resistance to five antimicrobials – ampicillin, chloramphenicol, streptomycin, sulfonamides, and tetracyclines. Infection with this strain is associated with greater morbidity and mortality than susceptible strains. DT 104 has been associated with contact with farm animals or meat products.

Reservoir

Non-typhoidal *Salmonella* are found in the gastrointestinal tracts of domesticated and wild animals, including poultry, swine, cattle, rodents, dogs, cats, birds (including pet ducks and chicks), reptiles (including iguanas, snakes, and turtles), insects, and human carriers.

Some serotypes have been specifically associated with reptiles. Serotype *S. enteritidis* has been specifically associated with eggs and poultry, but has also been associated with an outbreak traced to reptile exposure.

Mode of Transmission

Salmonella is transmitted through the ingestion of food and water contaminated with human or animal waste. Contaminated raw vegetables or fruits have also been implicated in some recent outbreaks. Transmission through the fecal-oral route is important, especially from persons who have diarrhea or who are incontinent.

Incubation Period

Non-typhoidal Salmonella: six to 72 hours

Extra-intestinal infection: probably about three to four weeks

Infectious Period

As long as bacilli appear in the stool during illness and usually several days to several weeks thereafter. One percent of adults and five percent of infants and toddlers excrete *Salmonella* for over one year after infection.

Outbreak Recognition

Outbreak recognition and investigation requires timely and complete epidemiological investigation (risk factors, food history, history of exposure to animals, etc.) paired with timely and complete laboratory investigation (serotyping and pulsed field gel electrophoresis). With the use of modern laboratory techniques, outbreaks may be defined as three or more epi-linked cases infected with *Salmonella* of the same serotype and PFGE pattern.

Community-based outbreaks have been linked to individual food handlers, improper preparation of eggs, meats and poultry dishes, and exposure to iguanas or other animals. Contaminated water has rarely been implicated in community-based outbreaks involving non-chlorinated public water supplies. National and international outbreaks have been associated with widespread distribution of contaminated commercial food products, vegetables, fruits, cereals, and meats.

Case Definition for Salmonellosis

Clinical Description

An illness of variable severity manifested by diarrhea, abdominal pain, nausea, headache, and sometimes vomiting. Some serotypes may cause bloody diarrhea and invasive disease. Asymptomatic infections may occur, and the organism may cause extra-intestinal infections.

Laboratory Criteria for Diagnosis

Isolation of non-typhoidal *Salmonella* from a clinical specimen.

Case Classification

<u>Probable</u>: a clinically compatible case that is epidemiologically linked to a confirmed case.

Confirmed: a case that is laboratory confirmed.

Comment

If laboratory confirmed, it is considered a confirmed case that should be reported to the local health department in the patient's county of residence within one week of the diagnosis.

Laboratory Notes

The Office of Laboratory Services accepts isolates for serotyping and pulsed field gel electrophoresis. Cary Blair Transport Media is used for transporting stool cultures for *Salmonella* testing and can be ordered from the lab (1 box = 12 vials). Take special care to assure that all isolates are rapidly sent for serotyping and PFGE to West Virginia Office of Laboratory Services, 167 11th Avenue, South Charleston, WV 25303.

Preventive Interventions

Share these prevention messages:

- Wash hands well after using the toilet, cleaning the toilet, after changing diapers, and after handling soiled towels or linens.
- Wash hands well before, during, and after fixing food.
- Thoroughly cook all foods from animal sources, especially chicken, beef, pork, meat dishes, and eggs.
- After preparing raw meat, thoroughly wash and rinse all utensils, bowls, counters, and hands.
- Use a separate cutting board to prepare raw meats. Use a clean plate for cooked meat. Never return cooked meat to the same plate used for raw meat.
- Marinade or BBQ sauce used on raw meat should not be used on cooked meat.
- Do not eat raw or partially cooked eggs, as in eggnog or homemade ice cream. Use pasteurized egg products from the grocery store for these purposes.

- Cook eggs until the yolks are hard. "Sunny-side up" and "over easy" eggs may be a source of *Salmonella* infection.
- Thoroughly rinse or wash fruits and vegetables that will be eaten raw.
- Avoid the use of untreated manure as a fertilizer for fruits and vegetables.
- Drink only pasteurized milk and milk products.
- Keep food at proper refrigeration temperatures.
- Wash hands after handling pets, pet toys, pet feces, pet beds, and pet cages.
- Keep pets out of food-preparation areas.
- Do not clean pet or reptile cages in the kitchen sink or in the bath tub.
- Iguanas or other reptiles should not be allowed to roam the house.
- Do not let children handle reptiles without supervision.
- Reptiles should not be kept in child care centers.
- Households with children under age five, pregnant women, and persons with depressed immune systems, such as AIDS, should not have reptiles.
- Before traveling to developing countries, educate yourself about safe food and water ("boil it, cook it, peel it, or forget it"), and check with your travel clinic about the necessary immunizations.

Treatment

- 1. Re-hydration and electrolyte replacement.
- 2. Antibiotics may prolong the carrier state and may lead to resistant strains or more severe infections.
 - a. However, infants under the age of two months, the elderly, the debilitated, those with sickle cell disease, persons infected with HIV, or patients with high fever or manifestations of extra-intestinal infection should be given antibiotic therapy.
 - b. Ampicillin or amoxicillin is usually recommended when antibiotics must be administered; however, check antimicrobial susceptibilities to identify inappropriate agents.
- 3. Antimicrobial therapy is recommended for *Salmonella* gastroenteritis occurring in patients with an increased risk of invasive disease, including infants younger than three months of age and persons with malignant neoplasms, hemoglobinopathies, HIV infection or other immunosuppressive illnesses or therapy.
- 4. Ampicillin, amoxicillin, trimethoprim-sulfanathoxazole (TMP-SMX), cefotaxime, or ceftriaxone is recommended for susceptible strains in patients for whom therapy is indicated.

Surveillance Indicators

- Proportion of investigations with complete demographic information.
- Proportion of investigations with complete information on high-risk occupations.
- Proportion of confirmed cases with known non-typhoidal *Salmonella* serotype.
- Proportion of confirmed cases with antibiotic susceptibility profile.
- Proportion of cases with complete risk factor investigation including three-day food history.