

Salmonella Agona

Background: *Salmonella enterica* subsp. *enterica* serovar Agona (antigenic formula 1,4,[5],12:f,g,s:[1,2]) is a serovar of the O:4 (B) serogroup. *S. Agona* is among the 15th most common serovars in humans the U.S., and the 4th most common serovar in clinical non-human sources. This serovar was first isolated from cattle in Ghana in 1952, since then numerous [outbreaks](#) in the U.S. and [Europe](#) have occurred. Multi Locus Sequence Typing (MLST) has identified only four sequence types. Genome sequencing of 73 strains from multiple countries and sources was recently reported by [Zhou et al., 2013](#).

Animal reservoir: Different animal species, including turkey, swine and cattle are reservoirs of *S. Agona*.

Geographical distribution: Serovar Agona is among the most common serovars in North and South America, Europe, and Asia. In China, it is among the 10th most common serovars.

Outbreaks: Outbreaks linked to *Salmonella Agona* have been associated with different foods, including cereal, meat and fruits.

Year	Location	Associated source	Number of cases
2022	Sweden, Norway, Netherlands, & UK	Cucumbers (suspected)	107
2011	US-multistate	Imported Papayas	106
2008	US-multistate	Rice & Wheat Puff Cereal	28
2008	Europe (6 countries)	Meat, cocked sandwich	148
2008	Europe	Meat	119
2004	France	Infant formula	141
2002	Germany	Tea, aniseed herbal	42
1998	US-multistate	Toasted Oats Cereal	209

Border Rejections:

Year	Location	Associated Source	Number of Cases
2023	Germany	Onion powder from Hungary	NA

Relevant genetic characteristics: Whole genome sequences for 74 strains of *S. Agona* have been deposited at GenBank as of October, 2013. Genomic characteristics of the sequenced *S. Agona* include (i) a genome size ranging from 4.70 to 4.95 Mb, (ii) a mol G+C% of approx. 52, and (iii) 4,658 to 4,934 predicted genes. Comparative genomics of 73 of the sequenced strains identified three lineages of *S. Agona* that emerged approx. 80 years ago. *S. Agona* has an accessory genome of approx. 1.3 Mb; this accessory genome includes (i) multiple prophages (P2-like, Fels-like, Lambda-like), (ii) antibiotic resistance plasmids (e.g., IncI1 plasmids), (iii) genomic islands, (iv) transposons, and (v) chromosomal integrons.

Phylogenetic and pan-genomic analyses that included one of the sequenced *S. Agona* strains and other *Salmonella* serovars concluded that *S. Agona* belongs to clade A, according to [den Bakker et al. \(2011\)](#) classification and it contains 133 [gene families](#) unique to this serovar.

Genome sequences available:

1. *Salmonella enterica* subsp. *enterica* serovar Agona str. SL483 <http://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?mode=Info&id=454166&lvl=3&lin=f&keep=1&srchmode=1&unlock>
2. *Salmonella enterica* subsp. *enterica* serovar Agona str. SH08SF124 <http://www.ncbi.nlm.nih.gov/assembly/526088/>
3. *Salmonella enterica* subsp. *enterica* serovar Agona str. SH10GFN094 <http://www.ncbi.nlm.nih.gov/assembly/526108/>
4. *Salmonella enterica* subsp. *enterica* serovar Agona str. SH11G1113 <http://www.ncbi.nlm.nih.gov/assembly/526068/>
5. *Salmonella enterica* subsp. *enterica* serovar Agona str. 73.H.09 <http://www.ncbi.nlm.nih.gov/assembly/689058/>
6. *Salmonella enterica* subsp. *enterica* serovar Agona str. 72.A.52 <http://www.ncbi.nlm.nih.gov/assembly/689078/>
7. *Salmonella enterica* subsp. *enterica* serovar Agona str. 71.E.05 <http://www.ncbi.nlm.nih.gov/assembly/689098/>
8. *Salmonella enterica* subsp. *enterica* serovar Agona str. 70.E.05 <http://www.ncbi.nlm.nih.gov/assembly/689118/>
9. *Salmonella enterica* subsp. *enterica* serovar Agona str. 69.H.06 <http://www.ncbi.nlm.nih.gov/assembly/689138/>
10. *Salmonella enterica* subsp. *enterica* serovar Agona str. 68.U.05 <http://www.ncbi.nlm.nih.gov/assembly/689158/>
11. *Salmonella enterica* subsp. *enterica* serovar Agona str. 67.H.09 <http://www.ncbi.nlm.nih.gov/assembly/689318/>
12. *Salmonella enterica* subsp. *enterica* serovar Agona str. 66.F.99 <http://www.ncbi.nlm.nih.gov/assembly/689178/>
13. *Salmonella enterica* subsp. *enterica* serovar Agona str. 65.H.72 <http://www.ncbi.nlm.nih.gov/assembly/653108/>
14. *Salmonella enterica* subsp. *enterica* serovar Agona str. 64.H.00 <http://www.ncbi.nlm.nih.gov/assembly/689198/>
15. *Salmonella enterica* subsp. *enterica* serovar Agona str. 63.H.87 <http://www.ncbi.nlm.nih.gov/assembly/689218/>
16. *Salmonella enterica* subsp. *enterica* serovar Agona str. 62.H.72 <http://www.ncbi.nlm.nih.gov/assembly/689238/>
17. *Salmonella enterica* subsp. *enterica* serovar Agona str. 61.O.08 <http://www.ncbi.nlm.nih.gov/assembly/689258/>
18. *Salmonella enterica* subsp. *enterica* serovar Agona str. 60.O.08 <http://www.ncbi.nlm.nih.gov/assembly/689278/>
19. *Salmonella enterica* subsp. *enterica* serovar Agona str. 59.F.08 <http://www.ncbi.nlm.nih.gov/assembly/689298/>
20. *Salmonella enterica* subsp. *enterica* serovar Agona str. 58.E.08 <http://www.ncbi.nlm.nih.gov/assembly/676478/>
21. *Salmonella enterica* subsp. *enterica* serovar Agona str. 57.A.08 <http://www.ncbi.nlm.nih.gov/assembly/677478/>
22. *Salmonella enterica* subsp. *enterica* serovar Agona str. 56.O.08 <http://www.ncbi.nlm.nih.gov/assembly/676498/>
23. *Salmonella enterica* subsp. *enterica* serovar Agona str. 55.U.08 <http://www.ncbi.nlm.nih.gov/assembly/676518/>
24. *Salmonella enterica* subsp. *enterica* serovar Agona str. 54.O.08 <http://www.ncbi.nlm.nih.gov/assembly/676538/>
25. *Salmonella enterica* subsp. *enterica* serovar Agona str. 53.F.08 <http://www.ncbi.nlm.nih.gov/assembly/676558/>
26. *Salmonella enterica* subsp. *enterica* serovar Agona str. 52.F.08 <http://www.ncbi.nlm.nih.gov/assembly/676578/>
27. *Salmonella enterica* subsp. *enterica* serovar Agona str. 51.E.09 <http://www.ncbi.nlm.nih.gov/assembly/676598/>
28. *Salmonella enterica* subsp. *enterica* serovar Agona str. 50.E.08 <http://www.ncbi.nlm.nih.gov/assembly/676618/>
29. *Salmonella enterica* subsp. *enterica* serovar Agona str. 49.E.09 <http://www.ncbi.nlm.nih.gov/assembly/677498/>
30. *Salmonella enterica* subsp. *enterica* serovar Agona str. 48.E.08 <http://www.ncbi.nlm.nih.gov/assembly/676638/>
31. *Salmonella enterica* subsp. *enterica* serovar Agona str. 46.E.09 <http://www.ncbi.nlm.nih.gov/assembly/676658/>

32. *Salmonella enterica* subsp. *enterica* serovar Agona str. 45.E.09 <http://www.ncbi.nlm.nih.gov/assembly/676678/>
33. *Salmonella enterica* subsp. *enterica* serovar Agona str. 44.E.09 <http://www.ncbi.nlm.nih.gov/assembly/676698/>
34. *Salmonella enterica* subsp. *enterica* serovar Agona str. 43.E.09 <http://www.ncbi.nlm.nih.gov/assembly/676718/>
35. *Salmonella enterica* subsp. *enterica* serovar Agona str. 42.E.09 <http://www.ncbi.nlm.nih.gov/assembly/676738/>
36. *Salmonella enterica* subsp. *enterica* serovar Agona str. 41.E.09 <http://www.ncbi.nlm.nih.gov/assembly/676778/>
37. *Salmonella enterica* subsp. *enterica* serovar Agona str. 40.E.08 <http://www.ncbi.nlm.nih.gov/assembly/676758/>
38. *Salmonella enterica* subsp. *enterica* serovar Agona str. 39.O.03 <http://www.ncbi.nlm.nih.gov/assembly/677518/>
39. *Salmonella enterica* subsp. *enterica* serovar Agona str. 38.O.03 <http://www.ncbi.nlm.nih.gov/assembly/676798/>
40. *Salmonella enterica* subsp. *enterica* serovar Agona str. 37.F.02 <http://www.ncbi.nlm.nih.gov/assembly/676818/>
41. *Salmonella enterica* subsp. *enterica* serovar Agona str. 36.H.00 <http://www.ncbi.nlm.nih.gov/assembly/676838/>
42. *Salmonella enterica* subsp. *enterica* serovar Agona str. 35.H.08 <http://www.ncbi.nlm.nih.gov/assembly/676858/>
43. *Salmonella enterica* subsp. *enterica* serovar Agona str. 34.H.09 <http://www.ncbi.nlm.nih.gov/assembly/676878/>
44. *Salmonella enterica* subsp. *enterica* serovar Agona str. 33.A.05 <http://www.ncbi.nlm.nih.gov/assembly/676898/>
45. *Salmonella enterica* subsp. *enterica* serovar Agona str. 31.A.00 <http://www.ncbi.nlm.nih.gov/assembly/676918/>
46. *Salmonella enterica* subsp. *enterica* serovar Agona str. 31.H.09 <http://www.ncbi.nlm.nih.gov/assembly/676938/>
47. *Salmonella enterica* subsp. *enterica* serovar Agona str. 30.H.04 <http://www.ncbi.nlm.nih.gov/assembly/677538/>
48. *Salmonella enterica* subsp. *enterica* serovar Agona str. 29.O.08 <http://www.ncbi.nlm.nih.gov/assembly/676958/>
49. *Salmonella enterica* subsp. *enterica* serovar Agona str. 28.O.08 <http://www.ncbi.nlm.nih.gov/assembly/676978/>
50. *Salmonella enterica* subsp. *enterica* serovar Agona str. 27.O.98 <http://www.ncbi.nlm.nih.gov/assembly/676998/>
51. *Salmonella enterica* subsp. *enterica* serovar Agona str. 26.F.98 <http://www.ncbi.nlm.nih.gov/assembly/677558/>
52. *Salmonella enterica* subsp. *enterica* serovar Agona str. 24.H.04 <http://www.ncbi.nlm.nih.gov/assembly/677018/>
53. *Salmonella enterica* subsp. *enterica* serovar Agona str. 23.F.01 <http://www.ncbi.nlm.nih.gov/assembly/677038/>
54. *Salmonella enterica* subsp. *enterica* serovar Agona str. 22.H.04 <http://www.ncbi.nlm.nih.gov/assembly/677058/>
55. *Salmonella enterica* subsp. *enterica* serovar Agona str. 21.H.10 <http://www.ncbi.nlm.nih.gov/assembly/677078/>
56. *Salmonella enterica* subsp. *enterica* serovar Agona str. 20.H.06 <http://www.ncbi.nlm.nih.gov/assembly/677098/>
57. *Salmonella enterica* subsp. *enterica* serovar Agona str. 19.F.03 <http://www.ncbi.nlm.nih.gov/assembly/677118/>
58. *Salmonella enterica* subsp. *enterica* serovar Agona str. 18.H.07 <http://www.ncbi.nlm.nih.gov/assembly/677138/>
59. *Salmonella enterica* subsp. *enterica* serovar Agona str. 17.H.06 <http://www.ncbi.nlm.nih.gov/assembly/677158/>
60. *Salmonella enterica* subsp. *enterica* serovar Agona str. 15.H.03 <http://www.ncbi.nlm.nih.gov/assembly/677178/>
61. *Salmonella enterica* subsp. *enterica* serovar Agona str. 14.E.05 <http://www.ncbi.nlm.nih.gov/assembly/677198/>
62. *Salmonella enterica* subsp. *enterica* serovar Agona str. 13.E.05 <http://www.ncbi.nlm.nih.gov/assembly/677218/>
63. *Salmonella enterica* subsp. *enterica* serovar Agona str. 12.A.06 <http://www.ncbi.nlm.nih.gov/assembly/677238/>
64. *Salmonella enterica* subsp. *enterica* serovar Agona str. 11.A.05 <http://www.ncbi.nlm.nih.gov/assembly/677258/>
65. *Salmonella enterica* subsp. *enterica* serovar Agona str. 10.A.05 <http://www.ncbi.nlm.nih.gov/assembly/677458/>
66. *Salmonella enterica* subsp. *enterica* serovar Agona str. 09.F.08 <http://www.ncbi.nlm.nih.gov/assembly/677278/>
67. *Salmonella enterica* subsp. *enterica* serovar Agona str. 08.A.05 <http://www.ncbi.nlm.nih.gov/assembly/677298/>
68. *Salmonella enterica* subsp. *enterica* serovar Agona str. 07.O.05 <http://www.ncbi.nlm.nih.gov/assembly/677318/>
69. *Salmonella enterica* subsp. *enterica* serovar Agona str. 06.O.05 <http://www.ncbi.nlm.nih.gov/assembly/677338/>
70. *Salmonella enterica* subsp. *enterica* serovar Agona str. 05.O.06 <http://www.ncbi.nlm.nih.gov/assembly/677358/>
71. *Salmonella enterica* subsp. *enterica* serovar Agona str. 04.O.05 <http://www.ncbi.nlm.nih.gov/assembly/677378/>
72. *Salmonella enterica* subsp. *enterica* serovar Agona str. 03.O.05 <http://www.ncbi.nlm.nih.gov/assembly/677398/>
73. *Salmonella enterica* subsp. *enterica* serovar Agona str. 02.O.05 <http://www.ncbi.nlm.nih.gov/assembly/677418/>
74. *Salmonella enterica* subsp. *enterica* serovar Agona str. 01.O.05 <http://www.ncbi.nlm.nih.gov/assembly/677438/>

Relevant links and references:

1. <http://www.cdc.gov/salmonella/agona-papayas/index.html>
2. <http://www.ncbi.nlm.nih.gov/pubmed/20950515>
3. <http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=18956>
4. <http://genomea.asm.org/content/1/1/e00203-12.full>
5. <http://www.plosgenetics.org/article/info%3Adoi%2F10.1371%2Fjournal.pgen.1003471>