



## JOINT ECDC-EFSA RAPID OUTBREAK ASSESSMENT

# Prolonged cross-border multi-serovar *Salmonella* outbreak linked to consumption of sprouted seeds

6 March 2025

### Abstract

A cross-border multi-serovar *Salmonella enterica* outbreak linked to the consumption of sprouted seeds has been ongoing in Europe since 2023. Between January 2023 and January 2025, 509 confirmed cases of salmonellosis meeting the European case definition were identified in nine European Union/European Economic Area (EU/EEA) countries: Belgium (1), Denmark (4), Estonia (1), Finland (94), France (3), Germany (30), the Netherlands (9), Norway (257) and Sweden (110). One case was also reported by the United Kingdom. The outbreak encompasses eight *Salmonella* serotypes, several of which are rarely reported in the EU/EEA. Sprouts were identified as the vehicle of infection in multiple national investigations, which was confirmed by EU centralised whole genome sequencing (WGS) analysis.

Sharing of epidemiological, traceability, and WGS data across countries in both public health and food safety sectors, was crucial in linking seven national outbreaks in Finland, Germany, Norway and Sweden to a common seed supplier in Italy. Further food investigations linked the common supplier to three seed growers located in the same geographical area of Italy. The role of the environment in the seed contamination at grower level, and of cross-contaminations along the seed supply chain contributing to the multi-strain occurrence, should be further investigated.

Food safety authorities in the countries concerned implemented control measures, including withdrawal and recall of investigated batches. This significantly decreased case notifications. However, several countries have detected new cases, indicating that contaminated seed batches may still be in circulation and further interventions needed. Cases may continue to occur until the point(s) where the seeds were contaminated with *Salmonella* can be identified and properly controlled. Seed producers should apply all procedures necessary (e.g. Good Agricultural Practices (GAP)) to prevent microbial contamination of seeds intended for sprouting and sprout producers should implement adequate food safety management systems to ensure only safe products reach the market.

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## Event background

Due to an ongoing risk of infections with multiple *Salmonella* serotypes linked to sprouted seeds in a number of EU/EEA countries, on 16 January 2025 the European Commission asked ECDC and EFSA to produce a joint rapid outbreak assessment (ROA) to trigger further public health and food safety investigations.

Between January 2023 and January 2025, multiple *Salmonella enterica* outbreaks were detected in several European countries, all linked to exposure to alfalfa sprouts from a common seed supplier in Italy (food investigations are reported in the section 'Microbiological and environmental investigations of food and control measures' and in 'Annex 1').

The first outbreak occurred in Germany in January 2023 (EpiPulse event 2023-FWD-00017) [1], caused by *S. Adelaide*. While a source was not identified during the initial investigation, the outbreak strain was later detected in sprouted seeds. In autumn 2023, Finland reported an outbreak of *S. Enteritidis* (2023-FWD-00069) linked to sprouted seeds, where the outbreak strain was also isolated from products consumed by those individuals involved. Case isolates that were closely genetically linked were also identified in Germany, although they differed demographically from the Finnish cases and were investigated separately (see 2023-FWD-00071). The source of infection for the German cases was not identified.

Norway subsequently reported three distinct outbreaks: *S. Typhimurium* ST36 sub-strain A (May 2024; 2024-FWD-00049), *S. Hvitvingfoss* (August 2024; 2024-FWD-00089), and *S. Newport* ST31 (October 2024; 2024-FWD-00116). While those involved in all three outbreaks reported consuming sprouted seeds, the strongest evidence came from the *S. Newport* ST31 outbreak, where both a case-control study and laboratory testing of sprout samples confirmed the association. In August 2024, Sweden reported an outbreak of multiple closely related strains of *S. Typhimurium* ST36 (sub-strain B; 2024-FWD-00108), where consumption of sprouted seeds was found to be strongly associated with illness in a case-control study. Additional cases were also identified in Finland, Denmark and Norway. All outbreaks and food investigations were documented on the EpiPulse and RASFF notification platforms.

## Outbreak strains

For the European case definition used in this report, an outbreak strain is defined as any strain where:

- at least two case isolates cluster by whole genome sequencing AND
- at least two cases within the cluster have reported exposure to alfalfa sprouts OR
- the genetic cluster is linked to alfalfa sprouts grown from seeds sourced from the implicated seed supplier according to one of the following criteria:
  - alfalfa sprout products consumed by those involved were traced back to the implicated seed supplier OR
  - the same strain (clustering with case isolates by whole genome sequencing) was independently isolated from alfalfa sprouts grown from seeds sourced from the implicated seed supplier.

The strains meeting these criteria and strain-specific core genome MLST allelic difference (AD) thresholds are presented in Table 1.

**Table 1. Outbreak reference strains shared in EpiPulse per serotype and event**

#	Serotype	Sequence type	Threshold <sup>1</sup>	No of reference strains	Associated EpiPulse event(s) <sup>2</sup>
01.	<i>S. Adelaide</i>	10506	10 AD	1	• 2023-FWD-00017 (Germany)
02.	<i>S. Enteritidis</i>	11	5 AD	2	• 2023-FWD-00069 (Finland) • 2023-FWD-00071 (Germany)
03.	<i>S. Hvitvingfoss</i>	446	10 AD	1	• 2024-FWD-00089 (Norway)
04.	<i>S. Kinondoni</i>	5447	20 AD	2	• 2024-FWD-00116 (Norway)
05.	<i>S. Kisarawe</i>	5805	20 AD	3	• 2024-FWD-00116 (Norway)
06.	<i>S. Newport</i>	31	5 AD	2	• 2024-FWD-00116 (Norway)
07.	<i>S. Richmond</i>	909	20 AD	1	• 2024-FWD-00108 (Sweden)
08.	<i>S. Typhimurium</i>	36 (sub-strain A)	5 AD	1	• 2024-FWD-00049 (Norway)
09.	<i>S. Typhimurium</i>	36 (sub-strain B)	5 AD	14	• 2024-FWD-00108 (Sweden)

<sup>1</sup> Thresholds for inclusion in the European case definition are presented as number of allelic differences (AD) from the reference strains isolated from human cases provided by the countries that launched each investigation.

<sup>2</sup> The EpiPulse event IDs represent the original outbreak investigation during which the strains were isolated

According to these criteria, nine outbreak strains were identified through seven independent outbreak investigations undertaken across four European countries (Finland: 1, Germany: 2, Norway: 3, Sweden: 1). Eight distinct serotypes and sequence types (ST), were identified in human cases, including two sub-strains of *S. Typhimurium* ST 36 (A and B), which are described separately due to significant genetic differences between them (>300 allelic variations).

A data call to support this rapid outbreak assessment was issued by ECDC to EU/EEA countries to perform additional retrospective case finding for each of the listed outbreak strains. The data call also included two rare sequence types (*S. Kotte* ST 11989 and *S. Newport* ST 166) that had also been isolated from sprouted seeds; however, no human cases were identified.

## European outbreak case definitions

The European outbreak case definitions are provided below:

A confirmed outbreak case is defined as:

A laboratory-confirmed case of any *Salmonella enterica* outbreak strain defined in Table 1, with symptom onset on or after 1 January 2023 (date of sampling or date of receipt by the reference laboratory if date of onset is not available);

### AND

fulfilling at least one of the following laboratory criteria:

- falls within serotype-specific core genome allelic difference thresholds (or SNP differences, respectively) defined in Table 1 with respect to the representative outbreak reference strains when analysed in national bioinformatics pipelines OR
- clustering within the serotype-specific core genome allelic difference thresholds defined in Table 1 in a centralised single-linkage analysis ;

### OR

fulfilling the epidemiological criterion:

- epidemiologically linked to a laboratory-confirmed case based on a national outbreak case definition.

## Epidemiological and microbiological investigations of human cases

Between January 2023 and January 2025, 509 laboratory confirmed cases of salmonellosis linked to this outbreak were reported by nine EU/EEA countries; Belgium (1), Denmark (4), Estonia (1), Finland (94), France (3), Germany (30), the Netherlands (9), Norway (257) and Sweden (110). In addition, one case was reported by the United Kingdom (Table 2.). Nordic countries (particularly Norway, Sweden and Finland) were the most affected. The majority of cases were female (66%, n = 336) and adult (median: 44 years, range: 1–90 years). Information on hospitalisation was available and confirmed for 100 cases (20%), the majority of which were infected with *Salmonella* Typhimurium ST 36 (n = 44) and *S. Newport* ST 31 (n = 39). No deaths were reported. Table 2 summarises a description of case demographics, microbiological and epidemiological evidence. All case isolates were linked by WGS to genetic clusters with confirmed links to alfalfa sprouts and meet the European case definition for this outbreak, as described in the previous section.

**Table 2. Demographic summary of laboratory confirmed *Salmonella* outbreak cases, stratified by country and serotype in nine EU/EEA countries (n = 509 cases), January 2023 – January 2025**

Country	Outbreak strain	N confirmed cases			Age (years) Median (range)	Epidemiological and microbiological evidence			
		Total	Female	Male		Interviews <sup>1</sup>	Receipts <sup>2</sup>	Study <sup>3</sup>	Sprout isolates <sup>4</sup>
<b>Belgium</b>	<i>S. Enteritidis</i> 11	1	0	1	* (30–40)	-	-	-	-
<b>Denmark</b>	<i>S. Typhimurium</i> 36a	2	1	1	42 (20–65)	-	-	-	-
	<i>S. Typhimurium</i> 36b	2	0	2	65 (50–80)	-	-	-	-
<b>Estonia</b>	<i>S. Typhimurium</i> 36b	1	1	0	* (40–50)	-	-	-	-
<b>Finland</b>	<i>S. Enteritidis</i> 11	75	49	26	40 (2–90)	Trawling	-	Case-case	<i>S. Enteritidis</i> 11
	<i>S. Kinondoni</i> 5447	1	1	0	* (30–40)	-	-	-	-
	<i>S. Typhimurium</i> 36b	18	8	10	36 (14–66)	Trawling	-	-	<i>S. Kisarawe</i> 5805
<b>France</b>	<i>S. Enteritidis</i> 11	3	1	2	17 (5–28)	-	-	-	-
<b>Germany</b>	<i>S. Adelaide</i> 10506	14	9	5	41 (11–76)	Trawling	-	-	<i>S. Adelaide</i> 10506
	<i>S. Enteritidis</i> 11	13	9	4	11 (1–81)	-	-	-	-
	<i>S. Kinondoni</i> 5447	1	0	1	* (80–90)	-	-	-	-
	<i>S. Newport</i> 31	1	1	0	* (70–80)	-	-	-	-
	<i>S. Typhimurium</i> 36b	1	1	0	* (20–30)	-	-	-	-
<b>The Netherlands</b>	<i>S. Adelaide</i> 10506	1	0	1	* (65–75)	-	-	-	-
	<i>S. Kinondoni</i> 5447	2	2	0	38 (20–55)	-	-	-	-
	<i>S. Kisarawe</i> 5805	3	2	1	25 (20–85)	-	-	-	-
	<i>S. Typhimurium</i> 36b	3	1	2	75 (20–85)	-	-	-	-
<b>Norway</b>	<i>S. Hittingfoss</i> 446	12	8	4	52 (20–71)	Trawling	Yes	-	-
	<i>S. Kinondoni</i> 5447	2	2	0	29 (1–58)	Targeted	-	-	<i>S. Kinondoni</i> 5447
	<i>S. Kisarawe</i> 5805	3	2	1	45 (45–56)	Targeted	-	-	<i>S. Kisarawe</i> 5805
	<i>S. Newport</i> 31	105	74	31	49 (1–90)	Trawling/ .targeted	Yes	Case-control	<i>S. Newport</i> 31
	<i>S. Richmond</i> 909	1	1	0	* (80–90)	-	-	-	-
	<i>S. Typhimurium</i> 36a	14	10	4	44 (6–78)	Trawling	Yes	-	-
<b>Sweden</b>	<i>S. Typhimurium</i> 36b	120	81	39	54 (2–87)	Targeted	Yes	-	-
	<i>S. Kinondoni</i> 5447	4	1	3	28 (8–59)	-	-	-	-
	<i>S. Newport</i> 31	1	1	0	* (80–90)	-	-	-	-
	<i>S. Richmond</i> 909	5	5	0	63 (38–76)	Trawling	-	-	-
<b>Total for EU/EEA countries</b>		<b>509</b>	<b>336</b>	<b>173</b>	<b>44 (1–90)</b>				
	<b>United Kingdom</b>								
	<i>S. Typhimurium</i> 36b	1	0	1	* (50–60)	-	-	-	-

\*For country/serovar combinations with a single case, age range has been replaced with the 10-year age group for the case.

<sup>1</sup>Exposure data sourced from routine surveillance questionnaires, trawling questionnaires, or targeted case interviews

<sup>2</sup>Grocery receipts or purchase orders with evidence of sprouted seeds being purchased.

<sup>3</sup>Analytical studies with statistically significant association between illness and sprout consumption.

<sup>4</sup>Strains (serotype and sequence type) isolated from sprouted seeds

+ Highlighted rows indicate countries with primary outbreak investigations; other strains were detected as part of these investigations.

Epidemiological evidence of exposure to sprouted seeds was gathered via case interviews, trawling, targeted, or routine surveillance questionnaires (Table 2). For the three largest outbreaks in Finland, Norway and Sweden, case-case and

<sup>1</sup> Crude median calculated from country-specific median age

case-control studies were also undertaken. In Finland, a case-case study conducted during the 2023 *S. Enteritidis* ST 11 outbreak, involving 75 cases from different parts of the country, was found to support the sprouts hypothesis. In Norway, a case control study undertaken during the *S. Newport* ST 31 outbreak in October and December 2024, found that cases (n = 12) were three times more likely to have eaten sprouted seeds prior to onset than controls (n = 35) (LASSO regression penalised adjusted odds ratio of 3.13). Moreover, purchase of the implicated products was confirmed via grocery store receipts for eight cases. In Sweden, a case control study, undertaken during the *S. Typhimurium* ST 36 outbreak from August to November 2024, found that consumption of alfalfa sprouts was four times more likely among cases than controls (adjusted odds ratio: 4.15, 95% confidence interval: 1.15–15.1). In all three studies, for some cases multiple strands of evidence were available (self-reported consumption of alfalfa sprouts, grocery receipts, and microbiological findings in packages of sprouted seeds purchased by the individual involved). Further details on country-specific investigations are provided in the following section.

## Finland (one outbreak)

### *S. Enteritidis* ST 11 (2023-FWD-00069)

Finland was the epicenter of an *S. Enteritidis* ST 11 outbreak from August to October 2023, involving a total of 75 cases (EpiPulse event 2023-FWD-00069). Genetically linked case isolates were also reported by Belgium (1), France (3) and Germany (13) which met the European case definition. The cluster of German cases and the genetically linked Belgian case were reported and investigated as a separate event (see below). A case-case study identified alfalfa sprouts as the probable vehicle of infection. The outbreak strain was also isolated from sprouted seeds sampled from a package belonging to one of the cases.

#### Other linked outbreak strains

Between August and December 2024, Finland identified 18 *S. Typhimurium* ST 36 sub-strain B cases and one *S. Kinondoni* ST 5447 case that were closely genetically linked to other outbreak strains originally reported by Sweden and Norway, respectively. *S. Kisarawe* was isolated from an opened alfalfa and red clover sprout mix package, sampled from the home of one of the cases with *S. Typhimurium* ST 36 sub-strain B.

## Germany (two outbreaks)

### *S. Adelaide* ST 10506 (2023-FWD-00017)

Germany reported 14 cases linked to a multi-region *S. Adelaide* ST 10506 outbreak that occurred over a six-month period from January to June 2023 (EpiPulse event 2023-FWD-00017). Four of nine cases interviewed reported consuming sprout products. The Netherlands reported one genetically linked case (within 5 AD of the German reference strain) from July 2023. The outbreak strain was also independently isolated from a sample of organic sprouts sold in Germany.

### *S. Enteritidis* ST 11 (2023-FWD-00071)

Between July and September 2023, Germany reported 12 cases that were genetically linked to the Finnish *S. Enteritidis* ST 11 outbreak (confirmed with ECDC-EFSA centralised WGS analysis as being 3 AD from the Finnish isolate, sampled from a sprout package belonging to one of the cases). The cases were reported as a separate event in EpiPulse (2023-FWD-00071) due to the difference in demographics and stronger clonality of case isolates. The cases affected were predominantly female children from multiple regions across Germany and most case isolates clustered very closely together (within 1 AD). A year later, in September 2024, a thirteenth case was identified (isolate with 1 AD compared to the German reference strain) in a female child. Belgium also reported a closely linked case isolate (with 1 AD compared to the German reference strain) from an adult male, isolated in September 2023. The vehicle of infection for this sub-cluster was not identified.

#### Other linked outbreak strains

Germany also reported one each of *S. Typhimurium* ST 36 sub-strain B and *S. Kinondoni* ST 5447 cases with isolates closely linked to the Swedish and Norwegian outbreak strains, respectively, from September 2024.

## Norway (three outbreaks)

### *S. Typhimurium* ST 36 sub-strain A (2024-FWD-00049)

Norway reported 14 cases linked to a multi-region *S. Typhimurium* ST 36 sub-strain A outbreak that occurred between May and August 2024 (EpiPulse event 2024-FWD-00049). On investigation, the majority (nine cases) reported consumption of sprouted seeds in trawling questionnaires and there was no indication of any association with travel. The outbreak was characterised by relatively high hospitalisation rates (57%) and included two cases with bacteraemia. Denmark also identified two genetically linked cases (1-2 AD compared to the Norwegian reference strain) that had not travelled outside of Denmark prior to onset, from July 2024 and January 2025, respectively.

### *S. Hvittingfoss* ST 446 (2024-FWD-00089)

Between August and October 2024, Norway experienced a second outbreak linked to consumption of sprouted seeds (EpiPulse event 2024-FWD-00089). The outbreak strain was *S. Hvittingfoss* ST 446 and involved 12 cases from different regions across Norway. As with the first outbreak, there was no indication of foreign travel, and for five of the cases the trawling questionnaires reported consumption of sprouted seeds prior to onset.

### *S. Newport* ST 31 (2024-FWD-00116)

Between October and December 2024, Norway identified 105 geographically dispersed cases linked to a third outbreak; the causative agents were two distinct clusters of *S. Newport* ST 31 (2024-FWD-00116). The majority of cases reported consumption of alfalfa sprouts prior to onset, and this association was also corroborated with a case control study and evaluation of grocery receipts. Two additional genetically linked cases in adult females aged 70–90 years from November and December 2024 were reported by Sweden (4 SNPs compared to the Norwegian reference strain) and Germany (3 AD from the Norwegian reference strain), respectively. The outbreak strain (*S. Newport* ST 31) was isolated from an open package of sprouted seeds, sampled from the home of an individual involved in one of the cases (0 AD between case and sprout isolate). *S. Newport* ST 31, *S. Newport* ST 166, *S. Kisarawe* ST 5805, *S. Kinondoni* ST 5447 and *S. Kotte* ST 11989 were also isolated from sprouted seeds sampled at a restaurant linked to the *S. Newport* outbreak investigation.

#### Other linked outbreak strains

Between November and December 2024, Norway also reported 120 cases of *S. Typhimurium* ST 36 sub-strain B (outbreak strains circulating in Sweden and reported in EpiPulse event 2024-FWD-00108). Two *S. Kinondoni* and three *S. Kisarawe* cases in individuals who reported consuming sprouted seeds prior to onset were subsequently identified via isolates that were genetically similar (within 20 AD) to those isolated from sprouted seeds. One *S. Richmond* ST 909 case was identified via genetic linkage to a strain that had been identified by Sweden as also linked to consumption of sprouted seeds.

### Sweden (one outbreak)

#### *S. Typhimurium* ST 36 sub-strain B (2024-FWD-00108)

Between August and November 2024, Sweden reported an outbreak of 100 cases of *S. Typhimurium* ST 36 sub-strain B. Cases were infected with 14 distinct but genetically related strains (all within the same 53 SNP cluster) that were each dominant for a short time span (mainly three to six weeks) before being replaced by another strain. The 14 clustered strains were genetically distinct from any others that had been identified in the Swedish sequencing database since 2019. Some strains were initially investigated and reported as separate outbreaks (see EpiPulse events 2024-FWD-00079, 2024-FWD-00088 and 2024-FWD-00104) before being consolidated into a single outbreak investigation (EpiPulse event 2024-FWD-00108). Cases were geographically dispersed across Sweden (18 of 21 regions), and had not travelled prior to onset. The majority were female ( $n = 65$ ). The results of a case control study gave strong indications that nationally produced alfalfa sprouts were the vehicle of infection. Seven additional countries have since identified case isolates that are genetically linked to one or more of the 14 Swedish *S. Typhimurium* ST 36 reference strains: Estonia (one in Q4 2023), the United Kingdom (one in Q2 2024), the Netherlands (3), Finland (7), Germany (1), Denmark (2) and Norway (120).

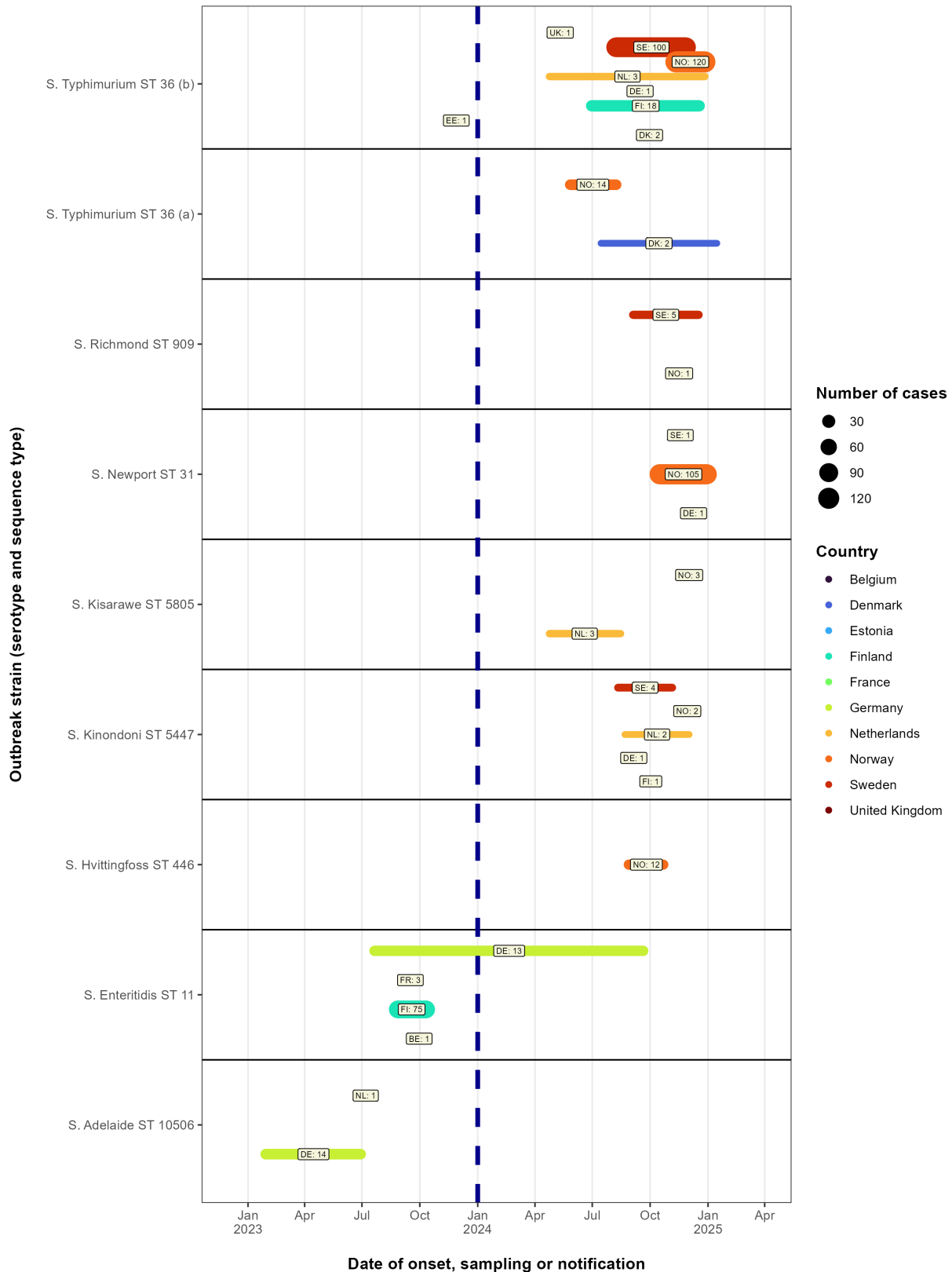
#### Other linked outbreak strains

In addition to the *S. Newport* case linked to the Norwegian outbreak mentioned above, Sweden identified a further nine cases with isolates genetically linked to other outbreak strains; four *S. Kinondoni* ST 5447 (11–20 SNPs from Norwegian case isolates and 15–23 SNPs from an Italian sprout isolate), and five *S. Richmond* ST 909 (one case reported consumption of sprouted seeds in a trawling questionnaire and all five case isolates were genetically linked to a strain sampled from sprouted seeds in Italy).

#### Outbreak timelines

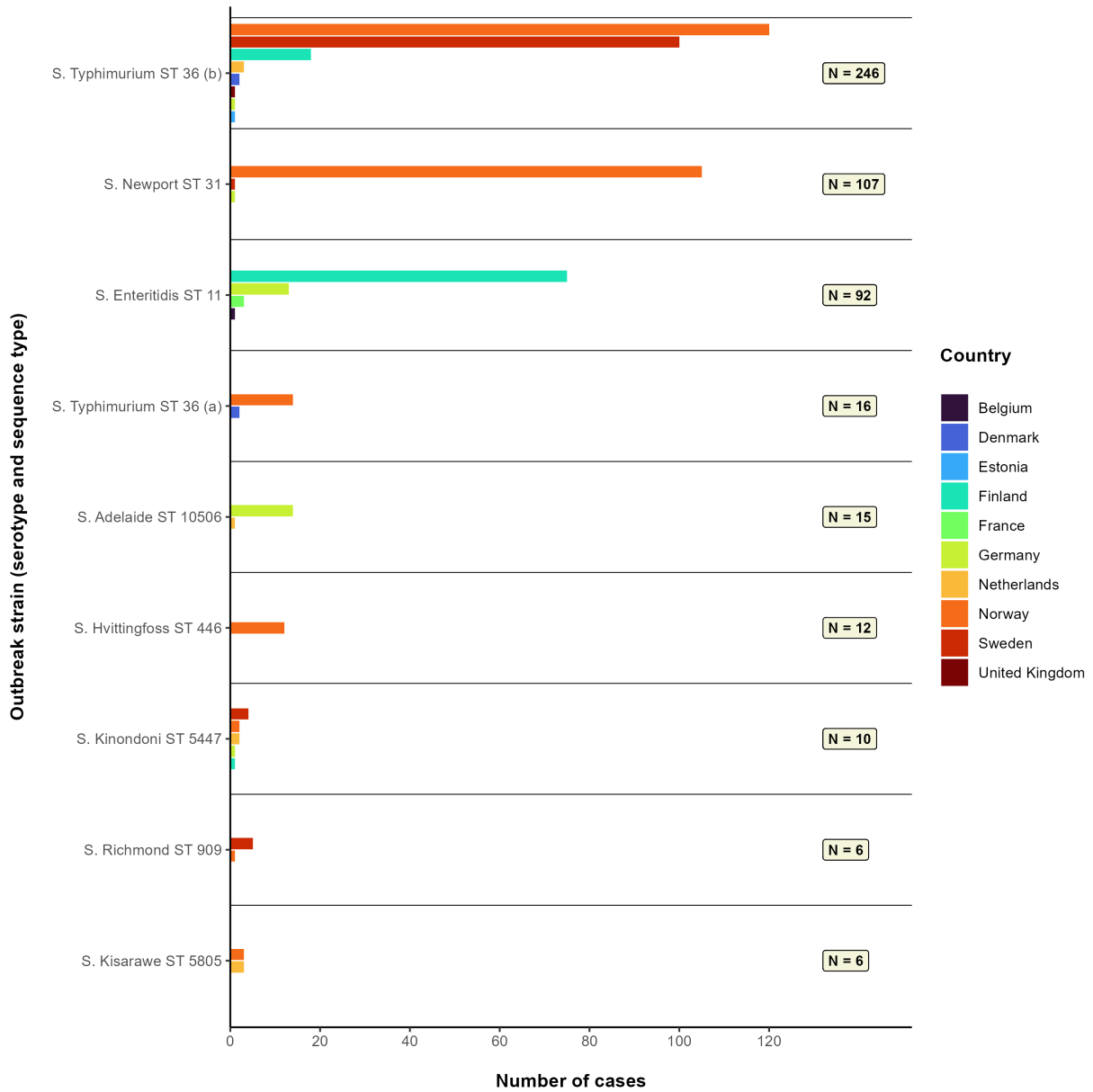
The timeline of each linked outbreak, stratified by *Salmonella* serotype and country, is presented in Figure 1. *S. Adelaide* and *S. Enteritidis* outbreaks occurred primarily in quarters 1–2 and 3 of 2023, respectively, while *S. Typhimurium*, *S. Newport* and the remaining strains were dominant in quarters 2–4 of 2024. Two genetically and temporally distinct *S. Typhimurium* sequence type 36 strains (sub-strains A and B) caused outbreaks during different time periods. Sub-strain A was prevalent in Norway in quarters 2–3, while sub-strain B was prevalent in Finland in quarter 2, Sweden in quarters 3–4 and in Norway in quarter 4, 2024.

**Figure 1. Timeline of associated events by serovar and country of occurrence**



The number of cases within each linked outbreak, stratified by strain and country, are presented in Figure 2. The serotypes with the highest number of cases were *S. Typhimurium* ST 36 sub-strain B (n = 246), followed by *S. Newport* ST 31 (n = 107) and *S. Enteritidis* ST 11 (n = 92). Fewer than 100 cases have been reported for all other serotypes to date. Genetically linked case isolates from at least two countries have been reported for all eight outbreak strains, with the exception of *S. Hvittingfoss* which was only detected in Norway. *S. Typhimurium* ST 36 sub-strain B has the widest geographical distribution, with cases reported from eight countries to date.

**Figure 2. Case distribution by serotype and country**





## Microbiological and environmental investigations of food and control measures

This section summarises the results of the food investigations performed by the food safety authorities in all countries concerned by this multi-country outbreak (Finland, Germany, Italy, the Netherlands, Norway, Spain, and Sweden). The traceability and analytical results were shared as of 21 February 2025 by the Member States involved under the RASFF notifications 2024.8840 (12 European Commission (EC) validated follow-ups, *fups*), 2024.9155 (eight *fups*), 2023.6714 (five *fups*), 2025.0200 (eight *fups*), 2025.0402 (six *fups*), 2023.4749 (seven *fups*), 2024.7982 (seven *fups*), and 2024.8206 (four *fups*). A detailed description is available in Annex 1. A visual representation of these food investigations is displayed in Figures 3a and 3b.

Briefly, traceability investigations pointed towards 10 sprout products, including two with no labelling information. In total, 13 sprout batches were identified. Moreover, the investigations identified 23 seed batches, including five with no labelling information. The 23 seed batches included five seed consignments from primary production and 18 seed batches from suppliers. A total of nine sprout producers (in six countries), two seed suppliers, and three seed growers (all in Italy) were identified.

Seven sprout products out of 10 (including three with no labelling information), corresponding to eight batches, were reported to be positive for *Salmonella* (serovars: Newport ST166 and ST31, Enteritidis ST11, Adelaide, Kisarawe ST5805, Richmond ST909, Kotte, and Kinondoni ST5447) (Table 3).

These *Salmonella*-positive sprout products were produced by six sprout producers in five countries, with seeds traced back to the same seed supplier (Italian Seed Supplier A) and mainly to a second seed supplier (the Italian Seed Supplier B) located in Italy (Figures 3a and 3b).

Six of the seven positive sprout products were traced back to the three growers (Italian Grower A, Italian Grower B Italian Grower C) located in the same geographical area of Italy (Figures 3a and 3b).

In addition, one environmental sample positive for *Salmonella* (serovar: Kisarawe ST5805), collected on 28 November 2024 at the Norwegian Sprouts Producer C was reported (RASFF 2024.9155) (Figures 3a).

On 21 January 2025, the food safety authority in Italy announced in RASFF 2025.0402 that a strategic sampling of seeds would be carried out by the local competent authorities and an audit would be carried out by the national food authority (mid-February 2025) at the Italian Seed Supplier A.

On 5 February 2025, the local competent authority carried out an official sampling at the Italian Seed Supplier B. *Salmonella* was not detected in two seed consignments sampled, both originating from the Italian Grower A (*fup5*, 2025.0402).

On 11 February 2025, the local competent authority carried out an official sampling at the Italian Seed Supplier A; *Salmonella* was not detected in the samples taken from an alfalfa seed batch (batch not available in RASFF) (*fup6*, 2025.0402).

Control measures, including withdrawals from supermarket shelves and recalls of the positive and suspected batches, were reported by the food safety authorities of Finland, Germany, Italy, the Netherlands, Norway, Spain, and Sweden.

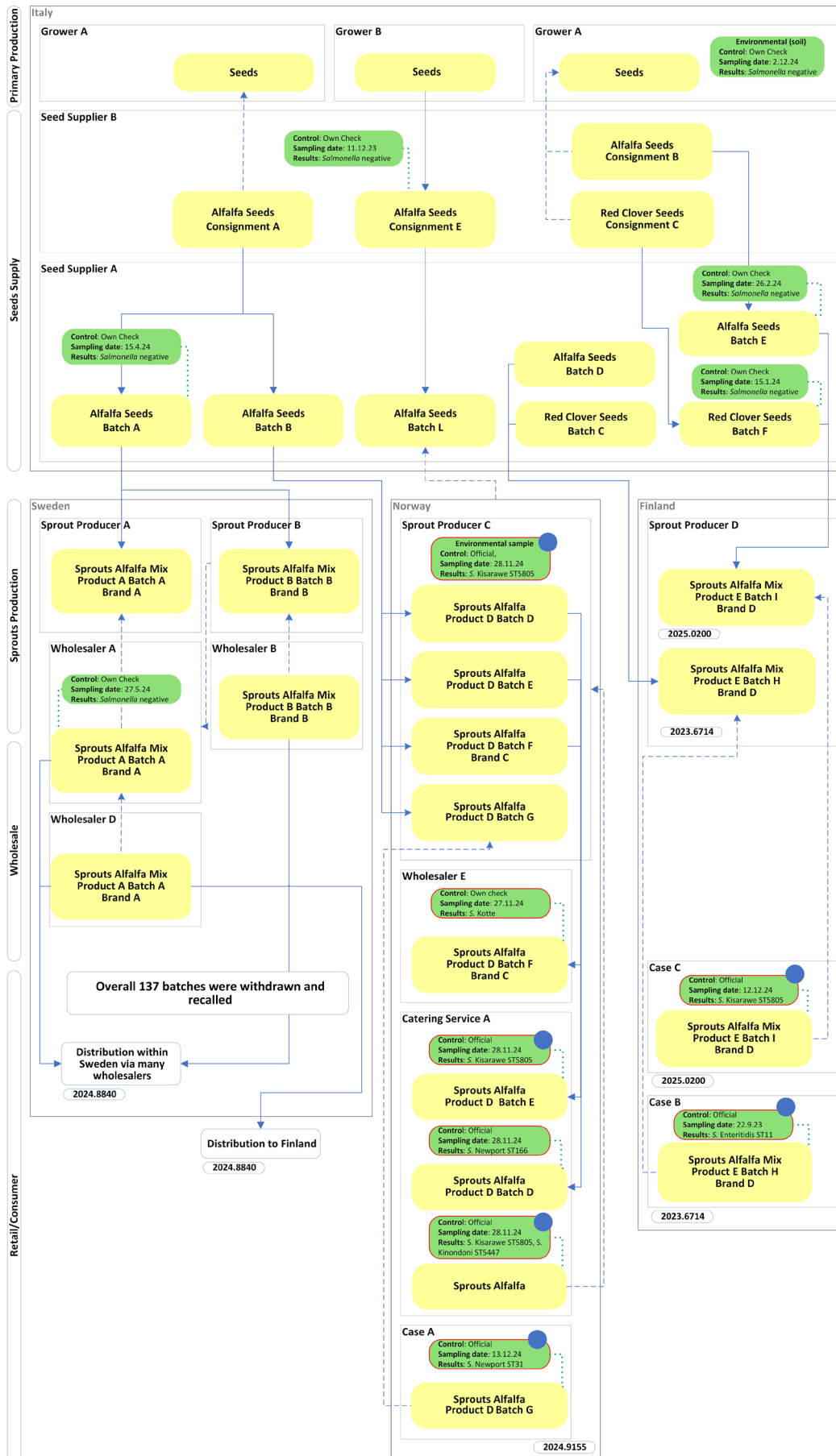
**Table 3. List of the seven sprout products investigated that were reported to be positive for *Salmonella***

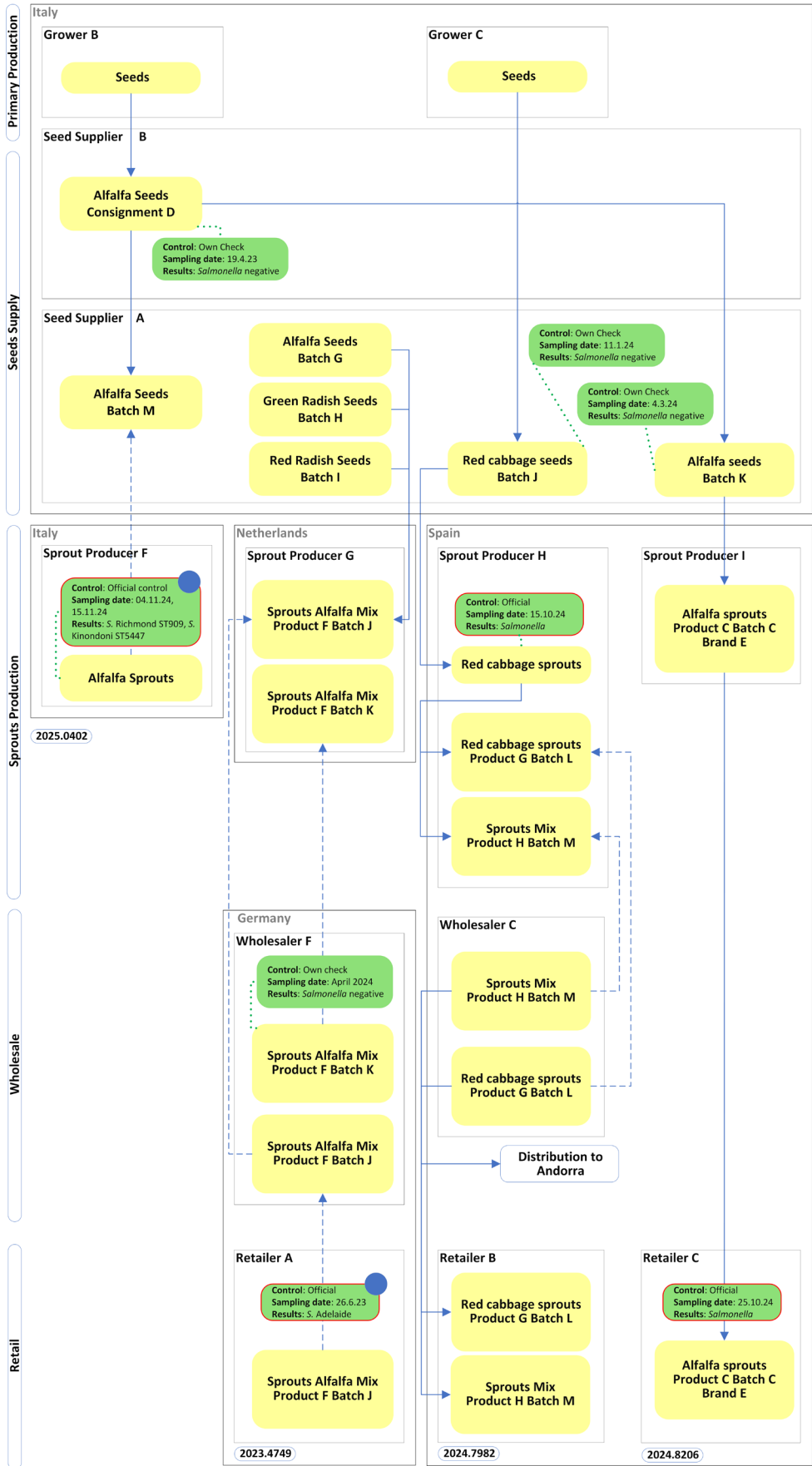
Country	Product	Batch	Date of Sampling	Serovar	Sampling location	RASFF Notification
Norway	Alfalfa sprouts Product D	Batch D	28.11.24	<i>S. Newport</i> ST166	Catering Service A	2024.9155
		Batch E	28.11.24	<i>S. Kisarawe</i> ST5805	Catering Service A	2024.9155
		Batch F	27.11.24	<i>S. Kotte</i>	Wholesaler E	2024.9155
		Batch G	13.12.24	<i>S. Newport</i> ST31	Case A	2024.9155
	Alfalfa sprouts	-	28.11.24	<i>S. Kinondoni</i> ST5447	Catering Service A	2024.9155
		-	28.11.24	<i>S. Kisarawe</i> ST5805	Catering Service A	2024.9155
Finland	Sprouts Alfalfa Mix Product E	Batch H	22.09.23	<i>S. Enteritidis</i> ST11	Case B	2023.6714
		Batch I	12.12.24	<i>S. Kisarawe</i> ST5805	Case C	2025.0200
Italy	Alfalfa sprouts	-	04.11.24	<i>S. Richmond</i> ST909	Sprout Producer F	2025.0402
		-	15.11.24	<i>S. Kinondoni</i> ST5447	Sprout Producer F	2025.0402
Germany	Sprouts Alfalfa Mix Product F	Batch J	26.06.23	<i>S. Adelaide</i>	Retailer A	2023.4749
Spain	Alfalfa sprouts Product C	Batch C	25.10.24	<i>Salmonella</i>	Retailer C	2024.8206
	Red cabbage sprouts	-	15.10.24	<i>Salmonella</i>	Sprout Producer H	2024.7982

Note: - indicates information not available.

Seven of the 23 seed batches were tested (own check analysis) and reported to be negative for *Salmonella*.

**Figures 3a and 3b.** Graphical representations of the traceability and microbiological investigations, as reported by the countries involved to RASFF (as of 21 February 2025)





Blue dots indicate the food isolates matching the outbreak strains in the EU WGS centralised analysis; 2024.8840, 2025.0200, 2024.9155, 2023.6714, 2025.0402, 2023.4749, 2024.7982, and 2024.8206 indicate the RASFF notifications. Yellow boxes indicate traced products, green and red framed boxes indicate the *Salmonella* positive results, green boxes indicate the *Salmonella* negative results, dashed arrows indicate the traced back distribution, arrows indicate the traced forward distribution

# European whole genome sequencing analysis of human and non-human isolates

## WGS data collection and cross-sectoral analysis

### Human isolates

Cluster analysis was performed on isolate sequences shared in connection with the multiple launched events and possible matching isolates in ECDC's WGS database. In total, 241 representative sequences were shared from Sweden, Norway, Finland, Germany and the UK. Serovars included *S. Typhimurium* ST36, *S. Newport* ST31, *S. Enteritidis* ST11, *S. Adelaide*, *S. Hvittingfoss* ST446, *S. Kisarawe* ST5805, *S. Kinondoni* ST5447. No isolates of *S. Kotte* or *S. Newport* ST166 were reported. All isolates were from 2024, except *S. Adelaide* and *S. Enteritidis* which were from 2023. The majority of reported isolates belonged to *S. Typhimurium* sub-strain B. As reported by the event launching country, Sweden, this strain variant included smaller subclusters with an overall SNP distance of 53. The sequences reported from Sweden were generated with IonTorrent technology which could to a limited extent influence the number of allele distances produced in the centralised cgMLST analysis.

### Non-human isolates

EFSA launched a call for data in January 2025. Countries were invited to submit the genomic information on isolates of *S. Typhimurium* ST36, *S. Newport* ST31, *S. Newport* ST166, *S. Enteritidis* ST11, *S. Adelaide*, *S. Hvittingfoss* ST446, *S. Kisarawe* ST5805, *S. Kinondoni* ST5447, *S. Kotte* ST11989, and *S. Richmond* ST909 matching the representative outbreak strains to the EFSA WGS System. Six countries (Austria, Cyprus, Ireland, Iceland, the Netherlands and Portugal) replied that they did not have any non-human-isolates.

For cross-sectoral analysis, the cgMLST analysis was performed at both ECDC and EFSA, as previously described [2]. Genome profiles were calculated from assembled genomes using chewBBACA version  $\geq 2.8.5$ , according to the schema described by Rossi et al. 2018 [3] for *Salmonella enterica*, made available by Chewie Nomenclature Server [4]. Isolates with more than 10% of missing loci (325 from a total of 3 255 loci) were excluded from the analysis.

## Results of cross-sectoral WGS analysis

ECDC queried the EFSA WGS system on 21 February 2025, using the sequences in the implicated outbreak clusters and the European case definition allelic distances as thresholds in the query. In total, 14 non-human isolates matched 16 representative human isolates sequences (Figure 5). The human outbreak strains without matching isolates in the EFSA WGS system were *S. Typhimurium* ST36 and *S. Hvittingfoss*.

The 14 non-human isolates matching the representative outbreak strains are listed below. Ten of the 14 isolates are also epidemiologically connected to the outbreak investigations carried out by the countries.

Eleven isolates derived from food samples:

- One *S. Adelaide* isolate from sprout product (Product F Batch J collected in Germany in 2023) (RASFF 2023.4749)
- One *S. Enteritidis* ST11 isolate from a sprout product (Product E Batch H collected in Finland in 2023) (RASFF 2023.6714)
- One *S. Kisarawe* ST5805 isolate from a sprout product (Product E Batch I collected in Finland in 2024) (RASFF 2025.0200)
- One *S. Kisarawe* ST5805 isolate from a sprout product (collected in Norway in 2024) (RASFF 2024.9155)
- One *S. Kisarawe* ST5805 isolate from a sprout product (Product D Batch E collected in Norway in 2024) (RASFF 2024.9155)
- One *S. Kisarawe* ST5805 isolate from a sprout product (collected in Belgium in 2024)
- One *S. Kinondoni* ST5447 isolate from a sprout product (collected in Italy in 2024) (RASFF 2025.0402)
- One *S. Kinondoni* ST5447 isolate from a sprout product (collected in Germany in 2024)
- One *S. Kinondoni* ST5447 isolate from a sprout product (collected in Norway in 2024) (RASFF 2024.9155)
- One *S. Newport* ST31 isolate from a sprout product (Product D Batch G collected in Norway in 2024) (RASFF 2024.9155)
- One *S. Richmond* ST909 isolate from a sprout product (collected in Italy in 2024) (RASFF 2025.0402)

One isolate derived from an environmental sample:

- One *S. Kisarawe* ST5805 isolate from an environmental sample (collected in Norway at the Norwegian Sprout Producer C in 2024) (RASFF 2024.9155)

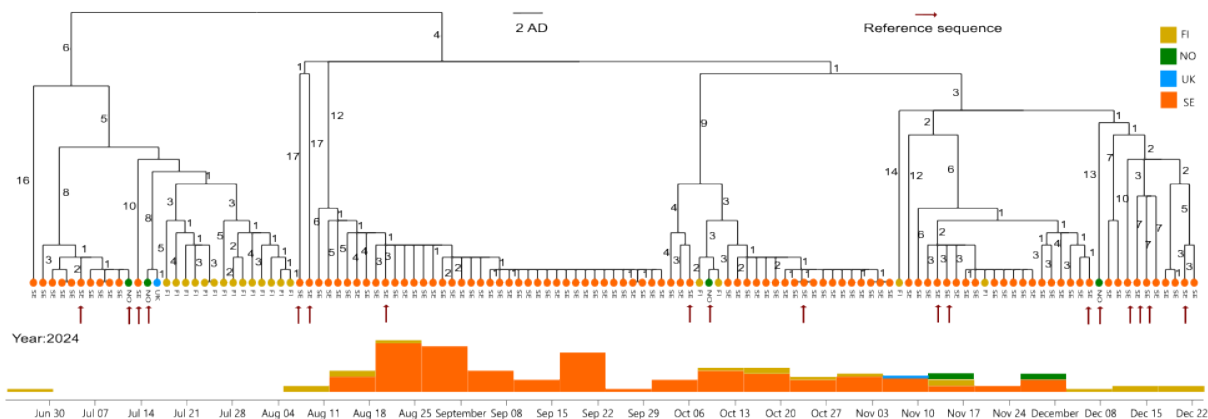
One isolate derived from a feed sample:

- One *S. Adelaide* isolate from feed intended for farmed animals (collected in Italy in 2023)

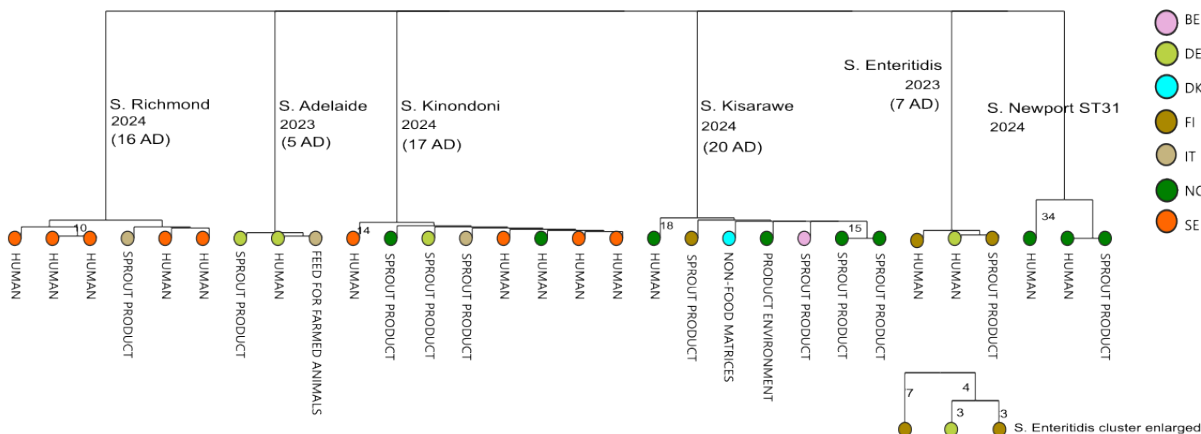
One isolate derived from non-food matrices:

- One *S. Kisarawe* ST5805 of unknown origin (collected in Denmark in 2024).

**Figure 4. Single-linkage cluster tree of 123 human *S. Typhimurium* ST36 strain B isolates collected in 2024, by country (Sweden, Finland, Norway and the UK). All isolates are within a 22 AD single linkage cluster. There are no other isolates clustering within this clade in the ECDC EFSA WGS One Health system**



**Figure 5. Single-linkage cluster tree of in total 16 human and 14 non-human isolates of *S. Richmond*, *S. Adelaide*, *S. Kinondoni*, *S. Kisarawe*, *S. Enteritidis* and *S. Newport* ST31 collected in 2023 and 2024 respectively, by country (Belgium, Germany, Denmark, Finland, Italy, Norway and Sweden) and source origin**



The serotype specific single linkage cluster AD cut-offs following the EU case definition are indicated in brackets. *S. Typhimurium* strain A and *S. Hvittingfoss* from Norway are not included in the cluster figure as they are represented only by one human isolate sequence per strain. No isolates in the EFSA WGS system had matches with these two strains. Non-human isolates of *S. Kotte* and *S. Newport* ST166 are not included as there were no matching human isolate sequences reported.

## ECDC and EFSA risk assessment for the EU/EEA

Between 2023 and 2025, seven independent national investigations of foodborne outbreaks were conducted in four countries (Finland, Germany, Norway and Sweden), with 509 cases identified across nine EU/EEA countries: Belgium (1), Denmark (4), Estonia (1), Finland (94), France (3), Germany (30), the Netherlands (9), Norway (257) and Sweden (110) and one additional linked case identified in the United Kingdom. The outbreaks were initially investigated as separate events but were ultimately linked to a single common alfalfa seed supplier in Italy.

Across the outbreaks, cases were infected with nine different strains of *Salmonella enterica* comprising eight serotypes (*S. Adelaide*, *S. Enteritidis*, *S. Hvittingfoss*, *S. Kinondoni*, *S. Kisarawe*, *S. Newport*, *S. Typhimurium* and *S. Richmond*). Many of these serotypes are rarely reported in the EU/EEA. Most outbreak strains, except for *S. Hvittingfoss*, were detected in multiple countries and isolated from cases in individuals who had not travelled abroad before symptom onset. Substantial genetic variation and sub-clustering was also detected within some strains. For six of the nine strains, matching sequences were also isolated from sprouted seeds, as confirmed by centralised WGS analysis performed by ECDC and EFSA. In three cases, strains isolated from sprouted seeds differed from the strains infecting the cases that were exposed to them. This may be due to a methodological artefact, for example only one subset of colonies being selected from the culture plate for further typing. While sprouted products tested positive for *Salmonella* (multiple serovars including the outbreak strains) at different stages of the food chain, including at consumer level, and in different countries, *Salmonella* was not detected in any of the associated seed batches when tested at supplier level. This could be due to the fact that *Salmonella enterica* may be challenging to detect on dry seeds [5].

In epidemiological investigations, sprouted seeds are considered stealth vehicles that may be challenging to recall having consumed, due to their use as a minor ingredient in salads and sandwiches, or as a decorative garnish. It is therefore significant that some of those interviewed or surveyed in all four investigating countries, including cases infected with seven of nine outbreak strains, specifically reported consumption of sprouted seeds prior to illness. Analytical studies in three countries (Finland, Sweden and Norway) also revealed statistically significant associations between consumption of sprouted seeds and illness.

Traceability investigations (in Finland, Germany, Italy, the Netherlands, Norway, Spain and Sweden) on *Salmonella*-positive or suspected sprout products led to the identification of the common seed supplier (Supplier A), further linked to a second supplier (Supplier B) and three primary producers (seed growers), according to the investigation carried out by the food safety authority in Italy. The three growers identified were all located in the same geographical area in Italy; this area is hypothesised as a potential origin of the seed contamination with *Salmonella*. Therefore, further investigations are needed to assess the role of the environment in the seed contamination at grower level and the possible role of cross-contaminations along the seed supply chain contributing to the multi-strain occurrence.

The sharing of epidemiological information and WGS data across countries in both public health and food safety sectors via EpiPulse, ECDC and EFSA WGS systems and the RASFF platform, respectively, was crucial in linking all seven outbreaks in Finland, Germany, Norway and Sweden and evidence from national investigations to a common seed supplier in Italy.

The food safety authorities of the countries concerned by the traceability investigations (Finland, Germany, Italy, the Netherlands, Norway, Spain, and Sweden) reported the implementation of control measures, including the withdrawal and recall of positive and suspected-positive batches. Since these interventions, case notifications have significantly decreased, however, several countries had detected new *S. Newport* ST 31 and *S. Typhimurium* ST 36 sub-strain B cases up to 30 December 2024 and Denmark reported one new case of *S. Typhimurium* ST 36 sub-strain A in January 2025 (four months after the last notified case). This indicates that some contaminated seed batches may still be in circulation.

Cases may continue to occur until the point(s) where the seeds were contaminated with *Salmonella* can be identified and properly controlled.

Seed producers should apply all the procedures (e.g. Good Agricultural Practices (GAPs)) necessary to prevent microbial contamination of seeds intended for sprouting and sprout producers should implement adequate food safety management systems to ensure that only safe products reach the market.

## Recommendations for further assessment and investigations

Public health authorities are encouraged to:

- Investigate exposure information if new salmonellosis cases linked to the present outbreak strains are identified. Sprouted seeds should be considered as a likely vehicle of infection.
- Sequence human isolates of *Salmonella* serovars linked to the present outbreak, either microbiologically or epidemiologically, and share them in the ECDC WGS system. ECDC can offer sequencing support to countries with limited or no capacity.
- Update the EpiPulse event [2025-FWD-0006](#) with possible new cases.
- If new *Salmonella* cases linked to the outbreak are detected, work closely with food safety authorities on national investigations to identify the contaminated food product.

Food safety authorities are encouraged to:

- Share in the EFSA WGS system any sequences of the *Salmonella* serovars concerned from food and environmental isolates linked to the present cluster, either microbiologically (serotype or sequence type) or epidemiologically (e.g. suspected food items reported by patients) and share in RASFF the traceability information related to the foods these sequences were derived from.
- Submit genomic data of *Salmonella* isolates from any kind of food, feed, animal or environmental samples to the EFSA WGS System.
- Follow the ISO analytical methods for the microbiological detection of *Salmonella* in dry seeds and full application of the requirements on sampling of sprouted seeds, as per Chapter 3.3 of Annex I, Commission Regulation (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs.

## Source and date of request

On 16 January 2025 the European Commission sent a request to EFSA to produce a joint rapid outbreak assessment (ROA). EFSA sent a request to ECDC the next day. ECDC accepted the request on 17 January 2024.

## Consulted experts and national contact points

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## Disclaimer

This rapid outbreak assessment was written jointly by the European Centre for Disease Prevention and Control (ECDC) and the European Food Safety Authority (EFSA).

ECDC issued this outbreak assessment document in accordance with Article 20 of Regulation (EU) 2022/2371 on serious cross-border threats to health, Articles 7(1) and 8a of Regulation (EC) No 853/2004 establishing a European Centre for Disease Prevention and Control. EFSA's contribution is based on a mandate from the European Commission requesting EFSA to provide scientific assistance from EFSA in the investigation of multinational food-borne outbreaks (Ares (2013) 2576387, Mandate M-2013-0119, 4 July 2013) in accordance with Article 31 of Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002, laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety.

The specific purpose of an ECDC-EFSA rapid outbreak assessment is to present an analysis of a cross-border food-borne threat to health and to provide science-based recommendations and options for response. The responsibility for the choice of which options to pursue and which actions to take at national level, following ECDC and EFSA's recommendations, lies with EU/EEA countries.

All data published in this rapid outbreak assessment are data collected from EU and/or EEA countries concerned by the outbreak until the date this assessment was produced. Maps and figures published do not represent statements from ECDC or EFSA on the legal or border status of the countries and territories shown but constitute the information on which this rapid outbreak assessment is based.

# Annex 1. Description of the traceability, food investigations, and control measures, by country

## RASFF notification 2024.8840

### Sweden

As part of an outbreak investigation related to *S. Typhimurium* ST36 cases with epidemiological evidence pointing to consumption of alfalfa sprouts, the food safety authority in Sweden shared in RASFF (2024.8840) the traceability information linked to withdrawn and recalled batches of sprouted seeds. The authority reported that the suspected alfalfa sprouts originated from two large producers in Sweden (Sprout Producer A and Sprout Producer B) and were obtained from alfalfa (*Medicago sativa*) seeds (Seed Batch A) supplied by the Italian Seed Supplier A (*fup2*, *fup12*, 2024.8840).

On 26 November 2024, the sprout producers concerned implemented withdrawals and recalls of alfalfa sprouts expiring between November and December 2024. Specifically, these control measures concerned 137 batches of sprouted seeds that included sprouts from Product A, Brand A, Batch A (Batch A includes many batches) produced by Sprout Producer A and delivered to the Swedish Wholesaler A, and sprouts from Product B Brand B Batch B (Batch B includes many batches) produced by the Swedish Sprouts Producer B and delivered to the Swedish Wholesaler B. The sprouts had been delivered between 17 and 25 November 2024. The two wholesalers distributed the sprouts to several other wholesalers that redistributed to other wholesalers, restaurants, and retailers. The 137 batches of sprouts were almost exclusively distributed within Sweden, with the exception of one wholesaler (Wholesaler D) that also distributed to one operator in Finland.

There was no microbiological testing of the sprout products (not available in RASFF). However, the authority reported that sprouts produced with seeds from Batch A were tested at the Swedish Wholesaler A and *Salmonella* was not detected (*fup2*, 2024.8840). In addition, the seeds from Batch A were sampled by the food safety authority and sent for analysis after sprouting. *Salmonella* was not detected (*fup12*, 2024.8840).

### Italy

Upon notification from Sweden, the food safety authority in Italy reported in RASFF that a food investigation had been carried out. The Italian Seed Supplier A had delivered the entire batch (Seeds Batch A) of organic alfalfa seeds for sprouting to the Swedish Sprout Producer A in May 2024 (*fup2*, 2024.8840). Seed Batch A was tested in a self-check control (by the Italian Seed Supplier A) on 15 April 2024 and *Salmonella* was not detected (*fup6*, 2024.8840). Seed Batch A originated from organic alfalfa seeds supplied by the Italian Seed Supplier B (Consignment A) (*fup8*, *fup10*, 2024.8840). The Italian Seed Supplier B purchased the seeds (Consignment A) from the Italian Grower A (*fup11*, 2024.8840).

### Finland

The food safety authority in Finland reported the implementation of control measures such as the destruction of the suspected sprouts distributed in Finland via the Swedish Wholesaler D (*fup3*, 2024.8840).

## RASFF notification 2024.9155

### Norway

As part of a national investigation into an outbreak caused by *S. Typhimurium* ST36 and *S. Newport* ST31 with cases reporting consumption of alfalfa sprouts prior to illness, the food safety authority in Norway reported in RASFF the detection of *Salmonella* in some sprout products and from an environmental sample.

These sprouts were from Product D Batch D and Batch E (both expiring in December 2024), collected on 28 November 2024 at the Catering Service A. *S. Newport* ST166 and *S. Kisarawe* ST5805 were isolated, respectively. Product D from Batch D and from Batch E were locally produced by the Norwegian Sprout Producer C.

Alfalfa sprouts from Product D Batch F (Brand C) had been collected on 27 November 2024 in a self-check control at the Norwegian Wholesaler E and *S. Kotte* was detected. Product D Batch F was produced by the Norwegian Sprout Producer C.

Alfalfa sprouts from Product D Batch G had been collected on 13 December 2024 during an official control at the house of one case (Case A). The sprouts tested positive for *S. Newport* ST31. The sprouts were taken from an

open package and were marked with an expiry date in November 2024. Product D Batch G was produced by the Norwegian Sprout Producer C.

Furthermore, an official environmental sample collected on 28 November 2024 at the Norwegian Sprout Producer C revealed the presence of *S. Kisarawe* ST5805.

The food authority traced back the above-mentioned sprouts to the same batch of organic alfalfa seeds (Seed Batch B), expiring in 2026, that the Norwegian Sprout Producer C received from the Italian Seed Supplier A.

On 26 February 2025, the food safety authority in Norway reported that an additional official sample, collected on 2 December 2024 at the house of an individual involved in one of the cases (open package of alfalfa sprouts from the Norwegian Sprout Producer C) tested positive for *S. Kisarawe* ST5805 (not included in Figure 3a, 3b). The alfalfa sprouts were produced with Seed Batch B (*fup9*, 2024.9155).

The authority reported the implementation of control measures, such as the withdrawal and recall (November 2024) of sprout products from the Norwegian Sprout Producer C with expiry dates between end of November and beginning of December 2024. In addition, the authority reported that the production of sprouts at the Norwegian Sprout Producer C with seeds originating from the Italian Seed Supplier A (2024.9155) had been interrupted.

Finally, the authority reported that official samples of sprouts (traceability not available in RASFF) from the Norwegian Sprout Producer C (as the same sprouts used in Product D) collected on 28 November 2024 at the local Catering Service A tested positive for *S. Kisarawe* ST5805 and *S. Kinondoni* ST5447 (*fup3*, 2024.9155).

## Italy

Upon receiving a request for collaboration from Norway, the food safety authority in Italy reported that the Italian Seed Supplier A had delivered the entire batch (Seeds Batch B, organic alfalfa seeds for sprouting, expiring in 2026) to the Norwegian Sprouts Producer C in July 2024 (*fup1*, 2024.9155). Seeds from Batch B consisted of organic alfalfa seeds (Consignment A) that the Italian Seed Supplier A received from the Italian Seed Supplier B (*fup2*, 2024.9155).

On 10 February 2025, the food safety authority reported having carried out an official control at the Italian Seed Supplier B and clarified that the seeds were only sorted at the plant, while the primary production of the seeds (Consignment A) took place at the Italian Grower A (*fup7*, 2024.9155).

The food safety authority also reported that an additional batch of alfalfa seeds under investigation in Norway (*fup4*, 2024.9155) (Seed Batch L, suspected to be the source of two earlier outbreaks caused by *S. Typhimurium* and *S. Hvitittingfoss*) had been traced back to the Italian Seed Supplier B and originated from Consignment E (*fup6*, 2024.9155). Consignment E tested negative for *Salmonella* in a self-check control (sampling date 11 December 2023). Further food investigations revealed that Consignment E originated from seeds grown at the Italian Grower B (*fup8*, 2024.9155). There was no further trace forward or microbiological information in RASFF regarding Seed Batch L (*fup6*, 2024.9155).

## RASFF notifications 2023.6714 and 2025.0200

### Finland

During the investigations of a 2023 outbreak caused by *S. Enteritidis* ST11 with epidemiological evidence pointing to a composite food (salad of red clover and alfalfa mixed sprouts) as the likely vehicle of the infections, the food safety authority in Finland shared in RASFF (2023.6714) the outcome of the food investigation performed. The authority reported that *S. Enteritidis* ST11 was isolated from the composite food opened package Product E Batch H collected at the house of one case (Case B) on 22 September 2023. Product E Batch H was manufactured by the Finnish Sprout Producer D, and it was only sold on the Finnish market (2023.6714).

Seeds used in the production of the composite food Product E (Batch H) were traced back to the Italian Seed Supplier A and were identified as organic red clover seeds (Batch C) and organic alfalfa seeds (Batch D) (2023.6714).

In early 2025, the food safety authority in Finland reported in RASFF (2025.0200) the detection of *S. Kisarawe* ST5805 in a mixed sprouts product (Product E Batch I Brand D) sampled (from an open package) on 12 December 2024 during an official control at the house of one of the individuals involved in a *S. Typhimurium* case (Case C) (*fup6*, 2025.0200). Sprout Product E Batch I was manufactured by the Finnish Sprout Producer D with alfalfa seeds from Batch E and red clover seeds from Batch F supplied on 18 April 2024 by the Italian Seed Supplier A (*fup5*, 2025.0200). In addition, the authority reported that no non-compliance had been identified at the Finnish Sprout Producer D (*fup5*, 2025.0200).

### Italy

Upon receiving notification from Finland in 2023 (2023.6714), the food authority in Italy carried out an official control (October 2023) at the Italian Seed Supplier A and shared in RASFF the outcome of the inspection. The food safety authority reported not having found any non-compliance at the plant (*fup2*, 2023.6714). The authority also clarified that the supplier produced and marketed both seeds intended for sprouting and seedlings. The two types are handled in different areas of the plant. The supplier does not produce sprouts. The primary production of seeds intended for sprouting is carried out by growers. Upon collection, seeds are delivered to the supplier within a few days. Afterwards seeds are sorted, selected and stored under controlled temperature and humidity conditions in big bags intended for food. Upon entry into the plant, the seeds undergo microbiological analysis. A best-before date of 24 months is given to seed lots in the absence of pathogen detection. The sampling is carried out on 80% of the incoming seed lots. Testing is carried out for the presence of *Salmonella*, *Listeria monocytogenes*, *E. coli* (VTEC) (absence in 25g), and *Bacillus cereus* (<10<sup>3</sup>CFU/g) (*fup2*, 2023.6714).

Upon notification in 2025 (2025.0200), the food authority informed that the Italian Seed Supplier A supplied alfalfa seeds from Batch E and red clover seeds from Batch F only to the Finnish Sprout Producer D. Batch E and Batch F tested negative for *Salmonella* in a self-check control on 26 February 2024 and 15 January 2024, respectively (*fup3*, 2025.0200).

Batch E and Batch F originated from organic alfalfa seeds (Consignment B) and organic red clover seeds (Consignment C) that the Italian Seeds Supplier B (*fup7*, 2025.0200) received from the Italian Grower A (*fup8*, 2025.0200).

On 26 February 2025, the food safety authority reported the latest outcome of the inspections carried out by the national and local competent authorities at the Italian Grower A as part of the ongoing multi-country outbreak. *Salmonella* was not detected in the soil sampled on 2 December 2024 (*fup9*, 2025.0200).

### The Netherlands

On 24 January 2025, the food authority in the Netherlands shared in RASFF the outcome of a microbiological investigation (*fup3*, 2023.6714). The authority reported that seeds tested by the Dutch Sprout Producer E had tested positive for *Salmonella* and therefore had not been put into production for sprouts (batches not available in RASFF). Specifically, water samples collected in a self-check control at the plant revealed the detection of *Salmonella* on 15 January and 29 January 2024, 21 June 2024, and 11 July 2024. As a follow-up, the authority requested the isolates for further molecular typing (*fup3*, 2023.6714) but they were not available (*fup4*, 2023.6714). However, this sprout producer had received the seeds from Myanmar (*fup5*, 2023.6714).

## RASFF notification 2025.0402

### Italy

In early 2025, the food safety authority in Italy reported in RASFF (2025.0402) the retrospective identification of alfalfa sprout products (batches not available in RASFF) testing positive for *Salmonella*. The official samples had been collected on 4 November 2024 and on 15 November 2024 at the Italian Sprout Producer F and serotyping had revealed the presence of *S. Richmond* ST909 and *S. Kinondoni* ST5447, respectively. These alfalfa sprout products (from the same batch not available in RASFF) were not released onto the market. The Italian Sprout Producer F purchased the seeds (Batch M) used for sprouting from the Italian Seed Supplier A (2025.0402). Batch M from the Italian Seed Supplier A (*fup3*, 2025.0402) contained organic seeds of Consignment D from the Seed Supplier B. The Seed Supplier B purchased Consignment D from the Italian Grower B (*fup5*, 2025.0402). Consignment D was sampled in a self-check control by the Seed Supplier B on 19 April 2023 and tested negative for *Salmonella* (*fup5*, 2025.0402).

On 21 January 2025, the food safety authority in Italy announced in RASFF 2025.0402 that an extra sampling of seeds would be carried out by the local competent authorities and an audit would be carried out by the national food authority (mid-February 2025) at the Italian Seed Supplier A.

On 5 February 2025, the local competent authority carried out an official sampling at the Italian Seed Supplier B. *Salmonella* was not detected in the 15 samples taken from a red clover seed consignment (Consignment F) or the 15 samples taken from an alfalfa seed consignment (Consignment G), both originating from the Italian Grower A (*fup5*, 2025.0402).

On 11 February 2025, the local competent authority carried out an official sampling at Italian Seed Supplier A and *Salmonella* was not detected in any of the five samples taken from an alfalfa seed batch (batch not available in RASFF) (*fup6*, 2025.0402).

## RASFF notification 2023.4749

### Germany

As part of the investigations of a 2023 outbreak caused by *S. Adelaide*, the food safety authority in Germany reported on 12 July 2023 in RASFF (2023.4749) that *S. Adelaide* (*fup5*, 2023.4749) had been detected in the chilled mixed sprouts Product F Batch J consisting of organic alfalfa, green radish and red radish sprouts (*Medicago sativa*, *Raphanus sativus*). Product F Batch J had been collected in official control on 26 June 2023 at retail level (Retailer A) (2023.4749).

The molecular typing cluster analysis confirmed the presence of *S. Adelaide* matching the human reference strain of the national outbreak (*fup5*, 2023.4749).

Product F Batch J expiring in June 2023 was manufactured by the Dutch Sprout Producer G and distributed in Germany by the German Wholesaler F.

The food safety authority reported that the German Wholesaler F (*fup6*, 2023.4749) reported no *Salmonella* detections during a previous self-check control which sampled Product F (Batch K) carried out in April 2023 (2023.4749).

### The Netherlands

After receiving a request for collaboration from Germany, the food safety authority in the Netherlands reported that the seeds used for the sprouts of Product F Batch J originated from Italy and were supplied by the the Italian Seed Supplier A (*fup1*, 2023.4749). Specifically, the Dutch Sprout Producer F received the alfalfa seeds of Batch G, the green radish seeds of Batch H, and the red radish seeds of Batch I.

### Italy

Following the notification, the food authority in Italy carried out an official control at the Italian Seed Supplier A in October 2023 and shared the outcome of the inspection in RASFF (*fup2*, *fup3*, *fup4*, *fup6*, 2023.4749). The food safety authority reported that there was no non-compliance at the plant concerned.

## RASFF notifications 2024.7982 and 2024.8206

### Spain

On 29 October 2024, the food safety authority in Spain reported in RASFF (2024.7982) that *Salmonella* (serovar not available in RASFF) had been detected in five official samples of red cabbage (*Brassica oleracea*) sprouts intended for Product G Batch L and Product H Batch M. The two products involved (same batch and expiry dates) were marketed under different brand names. The sprouts sampled on 15 October 2024 at production level (Spanish Sprout Producer H) were obtained from seeds (Batch J) purchased from the Italian Seed Supplier A.

Product G Batch L and Product H Batch M were distributed by the Spanish Wholesaler C to supermarkets of the same group (group Retailer B) within Spain and Andorra (*fup2*, 2024.7982). The authority reported that withdrawals and recalls had been implemented by the producer concerned. In addition, the food safety authority ordered the seizure of some of the batches produced at the same time as the recalled batches, and of some remaining seeds from Batch J. The authority also carried out an official sampling at the producer concerned of both food (seeds from Batch J, sprouts) and environment (results of sampling not available in RASFF). The authority reported that the producer had carried out the relevant cleaning and disinfection operations and implemented some preventive measures (e.g. pre-washing with water, increasing the concentration of the disinfectant) (*fup2*, *fup3*, 2024.7982).

On 5 November 2024, the food safety authority in Spain reported in RASFF (2024.8206) having detected *Salmonella* (serovar not available in RASFF) in chilled alfalfa sprouts Product C Batch C (Brand E) produced by the Spanish Sprout Producer I. The batch was distributed within Spain. The sample was taken on 25 October 2024 in an official control at the Spanish Retailer C. The authority reported that control measures, such as withdrawals and recalls of the batch, had been implemented. The traceback of the seeds (Batch K) used for Batch C indicated the Italian Seed Supplier A as the origin (*fup1*, 2024.8206).

### Italy

Following notification from Spain (2024.7982), the food safety authority in Italy reported that the red cabbage seeds from Batch J delivered entirely to the Spanish Sprout Producer H revealed no *Salmonella* detection (*fup1*, *fup4*, 2024.7982). This was in accordance with the own check sampling carried out on 11 January 2024 by the Italian Seed Supplier A (*fup1*, 2024.7982). The food safety authority also reported that the Italian Seed Supplier A purchased the red cabbage (*Brassica oleracea*) seeds (consignment not available in RASFF) from the Italian Grower C (*fup5*, *fup6*, 2024.7982).

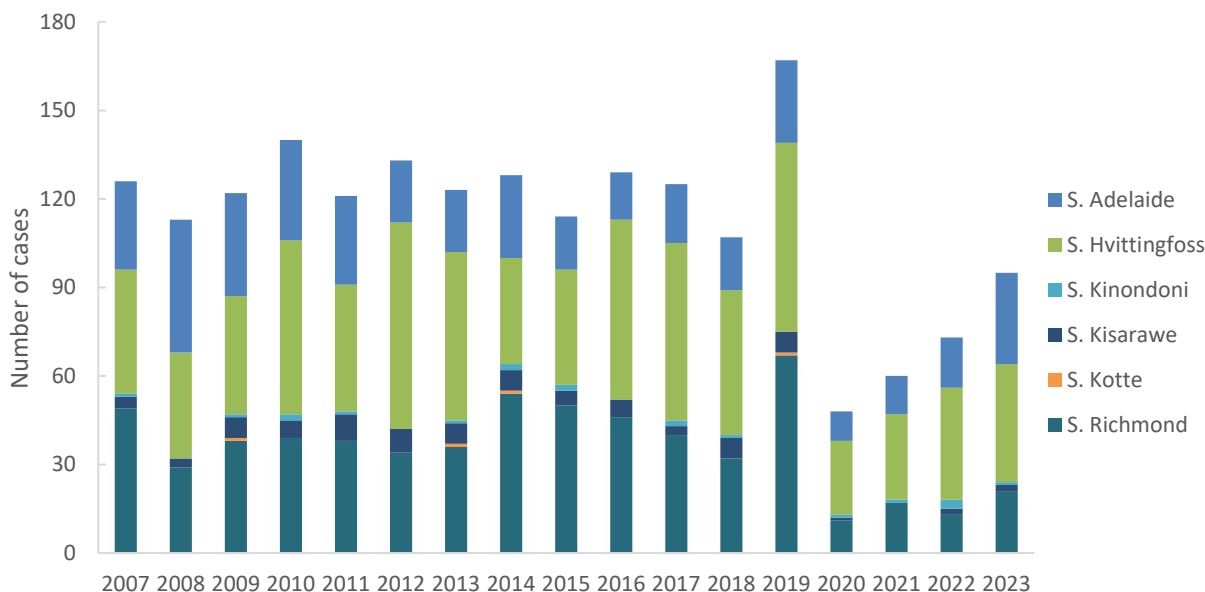
In addition, the food safety authority reported that there had been no *Salmonella* detected in alfalfa seeds from Batch K which were only delivered to the Spanish Sprout Producer I. This was in accordance with the self-check sampling control carried out on 4 March 2024 by the Italian Seed Supplier A (*fup3*, 2024.8206). The food safety authority also reported that the Italian Seed Supplier A purchased the alfalfa seeds (Consignment D) from the Italian Seed Supplier B (*fup3*, *fup4*, 2024.8206). The Italian Seed Supplier B purchased alfalfa seeds (Consignment D) from the Italian Grower B.

## Annex 2. Disease background

### Surveillance of *Salmonella* infections in the EU/EEA

Salmonellosis is a notifiable disease in the EU. From 2007 to 2023, the two most commonly reported serotypes were *S. Enteritidis* and *S. Typhimurium*, which together represented almost 70% of all the salmonella cases reported to The European Surveillance System (TESSy) by 30 EU/EEA countries. *S. Newport* was the fifth most commonly reported serotype (524–1 170 cases reported annually) during the same time period. On the other hand, *S. Adelaide*, *S. Hvitittingfoss*, *S. Kinondoni*, *S. Kisarawe*, *S. Kotte* and *S. Richmond* were rarely reported serotypes (48–167 cases reported annually for all six serotypes together). In 17 years (2007–2023), only 1 924 cases of these six serotypes have been reported to TESSy, with a notable decrease in cases since 2020 due to the COVID-19 pandemic and the UK not reporting cases since Brexit (Figure 6). Most of the cases were reported by France (25.6%) and Germany (21.5%).

**Figure 6. Number of cases of six rare serovars (*S. Adelaide*, *S. Hvitittingfoss*, *S. Kinondoni*, *S. Kisarawe*, *S. Kotte* and *S. Richmond*) cases (n = 1 924) by serotype and year, EU/EEA countries, 2007–2023**



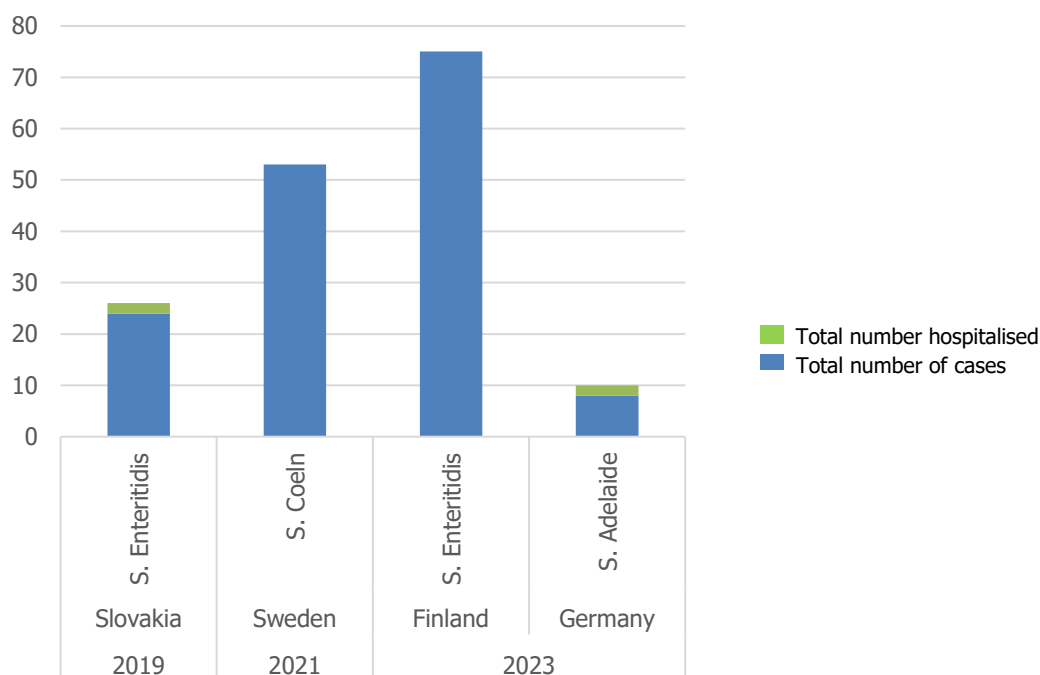
Source: Austria, Belgium, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom (until 2019).

Further information on salmonellosis in the EU/EEA can be found in the online Surveillance Atlas of Infectious Diseases [6] and in ECDC's Annual epidemiological report [7].

### Food-borne outbreaks caused by *Salmonella* in sprouts products

Country specific data on food-borne outbreaks associated with *Salmonella* in sprout products are reported to EFSA by countries in accordance with the Zoonoses Directive 2003/99/EC. Overall, four strong-evidence foodborne outbreaks caused by *Salmonella* in sprout products have been reported (between 2019 and 2023), with 160 human cases, four hospitalisations and no deaths. The outbreaks were reported by four EU Member States: Slovakia (2019), Sweden (2021), Germany (2023) and Finland (2023). The reported food vehicles were 'lentil sprouts', 'Alfalfa sprouts', 'sprouts' and 'sprouts - ready-to-eat', respectively. Three different *Salmonella* serovars were reported in these outbreaks: *S. Enteritidis* (Slovakia, 2019; Finland 2023), *S. Coeln* (Sweden 2021) and *S. Adelaide* (Germany, 2023) (Figure 7).

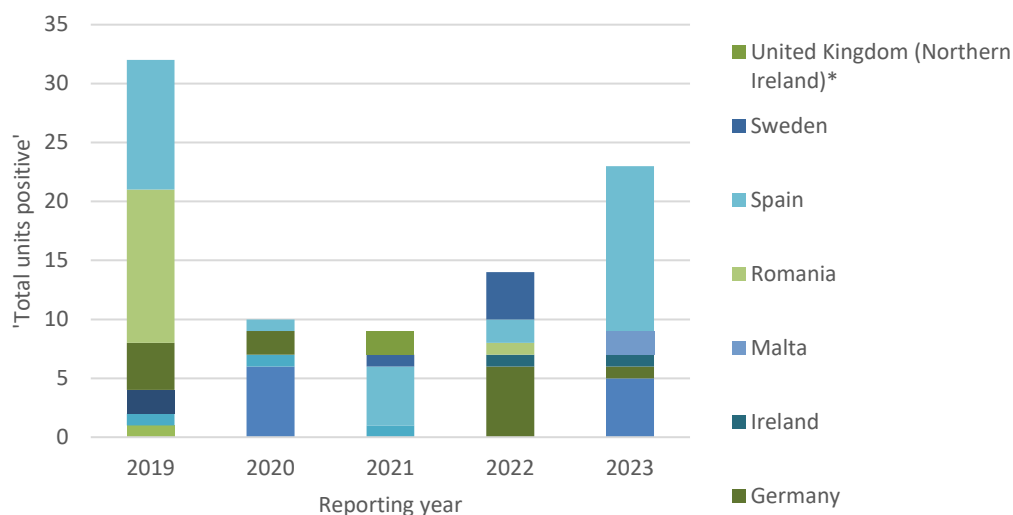
**Figure 7. Overall distribution of reported foodborne outbreaks caused by *Salmonella* in sprout products in the EU (2019-2023)**



## Occurrence of *Salmonella* in food

This section summarises country-specific data on the occurrence of *Salmonella* for the matrix seeds and sprouted seeds, representing the main food categories involved in this assessment, as reported to EFSA between 2019 and 2023 by the EU Member States and Northern Ireland in accordance with the Zoonoses Directive 2003/99/EC. (Figure 8)

**Figure 8. Distribution of *Salmonella* positive samples (from seeds and sprouted seeds) across EU Member States and Northern Ireland, 2019 to 2023**



For the food categories seeds and sprouted seeds, Belgium, Croatia, Cyprus, France, Germany, Ireland, Malta, Northern Ireland\*, Romania, Spain and Sweden reported 88 (percent positive 0.92%) 'total units positive' out of 9 560 'total units tested' for *Salmonella*. Specifically, 1 959 'total units tested' were reported in 2019 (percent positive 1.63%); 1 953 'total units tested' were reported in 2020 (percent positive 0.51%); 1 735 'total units tested' were reported in 2021 (percent positive 0.52%); 1 453 'total units tested' were reported in 2022 (percent positive 0.96%) and 2 460 'total units tested' were reported in 2023 (percent positive 0.93%).

*\*In accordance with the Agreement on the withdrawal of the United Kingdom of Great Britain and Northern Ireland from the European Union and the European Atomic Energy Community, and in particular Article 5(4) of the Windsor Framework in conjunction with Section 24 of the Annex 2 to that Framework, for the purposes of this report, references to Member States include the United Kingdom in respect of Northern Ireland.*



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