

National Enteric Disease Surveillance: *Salmonella* Annual Summary, 2009

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An overview of National *Salmonella* Surveillance is available online at http://www.cdc.gov/nationalsurveillance/PDFs/NationalSalmSurveillOverview_508.pdf (1).

National Salmonella Surveillance Data (Laboratory-based Enteric Disease Surveillance, LEDS)

LEDS Data Tables for 2009 are available online at <http://www.cdc.gov/ncezid/dfwed/PDFs/SalmonellaAnnualSummaryTables2009.pdf>, pages 1-84.

- The top 20 *Salmonella* serotypes isolated from human sources in 2009 are shown in Table 1; the percent change in the number of these isolates over time, comparing 2009 with 1999 and with 2004, is shown in Table 1a.
 - During 2009, 40,828 laboratory-confirmed *Salmonella* isolates were reported to CDC through LEDS
 - The top 4 serotypes in 2009 were Enteritidis (18%), Typhimurium (including Typhimurium var. 5-) (15%), Newport (9%) and Javiana (5%).
 - Serotype Schwarzengrund had the largest increase (125%) since 1999 of any serotype for which surveillance has been stable; most of this increase occurred after 2004.
 - Although serotype I 4,[5],12:i:- has increased 618% from 1999, this reflects at least partly a change in nomenclature (1).
- The number of isolates from human sources by serotype and year from 1999 to 2009 is shown in Tables 3 and 3a.
 - The number of unknown and partially serotyped isolates increased from 4% in 1999 to 11% in 2009.
- The geographic distribution of isolates is shown in Tables 4 and 5 and Figure 2.
 - The South Atlantic region reported the highest proportion of *Salmonella* isolates in 2009 (19%), followed by the Pacific region (17%) (Tables 4 and 5).
 - Serotype Enteritidis isolation rates (per 100,000 population) by region from 1970 to 2009 are shown in Figure 2; in 2009, the New England region reported the highest isolation rate of serotype Enteritidis isolates.
- The four *Salmonella* serotypes with the highest isolation rates from 1970 to 2009 were serotypes Typhimurium, Enteritidis, Heidelberg, and Newport, shown in Figure 3.
 - In 2009, these four serotypes represented 46% of all isolates.
 - In 2009, serotype Javiana was more commonly isolated than serotype Heidelberg, however, serotype Heidelberg is still among the top 4 most commonly isolated serotypes since 1970.

NNDSS Data

The National Notifiable Disease Surveillance System (NNDSS) collects and compiles reports of nationally notifiable infectious diseases, including *Salmonella*. This system includes reports of laboratory-confirmed cases and probable cases (clinically compatible cases with an epidemiological link to a confirmed case). The 2009 NNDSS report is available at <http://www.cdc.gov/mmwr/PDF/wk/mm5853.pdf>.

- A total of 49,192 cases of salmonellosis were reported to NNDSS during 2009; serotype information was not available in this system for 2009 (1).

Antimicrobial Resistance Data

The National Antimicrobial Resistance Monitoring System (NARMS) monitors antimicrobial resistance among enteric bacteria (including *Salmonella*) isolated from humans. The 2009 NARMS report on human isolates is available at http://www.cdc.gov/narms/pdf/NARMSAnnualReport2009_508.pdf.

In the United States, fluoroquinolones (e.g., ciprofloxacin) and third-generation cephalosporins (e.g., ceftriaxone) are commonly used to treat severe *Salmonella* infections, including *Salmonella* serotype Typhi, the organism that causes typhoid fever. In *Enterobacteriaceae*, resistance to nalidixic acid, an elementary quinolone, correlates with decreased susceptibility to ciprofloxacin (MIC ≥ 0.12 $\mu\text{g/mL}$) and possible fluoroquinolone treatment failure. Ceftiofur is a third-generation cephalosporin used in food animals in the United States; resistance to ceftiofur among *Enterobacteriaceae* correlates with resistance to ceftriaxone (MIC ≥ 4 $\mu\text{g/mL}$).

- 1.8% of nontyphoidal (nontyphoidal *Salmonella* refers to all *Salmonella* serotypes other than Typhi, Paratyphi A, Paratyphi B¹, and Paratyphi C) *Salmonella* isolates were resistant to nalidixic acid, including
 - 3.7% of serotype Enteritidis isolates, and
 - 2.2% of serotype Typhimurium isolates.
 - The most common serotypes among the nalidixic acid-resistant isolates were Enteritidis (38%) and Typhimurium (21%)
- 3.4% of nontyphoidal *Salmonella* isolates were resistant to ceftriaxone, including
 - 21% of serotype Heidelberg isolates, and
 - 6.5% of serotype Typhimurium isolates.
 - The most common serotypes among the ceftriaxone acid-resistant isolates were Typhimurium (32%) and Heidelberg (24%)
- 60% of serotype Typhi isolates were resistant to nalidixic acid and 3.3% (12/361) to ciprofloxacin

¹ Two distinct pathotypes of *Salmonella* serotype Paratyphi B are recognized; one pathotype is associated with paratyphoid fever and the other is associated with uncomplicated gastroenteritis. The two pathotypes are known to have distinct virulence characteristics, but are currently differentiated based on the ability to ferment tartrate. The paratyphoidal pathotype is unable to ferment tartrate and is designated serotype Paratyphi B; the gastrointestinal pathotype ferments tartrate and is designated serotype Paratyphi B var. L(+) tartrate+.

Multidrug resistance is described in NARMS as resistance to three or more classes of antimicrobial agents, as defined by the Clinical and Laboratory Standards Institute (CLSI).

- 13% of nontyphoidal *Salmonella* isolates were resistant to two or more CLSI classes
- 9.5% were resistant to three or more CLSI classes. Those resistant to three or more classes included
 - 28% of serotype Typhimurium isolates
 - 26% of serotype Heidelberg isolates
 - 7.6% of serotype Newport isolates
- 50% of nontyphoidal *Salmonella* isolates that were resistant to three or more classes were serotype Typhimurium.

Outbreak Data

The Foodborne Disease Outbreak Surveillance System (FDOSS) collects reports of foodborne disease outbreaks from local, state, tribal, and territorial public health agencies. Reports can be found at http://www.cdc.gov/outbreaknet/surveillance_data.html.

The Waterborne Disease and Outbreak Surveillance System (WBD OSS) collects reports of waterborne disease outbreaks associated with drinking water and recreational water from local, state, tribal, and territorial public health agencies. Reports can be found at <http://www.cdc.gov/healthywater/statistics/wbdoss/surveillance.html>.

Non-human Data (National Veterinary Services Laboratories, NVSL)

NVSL Data Tables for 2009 are available online at <http://www.cdc.gov/ncezid/dfwed/PDFs/SalmonellaAnnualSummaryTables2009.pdf>, pages 85-96.

The 20 most frequently reported *Salmonella* serotypes from clinical and non-clinical non-human sources reported to CDC and the National Veterinary Services Laboratories (NVSL) in the Animal and Plant Health Inspection Service (APHIS) of the United States Department of Agriculture (USDA) in 2009 are shown in Table 6.

Clinical animal isolates (referred to as “clinical/non-human”) are defined as *Salmonella* isolates from animals with clinical signs of salmonellosis; *Salmonella* isolates identified through herd and flock monitoring and surveillance, feed sample testing, environmental testing, and USDA Food Safety and Inspection Service (FSIS) food testing programs are designated “non-clinical/non-human” isolates. Clinical/non-human and non-clinical/non-human *Salmonella* isolates reported to CDC and NVSL by serotype and source in 2009 are shown in Tables 7 and 8.

- The most common clinical/non-human serotype reported to NVSL during 2009 was serotype Typhimurium (including Typhimurium var. 5-, 22%).
- The most common non-clinical/non-human serotype reported to NVSL during 2009 was serotype Kentucky (15%); the next most common was Enteritidis (15%).

- The following table summarizes the non-human animal sources (bovine, chicken, porcine, and turkey) for clinical isolates of the top 4 serotypes causing human illness in 2009.

Serotype	Human Rank, 2009	Non-Human (clinical) Sources			
		Bovine (%)	Chicken (%)	Porcine (%)	Turkey (%)
Enteritidis	1	3	51	5	0
Typhimurium (including Typhimurium var. 5-)	2	14	1	49	0
Newport	3	40	0.9	5.4	0
Javiana	4	0	0	0	0

- The following table summarizes the non-human animal sources (bovine, chicken, porcine, and turkey) for non-clinical isolates of the top 4 serotypes causing human illness in 2009.

Serotype	Human Rank, 2009	Non-Human (non-clinical) Sources			
		Bovine (%)	Chicken (%)	Porcine (%)	Turkey (%)
Enteritidis	1	0.2	82	0	0.2
Typhimurium (including Typhimurium var. 5-)	2	6	29	13	6
Newport	3	11	28	0.8	13
Javiana	4	0	13	0	0

References

- CDC. Summary of notifiable diseases—United States, 2009. *MMWR* 2011; 58(53): 1-104.
- CDC. National Antimicrobial Resistance Monitoring System for Enteric Bacteria (NARMS): Human Isolates Final Report, 2009. Atlanta, Georgia: U.S. Department of Health and Human Services, CDC, 2010.

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