Salmonellosis

Means of transmission and usual reservoirs
Salmonellosis is a type of bacterial food poisoning caused by the Salmonella enterica. The usual reservoirs for this bacterium include domestic and wild animals as well as other humans. However, it is not only limited to animals (1). Fruits, vegetables, eggs, and processed foods such as peanut butter are also potential reservoirs as well. Salmonella enterica is transmitted into these reservoirs via the feces of animals. The guts of animals provide a natural environment for this bacterium, and so their feces can contaminate food or water in the environment (2). Human infection, therefore, occurs when consuming or handling these contaminated objects and animals (1).

Etiological agent and key tests for identification
The etiological agent is enterobacteriaceae of the genus Salmonella, specifically Salmonella enterica. This agent is a gram-negative, facultative anaerobe, motile, non-spore forming, and rod shaped bacilli (3). Some biochemical tests that can be used to identify Salmonella are fermentation of glucose, negative urease reaction, lysine decarboxylase, negative indole test, H2S production, and fermentation of dulcitol. Moreover, Salmonella is flagellated to give a positive motility test. Unfortunately within Salmonella, there are over 2,000 different serotypes (4). Usually serological tests for Salmonella confirmation use polyvalent antisera for flagellar (H) and somatic (O) antigens. Agglutination with both H and O antisera are identified as Salmonella spp.

Historical information
Medical research scientist Theobald Smith who worked under the administration of Daniel Elmer Salmon discovered salmonella in 1885. Initially the two were looking for the cause of hog cholera, but discovered that all species of the genus Salmonella caused infectious diseases. In 1900 the name Salmonella was adopted after Smith’s first type-strain (5).

Signs and Symptoms of the disease
Some common signs and symptoms of this disease would be diarrhea, fever, and cramps. These symptoms usually appear 12 hours - 3 days after infection and last 4 - 7 days. High risks include people who have a weaker immune system and who become extremely dehydrated due to diarrhea. Reiter’s syndrome, can lead to chronic arthritis, may also develop in a small number of infected people and can last for months or years (6).

Microbial virulence mechanisms contributing to the disease process
After ingestion of the bacteria, Salmonella is able to survive the gastric acids of the stomach with its cell wall. It then attaches to the intestinal lumen using its fimbriae. Salmonellae injects a protein SopE which is a molecule sufficient to trigger the diarrheal disease (7). The protein molecule triggers a cascade of signals when inside the intestinal epithelium cell. These signals weaken the cytoskeleton of the cell allowing Salmonellae to penetrate the intestinal tissue and activate an inflammatory response. This action triggers the release of proinflammatory cytokines. The acute inflammatory response leads to many of the symptoms of Salmonellosis. The acute inflammatory response leads to many of the symptoms of Salmonellosis, such as cramps, nausea, and fever. In addition specific antigens on the surface of Salmonella prevent antibody-mediated opsonization and complement-mediated lysis. In addition though they selectively attach to the intestinal lumen, within 14 days a biofilm can develop and more the bacteria may appear in the bloodstream, migrating to other areas of the body (8). In short Salmonella has many virulence factors that enable it to cause disease like acid-resistant cell walls, fimbriae for cell-mediated attachment, toxin production, antigenic variation, and biofilm development.
Since there are numerous serotypes of *Salmonella*, each one possess a slightly different set of virulence mechanisms.

**Control or Treatment for the disease**

Due to the dehydration, fluid and electrolyte replacement as well as nausea and vomiting controls are needed. Although antibiotic therapy may be helpful in prolonging the duration of excretion of non-typhoid *Salmonella*, *Salmonella* gastrointestinal infections usually resolve in 4-7 days and . Therefore, antibiotics is only recommended for young infants and severe patients. These antibiotics include fluoroquinolones, cephalosporins, and ampicillin to treat bacteremia. Chloramphenicol is the most common antibiotic used to treat fever.

**Current outbreaks or cases**

Local: Bean sprouts

On November 21, 2014, there was an outbreak of Salmonella with a total of 63 infected persons reported from 10 states in the Northeastern part of the United States. Most infected people had in common the consumption of bean sprouts at Asian food service establishments. A thorough investigation led to Wonton Foods, Inc. in Brooklyn, New York. Wonton Foods although completed sanitation and cleaning as well as the destruction of any remaining products, still had, as of December 2, 87 persons from 11 states became infected with *Salmonella*. The incidence map and chart are pictured below for additional information.

Persons infected with the outbreak strains of *Salmonella Enteritidis*, by state of residence, as of December 4, 2014 (n=87)

![Incidence map of people infected with the outbreak strains of *Salmonella Enterica*, by state (9). The map is current as of December 4, 2014 (n = 87).](image-url)
Figure 2: Incidence chart of people infected with Salmonella by date of illness (9). Investigation is still ongoing so all cases have not been reported yet.

Global: Turkey meat

Between August 1, 2011 and January 31, 2013, 710 cases of non-travel related Salmonella Stanley infections were identified in Austria, Germany, Hungary, and the United Kingdom (Scotland). The strain had a common resistance to nalidixic acid originating from the turkey production chain. Out of 42, nine cases had consumed kebab made with turkey meat 3 days before disease onset. On April 8, 2014, the Austrian food authorities issued notification entitled “Salmonella Stanley in frozen turkey kebab from Hungary, with raw material from Austria and Hungary.” As of April 22, 2014, Hungary reported 13 cases and Scotland reported sporadic cases in 2014 caused by the 2011-2012 outbreak strain. This is suggesting that the outbreak from the turkey production chains are still circulating (10).

Incidence figure of Salmonella cases from January 2011 - December 2013

Prevention
There is no vaccine currently available to prevent *Salmonellosis*. However, to reduce the possibility and prevent contracting *Salmonella*, it's important to thoroughly wash hands, fruits vegetables, and any surface that will or have touched meat. However, directly washing meats could potentially spread *Salmonella* to other foods. It is also important to thoroughly cook meat, poultry, and eggs to safe temperatures. Unpasteurized dairy products and food recalls also need to be taken notice of.

**References**


