



JOINT ECDC–EFSA RAPID OUTBREAK ASSESSMENT

Multi-country outbreak of *Salmonella* Stanley infections

Third update, 8 May 2014

Main conclusions and options for action

- Between 1 August 2011 and 31 January 2013, 710 cases of non-travel-related *Salmonella* Stanley infections were identified in 10 EU Member States. Epidemiological and microbiological information gathered through a public health, food and veterinary investigation strongly suggested that a contamination in the turkey production chain was the source of the outbreak.
- Since January 2014, new cases, clusters and epidemics of *S. Stanley* have been reported in four Member States, all potentially linked to the previous *S. Stanley* outbreak in 2011–2012. All cases shared the same indistinguishable pulsed-field gel electrophoresis (PFGE) outbreak strain.
- The recent cases and changes in the epidemiology of *S. Stanley* in the EU suggest that the 2011–2012 outbreak strain is still present on the European food market. Therefore, new sporadic cases and outbreaks of *S. Stanley* are expected, and other European countries may get involved.
- ECDC encourages Member States to investigate small clusters and outbreaks of domestically acquired *S. Stanley* infections and report findings through the EPIS-FWD platform. A questionnaire developed for the 2011–2012 outbreak is available through EPIS-FWD. ECDC also encourages all countries to participate in ECDC's molecular surveillance pilot study and submit PFGE patterns of *S. Stanley* isolates to TESSy.
- It is important to highlight that persons working in the food industry (from production to catering), as well as consumers, should follow strict personal hygiene measures (e.g. hand washing); the same applies to food hygiene standards; for example when handling raw turkey meat, cross-contamination between ready-to-eat and raw meat should be avoided.
- ECDC and EFSA recommend that further actions should be taken by risk managers in countries to detect and contain *S. Stanley* infections in the turkey production chain, thus avoiding the subsequent contamination of turkey meat. If necessary, similar steps should be taken in the broiler production chain.

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Source and date of request

Following an urgent inquiry related to the outbreak of *S. Stanley* launched by Austria on 8 April 2014, ECDC and EFSA agreed on 16 April 2014 to update their earlier rapid outbreak assessment entitled 'Multi-country outbreak of *Salmonella* Stanley infections', originally published on 21 September 2012.

A related request from the European Commission is tagged 'EFSA-Q-2014-00315'.

Public health issue

A multi-country outbreak of *Salmonella* enterica serovar Stanley (*Salmonella* Stanley) infection with microbiologically linked cases reported in Austria, Germany, Hungary and the United Kingdom (Scotland).

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Disease background information

S. Stanley serovar isolations in humans

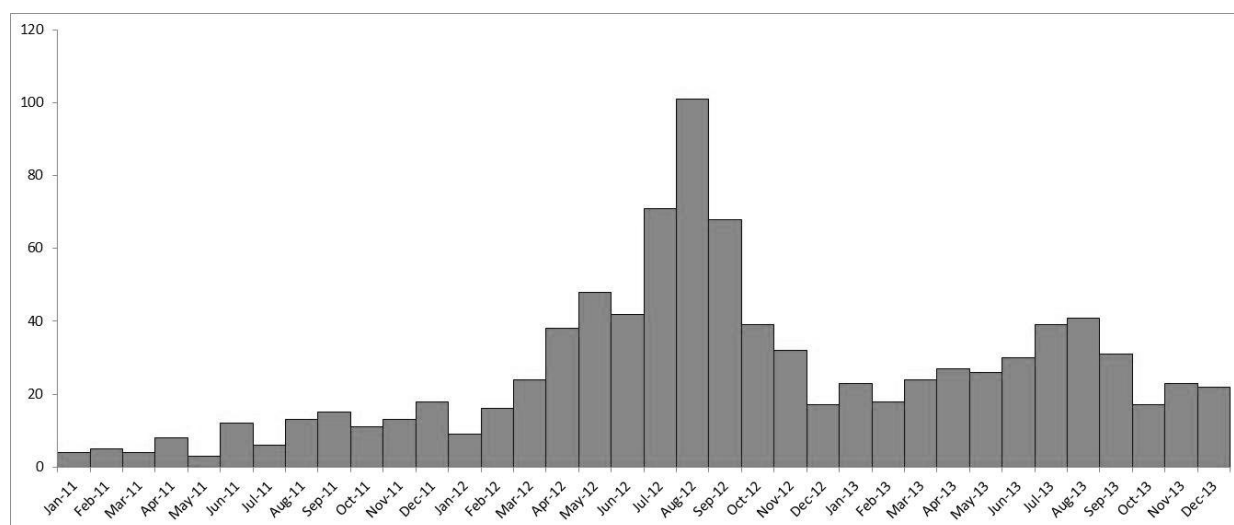
Salmonella enterica serovar Stanley (*S. Stanley*), although rare in Europe, is one of the most common serovar associated with human infections in south-east Asia. Between 2002 and 2007, *S. Stanley* was the second most common serovar in human salmonellosis reported in Thailand, accounting for 11% of all cases of salmonellosis [1]. In the central region of Thailand, *S. Stanley* isolates collected from patients, asymptomatic carriers and non-human sources between 2001 and 2006 showed the highest rates of antibiotic resistance to sulfamethoxazole (92%), tetracycline (80%) and streptomycin (77%), whereas resistance to nalidixic acid and ciprofloxacin was low, at 5% and 2%, respectively [2]. From 2001 to 2007, *S. Stanley* was among the 20 most frequently reported serovars in Japan, Malaysia, Philippines, Croatia, Denmark, Finland, the Netherlands and Canada [3].

There is no indication that the clinical presentation of *S. Stanley* cases differs from usual *Salmonella* infections caused by other commonly occurring non-typhoidal serovars, especially in terms of severity [4]. Symptoms in *Salmonella* infections usually include diarrhoea (sometimes bloody), fever, abdominal cramps and vomiting [5].

Since 1995, several local and international outbreaks of gastroenteritis caused by *S. Stanley* have been reported in Europe [6-11]. The sources of the outbreaks were among other alfalfa sprouts, peanuts, soft cheese, and turkey meat.

Between 2006 and 2013, 24 EU/EEA countries reported a total of 4 300 cases of *S. Stanley* infection to the European Surveillance System (TESSy). In 2012, an outbreak of *S. Stanley* infection was notified, with a peak in the number of cases in August 2012 (Figure 1).

Figure 1. Non-travel related cases of *S. Stanley* infections reported by Member States to TESSy, by month of illness onset, January 2011 to December 2013 (n=938)



Between 2007 and 2013, 1 885 (58%) of 3 255 cases with a known travel history were travel-related (Table 1). Since 2012, most of the reported cases (68%) have been domestic (Table 1).

Table 1. Distribution of reported human *Salmonella* Stanley infections by travel status, EU/EEA, 2007–2013

	2007		2008		2009		2010		2011		2012		2013	
	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
Domestic	141	27.1	109	22	92	25.7	90	27	112	33.4	505	65.8	321	71.8
Travel-related	380	72.9	387	78	263	74.3	243	73	223	66.6	263	34.2	126	28.2
Unknown travel history	151	-	124	-	101	-	85	-	110	-	203	-	143	-
All cases	672	100	620	100	456	100	418	100	445	100	971	100	590	100

Source: The European Surveillance System

During the period 2006–2013, the top five source countries for travel-related *S. Stanley* infections were: Thailand (69% of all cases with known data), Pakistan (4%), India (4%), Vietnam (3%) and the Philippines (3%).

The analysis of strains from the former PulseNet Europe and TESSy databases show a high genetic diversity, with no single genetic group dominating, neither temporarily nor geographically.

Resistance to nalidixic acid was previously rarely reported for *S. Stanley*. In a study of 125 *S. Stanley* isolates from clinical cases in Asia and Europe in 2008, only seven (6%) strains were resistant to nalidixic acid (five of them were isolated from travel-related infections) [1]. In *S. Stanley* reports to TESSy between 2007 and 2013, a marked increase in the proportion of nalidixic-acid-resistant isolates was observed among cases acquired in the EU/EEA: from an annual average of 12% in 2007–2010 to 70% in 2011–2013. Meanwhile, the proportion of nalidixic-acid-resistant isolates among cases acquired outside the EU/EEA remained fairly stable (average 18%, range 8–27%) over the period.

***S. Stanley* serovar isolations from food, animals and feed**

EU Member States as well as Norway and Switzerland have only rarely reported *S. Stanley* serovar from food and animals (national zoonoses monitoring in accordance with Directive 2003/99/EC).

From 2004 to 2012, these countries reported a total of 1 252 isolations of *S. Stanley* from the following animals: pigs (11 isolates), cattle (2), chickens (*Gallus gallus*) (39), turkeys (1 087), other poultry (9), wild birds (2), wild boar (4), reptiles (1), cats (1), dogs (1), and hedgehogs (1).

S. Stanley isolations were from the following foods: pork (3), turkey meat (55), broiler meat (15), meat from bovine animals (1), other red meat (2), dairy products (1), food of non-animal origin (1), mushrooms (1), meat from poultry tagged as 'unspecified' (1), meat from other animals species (1), other non-specified products of animal origin (2), and other food (3). Eight isolations were reported from feed for fur animals, feed material and pet food.

Only 55 isolations were reported between 2004 and 2010 (but no *S. Stanley* isolations reported related to turkeys or turkey meat); numbers increased to 311 in 2011, and to 886 in 2012.

The EU-wide *Salmonella* baseline survey in turkey flocks (2006–2007) could not detect the presence of *S. Stanley*. But in 2008, three Member States reported a total of nine isolates of *S. Stanley* (two isolates from Hungary, four from the Netherlands, and three from the United Kingdom) in the EU-wide *Salmonella* baseline survey in holdings with breeding pigs.

The majority of the 2012 *S. Stanley* isolations were obtained from turkey fattening flocks, turkey breeding flocks and turkey meat (844 isolations), while other isolations were reported from broiler flocks (11), chickens (*Gallus gallus*) breeding flocks (1), pigs (1), other poultry (6), wild boar (4), wild birds (2), broiler meat (9) and pig meat (1).

In 2012, *S. Stanley* isolations from turkeys (796) and turkey meat (48) were reported by six Member States: Austria (98 isolates from turkeys, 10 from turkey meat), the Czech Republic (nine isolates from turkey fattening flocks and one from turkey meat), Germany (one from turkey meat), Hungary (676 isolates from turkey production flocks, one isolate from a turkey breeding flock, 12 isolates from unspecified turkeys, 14 from fresh turkey meat, and four isolates from minced turkey meat), Italy (14 isolates from turkey meat products), and Poland (four isolates from turkey meat).

In 2012, Hungary also reported *S. Stanley* isolations from broiler flocks of *Gallus gallus* (eight isolates), from breeding flocks of *Gallus gallus* (one isolate) and from meat from broilers (six isolates).

Table 2. Reported isolations of *S. Stanley* from food, animals and feed, EU Member States and other reporting countries, 2004–2012

Source	No. of isolations in 2004–2010	No. of isolations in 2011	No. of isolations in 2012	Total no. of isolations (2004–2012)
Animals				
Chickens (<i>Gallus gallus</i>)	20	7	12	39
Turkeys		291	796	1 087
Other poultry		3	6	9
Pigs	9	1	1	11
Cattle	2			2
Reptiles	1			1
Cats	1			1
Dogs	1			1
Hedgehogs		1		1
Wild birds			2	2
Wild Boar			4	4
Food				
Meat from broilers	5	1	9	15
Meat from poultry tagged as 'unspecified'			1	1
Meat from turkeys		7	48	55
Meat from bovine animals	1			1
Meat from pigs	2		1	3
Red meat	1		1	2
Meat from other animal species			1	1
Dairy products	1			1
Food of non-animal origin	1			1
Other food	3			3
Other products of animal origin	2			2
Mushrooms	1			1
Feed				
Feed material	1		3	4
Feed for fur animals	1			1
Pet food	2		1	3
Total	55	311	886	1 252

Note: Based on Directive 2003/99/EC of the European Parliament and of the Council of 17 November 2003 on the monitoring of zoonoses and zoonotic agents, amending Council Decision 90/424/EEC and repealing Council Directive 92/117/EEC

S. Stanley serovar isolations reported to the Rapid Alert System for Food and Feed (RASFF)

From 2005 to 2014, 21 RASFF notifications on *S. Stanley* were released. Until 2010, these notifications mostly related to food (e.g. fresh herbs) and feed items originating from Thailand.

From 2011 onwards, all notified products originated in European Union Member States. Between 2011 and 2014, four RASFF notifications were issued because of contaminated poultry meat (e.g. turkey kebab, turkey sticks, whole chicken and chicken thighs).

Event background information

Summary of the multi-country outbreak of *S. Stanley* infections from August 2011 to January 2013

On 29 June 2012, the National Reference Centre for *Salmonella* in Belgium – through the Epidemic Intelligence Information System for Food- and Waterborne Diseases and Zoonoses (EPIS-FWD) – reported a significant increase of human cases of *S. Stanley* infections. The increase was associated with a nalidixic-acid-resistant strain with an indistinguishable PFGE pattern (referred to as the 'outbreak strain' in this document).

In July 2012, the European Centre for Disease Prevention and Control (ECDC), in collaboration with the affected Member States, the European Food Safety Authority (EFSA) and the European Reference Laboratory for *Salmonella* (EURL *Salmonella*) initiated a Europe-wide investigation on this *Salmonella* Stanley outbreak.

A confirmed case was defined as a person with a laboratory-confirmed infection caused by *S. Stanley*, with a PFGE pattern matching the 'outbreak strain', who developed symptoms after August 2011 and had no travel history outside the EU in 1–7 days prior to the onset of symptoms. A probable case was defined as a person with a laboratory-confirmed infection caused by *S. Stanley*, with no PFGE pattern available, who developed symptoms after August 2011 and had no travel history outside the EU in 1–7 days prior the onset of symptoms. Persons with *S. Stanley* infections but a different PFGE pattern were excluded from the analysis.

Between 1 August 2011 and 31 January 2013, 710 cases of non-travel-related *S. Stanley* infections (probable and confirmed cases) were identified in 10 EU Member States: Hungary (246), Austria (190), Germany (80), the United Kingdom (68), Belgium (41), the Czech Republic (40), Sweden (18), Italy (14), the Slovak Republic (12) and Greece (1).

Descriptive epidemiology indicated a transmission originating from a persistent common source (or multiple sources) in the EU, contaminated with indistinguishable isolates. Food and veterinary investigations conducted in Austria, Belgium, Germany, the Czech Republic, Poland and Hungary identified an indistinguishable XbaI-PFGE fingerprint to the 'outbreak strain' and a common resistance to nalidixic acid among *S. Stanley* isolates originating from the turkey production chain (turkeys and turkey meat). In addition, isolates with indistinguishable PFGE patterns were also detected in some cases from broiler flocks (breeding and fattening) and meat from other animal species (beef and pork).

The epidemiological and microbiological information gathered through a public health, food and veterinary investigation strongly suggested that a contamination in the turkey production chain was the source of the outbreak. However, a contribution of other food and animal sources, such as beef, pork and broiler meat could not be excluded.

ECDC released a first assessment of the outbreak on 27 July 2012 and posted an update on 29 August 2012. A joint ECDC/EFSA rapid risk assessment was published on 21 September 2012:

http://ecdc.europa.eu/en/publications/Publications/20120921_RRA_Stanley_Salmonella.pdf

Current situation: Investigation of outbreaks of *S. Stanley* from December 2013 to May 2014

After a multinational *S. Stanley* outbreak in 2011–2012, the number of cases reported at the EU level remained above the pre-outbreak level: in 2007–2010, an average of 108 cases was reported annually; in 2011–2013, an average of 313 cases was reported annually). In 2013, an average of 38 cases per month was reported through TESSy; most of the cases had a domestic origin (71%).

On 8 April 2014, Austria reported through the EPIS-FWD platform that the National Reference Centre for *Salmonella* had observed an increase of cases of *S. Stanley* infection since the beginning of the year. As of 9 April 2014, 42 cases have been identified, compared with 12 cases in the first quarter of 2013. Nine cases were hospitalised (21%).

Of 42 cases, nine cases (21%) had consumed Döner kebab made with turkey meat within 72 hours before disease onset. A sample from originally sealed kebab meat, collected at an epidemiologically related kebab stand, was tested positive for *S. Stanley*. A trace-back analysis revealed that the kebab meat was produced in Hungary using turkey meat from Austrian and Hungarian turkey fattening farms.

On 8 April 2014, the Austrian food authorities issued a RASFF notification entitled '*Salmonella* Stanley in frozen turkey kebab from Hungary, with raw material from Austria and Hungary' (notification number 2014.0480).

Isolates from 12 of the 42 cases, as well as one isolate from the turkey meat in question, were typed by XbaI-PFGE. All isolates had an XbaI-PFGE profile which was identical to the outbreak strain of the 2011–2012 European multi-country *S. Stanley* outbreak.

The typed strains were resistant to nalidixic acid/ciprofloxacin. The 2011–2012 outbreak strains were resistant to nalidixic acid only, but the resistance pattern can be considered identical when the revision of the breaking point is taken into account.

A small local outbreak of *S. Stanley* infections in Hamburg, Germany, in December 2013 involved 14 cases. A kebab with poultry meat was the suspected vehicle of infection. An isolate from the meat, typed at the German National Reference Centre, had a PFGE-pattern indistinguishable from the outbreak strain. The identified strains from this local outbreak, including the strain from the poultry meat kebab, were tested for antibiotic resistance. The strains exhibited resistance against nalidixic acid and low level resistance to ciprofloxacin. Patient isolates of *S. Stanley* received in July, September, December 2013 and January 2014 had identical XbaI-PFGE profiles.

On 9 April 2014, Scotland reported three human cases of *S. Stanley* with PFGE patterns indistinguishable from the 2011–2012 outbreak strain. The cases were identified in January (2) and March (1) 2014. Two of the three isolates were resistant to nalidixic acid and expressed low level resistance to ciprofloxacin. No information about exposure of the cases from January was available. The case from March did not report travel to Austria or consumption of turkey meat.

As of 22 April 2014, Hungary reported thirteen cases of *S. Stanley* identified in 2014, two of whom had to get hospitalised. The Department of Phage Typing and Molecular Epidemiology of the National Centre for Epidemiology tested 29 *S. Stanley* strains, 26 strains were resistant to nalidixic acid but not resistant to ciprofloxacin (disc diffusion method). PFGE analysis identified the pattern as being indistinguishable from the 2011–2012 outbreak strain.

In January 2014, Sweden identified an increase in *S. Stanley* with eight cases reported for that month. Sweden normally observes a maximum of two non-travel-related cases per month. Seven cases were adults, one case was a child, and half of them were female. Trawling interview suggested shellfish or lettuce as the vehicle of infection. Unfortunately, no PFGE typing could be done on the isolates from the cases.

Cyprus, Denmark, England, Estonia, Finland, France, Greece, Ireland, Italy, Lithuania, Luxembourg, Norway, Slovenia, Spain and the United States neither reported an increase in the number of *S. Stanley* infections nor any outbreaks in 2014.

Threat assessment for the EU

In 2011–2012, a large outbreak with more than 700 cases was investigated at the EU level. Epidemiological and microbiological information gathered through a public health, food and veterinary investigation strongly suggested that a contamination in the turkey production chain was the source of the outbreak. The distribution of cases indicates a steady spread and the transmission pattern suggests persistent common sources. The wide geographical distribution of cases and food isolates points towards a contamination of widely distributed products in several EU countries. After the implementation of control measures the number of *S. Stanley* cases decreased in 2013, but remained at a higher level than during the pre-epidemic period.

While most of the *S. Stanley* cases between 2007 and 2010 were travel related, the majority of the cases from 2011 onwards had no connection to travel in the week before the onset of the disease. This indicates a change in the epidemiology of human *S. Stanley* infections in the EU and suggests that the strain is present and is still circulating in the European food market.

In addition, the proportion of nalidixic-acid-resistant isolates increased markedly from 17% (between 2007 and 2010) to 52% (since 2011).

In April 2014, an *S. Stanley* outbreak with a PFGE pattern indistinguishable from the 2011–2012 outbreak strain was identified in Austria. The probable source of the outbreak was turkey meat. In December 2013, Germany experienced a local outbreak of *S. Stanley* with the 2011–2012 outbreak strain. In addition, Hungary and Scotland report sporadic cases in 2014 caused by the 2011–2012 outbreak strain. These recent cases and findings suggest that the 2011–2012 outbreak strain is still circulating, most likely in the turkey production chain. Therefore, new sporadic cases and outbreaks of *S. Stanley* are expected to occur, involving other European countries.

References

1. Hendriksen RS, Le Hello S, Bortolaia V, Pulsrikarn C, Nielsen EM, Pornruangmong S, et al. Characterization of isolates of *Salmonella* enterica serovar Stanley, a serovar endemic to Asia and associated with travel. J. Clin. Microbiol. 2012; 50(3):709.
2. Sirichote P, Bangtrakulnonth A, Tianmanee K, Unahalekhaka A, Oulai A, Chittaphithakchai P, et al. Serotypes and antimicrobial resistance of *Salmonella* enterica spp. in central Thailand, 2001–2006. Southeast Asian J Trop Med Public Health. 2010 Nov;41(6):1405–15.
3. Hendriksen RS, Vieira AR, Karlslose S, Lo Fo Wong DM, Jensen AB, Wegener HC, et al. Global monitoring of *Salmonella* serovar distribution from the World Health Organization Global Foodborne Infections Network Country Data Bank: results of quality assured laboratories from 2001 to 2007. Foodborne Pathog DiS. 2011 ; 8(8): p. 887–900.
4. Jones TF, Ingram LA, Cieslak PR, Vugia DJ, Tobin-D'Angelo M, Hurd S, et al. Salmonellosis outcomes differ substantially by serotype. J Infect DiS. 2008 Jul 1;198(1):109-14.
5. Sánchez-Vargas FM, Abu-El-Haija MA, Gómez-Duarte OG. *Salmonella* infections: an update on epidemiology, management, and prevention. Travel Med Infect DiS. 2011 Nov;9(6):263-77
6. Mahon BE, Pönkä A, Hall WN, Komatsu K, Dietrich SE, Siitonen A, et al. An international outbreak of *Salmonella* infections caused by alfalfa sprouts grown from contaminated seeds. J Infect DiS. 1997;175:876–882.
7. Kirk MD, Little CL, Lem M, Fyfe M, Genobile D, Tan A, et al. An outbreak due to peanuts in their shell caused by *Salmonella* enterica serotypes Stanley and Newport sharing molecular information to solve international outbreaks. Epidemiol Infect. 2004;132:571–577.
8. Pastore R, Schmid H, Altpeter E, Baumgartner A, Hächler H, Imhof R, et al. Outbreak of *Salmonella* serovar Stanley infections in Switzerland linked to locally produced soft cheese, September 2006–February 2007. Euro Surveill. 2008;13(37):pii=18979. Available from: <http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=18979>.
9. Lindqvist A. *Salmonella* Stanley från limeblad. EPI-aktuellt [in Swedish]. 2006:5.
10. Werner S, Boman K, Einemo I, Erntell M, de Jong B, Lindqvist A, et al. Outbreak of *Salmonella* Stanley in Sweden associated with alfalfa sprouts, July-August 2007. Euro Surveill. 2007;12(42):pii=3291. Available from: <http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=3291>.
11. Epidemic Intelligence Information System (EPIS), reply from Austria to an Urgent Inquiry posted by Belgium: Outbreak *Salmonella* Stanley in Belgium, 17 August 2012.