

## JOINT ECDC-EFSA RAPID OUTBREAK ASSESSMENT

# Multi-country outbreak of *Salmonella* Enteritidis sequence type (ST)11 infections linked to eggs and egg products

8 February 2022

### Abstract

On 2 September 2021, France reported an increase in *Salmonella* Enteritidis ST11 infections. By 11 January 2022, 272 confirmed cases had been reported in five European Union/European Economic Area (EU/EEA) countries and the United Kingdom (UK): Denmark (n=3), France (n=216), the Netherlands (n=12), Norway (n=7), Spain (n=22), and the UK (n=12) in 2021. Two deaths were recorded in adult men. Twenty-five cases were hospitalised. Sixty cases reported consumption of eggs/egg products.

Some cases reported in France in 2021 had visited restaurants serving eggs distributed by a common supplier, Spanish Packing Centre A. The eggs originated from three Spanish farms, one testing positive for the outbreak strain. Fresh table eggs from the farms linked to the outbreak were withdrawn and redirected for use in heat-treated egg products. No other countries received eggs from the same farms via Packing Centre A during summer 2021. Therefore, the source of infection for cases in late 2021 and in countries other than Spain and France could not be established.

This 2021 outbreak is linked microbiologically to a historical cross-border outbreak reported by the Netherlands in 2019. Eggs consumed by cases in the Dutch outbreak were traced back to a Spanish farm, but it was not possible to identify an epidemiological link with the 2021 outbreak. This suggests a wide distribution of the outbreak strain that could affect the food supply chain and/or earlier steps in the production chain. There may be multiple heterogeneous sources of *S. Enteritidis* ST11, and the outbreak strain could also be circulating at other farms, inside or outside Spain.

The risk of new infections caused by the outbreak strain and contaminated eggs remains high in the EU/EEA. It is therefore important to foster cross-sectoral investigations of contaminations in the egg supply chain in countries where *S. Enteritidis* ST11 has been detected.

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## Event background

On 2 September 2021, France reported a cluster of 46 cases with *Salmonella* Enteritidis ST11 infections since June 2021 in the European Centre for Disease Prevention and Control's (ECDC's) EpiPulse system (event ID 2021-FWD-00065). According to the EnteroBase hierarchical clustering of cgMLST scheme (HierCC-cgMLST), the isolates belonged to the HC5\_2301 cluster [1]. Following the French alert, several countries reported *S. Enteritidis* ST11 cases with isolates that were closely related genetically to the representative French isolates, thus confirming an ongoing multi-country event. The French cluster from 2021 was closely related genetically to a historical multi-country *S. Enteritidis* ST11 cluster of MLVA-type 2-11-7-3-2, reported by the Netherlands on 20 September 2019 (2019-FWD-00065, UI-601 in the former platform EPIS-FWD). The historical cluster in 2019 and the newer cluster in France in 2021 suggest a continuous and ongoing spread of this *S. Enteritidis* ST11 strain in the European Union/European Economic Area (EU/EEA) as well as in the United Kingdom, hence triggering the initiation of a joint ECDC-EFSA Rapid Outbreak Assessment (ROA).

## Outbreak case definition in the EU/EEA and the United Kingdom

Three representative French isolates from 2021 are publicly available in the European Bioinformatics Institute/European Nucleotide Archive (EBI/ENA) under the name Project PRJEB49231 and genome names ERR7564875, ERR7564876, and ERR7564877.

The European outbreak case definition is as follows:

### A confirmed outbreak case

- A laboratory-confirmed *Salmonella* Enteritidis case with symptom onset on or after 1 January 2021 (date of sampling or date of receipt by the reference laboratory if date of onset is not available).

AND

- Fulfilling the following laboratory criteria: a *S. Enteritidis* ST11 isolate clustering with any of the three representative outbreak strains by:
  - the national cgMLST pipeline within five allelic differences (AD); OR
  - clustering in a centralised whole genome sequencing (WGS) analysis within five ADs in a single linkage analysis; OR
  - belonging to the same cgMLST HC5\_2301 cluster according to the EnteroBase scheme; OR
  - belonging to the phylogenetically-defined outbreak-associated lineage within the 5-SNP (single nucleotide polymorphism) single linkage cluster 1.2.3.18.180.180.% (t5.180) (eburst group 4), according to the UK Health Security Agency (UKHSA) pipeline (UK excluding Scotland).

### A historical outbreak-related case\*

- A laboratory-confirmed *Salmonella* Enteritidis case with symptom onset on or before 31 December 2020 (date of sampling or date of receipt by the reference laboratory if date of onset is not available).

AND

- Fulfilling any of the laboratory criteria for a confirmed outbreak case.

\* *In the current rapid outbreak assessment, these cases are presented in an aggregated form by year.*

## Epidemiological and microbiological investigations of human cases

As of 7 January 2022, **Denmark** had identified three confirmed cases, two in August 2021 and one in November 2021. One case reported travel to France, one case had no travel history, and the travel history for the third case was unknown. Eleven historical cases have been detected in Denmark: two in 2020, four in 2019, three in 2018, one in 2014 and one in 2013. Among the historical cases, travel history is known for three; two cases having travelled to Spain in 2018 and one in 2019.

**France** started investigations in late August 2021 when an unusual number of confirmed cases (n=42) were reported, mainly in southern France (region Provence-Alpes Maritime-Corse) (n=24), with isolation dates between week 25 and week 30 (peak in week 29). Among those cases interviewed, some reported foodborne outbreaks that occurred in four different restaurants and fast-food chains in southern France. In total, there were three waves of cases in France with isolation peaks in week 29 (n=18), week 34 (n=17) and week 46 (n=11). During the period, southern France (region Provence-Alpes Maritime-Corse) represented 35% of the cases and the Paris area 19%. By

10 January 2022, France had reported 216 confirmed cases of *S. Enteritidis* ST11 in the HC5\_2301 cluster in 2021. Travel history was available for 91/216 (42.1%) cases and the reported travel destinations were Spain (n=13), Montenegro (n=4), Poland (n=3), Portugal (n=3), Hungary (n=1), Italy (n=1), Luxembourg (n=1), and Tunisia (n=1). Most of the *Salmonella* isolates causing the 2021 cases in France were susceptible to all antimicrobials tested. However, 27 HC5\_2301 isolates (12% of 216) carried a mutation in the GyrA gyrase sub-unit (D87Y) that confers resistance to quinolones. This highlights the importance of preventing the spread of such an antimicrobial-resistance clone before it becomes dominant in Europe, similar to the highly-drug resistant clone of *S. Kentucky* ST198-X1 [2].

As of 10 January 2022, **the Netherlands** had reported 12 confirmed cases for 2021. Of these, 10 had no travel history but one reported travel to Poland and one to the Dominican Republic. In addition, historical cases have been identified from 2020 (n=17), 2019 (n=36), and 2018 (n=3). On 20 September 2019, the Netherlands reported a family cluster of *S. Enteritidis* with the majority of isolates of MLVA (multilocus variable number tandem repeat) type 02-11-07-03-02. Based on the case interviews in 2019, tiramisu was the suspected vehicle of infection and contaminated eggs the source at the time.

As of 19 January 2022, **Norway** reported seven confirmed cases in 2021. Two cases reported travel history to Spain and one to Denmark within seven days of infection. Three cases had no travel history, and travel history was unknown for one case. Norway has identified historical cases in 2020 (n=35), 2019 (n=29), and 2018 (n=11). Of the historical cases with known travel history, 83% (44/53) reported travel to Spain. The latest case was sampled on 22 December 2021.

By 21 December 2021, **Spain** had reported 22 confirmed cases in 2021. Several cases were part of different local outbreaks. Seven cases were confirmed in an outbreak involving 18 cases at a nursing home. Six cases were confirmed in an outbreak related to a family meal involving 15 people at which they were served an omelette made by one of the participants. Nine people were hospitalised. Three cases were confirmed in an outbreak involving four cases. The suspected vehicle was a home-made cake, prepared with eggs. In another outbreak involving two cases, the food consumed was shrimps, although cross-contamination with unclean eggs in the fridge was suspected as the source. One case had consumed salad with mayonnaise. Seventy historical cases were identified: one in 2020, 39 in 2019, and 30 in 2018.

By 22 December 2021, **the United Kingdom** had identified 10 confirmed cases in England and two confirmed cases in Scotland during 2021. Travel history was reported for four cases, three of whom reported a travel destination; two having travelled to Spain and one to Poland prior to disease onset. Historical cases were identified in 2020 (n=33), 2019 (n=144), 2018 (n=73), and 2017 (n=5). Travel history for historical cases, where this information was known, was predominantly to Spain (45 out of the 74 cases who reported travel) and Cape Verde (11/74), with the remainder either not reporting a travel destination or only one case per destination country. If the alternative laboratory criterion in the case definition is applied in the UK, including cases belonging to the same cgMLST HC5\_2301 cluster according to the Enterobase scheme instead of the phylogenetic lineage-based criteria, there would have been over 1 000 cases in England, Wales, and Northern Ireland since 2014.

In **Germany**, only historical cases have been reported: two in 2020, 17 in 2019, three in 2018, one in 2017, and one in 2016. **Ireland** has reported five historical adult cases with sampling months between October 2018 and January 2020. All five Irish cases reported travel to Spain.

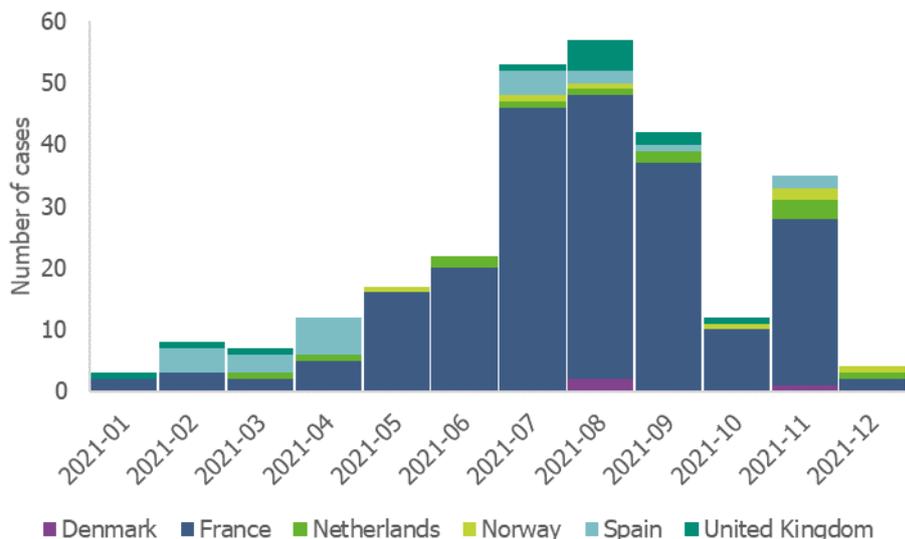
In addition, **the United States** has recorded over 800 cases within five alleles of at least one of the three French outbreak strains since 2016. Of these, 10 cases form a clade with the French outbreak strains that is 0-6 AD. Two of the 10 isolates were reported in 2021, both in August.

## Epidemiological overview

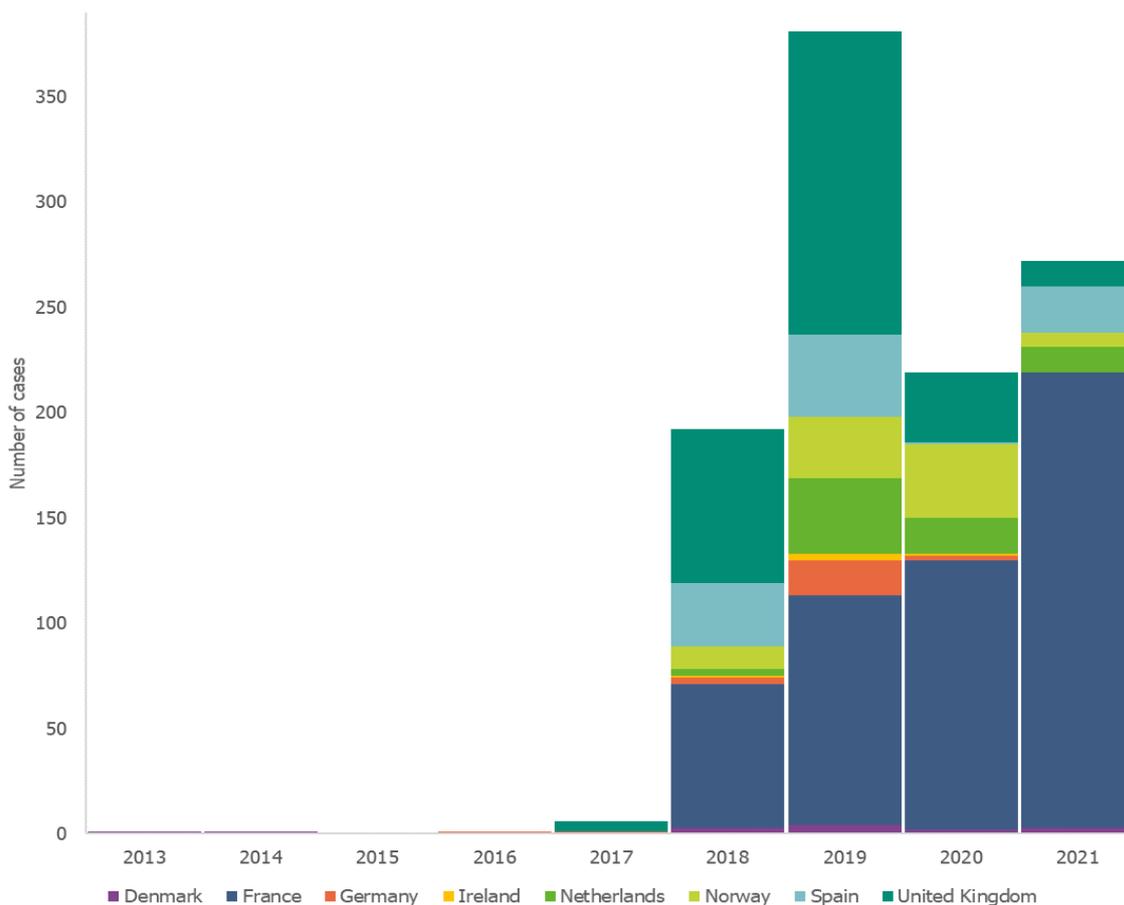
In 2021, 272 cases of confirmed *S. Enteritidis* ST11 infections were reported in five EU/EEA countries and the United Kingdom: Denmark (n=3), France (n=216), the Netherlands (n=12), Norway (n=7), Spain (n=22), and the United Kingdom (n=12) (Table 1). The cases follow the typical seasonal pattern of *S. Enteritidis* infections with the highest number of cases reported in July–September (Figure 1). A further 801 historical cases with genetically close isolates according to the national pipelines were reported prior to 2021 in Denmark (n=11), France (n=305), Germany (n=24), Ireland (n=5), the Netherlands (n=56), Norway (n=75), Spain (n=70), and the United Kingdom (n=255) (Table 1, Figure 2). The earliest two confirmed cases were detected in Denmark in 2013 and 2014 (Table 1). The most recent case was sampled in Norway on 22 December 2021.

Travel history was reported for 36 of 118 cases (30.5%) in Denmark (n=1), France (n=27), the Netherlands (n=2), Norway (n=3), and the United Kingdom (n=3). The destinations reported prior to illness were Spain (n=17), Poland (n=5), Montenegro (n=4), Portugal (n=3), and one each for Denmark, Dominican Republic, France, Hungary, Italy, Luxembourg and Tunisia.

**Figure 1. Distribution of 272 confirmed *S. Enteritidis* ST11 outbreak cases by month in five EU/EEA countries and the United Kingdom in 2021, as of 11 January 2022**



**Figure 2. Distribution of 1 073 confirmed and historical outbreak-related *S. Enteritidis* ST11 cases in seven EU/EEA countries and the United Kingdom by country and year\*, 2013–2021, as of 11 January 2022**



\*One case each in 2013 (Denmark), 2014 (Denmark), and 2016 (Germany).

**Table 1. Confirmed and historical outbreak-related cases of *S. Enteritidis* ST11 infections in seven EU/EEA countries and the United Kingdom by country and year, 2013–2021, as of 11 January 2022<sup>1</sup>**

Country	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Denmark	1	1	0	0	0	3	4	2	3	14
France	0	0	0	0	0	68	109	128	216	521
Germany	0	0	0	1	1	3	17	2	0	24
Ireland	0	0	0	0	0	1	3	1	0	5
Netherlands	0	0	0	0	0	3	36	17	12	68
Norway	0	0	0	0	0	11	29	35	7	82
Spain	0	0	0	0	0	30	39	1	22	92
United Kingdom	0	0	0	0	5	73	144	33	12	267
<b>Total</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>6</b>	<b>192</b>	<b>381</b>	<b>219</b>	<b>272</b>	<b>1073</b>

Infections were recorded in all age groups from under one year to 93 years of age (Table 2). Over half of the reported cases in 2021 (53.7%) were females but there was no major difference in sex overall in the EU/EEA or by country (Table 2). When looking at gender distribution by age group, females featured significantly more frequently than males in the age group over 74 years (chi-squared test,  $p < 0.01$ ) (Figure 3). This could be due to relatively higher representation of females in the elderly population. The majority of cases (86.7%) occurred in a population aged between one and 64 years (Figure 3). Two deaths were recorded: in a 66-year-old male in France and a 58-year-old male with underlying conditions in Spain. Of 80 cases with known information, 25 (31.3%) were hospitalised.

All 22 Spanish and 12 Dutch cases were linked to a local or national outbreak investigation, and in France, 12 cases were linked to local outbreaks.

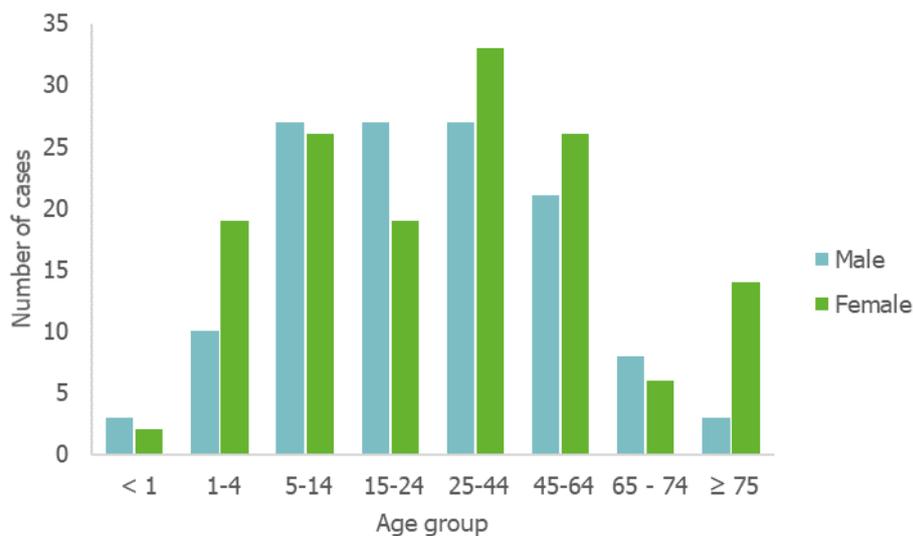
**Table 2. Number of 271 confirmed *S. Enteritidis* ST11 outbreak cases\* in five EU/EEA countries and the United Kingdom by country, gender, and age range in 2021, as of 11 January 2022**

Country	Male	Female	Age range (median)
Denmark	3	0	1-23 (10)
France	97	119	<1 - 93 (23)
Netherlands	5	6	3-81 (41)
Norway	3	4	46-75 (52)
Spain	11	11	1-87 (43)
United Kingdom	7	5	<1 - 72 (19)
<b>Total</b>	<b>126</b>	<b>145</b>	<b>&lt;1 - 93 (25)</b>

\*One case without gender information in the Netherlands.

<sup>1</sup> Countries began using WGS for *Salmonella* isolate typing around 2018, therefore the epidemiological overview does not reflect the actual situation in the years before 2018.

**Figure 3. Distribution of 271 confirmed *S. Enteritidis* ST11 outbreak cases\* in five EU/EEA countries and the United Kingdom by age group and gender in 2021, as of 11 January 2022**



\*One case without gender information in the Netherlands

### Information from patient interviews

Overall, interviews were performed for 62 cases and specific information on food exposure was available for 60 cases. Consumption of eggs in some form was reported by all interviewed cases, and of poultry products by 93% of these cases (Table 3). Of the 60 cases, 18 (30.0%) were part of an outbreak investigated at local or national level.

In France, all interviewed cases reported egg consumption and 86% reported eating food containing raw/undercooked eggs (e.g. tiramisu, mayonnaise, chocolate mousse, 'tartare' steak, scrambled eggs, chocolate cake, pancakes etc.).

**Table 3. Exposure to eggs and egg products by 60 confirmed *S. Enteritidis* ST11 cases interviewed, as of 11 January 2022**

Food exposure	Yes (%)	No (%)	Total
Raw or undercooked eggs	27 (90)	3 (10)	30
Any type of food possibly containing raw or undercooked eggs (e.g. tiramisu, home-made mayonnaise, Hollandaise sauce, etc.)	44 (94)	3 (6)	47
Eggs (in any form)	60 (100)	0 (0)	60
Any type of poultry meat or poultry products	39 (93)	3 (7)	42

# Microbiological and environmental investigations of food and control measures

## Traceability and microbiological investigations of products linked to cases in 2021

This section summarises country-specific information on microbiological investigations, traceability analyses of food products and control measures implemented by the EU/EEA countries involved in the RASFF notification 2021.4751 (14 follow up – *fup*, as of 4 February 2022). A visual representation is provided in Figure A1 (Annex 1).

### France

On 3 September 2021, the food safety authority in France reported the results of the trace-back analysis of the eggs supplied to restaurants frequented by the French cases in RASFF (RASFF 2021.4751). The backward traceability analysis of the supply chains identified the Spanish Packing Centre A as a common operator for many of the restaurants visited. The restaurants were supplied by different wholesalers, several of whom had purchased eggs from the Spanish Packing Centre A (RASFF 2021.4751). According to the trace-back investigation performed in France, French Wholesaler A, French Wholesaler B, and French Wholesaler C received eggs from the Spanish Packing Centre A and distributed them to restaurants visited by some of the cases (RASFF 2021.4751, *fup0*, *fup2*, *fup5*, *fup12*).

More specifically, French Wholesaler A received weekly consignments of medium and large eggs with multiple best-before dates from the Spanish Packing Centre A, originating from Spanish Farm A, Spanish Farm B and Spanish Farm C (RASFF 2021.4751, *fup0*).

During the period December 2020–September 2021, French Wholesaler B received eggs with multiple best-before dates from the Spanish Packing Centre A, also originating from Spanish Farm A, Spanish Farm B and Spanish Farm C (RASFF 2021.4751, *fup12*). On 24 August 2021, French Wholesaler B distributed on two cartons of these medium eggs to a restaurant in France that was visited by a case (RASFF 2021.4751, *fup12*).

On 8 July 2021, French Wholesaler C received 240 packages of fresh eggs from the Spanish Packing Centre A (RASFF 2021.4751, *fup5*, *fup12*). On 19 July 2021, French Wholesaler C delivered two of these packages to a restaurant in France where two cases had eaten egg-based products (pancakes) (RASFF 2021.4751, *fup5*). In addition, French Wholesaler C also received eggs with multiple other best-before dates from the Spanish Packing Centre A that were delivered to the same restaurant (RASFF 2021.4751, *fup12*).

Some cases had frequented a restaurant for which no link could be established with the Spanish Packing Centre A according to the traceability information provided (RASFF 2021.4751, *fup12*).

### Spain

According to the WGS analyses performed at national level, or belonging to the same HC5 cluster (HC5\_2301) as the outbreak strain, in accordance with the Enterobase hierarchical clustering of cgMLST (HierCC-cgMLST) scheme, the following non-human isolates were identified in 2021 clustering with the outbreak strain:

- one isolate of *S. Enteritidis* ST11, detected in an official dust sample collected at Shed D of Spanish Farm C on 29 July 2021;
- one isolate of *S. Enteritidis* ST11, detected in an official faecal sample collected from Flock E of Spanish Farm F on 21 September 2021.

On 17 September 2021, the food safety authority in Spain reported the outcome of the investigations performed at the Spanish Packing Centre A in response to the alert launched by France in RASFF (RASFF 2021.4751, *fup3*). The eggs sold by the Spanish Packing Centre A to French Wholesaler A originated from two packing centres - the Spanish Packing Centre B and the Spanish Packing Centre C. The Spanish Packing Centre B supplied eggs originating from the Spanish Farm C, owned by Spanish Packing Centre B, with multiple best-before dates, to French Wholesaler A. The Spanish Packing Centre C supplied eggs with multiple best-before dates originating from Spanish Farm A and from Spanish Farm B to French Wholesaler A. Both Spanish Farm A and Spanish Farm B were owned by the Spanish Packing Centre C. The Spanish Packing Centre C also sold eggs originating from Spanish Farm D (owned by the Spanish Packing Centre C), that were not distributed to French Wholesaler A, but to other customers in France (unspecified) (RASFF 2021.4751, *fup8*). At the time of the inspection performed by the Spanish authorities, the Spanish Packing Centre A no longer had any of the suspected lots in stock and therefore samples were not collected (RASFF 2021.4751, *fup3*).

The investigations performed by the Spanish authorities confirmed that French Wholesaler B and French Wholesaler C also received eggs from the Spanish Packing Centre A with multiple best-before dates originating from the same farms as French Wholesaler A - i.e. Spanish Farm A, Spanish Farm B and Spanish Farm C (RASFF 2021.4751, *fup8*).

In addition to French Wholesaler A, French Wholesaler B, and French Wholesaler C, already identified as customers of the Spanish Packing Centre A, 65 other customers in France received eggs from Spanish Packing Centre A, originating from Spanish Farm A, Spanish Farm B, and Spanish Farm C between June and mid-September 2021 (RASFF 2021.4751, fup8).

Official controls were reported to have been carried out at Spanish Farm C owned by the Spanish Packing Centre B. Spanish Farm C consists of four sheds: Shed A, Shed B, Shed C and Shed D. Egg samples were collected from Farm C-Shed A on 4 August 2021 during an official control, and all were negative for *Salmonella*. Egg samples were collected from Farm C-Shed B on 5 August 2021 in an official control, and *Salmonella* was detected from two eggshell samples. The *Salmonella* isolates from Farm C-Shed B were serotyped as *S. Ohio* 6,7: b: l,w, and therefore not related to the outbreak. No samples were collected from Farm C-Shed C as it was empty. Official dust and faecal samples had been collected from Farm C-Shed D on 29 July 2021 in relation to a different investigation. One dust sample tested positive for *S. Enteritidis* ST11 belonging to the HC5\_2301 cluster according to the EnteroBase hierarchical clustering of cgMLST (HierCC-cgMLST) scheme - i.e. the same as the outbreak strain (RASFF 2021.4751, fup3, fup9). In later samples collected from eggs at Farm C-Shed D, *Salmonella* was not detected (RASFF 2021.4751, fup3).

After the detection of *Salmonella*-positive samples, the Spanish Packing Centre B was inspected again by the Spanish authorities, and no deficiencies were found in the establishment. All own-check egg samples collected at the Spanish Packing Centre B between December 2020 and July 2021 and originating from the four sheds of Spanish Farm C were negative for *Salmonella* (RASFF 2021.4751, fup4).

The food safety authority in Spain also reported the outcome of investigations performed at Spanish Farm A of the Spanish Packing Centre C. Spanish Farm A consists of two sheds containing two flocks, Farm A-Flock A reared in cages and Farm A-Flock B with a free-range production system. Eggs from Farm A-Flock A were destined for the Spanish Packing Centre A. As part of the official control carried out on 15 September 2021, cloths, water, faeces, feed, muscle, liver and kidney samples from the animals were collected for both flocks. For Farm A-Flock A, an environmental sample (900 cm<sup>2</sup> cloth) tested positive for *S. Mikawasima* which was not related to this outbreak. The remaining samples tested negative for *Salmonella*. For Farm A-Flock B, an own-check sample of faeces collected on 8 September 2021 tested positive for *S. Enteritidis* ST11 belonging to the HC5\_291587 cluster in accordance with the EnteroBase hierarchical clustering of cgMLST (HierCC-cgMLST) scheme, which was different from the outbreak strain (RASFF 2021.4751, fup9). The samples collected from Farm A-Flock B during the official control on 15 September 2021 were *Salmonella*-negative (RASFF 2021.4751, fup8).

In addition, on 14 January 2022 the food safety authority in Spain reported in RASFF the outcome of investigations performed at Spanish Farm F, a farm for laying hens, owned by and adjacent to the Spanish Packing Centre A. Spanish Farm F includes five sheds (A, B, C, D, and E). Although, according to the traceability documents of Spanish Packing Centre A, eggs from Spanish Farm F were not distributed to France, the Spanish authorities decided to investigate the farm due to its proximity to the packing centre and the fact that it was under the same ownership. Looking at the records of the farm, it was reported that between 24 January and 5 April 2018 all flocks were culled due to the detection of *Salmonella*. Spanish Farm F was then kept empty until November 2019. On 8 September 2021, the Spanish food safety authorities discovered that no own-check sampling had been carried out at Spanish Farm F as part of the National *Salmonella* Control Programme since November 2019. Therefore, an official control was carried out on 21 September 2021. At the time of the official control, two sheds (B and D) were empty, while the other three (A, C, and E) contained three different flocks, Farm F-Flock A (Shed A-floor), Farm F-Flock C (Shed C-cage), and Farm F-Flock E (Shed E-cage). Three pairs of boot swab samples were taken from Farm F-Flock A, while three samples of 150g of faeces each were collected from Farm F-Flock C and Farm F-Flock E. *S. Enteritidis* was only detected in samples from Farm F-Flock A and Farm F-Flock E. WGS analysis of the two *S. Enteritidis* isolates revealed that the one collected from Farm F-Flock E was *S. Enteritidis* ST11, belonging to the same HC5 cluster (HC5\_2301) as the outbreak strain (RASFF 2021.4751, fup13).

After the WGS analysis confirmed that the isolate collected from Farm F-Flock E was genetically close to the outbreak strain, additional precautionary measures were imposed on Spanish Farm F. Specifically, disciplinary proceedings were initiated for not carrying out the mandatory own-checks, and the mandatory slaughter of Farm F-Flock A and Farm F-Flock E was ordered. In addition, a second official control was carried out to collect additional samples from Farm F-Flock C, and it was decided that an environmental control should be performed on the two sheds Farm F-Shed A and Farm F-Shed E (where Farm F-Flock A and Farm F-Flock E were kept) after they were emptied, cleaned and disinfected. Finally, the food safety authority in Spain initiated a traceability analysis of eggs from Farm F-Flock A and Farm F-Flock E, to verify whether the eggs had been delivered to French Wholesaler A by the Spanish Packing Centre A, and whether they were redirected for use in egg products after the detection of *S. Enteritidis*, as indicated by the authorities (RASFF 2021.4751, fup13).

## Control measures for products linked to cases in 2021

On 17 September 2021, the food safety authority in Spain reported that eggs from Shed D of Spanish Farm C had been blocked from the time of sampling until the analytical results were obtained. Following the detection of *S. Enteritidis* in a dust sample from Farm C-Shed D, the authority in Spain decided that the eggs that had been blocked, as well as eggs produced in the same shed afterwards, would be redirected for use in egg products (RASFF 2021.4751, fup3).

On 12 November 2021, the food safety authority in Spain reported that following the detection of *S. Enteritidis* from a faecal sample collected on 8 September 2021 as an own-check from Flock B of Spanish Farm A, the sale of eggs from Farm A-Flock B was prohibited from 8 September (date of own-check) until receipt of negative results from the official control performed on 15 September 2021. Furthermore, if eggs were intended for the production of egg products, the owner was requested to inform the authorities of the destination and quantity of eggs involved (RASFF 2021.4751, fup8).

On 14 January 2022, the food safety authority in Spain reported that, following the detection of *S. Enteritidis* in Flock A and Flock E of Spanish Farm F, the sale of eggs from the two positive flocks for fresh consumption had been prohibited from 21 September 2021 onwards (RASFF 2021.4751, fup13).

## Traceability and microbiological investigations of products linked to historical outbreak-related cases

This section summarises country-specific information on microbiological investigations, traceability analyses of food products and control measures implemented by the EU/EEA countries involved in the RASFF notification 2019.3069 (26 follow up – fup, as of 4 February 2022). A visual representation is provided in Figure A1 (Annex 1).

### The Netherlands

According to the WGS analyses performed at national level, the following food isolate clustering with the outbreak strain was identified in 2019:

- one isolate of *S. Enteritidis* ST11, detected in an official eggshell sample collected at the Dutch Retailer A on 22 August 2019.

On 28 August 2019, the food safety authority in the Netherlands reported the results of the trace-back analysis of eggs suspected to have been consumed by the cases related to a household cluster in the Netherlands in RASFF (RASFF 2019.3069). The eggs that were used had the stamp code A. The batch number and best-before date of the eggs were not available (RASFF 2019.3069, fup25). The eggs were purchased at Dutch Retailer A, probably on 10 August 2019. The food safety authority in the Netherlands reported that seven trays, with 30 eggs per tray, showing the stamp code A, sealed in plastic foil, were confiscated from Dutch Retailer A and sampled on 22 August 2019. Two pooled eggshell samples tested positive for *S. Enteritidis* (RASFF 2019.3069, fup3, fup11), one of which matched the human cases according to the WGS analysis performed at national level (RASFF 2019.3069, fup11).

Dutch Retailer A had bought the eggs with the stamp code A from Dutch Wholesaler D, who had purchased them from the Dutch Packing Centre E. The Dutch Packing Centre E had bought the eggs from Dutch Wholesaler E who had imported multiple batches of eggs with the stamp code A from Spanish Wholesaler F into the Netherlands, in separate deliveries at one-to-four-week intervals. The eggs were traced back to the Spanish Packing Centre D (RASFF 2019.3069, fup4, fup7).

The food safety authority in the Netherlands reported in RASFF that Dutch Wholesaler E received eggs from Spanish Wholesaler F in pallets. Dutch Wholesaler E distributed the pallets of eggs to the Dutch Packing Centre E, the Dutch Packing Centre F and 20 additional food business operators in the Netherlands (RASFF 2019.3069, fup25). The eggs that were found positive were delivered to the Dutch Packing Centre E as whole pallets containing egg trays wrapped in plastic foil. The Dutch Packing Centre E handled the original egg trays mechanically, reducing the chance of cross-contamination.

The Dutch Packing Centre F distributed the eggs with the stamp code A received from Dutch Wholesaler E to Dutch Wholesaler G and two additional food business operators in the Netherlands. Dutch Wholesaler G distributed the eggs to 613 different food business operators, 92 of which were located in Belgium (RASFF 2019.3069, fup6, fup14, fup25).

### Spain

According to the WGS analysis performed at national level, the following non-human isolate clustering with the outbreak strain was identified in 2019:

- one isolate of *S. Enteritidis* ST11, detected in an official fresh faeces sample collected at Shed C of Spanish Farm E on 7 June 2019.

During 2019–2020, the food authority in Spain reported in RASFF the outcome of the investigations linked to the outbreak reported by the Netherlands in 2019. Between 3 April 2019 and 22 August 2019, Spanish Wholesaler F sent eggs received from the Spanish Packing Centre D to the Netherlands (RASFF 2019.3069, fup7). Based on available evidence, all these eggs with the stamp code A originated from Shed A of Spanish Farm E, owned by the Spanish Packing Centre D (RASFF 2019.3069, fup7, fup15).

Spanish Farm E had a total of four sheds (Shed A, Shed B, Shed C and Shed D). All own checks carried out in all sheds in recent years as part of the National *Salmonella* Control Programme were negative (RASFF 2019.3069, fup8). Two faecal samples, collected during an official control performed at Farm E-Shed C on 7 June 2019, tested positive for *S. Enteritidis*. One *S. Enteritidis* isolate was sequenced and matched the outbreak strain according to the WGS analysis performed at national level (RASFF 2019.3069, fup8, fup18, fup20, fup26).

Following this positive detection, several official controls were performed at Spanish Farm E, and all the faecal and dust samples collected (on 25 June 2019, 3 September 2019, 6 September 2019 and 20 November 2019) tested negative for *Salmonella* (RASFF 2019.3069, fup8, fup9, fup10, fup26). In addition, the company performed own-check samples of eggs from Farm E-Shed A on 14 August 2019 and on 31 August 2019, and *Salmonella* was not detected (RASFF 2019.3069, fup7).

The most recent delivery of eggs for human consumption to the Netherlands from Farm E-Shed A was Batch A on 22 August 2019. Since 22 August 2019, eggs from the Spanish Packing Centre D have been distributed to other countries, but not to the Netherlands (RASFF 2019.3069, fup23).

The only customer in the Netherlands that received eggs from the Spanish Packing Centre D via Spanish Wholesaler F in the period April–August 2019 was Dutch Wholesaler E (RASFF 2019.3069, fup13, fup16, fup17).

On 10 October 2019, the food safety authority in Spain reported that no eggs from Farm E-Shed A were found at the Spanish Packing Centre D, except for those that were blocked on 4 September 2019 (RASFF 2019.3069, fup15, fup17).

On 29 August 2019, eggs originating from Shed C of Spanish Farm E were sold by the Spanish Packing Centre D to Dutch Wholesaler E via Spanish Wholesaler F. The shipment of egg pallets, belonging to Batch B and with the stamp code B, was rejected by Dutch Wholesaler E and returned to the Spanish Packing Centre D. The returned eggs were then redirected to the Spanish food industry (RASFF 2019.3069, fup13, fup16).

On 9 September 2019, the Spanish authorities inspected Spanish Wholesaler F, an intermediary without a warehouse. The inspection confirmed that the consignments from the Spanish Packing Centre D to Dutch Wholesaler E had been delivered between April and August 2019. Only eggs from the Spanish Packing Centre D were supplied to Dutch Wholesaler E by Spanish Wholesaler F (RASFF 2019.3069, fup16).

On 10 July 2020, the food safety authority in Spain reported in RASFF that the own-check samples collected between January and June 2020 from Spanish Farm E of the Spanish Packing Centre D as part of the National *Salmonella* Control Programme were negative for *Salmonella* (RASFF 2019.3069, fup22, fup23).

On 18 November 2020, faecal samples were collected from Farm E-Shed C during an official control. *Salmonella* was not detected in the samples (RASFF 2019.3069, fup26).

## Control measures for products linked to historical outbreak-related cases

On 28 August 2019, the Netherlands issued a public warning on eggs with the stamp code A (RASFF 2019.3069, fup3).

On 4 September 2019, the eggs from Farm E-Shed A that were blocked at the Spanish Packing Centre D were sent for destruction, while the remaining eggs from Farm E-Shed A that had not been blocked were redirected to the food industry. The last consignment of eggs from Farm E-Shed A to the food industry was delivered on 28 August 2019.

On 12 September 2019, the food safety authority in Spain reported that production at Shed A of Spanish Farm E had been suspended. Eggs produced in Farm E-Shed A since its suspected involvement in the outbreak were discarded by Spanish Farm E together with the poultry manure (RASFF 2019.3069, fup7, fup13, fup15, fup16, fup17).

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

WGS data of 98 representative human *S. Enteritidis* ST11 isolates from cases infected in 2021 in six EU/EEA countries and the UK were included in the centralised analysis from France (n=68), the Netherlands (n=11), Spain (n=8), Denmark (n=4), Norway (n=3) and the UK (n=4). In addition, two non-human isolates from Spain were included in the analysis, one dust sample collected at Farm C in 2021 and one faecal sample collected at Farm F in 2021 (Figure 4). The isolates in the minimum spanning tree clustered within five cg-allelic differences (cgMLST, Enterobase scheme) of any other isolate in the centralised single linkage analysis (Figure 4).

The Dutch outbreak strain from 2019 matches with the French outbreak strain from 2021 by 0 AD in cgMLST in single linkage cluster analysis.

The countries started to use WGS for *Salmonella* and *S. Enteritidis* isolates from humans at different times, which has had an impact on the temporal epidemiological overview. It is very likely that the cases identified represent only a subset of all historical cases infected with the outbreak strain as these have not been sequenced.

Below is an overview of WGS practices for human *Salmonella* isolates in affected countries.

**Denmark:** since 2017, all *Salmonella* isolates received are sequenced at Statens Serum Institut. In 2015/2016, isolates and corresponding background isolates of the same serovar were sequenced when these were connected to outbreaks.

**France:** the National Reference Centre (NRC) for *Salmonella* started performing routine WGS for all human *Salmonella* isolates sent to NRC in July 2018. This amounts to around 10 000 isolates annually.

**Ireland:** all human *Salmonella* isolates have been sequenced since 2016.

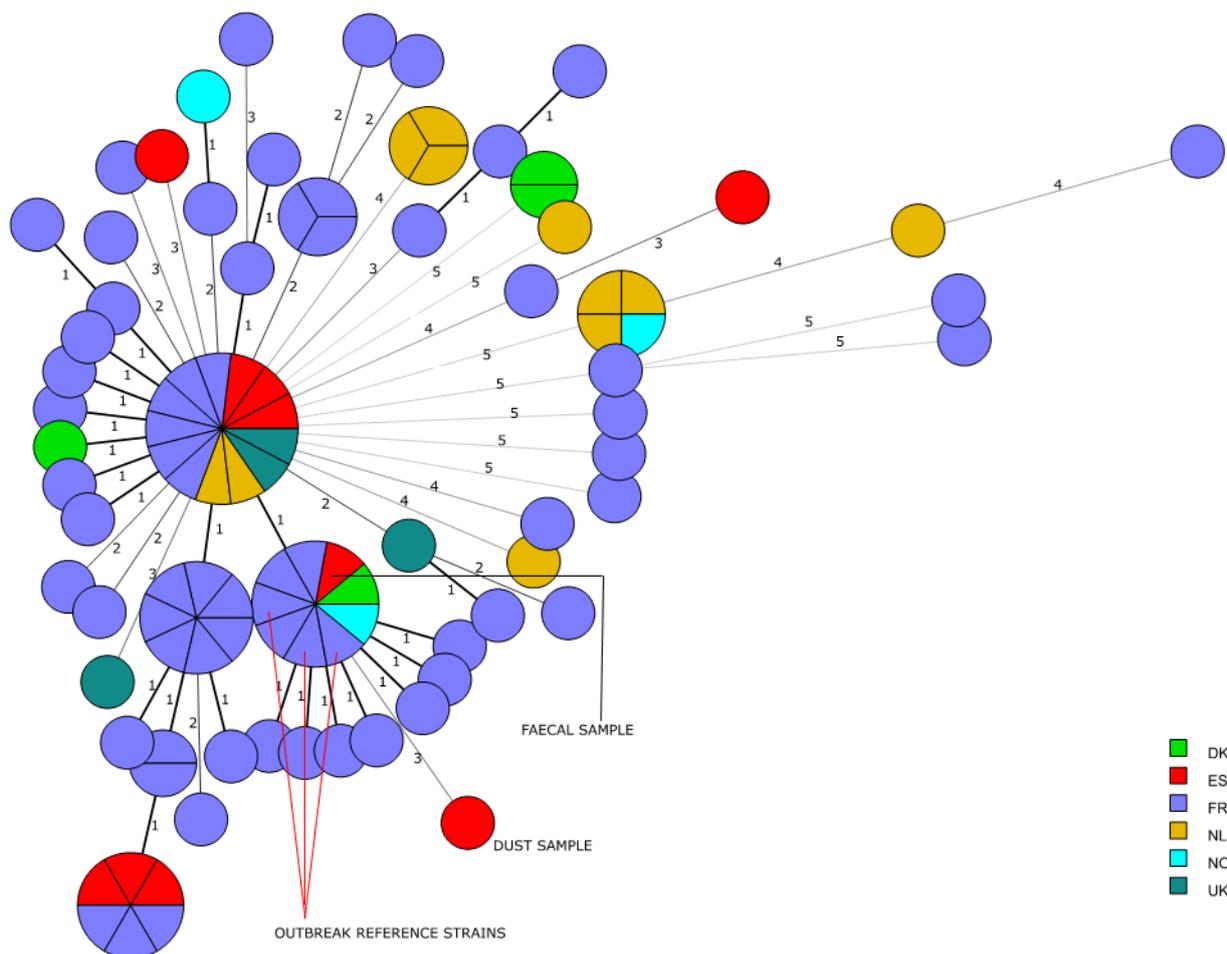
**Norway:** all *Salmonella* isolates received since March 2018 have been whole genome sequenced routinely.

**The Netherlands:** all *S. Enteritidis* isolates have been sequenced since 1 January 2019. Isolates from before that time have been retrospectively sequenced as part of (European) projects.

**Spain:** WGS has been performed routinely since 2018 in connection with outbreak investigations.

**United Kingdom:** at the United Kingdom Health Security Agency (UKHSA), routine WGS was introduced for *Salmonella* in April 2014 and this covers samples taken in England, Northern Ireland, and Wales [3]. In Scotland, WGS has been routinely used for all *Salmonella* isolates of human, animal, food, and environmental origin submitted to the reference laboratory since 30 October 2017. In addition, WGS data has been available for most isolates since 1 January 2017. This totals approximately 1 000 sequences per year, representing a large majority of the isolates identified in Scotland.

**Figure 4. Minimum spanning tree (MST) of 98 human and two non-human *S. Enteritidis* ST11 isolates in five EU/EEA countries and the UK in 2021, as of 2 February 2022**



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

On 2 September 2021, France reported a cluster of 46 cases with *Salmonella* Enteritidis ST11 infections, ongoing since June 2021, in the ECDC's EpiPulse system (2021-FWD-00065). Using the EU/EEA case definition, comparisons of French representative outbreak strains with strains in their own and other countries' national databases identified 272 confirmed cases of human *Salmonella* Enteritidis ST11 infection in five EU/EEA countries and the United Kingdom in 2021. These cases were in Denmark (n=3), France (n=216), the Netherlands (n=12), Norway (n=7), Spain (n=22), and the United Kingdom (n=12). The cases were distributed over the year with the typical seasonal peak for non-typhoidal salmonellosis in July–September. Individuals in all age groups from under one year to 93 years (median 25 years) were affected and 53.7% of cases were female. Two deaths have been recorded due to or with *Salmonella* infection, one in a 66-year-old male in France and one in a 58-year-old male with underlying conditions in Spain. Of 80 cases with known information, 25 (31.3%) were hospitalised. Interviews of 60 confirmed cases reported consumption of eggs in some form. Travel history was reported for 30.5% of cases with known information and Spain was the most common travel destination for 17/36 (47.2%) cases.

A proportion of the cases reported in France during 2021 declared having visited restaurants before the onset of symptoms. The trace-back analysis of the supply chain for the eggs served in French restaurants involved in the outbreak identified the Spanish Packing Centre A as a common supplier. Based on the available evidence, the eggs distributed by the Spanish Packing Centre A to France originated from three different Spanish farms, one of which, Farm C, tested positive for the outbreak strain in an environmental sample in July 2021. In addition, in September 2021 another farm linked to the Spanish Packing Centre A, Farm F, tested positive for the outbreak strain. Farm F is located at the same premises as the Spanish Packing Centre A and has the same owner. However, according to the traceability records of the Spanish Packing Centre A, eggs from Farm F were not distributed to France. Eggs from the farms linked to the outbreak were withdrawn as fresh table eggs and redirected for use in heat-treated egg products, in accordance with requirements laid down in EU legislation.

According to the traceability analyses covering the period between June and September 2021, no additional countries other than Spain and France were documented as being involved in the distribution of eggs by the Spanish Packing Centre A during that period. Therefore, the source of the infection for cases occurring later in 2021, and in countries other than Spain and France could not be established. Some of the cases in the other countries could be explained by travel to either France or Spain.

The outbreak in 2021 is microbiologically linked to a historical cross-border outbreak, first reported by the Netherlands in EPIS-FWD (UI-601), predecessor of EpiPulse, on 20 September 2019 (2019-FWD-00065). In the case of a Dutch household cluster, which was associated with the cross-border outbreak, eggs sampled in August 2019 at a Dutch retailer tested positive for the outbreak strain. This was the same Dutch retailer where eggs with the same stamp code had been purchased by cases belonging to the household cluster. The positive eggs were traced back to Shed A of Spanish Farm E and they were distributed from the Netherlands to food business operators located in Belgium. Another shed (Shed C) of the same Farm E tested positive for the outbreak strain during an official control in June 2019. With regard to control measures, the Netherlands issued a public warning on eggs with the same stamp code, while the Spanish authorities temporarily blocked the distribution of eggs from Shed A of Spanish Farm E, before later redirecting them to the food industry. According to the investigations performed by the Spanish authorities, eggs delivered to the Netherlands using the same stamp code originated solely from Farm E-Shed A, that tested negative for *Salmonella* in multiple own-check and official controls between June and November 2019. Therefore, the point of contamination of the eggs consumed by the cases reported in the Netherlands could not be established.

According to the trace-back analyses performed by France, the Netherlands and Spain, no common operator could be identified between the outbreak occurring in France in 2021 and the outbreak occurring in the Netherlands in 2019. The farms and packing centres involved in the two outbreaks are also located in geographically distinct areas. Therefore, a common point and/or source of contamination between the two events could not be identified. This suggests a wide distribution of the outbreak strain that could affect the food supply chain, or earlier steps in the production chain before the hens even enter the farms. Therefore, the possibility cannot be excluded that the outbreak strain could be circulating in other farms, inside or outside Spain.

By 11 January 2022, 801 historical outbreak-related cases, infected with the *S. Enteritidis* ST11 outbreak strain, were detected in seven EU/EEA countries and the UK. The noticeable increase in 2018 is most probably a surveillance artefact since the countries started to use WGS for *Salmonella* and *S. Enteritidis* isolates at different times, mainly around 2018. It is very likely that the cases identified represent only a subset of all historical cases infected with the outbreak-related isolates as these may not have been sequenced. The UK has actually identified over 1 000 human cases since 2014, when analysis was performed using one of the laboratory criteria for the case definition (within 5 AD by cgMLST to at least one of the three French representative outbreak strains). In addition, the United States has identified over 800 cases matching at least one of the representative outbreak strains since 2016, 10 of which were detected in 2021.

The cross-border outbreak in 2021 highlights the risk of exposure to eggs and/or egg products contaminated with *S. Enteritidis* ST11, but the outbreak strain belongs to a wider phylogenetic group of *S. Enteritidis* ST11 isolates, which has been spreading within the EU/EEA and the UK for several years. The multiple criteria for a case definition restrict the number of cases for the purpose of describing a subset of cases in this outbreak. However, it also highlights the magnitude of the public health problem, involving hundreds of cases with isolates that are closely related genetically in countries other than France and Spain. This also indicates that there may be multiple heterogeneous sources of *S. Enteritidis* ST11 in the EU/EEA countries, such as farms and related environments (including parent and grandparent farms), hatcheries, packing centres, and the facilities for the transport of animals and eggs [4].

The most recent case was reported in Norway with the sampling date 22 December 2021, suggesting that there is a risk of ongoing exposure. In conclusion, the risk for new infections caused by the *S. Enteritidis* ST11 outbreak strain and from contaminated eggs in general remains high in the EU/EEA.

## Options for response

ECDC encourages Member States to monitor human infections with *S. Enteritidis* by performing sequencing of isolates linked to a local, regional, or national outbreaks. Any new information on human cases linked to this event should be reported in EpiPulse under the event 2021-FWD-00065. ECDC can offer sequencing support for countries with limited or no WGS capacity. Notifications in the Early Warning and Response System (EWRS) should be issued if the appropriate criteria are fulfilled. ECDC further encourages public health authorities to cooperate closely with food safety and veterinary authorities, to investigate outbreaks caused by the *S. Enteritidis* ST11 strains specified in this assessment in order to identify exposures and, where possible, store related information on exposures to suspected food products.

EFSA encourages Member States to perform sequencing of *S. Enteritidis* non-human isolates related to the RASFF notifications 2021.4751 and 2019.3069 and/or linked to the present cluster either microbiologically (serotype or ST) or epidemiologically (e.g. consumption of eggs and egg products by human cases or isolates linked to the companies involved as in RASFF 2021.4751 and 2019.3069), and to share these sequences with EFSA and the EURL-*Salmonella*. The food safety authorities in the countries involved should share additional information on microbiological investigations at European Union level, including results of animal and environmental samples from primary production (including breeding farms and hatcheries), and tracing information by issuing relevant notifications through the Rapid Alert System for Food and Feed (RASFF). Further information on food traceability investigation can be requested from the RASFF contact point for the relevant countries.

It is important to foster cross-sectoral investigations of the possible origin(s) of contamination in the egg supply chain in countries where *S. Enteritidis* ST11 has been detected.

## Source and date of request

ECDC sent a request for a production of a Rapid Outbreak Assessment on 30 November 2021 and EFSA accepted the request on the same day.

## Consulted experts and national contact points

**ECDC experts (in alphabetical order):** Áine Collins, Cecilia Jernberg, Johanna Takkinen.

### Public health experts:

<b>Denmark:</b>	Eva Litrup, Luise Müller (Statens Serum Institut)
<b>France:</b>	Nathalie Jourdan Da Silva and Henriette de Valk (Santé publique France); Laetitia Fabre, Maria Pardos de la Gandara, François-Xavier Weill (Centre National de Référence des <i>E. coli</i> , <i>Shigella</i> et <i>Salmonella</i> , Institut Pasteur)
<b>Ireland:</b>	Martin Cormican (National <i>Salmonella</i> , <i>Shigella</i> & Listeria Reference Laboratory), Paul McKeown (Health Protection Surveillance Centre)
<b>The Netherlands:</b>	Roan Pijnacker (National Institute for Public Health and the Environment)
<b>Norway:</b>	Heidi Lange, Lin Thorstensen Brandal (National Institute of Public Health)
<b>Spain:</b>	Camille Jacqueline (European Public Health Microbiology Training Programme (EUPHEM), ECDC), Silvia Herrera León (National Centre of Microbiology, Instituto de Salud Carlos III), Carmen Varela Martinez (National Centre of Epidemiology, Instituto de Salud Carlos III)
<b>United Kingdom:</b>	Derek Brown (Scottish Microbiology Reference Laboratories, Glasgow); Lynda Browning (Public Health Scotland); Marie Chattaway, Lesley Larkin, Jacquelyn McCormick, Anaïs Painset, Caisey Pulford (United Kingdom Health Security Agency)
<b>United States:</b>	Beth Tolar (US Centers for Disease Control and Prevention).

All public health experts have submitted declarations of interest, and a review of these declarations did not reveal any conflict of interest.

**EFSA staff (in alphabetical order):** Lorena Corredor Barrera, Ernesto Liebana, Denise Pezzutto, Valentina Rizzi, Mirko Rossi.

**European Union Reference Laboratory for *Salmonella* (EURL-*Salmonella*):** Robin Diddens, Kirsten Mooijman, Angela van Hoek.

**RASFF contact points:** Belgium, France, the Netherlands, Spain.

**National experts consulted by the RASFF Contact Points:**

Spain: José Alejo Alcántara del Barrio (Spanish Agency for Food Safety and Nutrition).

## Disclaimer

ECDC issued this outbreak assessment document in accordance with Article 10 of Decision No 1082/13/EC and Article 7(1) of Regulation (EC) No 853/2004 establishing a European Centre for Disease Prevention and Control (ECDC), and with the contribution of EFSA 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 (EFSA) and laying down procedures in matters of food safety.

In the framework of ECDC's mandate, the specific purpose of an ECDC-EFSA outbreak assessment is to present different options on a certain matter. The responsibility on the choice of which option to pursue and which actions to take, including the adoption of mandatory rules or guidelines, lies exclusively with EU/EEA Member States. In its activities, ECDC strives to ensure its independence, high scientific quality, transparency and efficiency.

This report was written under the coordination of an internal response team at ECDC, with contributions from EFSA, at the behest of the European Commission based on a mandate requesting scientific assistance from EFSA in the investigation of multinational food-borne outbreaks (Ares (2013) 2576387, Mandate M-2013-0119, 7 July 2013).

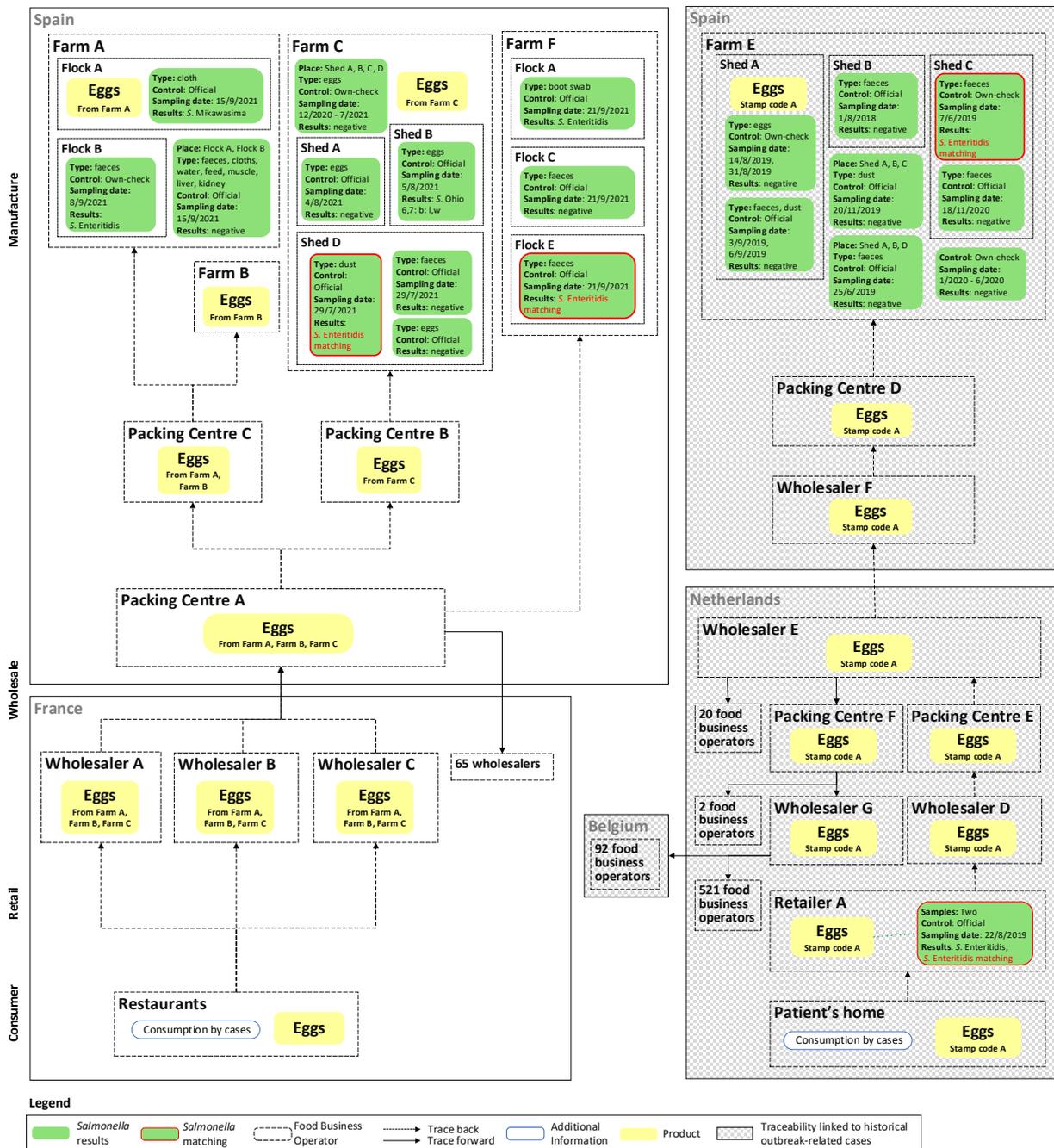
All data published in this rapid outbreak assessment are correct to the best of ECDC's and EFSA's knowledge as of 8 February 2022. Maps and figures published do not represent a statement on the part of ECDC, EFSA or its partners on the legal or border status of the countries and territories shown.

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# Annex 1. Food traceability and analyses

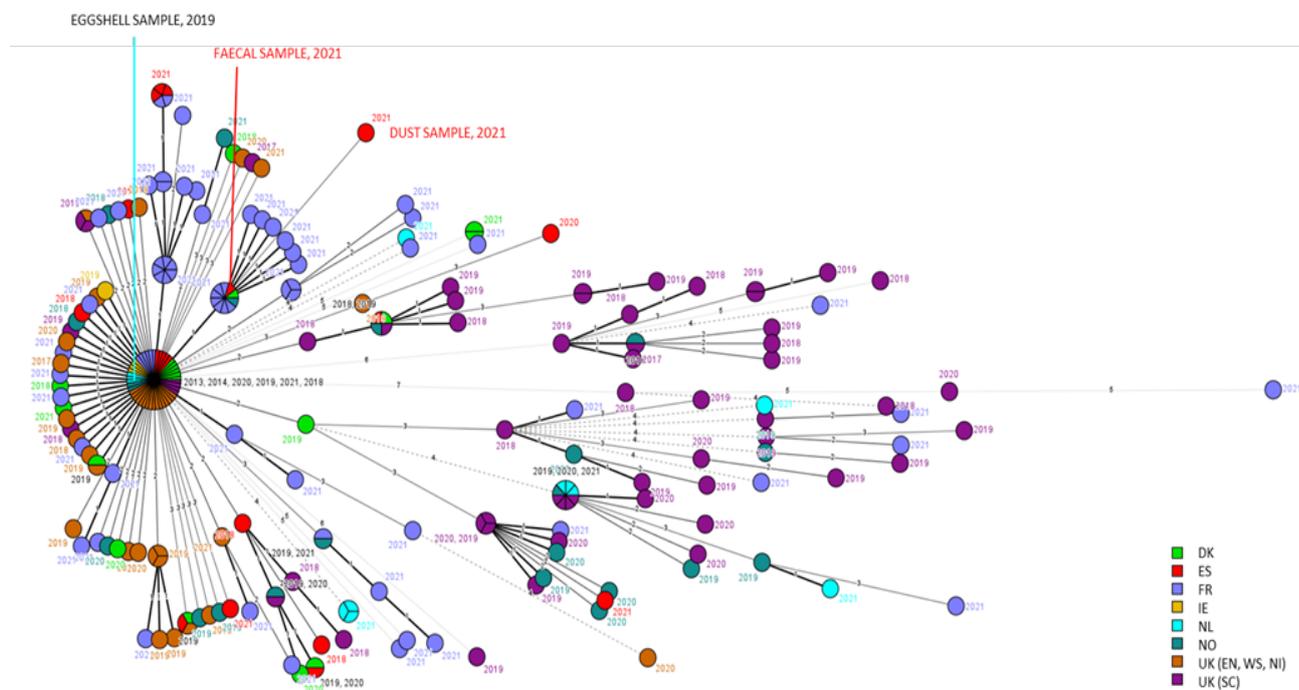
**Figure A1.** Graphical representation of the traceability, testing information and control measures for eggs linked to food exposure information, as reported by the countries involved under RASFF notifications 2019.3069 and 2021.4751 (the grey area refers to the traceability of historical outbreak-related cases)



## Annex 2. WGS analysis of confirmed and historical outbreak-related *S. Enteritidis* ST11 isolates

The outbreak strain was identified on multiple occasions before 2021, both in outbreaks and as sporadic cases. To place the present outbreak isolates in the context of those from historical confirmed cases, 244 human isolates collected from seven countries within the EU/EEA and the UK from cases infected between 2013 and 2021 were included in the wider centralised analysis. The isolates were collected in France (n=71), Norway (n=22), Denmark (n=19), Spain (n=18), the Netherlands (n=11), Ireland (n=5) and the UK (n=98). In addition, three non-human isolates, two from Spain and one from the Netherlands were included. The isolates from Spain were from a dust sample collected at Farm C in 2021 and from a faecal sample collected at Farm F in 2021. The isolate from the Netherlands was from an eggshell sample collected in 2019. The isolates in the minimum spanning tree clustered within five cg-allelic differences of any other isolate in the centralised single linkage analysis (cgMLST, Enterobase scheme) (Figure A2). The majority of the isolates, 187/244 (76.7%), clustered within 0-2 allelic distances in a single linkage cluster where all seven countries had representative isolates. In addition, the isolates spanned an eight-year period. This indicates that the outbreak strain is well established in the EU/EEA and the UK, as it has been repeatedly detected in the food chain, as well as causing disease in humans.

**Figure A2. Minimum spanning tree of 244 human and three non-human *S. Enteritidis* ST11 isolates in six EU/EEA countries and the UK in 2013–2021, as of 2 February 2022**



## Annex 3. Disease background

### Disease characteristics

Background information about salmonellosis can be found in the disease fact sheets from ECDC, US CDC, and WHO [5-7].

### Disease surveillance for *S. Enteritidis* in the EU

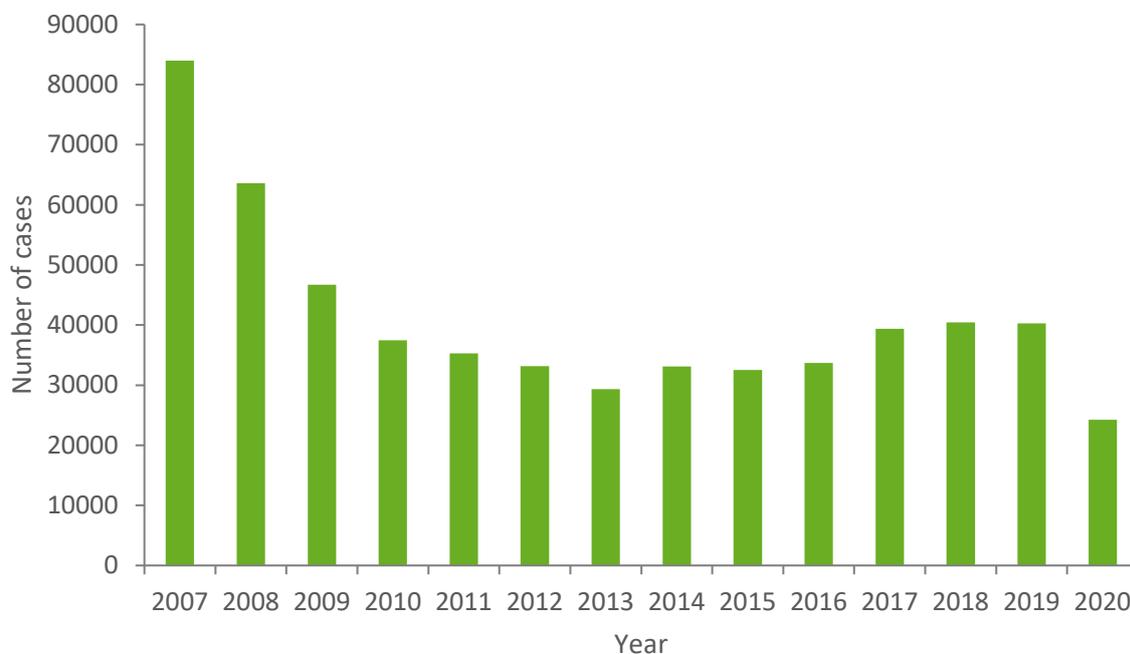
#### *Salmonella* Enteritidis isolation in humans

*Salmonella* Enteritidis is reported as part of salmonellosis surveillance in the EU/EEA. Notification of non-typhoidal salmonellosis is mandatory in most of the EU Member States, as well as in Iceland and Norway. In three Member States, reporting is voluntary (Belgium, France and Luxembourg). Food poisoning is a notifiable disease under national legislation in all countries of the UK, except Scotland. Under national legislation, reporting of *Salmonella* spp. isolated from human samples in public health laboratories is also mandatory throughout the UK. During part of the data reporting period (2007–2019), the United Kingdom was an EU Member State. The surveillance systems for salmonellosis have national coverage in all Member States except three (France, the Netherlands and Spain). The population coverage in 2020 is estimated to be 48% in France and 64% in the Netherlands and is not reported for Spain.

In 2020, eight countries reported data to the European Surveillance System (TESSy) using the 2018 EU case definition for salmonellosis, while 17 countries used either the 2008 or 2012 EU case definitions, which are essentially the same. Denmark, France, Germany, and Italy used another case definition.

Between 2007 and 2020, 573 240 cases of *S. Enteritidis* were reported to TESSy (mean number of cases per year 40 946, range 20 240 to 84 000) by 29 countries, with Germany and the Czech Republic accounting for 24.7% and 22.8% of all cases, respectively. Between 2007 and 2020, the number of reported cases decreased by 71% (Figure A3). The median age for all cases with information available was 19 years (interquartile range IQR=5–49); 52% (n=304 972) were female, and 90% (n=456 661) of infections were acquired in the reporting country. Among cases where the outcome was known (n=443 309), a total of 549 deaths were reported, 52% of which were females. The highest number of cases during a year was reported between July and October. The number of cases dropped between 2019 and 2020, probably due to the COVID-19 pandemic (Figure A3). Further information can be found online in ECDC's Surveillance atlas of infectious diseases [8].

**Figure A3. Number of confirmed *S. Enteritidis* cases by year, EU/EEA, TESSy 2007–2020, as of 24 January 2022**



## Foodborne outbreaks caused by *S. Enteritidis* linked to eggs and egg products

This section summarises country-specific data on foodborne outbreaks associated with *S. Enteritidis* linked to the category 'eggs and egg products', as reported between 2015 and 2020 to EFSA by the EU Member States in accordance with the Zoonoses Directive 2003/99/EC. During part of the data reporting period (2015–2019), the United Kingdom was an EU Member State.

In 2020, a total of 48 foodborne outbreaks (25 strong-evidence outbreaks and 23 weak-evidence outbreaks) due to *S. Enteritidis* linked to 'eggs and egg products' were submitted to EFSA by seven EU countries: Austria, Croatia, Estonia, France, Poland, Slovakia and Spain. Among the 25 strong-evidence outbreaks, 120 cases and 33 hospitalisations were reported. No deaths were reported. Among the 23 weak-evidence outbreaks, 96 cases, 34 hospitalisations and no deaths were reported. In 2020, one non-EU country (the United Kingdom) reported one strong-evidence foodborne outbreak due to *S. Enteritidis* in 'eggs and egg products' to EFSA, with 59 cases, no hospitalisations, and no deaths.

During the period 2015–2019, a total of 612 foodborne outbreaks (340 strong-evidence outbreaks and 272 weak-evidence outbreaks) caused by *S. Enteritidis* in 'eggs and egg products' were submitted to EFSA by 19 EU Member States: Austria, Belgium, Croatia, Czechia, Denmark, Estonia, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Poland, Slovakia, Spain and Sweden. Among the 340 strong-evidence outbreaks, 4 481 cases and 1 087 hospitalisations were reported. Ten patients died due to or with the disease. Among the 272 weak-evidence outbreaks, 1 873 cases, 435 hospitalisations and two deaths were reported. During the period 2015–2019, a total of 69 foodborne outbreaks (63 strong-evidence outbreaks and six weak-evidence outbreaks) caused by *S. Enteritidis* in 'eggs and egg products' were submitted to EFSA by four non-EU countries: Bosnia and Herzegovina, Serbia, Switzerland, and the United Kingdom. Among the 63 strong-evidence outbreaks, 1 155 cases and 143 hospitalisations were reported. One patient died due to or with the disease. Among the six weak-evidence outbreaks, 241 cases, 25 hospitalisations and no deaths were reported.

## Occurrence of *S. Enteritidis* in eggs and egg products

This section summarises country-specific data on the occurrence of *S. Enteritidis* in the food categories 'eggs' and 'egg products' from 2015 to 2020, as reported to EFSA by the EU Member States in accordance with the Zoonoses Directive 2003/99/EC. During part of the data reporting period (2015–2019), the United Kingdom was an EU Member State.

In 2020, for the categories 'eggs' and 'egg products', four EU Member States (Italy, Luxembourg, Romania, and Spain) reported 18 *S. Enteritidis*-positive units out of 787 total units tested for *Salmonella* (2.29%) to EFSA.

During the period 2015–2019, for the categories 'eggs' and 'egg products', 12 EU Member States (Austria, Bulgaria, Croatia, Czechia, Germany, Hungary, Italy, Portugal, Romania, Slovakia, Spain and Sweden) reported 107 *S. Enteritidis*-positive units out of 7 270 total units tested for *Salmonella* (1.47%) to EFSA. During the period 2015–2019, for the categories 'eggs' and 'egg products', one non-EU country (Montenegro) reported one *S. Enteritidis*-positive unit out of 120 total units tested for *Salmonella* (0.83%) to EFSA.