

Salmonella Kentucky

Background: *Salmonella enterica* subsp. *enterica* serovar Kentucky (antigenic formula 8,20:i:z6) is a serovar of the O:8 (C₂-C₃) serogroup. This serovar is commonly found in animals in the U.S. (Chickens, turkeys and cows), but rarely is reported in human cases. It is the most common serovar identified in non-clinical non-human sources, according to CDC, 2011. However, in Europe, serovar Kentucky is found in approx. 1% of the human cases. In Europe and Canada, multidrug resistant serovar Kentucky strains have been found. A highly resistant clone of *S. Kentucky* (MLST type ST198), has been reported to be isolated in Canada and in Europe in travelers returning from Asia and Africa. This strain shows resistance to -lactam antibiotics, carbapenems, quinolones, aminoglycosides, co-trimoxazole (trimethoprim-sulfamethoxazole), and to azithromycin. Molecular characterization shows a chromosomal **genomic island** carrying the resistance genes that confer resistance to these antimicrobials.

Animal reservoir: Serovar Kentucky is typically found in cattle and poultry

Geographical distribution: *S. Kentucky* is widely distributed. In the U.S., it is commonly found in animals (specifically cattle and poultry) and in meat. In Europe, Asia and Africa, this serovar is also regularly isolated from humans with symptoms consistent with salmonellosis.

Outbreaks: A number of human cases have been reported in Europe in travelers from Asia and Africa. However, there are limited outbreaks with epidemiological investigation and clear source identification have been reported.

Outbreaks: A number of outbreaks in the U.S., Europe and Australia have been linked to *S. Muenchen*.

Year	Location	Associated source	Number of cases
2016	US-multistate	alfalfa sprouts	1*

*25 other cases associated with this outbreak were identified as *Salmonella* Muenchen (i.e., N=26)

Relevant genetic characteristics: Whole genome sequences for two strains of *S. Kentucky*, one from a human (str. CDC 191) and one from chicken breast (str. CVM29188), have been deposited at GenBank as of October, 2013. Genomic characteristics of the sequenced *S. Kentucky* include (i) a genome size ranging from 4.7-5.09 Mb, (ii) a mol G+C% ranging from 51.9-52.2, and (iii) 4,735 to 5,295 predicted genes. *Salmonella* Kentucky str. CVM29188 is a multidrug resistant strain that contains three plasmids of 46, 101, and 146 kb. The two large plasmids are conjugative plasmids that carry antimicrobial resistance genes. The largest plasmid of 146 kb shows the same backbone and virulence genes as virulence plasmids of Avian Pathogenic *E. coli* (APEC). Partial sequences of a region in *Salmonella* Kentucky strain SRC73 are deposited at GenBank. This strain, from Indian spices, is a multidrug resistant strain that contains the resistance genes inserted in the chromosome in a genomic island (*Salmonella* Genomic Island 1 variant SGI1-K).

Phylogenetic and pan-genomic analyses that included completely sequenced *S. Kentucky* and other *Salmonella* serovars concluded that *S. Kentucky* (i) belongs to clade A, according to den Bakker et al. (2011) classification, (ii) appears to have several evolutionary origin, and (iii) contains 127 **gene families** unique to this serovar.

Genome sequences available

1. *Salmonella enterica* subsp. *enterica* serovar Kentucky str. CDC 191 <http://www.ncbi.nlm.nih.gov/assembly/210898/>
2. *Salmonella enterica* subsp. *enterica* serovar Kentucky str. CVM29188 <http://www.ncbi.nlm.nih.gov/assembly/444278/>
3. *Salmonella enterica* subsp. *enterica* serovar Kentucky strain SRC73, *Salmonella* Genomic Island 1 variant SGI1-K genomic sequence: <http://www.ncbi.nlm.nih.gov/nucleotide/AY463797>

Relevant links and references:

1. http://wwwnc.cdc.gov/eid/article/19/6/12-1351_article.htm
2. <http://www.thelancet.com/journals/laninf/article/PIIS1473-3099%2813%2970124-5/abstract>
3. <http://aac.asm.org/content/56/10/5096.full>
4. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2747853/>
5. <http://www.ncbi.nlm.nih.gov/nucleotide/AY463797>
6. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1797678/>
7. <http://www.biomedcentral.com/1471-2164/12/425/abstract>
8. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3175032/>
9. <https://www.cdc.gov/salmonella/muenchen-02-16/index.html>