

January 1-December 31, 2016

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The Diagnostic Bacteriology Laboratory within the National Veterinary Services Laboratories (NVSL) routinely performs serotyping of *Salmonella* isolates submitted by private, State, and Federal laboratories as well as veterinarians, researchers and other animal health officials. This report summarizes *Salmonella* serotyping submissions received at the NVSL from January 1 through December 31, 2016.

Salmonella isolates are identified as clinical (clinical signs of salmonellosis from primary or secondary infection) or non-clinical (herd and flock monitoring programs, environmental sources, food and other). Serotyping data from isolates submitted for research purposes are not included in the source-specific summaries. Based on information provided by the submitter, the isolates were divided into animal source categories for analysis. The animal sources include Avian, Cattle, Chicken, Dog/Cat, Equine, Pig, Reptile/Amphibian, Turkey, Wild/Zoo, and Other (environment, unknown).

Salmonella serotyping at the NVSL is an ISO 17025 accredited test. *Salmonellae* are typed via classical serotyping using polyvalent and single factor antisera to determine the O and H antigens and/or via molecular typing using the xMAP *Salmonella* serotyping assay. Approximately 60% of the sera used at the NVSL is produced in-house as previously described (Ewing, 1986) The remaining antisera are purchased from commercial vendors. All sera are subject to extensive quality control testing prior to use. *Salmonella* antigenic formulae are determined as previously described (Ewing) and interpreted via the White-Kauffmann-Le Minor scheme (Grimont, 2007). The subspecies designation precedes the antigenic formula for those serotypes other than subspecies I.

In 2016, 13,295 submissions were received for *Salmonella* serotyping. *Salmonella* isolates were divided into clinical isolates (5,258), non-clinical isolates (5,727), and research (2,310). The sources of clinical and non-clinical *Salmonella* isolates are shown in Table 1. There were 254 different serotypes identified from 47 states and the District of Columbia in 2016. Table 2 lists the 10 most common serotypes when all animal sources were combined. The 10 most common serotypes accounted for 62% of the total clinical isolates submitted and 60% of the total non-clinical isolates submitted. The most common isolates from chickens, turkeys, pigs, cattle, and equine are listed in Tables 3-7.

The NVSL provided a *Salmonella* Group D proficiency test to 98 individuals in 85 different laboratories. The purpose of the PT was to assess the ability of laboratories to detect or isolate *Salmonella* Group D and/or *Salmonella* Enteritidis from simulated environmental samples. The test consisted of 10 lyophilized cultures containing various combinations of *Salmonella* and common contaminants typically found in environmental swabs. The 2016 test included *Salmonella* serotypes Anatum, Enteritidis, Heidelberg, Javiana, Newport and I 9,12:non-motile. Contaminant bacteria included *Citrobacter sedlakii*, *Citrobacter amalonaticus*, *Citrobacter freundii*, *Enterobacter cloacae*, *Enterobacter* species, *Klebsiellae pneumoniae*, *Providencia rettgeri*, and *Pseudomonas aeruginosa*. Laboratories were instructed to test the samples according to the procedures used in their laboratories. The NVSL randomly retained 13% of the test kits and tested them blindly for QA purposes. The results of the proficiency test are shown in Table 8.

Table 1: Sources of submissions to the NVSL for Salmonella serotyping in 2016

Source	No. Clinical Submissions	No. Non-Clinical Submissions
Cattle	1,414	194
Chicken	287	3,252
Horse	830	39
Swine	1,885	235
Turkey	259	1,156
All others	583	851
Total	5,258	5,727

Table 2: Most common serotypes in 2016: All sources

Clinical		Non-Clinical	
Serotype	No. Isolates	Serotype	No. Isolates
4,[5],12:i:-	776	Senftenberg	751
Typhimurium	755	Mbandaka	412
Dublin	345	Enteritidis	364
Cerro	296	Typhimurium	309
Javiana	231	Hadar	300
Derby	189	Worthington	252
Montevideo	183	Thompson	223
Heidelberg	178	Cerro	217
Newport	177	Montevideo	212
Agona	161	London/Newport	198
All others	1,967	All others	2,291
Total	5,258	Total	5,727

Table 3: Most common serotypes in 2016: Chickens

Clinical		Non-Clinical	
Serotype	No. Isolates	Serotype	No. Isolates
Enteritidis	129	Senftenberg	490
Typhimurium	32	Mbandaka	363
Kentucky	31	Worthington	237
Heidelberg	15	Enteritidis	213
Ill 13,23:9,251:-	8	Thompson	198
All others	72	All others	1,751
Total	287	Total	3,252

Table 4: Most common serotypes in 2016: Turkeys

Clinical		Non-Clinical	
Serotype	No. Isolates	Serotype	No. Isolates
Senftenberg	38	Hadar	291
Ouakam	25	Senftenberg	239
Bredeney/Albany	21	London	194
Typhimurium	19	Muenchen	95
Uganda	17	Uganda/Albany	51
All others	118	All others	235
Total	259	Total	1,156

Table 5: Most common serotypes in 2016: Pigs

Clinical		Non-Clinical	
Serotype	No. Isolates	Serotype	No. Isolates
4,[5],12:i:-	652	4,[5],12:i:-	48
Typhimurium	277	Typhimurium	41
Derby	179	Derby	25
Infantis	98	Agona	17
Agona	91	Infantis	12
All others	588	All others	92
Total	1,885	Total	235

Table 6: Most common serotypes in 2016: Cattle

Clinical		Non-Clinical	
Serotype	No. Isolates	Serotype	No. Isolates
Dublin	332	Cerro	30
Cerro	275	Typhimurium	25
Typhimurium	142	Montevideo	17
Montevideo	110	Heidelberg	16
Heidelberg	101	Newport	15
All others	454	All others	104
Total	1603	Total	290

Table 7: Most common serotypes in 2016: Horses

All sources	
Serotype	No. Isolates
Javiana	207
Typhimurium	202
Newport	67
Agona	40
Montevideo	38
All others	315
Total	869

Table 8: Summary of NVSL *Salmonella* Group D proficiency test

	2011	2012	2013	2014	2015	2016
Participants	70	73	61	80	94	98
Mean Score	97%	92%	94%	98%	98%	97%
Score Range	100-85%	100%-29%	100-68%	100-80%	100-68%	100-80%
Below Passing	0	7	4	0	1	0

Ewing, WH. 1986. Edward and Ewing's Identification of Enterobacteriaceae. 4th edition. Elsevier Science Publishing Co., Inc., New York, U.S.

Grimont, PAD, Weill, FX. 2007. Antigenic Formulae of the *Salmonella* Serovars. 9th edition. WHO Collaborating Centre for Reference and Research on *Salmonella*. Paris, France.