

Outbreak of *Salmonella* Thompson in the Netherlands since July 2012

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An ongoing outbreak of salmonellosis due to *Salmonella* Thompson is affecting the Netherlands. Between 2 August and 19 October 2012, 866 cases were confirmed. Their median age was 44 years (range: 0–95 years), 63% were female and 36% were hospitalised. A matched case–control study suggested smoked salmon as the vehicle. *Salmonella* Thompson was confirmed in four of nine batches of smoked salmon from one producer. A recall of all concerned smoked salmon products was executed starting end of September.

On 15 August 2012 (week 33), the National Institute for Public Health and the Environment (RIVM) noticed an increase in the number of *Salmonella* Thompson cases. Two weeks earlier, there had been four cases, and in week 33 another 11 cases were detected. As normally around four cases of *S. Thompson* are seen in the Netherlands per year, an outbreak investigation was started.

Epidemiological investigation

Cases were defined as persons in the Netherlands with *S. Thompson* cultured from any sample type, confirmed by the RIVM, since August 2012. A semi-structured questionnaire exploring relevant food exposures in the seven days before the onset of symptoms was administered by telephone or face to face, beginning 16 August. Data were obtained relating to food consumption and place of purchase as well as other possible exposures such as contact with pets or a person with diarrhoea. Information regarding clinical symptoms, date of onset of illness and date of hospitalisation were also gathered.

A matched case–control study was conducted by sending a similar version of the questionnaire to four controls per case, matched on year of birth, sex and municipality.

Preliminary results

Between 2 August and 19 October 2012 (week 31–42), 866 cases were confirmed with an *S. Thompson*

infection (Figure 1), geographically spread throughout the country.

Women (63%) were more often affected than men (37%). The median age of the cases was 44 years (range: 0–95 years). Ten percent of the cases were between 0 and 9 years-old and another 16% were between 10 and 19 years-old. The regional public health services actively approached the first 184 cases, resulting in 111 completed questionnaires (60%). Data on hospitalisation were available for 107 cases of whom 36% were admitted to the hospital. First date of illness was known for 192 cases and ranged between 20 June and 6 October (Figure 2). Cases confirmed later than 1 October (week 39) were not contacted, as the most probable cause of the outbreak had been identified and been made public in the media. Date of onset for these cases is therefore only known when filled in on the application form for serotyping of the isolate. This has caused an artificial underrepresentation in the number of cases registered with date of onset in weeks 38, 39 and further.

As soon as new questionnaires were received, preliminary risk factor analyses were performed without a clear indication as to which food item was causing the outbreak. The latest preliminary analysis (24 September) was based on 80 case questionnaires and 175 control questionnaires. Cases had significantly more often (45%) eaten smoked fish, especially smoked salmon, than controls (28%) (adjusted odds ratio: 7.3; 95% confidence interval (CI) 2.4–22.0). Furthermore, cases were also more likely (21%) to have consumed raw salads than controls (11%) (adjusted odds ratio: 5.1; 95% CI: 1.2–21.4). Several supermarkets were reported significantly more often by cases than by controls. Most of these supermarkets turned out to do their purchases via the same organisation.

Traceback

Based on the preliminary results of the case–control study, the Dutch Food and Consumer Product Safety Authority (NVWA) performed a traceback study on smoked salmon and discovered that those

FIGURE 1

Cases of *Salmonella* Thompson, by week of confirmation, the Netherlands, 2 August–19 October 2012 (n=866)

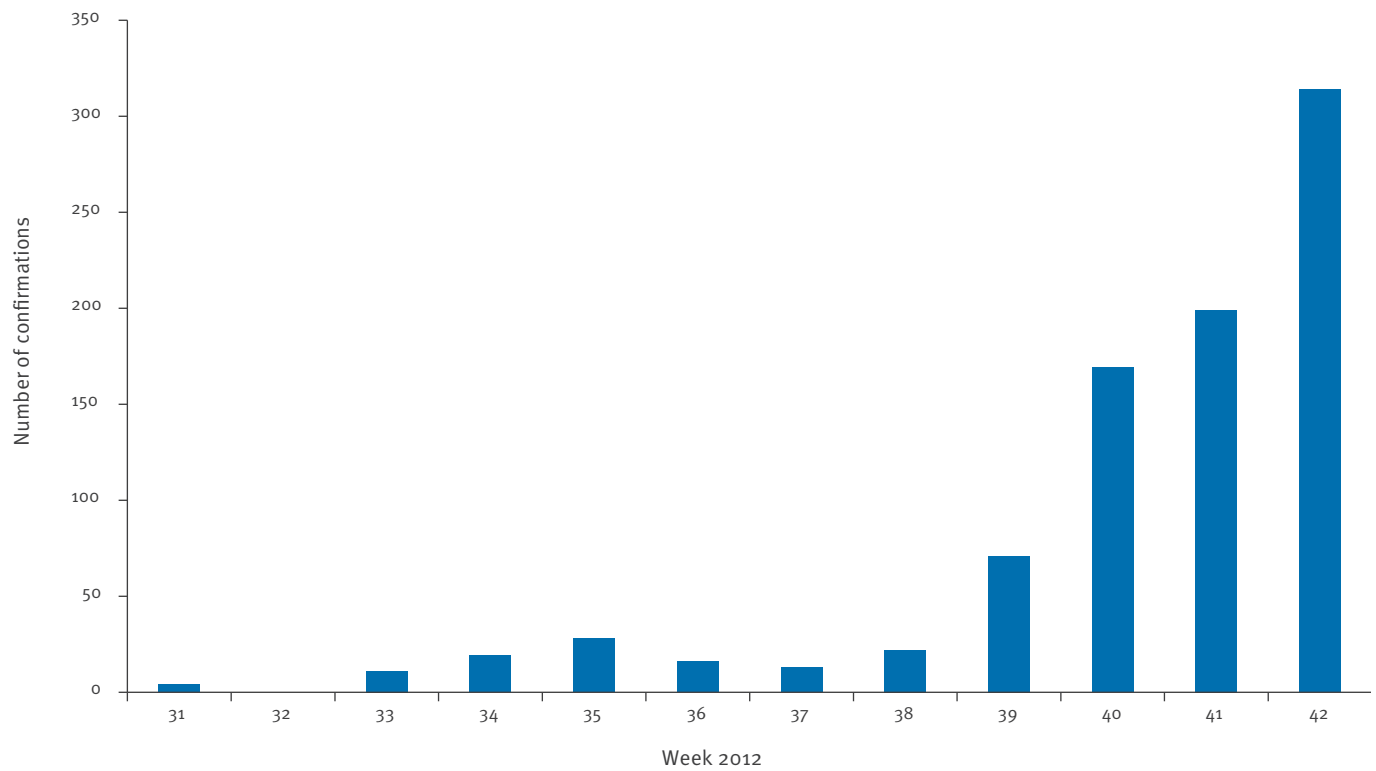
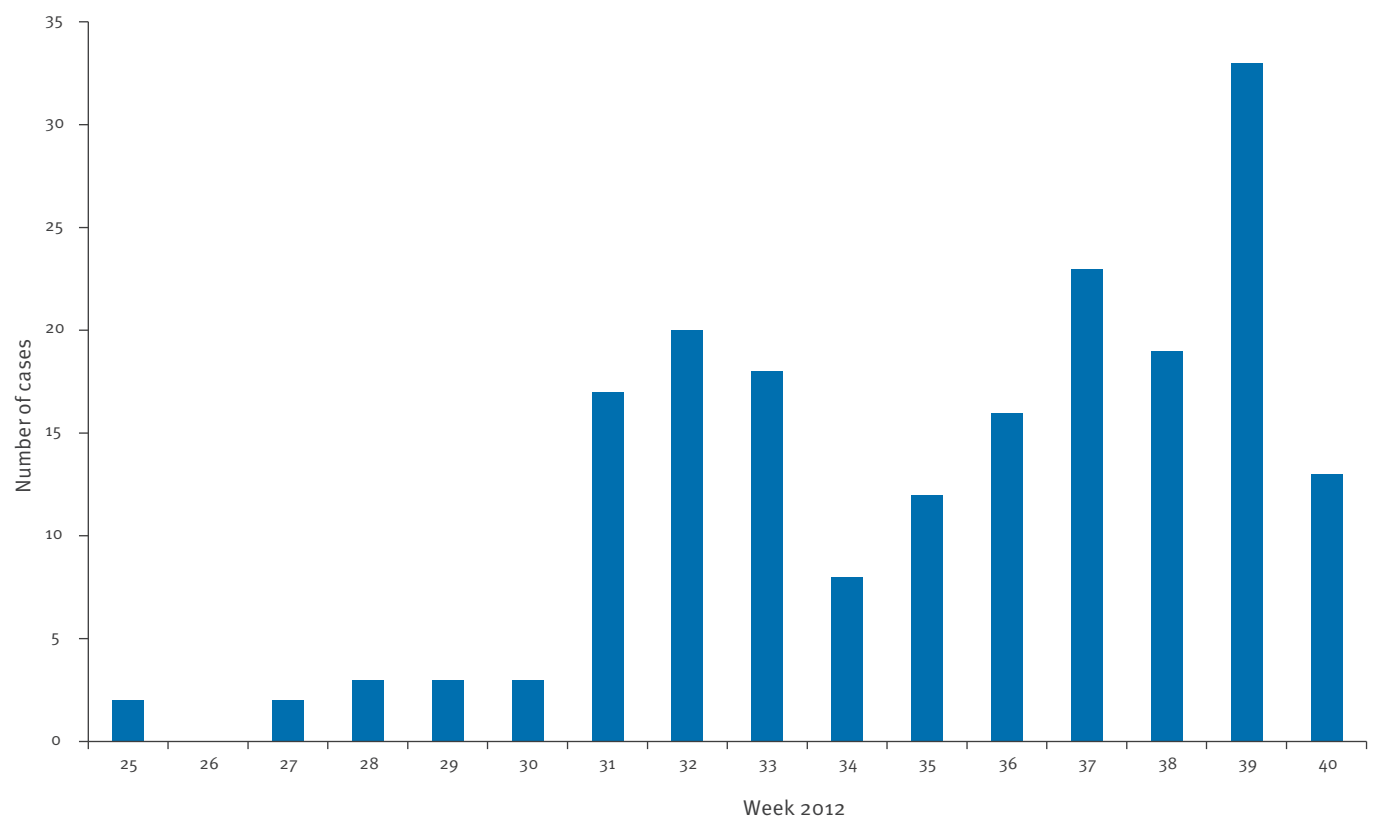


FIGURE 2

Cases of *Salmonella* Thompson, by week of onset, the Netherlands, 20 June–6 October 2012 (n=192 with known onset date)



supermarkets using the same purchasing organisation, as well as another often mentioned supermarket, purchased all or part of their smoked salmon from the same fish producer. On 26 September, the NVWA held an inspection at this fish production site and took samples from different batches of smoked salmon products. *S. Thompson* was detected in four of nine sampled batches of smoked salmon. Subsequently, all smoked salmon from this producer was recalled, starting Friday, 28 September (week 39). During the following week, other products containing salmon, such as salads, were recalled. How the contamination happened is still being investigated by the producer, supervised by the NVWA.

Microbiological investigation

Isolates of *Salmonella enterica* subsp. *enterica* Thompson from patients and sampled smoked salmon were subjected to molecular typing analysis by means of pulsed-field gel electrophoresis (PFGE) according to the PulsNet international protocol [1]. The enzyme used for digestion in the PFGE was *Xba*I. PFGE patterns of strains from the patients and the smoked salmon were indistinguishable using BioNumerics 6.6 (Applied Maths, Sint-Martens-Laten, België) with tolerance and optimisation both set on 1%. Historical strains from patients and food products that did not belong to this outbreak showed different fingerprints. Further analysis of these strains is ongoing to confirm these findings.

International investigations

An urgent inquiry was sent out on 23 August 2012 to European Union (EU) Member States via the Epidemic Intelligence Information System (EPIS, managed by the European Centre for Disease Prevention and Control). Members were asked to report any increase in the number of cases of *S. Thompson* in their countries. Eighteen EU countries replied and reported no increase. In the United States (US), a cluster of *S. Thompson* infections with a PFGE pattern indistinguishable from the current outbreak strain is being investigated (personal communication, Dr. Laura Gieraltowski and Dr. Peter Gerner-Smidt, Centers for Disease Control and Prevention, US). That ongoing investigation has not identified a connection between the US cluster and the current Dutch outbreak or a connection with the consumption of fish, nor with any other particular exposure.

Discussion

The epidemiological, molecular and traceback evidence gathered for the currently ongoing outbreak of salmonellosis due to *S. Thompson* in the Netherlands indicates that the food involved is contaminated smoked salmon. Previous outbreaks due to *S. Thompson* were related to contaminated fresh coriander [3], rucola lettuce [4] and pet treats [5,6]. However, *S. Thompson* has been found in a wide range of products and animals, such as poultry, pigs, cattle, birds and reptiles [7-10]. In the United States, 12,000 seafood samples were tested for salmonellae over a nine-year period, and

7% were found positive [11]. *S. Thompson* was the seventh most frequently isolated serovar with 22 of 830 positive samples. Among the smoked fish and seafood samples, 3% were positive for *Salmonella*. The current outbreak could have been caused by one batch of contaminated smoked salmon, as the production size of the identified producer is very large. Insufficient cleaning and disinfection of equipment may have resulted in an increase and persistence of the contamination of the production line, especially since *S. Thompson* has been reported to easily form a persistent biofilm [12].

As of 19 October, the number of isolates sent for confirmation remained very high (150 to 200 isolates per week). These high numbers of cases per week after recall of the incriminated food could be related to a lagging effect of about 20 days between date of disease onset and laboratory confirmation. Furthermore, people who consumed smoked salmon just before the recall and became ill want to be tested. Moreover, laboratories normally not participating in the surveillance now send *Salmonella* group C isolates for confirmation, increasing the number of confirmed cases that would otherwise have been missed. In addition, in the week before the recall, the identified smoked salmon was offered at a special discount at one of the largest supermarkets and people may therefore have bought larger quantities for storage in the freezer.

At the time of writing this report which includes data until 19 October, the outbreak seemed to be ongoing. Preliminary numbers as of 25 October indicate that the outbreak may have come to an end. The situation is and will be followed actively until the number of cases is back to normal.

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