National Enteric Disease Surveillance: *Salmonella* Annual Summary, 2008

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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 2008 are available online at http://www.cdc.gov/ncezid/dfwed/PDFs/SalmonellaAnnualSummaryTables2008.pdf, pages 1-84.

- The top 20 *Salmonella* serotypes isolated from human sources reported to CDC in 2008 are shown in Table 1; the percent change in the number of these isolates over time, comparing 2008 with 1998 and with 2003, is shown in Table 1a.
    - During 2008, 46,854 laboratory-confirmed *Salmonella* isolates were reported to CDC through LEDS.
    - The top 4 serotypes in 2008 were Enteritidis (16%), Typhimurium (including Typhimurium var. 5-) (14%), Newport (9%) and Javiana (5%).
    - Serotype Saintpaul had the largest increase (299%) since 1998 of any serotype for which surveillance has been stable.
    - Although serotype I 4,[5],12:i:- has increased 457% from 1998, this reflects at least partly a change in nomenclature (1).

- The distribution of isolates by age group and sex during 2008 is shown in Table 2 and Figure 1.
    - *Salmonella* was isolated most frequently from children under 5 years of age, who accounted for 26% of all isolates.
    - The distribution of isolates by gender varied, with a greater number of isolates from male than female infants and children and a greater number of isolates from female than male adults.

- The number of isolates by serotype and year from 1998 to 2008 is shown in Tables 3 and 3a.
    - The number of unknown and partially serotyped isolates increased from 4% in 1998 to 16% in 2008.
- The geographic distribution of isolates is shown in Tables 4 and 5, and in Figure 2.
    - Serotype Enteritidis isolation rates (per 100,000 population) by region from 1970 to 2008 are shown in Figure 2; in 2008, the Mid-Atlantic region reported the highest isolation rate.

- The four *Salmonella* serotypes with the highest isolation rates from 1970 to 2008 were Typhimurium, Enteritidis, Heidelberg, and Newport, shown in Figure 3.
    - In 2008 these four serotypes represented 44% of all isolates
    - In 2008, serotypes Javiana and Saintpaul were more commonly isolated than serotype Heidelberg but less commonly than Typhimurium, Enteritidis, and Newport.

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 2008 NNDSS report is available at http://www.cdc.gov/mmwr/pdf/wk/mm5754.pdf.

- A total of 51,040 cases of salmonellosis were reported to NNDSS during 2008; serotype information was not available in this system for 2008 (2).

Antimicrobial Resistance Data

The National Antimicrobial Resistance Monitoring System (NARMS) monitors antimicrobial resistance among enteric bacteria (including *Salmonella*) isolated from humans. The 2008 NARMS report on human isolates is available at http://www.cdc.gov/narms/annual/2008/NARMS_2008_Annual_Report.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 µg/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 µg/mL).

- 2.0% 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
  - 6.6% of serotype Enteritidis isolates
  - 61.7% of nalidixic acid–resistant isolates were serotype Enteritidis.

- 2.9% of nontyphoidal Salmonella isolates were resistant to ceftriaxone, including
  - 12.3% of serotype Newport isolates
  - 44.3% of ceftiofur–resistant isolates were serotype Newport.

- 59.0% of serotype Typhi isolates were resistant to nalidixic acid.

[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).

- 12.4% of nontyphoidal *Salmonella* isolates were resistant to two or more CLSI classes
- 9.4% of nontyphoidal *Salmonella* isolates were resistant to three or more CLSI classes. Those resistant to three or more classes included
    - 27.7% of serotype Typhimurium isolates
    - 13.5% of serotype Newport isolates
    - 0.2% of serotype Enteritidis isolates
- 49.3% of nontyphoidal *Salmonella* isolates 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. The 2008 annual summary of foodborne disease outbreaks is available at http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6035a3.htm?s_cid=mm6035a3_w

- In 2008, 110 confirmed, single-etiology *Salmonella* outbreaks with 4883 illnesses were reported (4).
    - The most common serotype causing confirmed, single-etiology *Salmonella* outbreaks was Enteritidis (29 outbreaks, 27%) (4).
    - Of 17 multistate outbreaks, nine were caused by *Salmonella*. The etiologic agent was isolated from an implicated food in six of these outbreaks. These foods were cantaloupe, cereal, ground turkey, ground white pepper, jalapeño and serrano peppers, and peanut butter and peanut butter paste (4).

The Waterborne Disease and Outbreak Surveillance System (WBDOSS) collects reports of waterborne disease outbreaks associated with drinking water and recreational water from local, state, tribal, and territorial public health agencies. The 2008 annual summary of waterborne disease outbreaks associated with drinking water is available at http://www.cdc.gov/mmwr/pdf/ss/ss6012.pdf

- In 2008, 16 waterborne disease outbreaks associated with drinking water were reported; two were caused by *Salmonella* (5):
    - An outbreak in Colorado of *Salmonella* serotype Typhimurium infections associated with well water caused 1300 cases and one death,
    - An outbreak in Tennessee of *Salmonella* serotype I,4,[5],12:i:- infections associated with spring water caused five cases and no deaths.

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

NVSL Data Tables for 2008 are available online at
http://www.cdc.gov/ncezid/dfwed/PDFs/SalmonellaAnnualSummaryTables2008.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 2008 are shown in Table 6.

Clinical animal isolates (referred to as "clinical/non-human") are defined as *Salmonella* isolates from animals with 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 NVSL by serotype and source in 2008 are shown in Tables 7 and 8.

- The most common clinical/non-human serotype reported to NVSL during 2008 was Typhimurium (including Typhimurium var. 5-, 21%).
- The most common non-clinical/non-human serotype reported to NVSL during 2008 was serotype Kentucky (20%); the next most common was Heidelberg (14%).
- 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 2008.

		Non-Human (clinical) Sources			
Serotype	Human Rank, 2008	Bovine (%)	Chicken (%)	Porcine (%)	Turkey (%)
Enteritidis	1	4	34	9	0.9
Typhimurium (including Typhimurium var. 5-)	2	20	16	48	0.5
Newport	3	46	0.2	4	2
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 2008.

		Non-Human (non-clinical) Sources			
Serotype	Human Rank, 2008	Bovine (%)	Chicken (%)	Porcine (%)	Turkey (%)
Enteritidis	1	0.6	89	0	0.1
Typhimurium (including Typhimurium var. 5-)	2	6	67	4	4
Newport	3	22	24	1	25
Javiana	4	5	33	0	0

References

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