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Nationwide outbreak of *Salmonella enterica* serotype 4,12:i:- infections in France, linked to dried pork sausage, March-May 2010

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In May 2010, a nationwide excess of infections with the specific monophasic variant *Salmonella enterica* serotype 4,12:i:- was investigated in France. Subtyping with multilocus variable number of tandem repeats analysis revealed a distinct epidemic strain within this excess. Epidemiological investigations identified a dried pork sausage sold by a particular chain of supermarkets as the likely vehicle of transmission. The suspected batches have been withdrawn and recalled.

Introduction

On 7 May 2010, the National Reference Centre for *Salmonella* (NRC) alerted the French Institute of Public Health Surveillance (InVS) to a cluster of six cases of infection with *Salmonella enterica* subsp. *enterica* serotype 4,12:i:- in the area of Limoges, France, and to a nationwide increase of this specific monophasic serotype in comparison to previous years (Figure 1). At that time, 69 confirmed cases had been identified since the beginning of the year, compared with 37 in 2009 and eight in 2008 over the equivalent period of time. An epidemiological investigation was launched in order to determine the extent of the outbreak and identify the vehicle of transmission.

S. enterica serotype 4,12:i:- is one of a number of monophasic variants of the serovar Typhimurium, that have been emerging in Europe and elsewhere in recent years and are of increasing concern [1-3]. Information from the French Food Safety Agency (Agence française de sécurité sanitaire des aliments (AFSSA)) shows that this variant had been identified in a variety of food-stuffs, but most frequently in pork delicatessen.

Epidemiological and microbiological investigations

For this outbreak, a case was defined as a person resident in France with *S. enterica* serotype 4,12:i:- isolated from stool or blood in 2010, and with symptoms

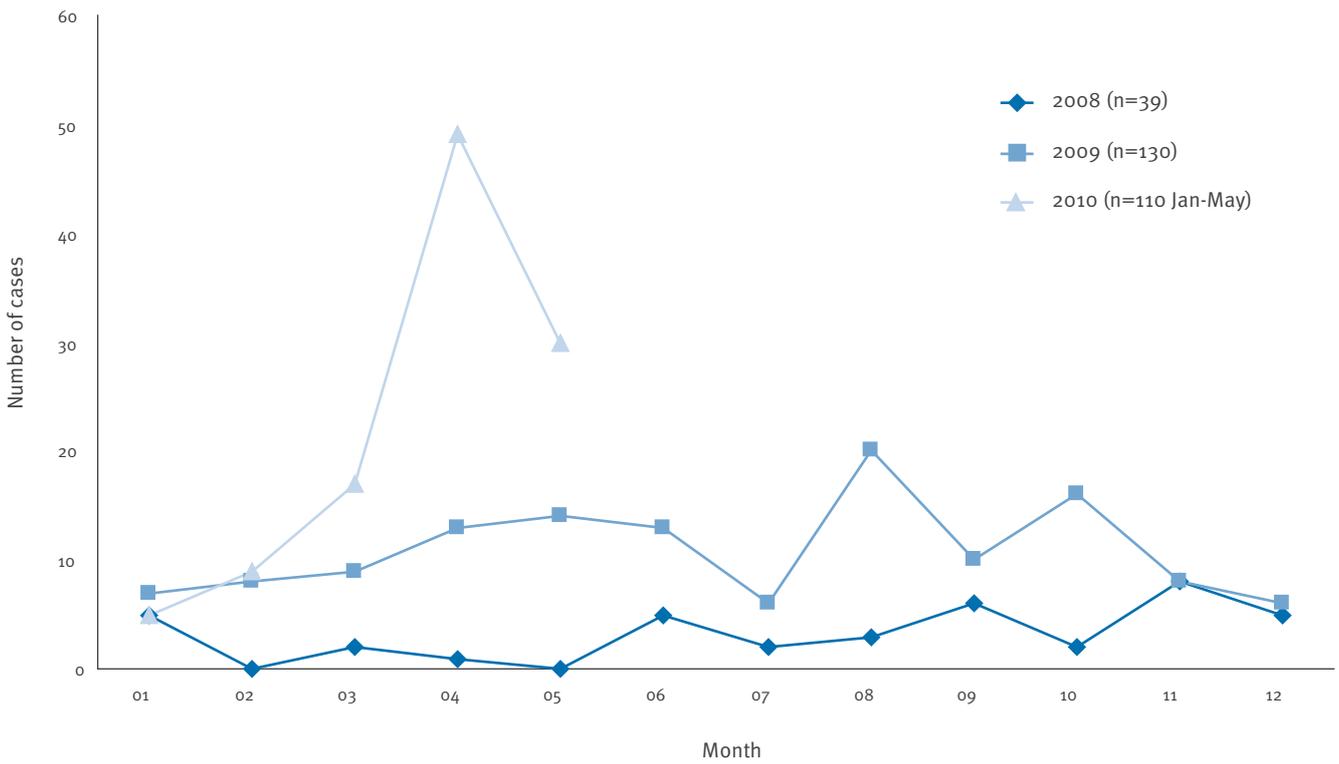
compatible with a *Salmonella* infection. The epidemic curve (by sample date, Figure 2) demonstrated an increase in the number of cases from week 12, with a peak in weeks 16 and 17. The investigation therefore focussed on the 90 (of 110) cases (as of 3 June) identified with a sample date from week 12 onwards. Among these cases, the median age was eight years (range 1-89 years), with a female:male sex ratio of 1.2. Cases were distributed throughout 49 of the 95 *départements* (administrative subdivisions) of mainland France, without any notable clustering (apart from the initial alert of six cases in Limoges).

As of 3 June 2010, 54 cases have been interviewed using a standardised semi-structured questionnaire exploring food consumption, travel history and other cases of diarrhoea in the household in the seven days before symptom onset. Dates of onset of symptoms for these cases ranged between 15 March and 16 May 2010. Twenty cases (37%) were hospitalised temporarily, with no deaths. Of these 54 cases, 53 (98%) reported buying pork delicatessen. Forty-two reported buying dried pork sausage (78%) and 33 reported shopping at supermarket chain A (61%). No other food types or activities were identified as likely sources of infection.

Multilocus variable number of tandem repeats analysis (MLVA) subtyping [4], using the latest nomenclature described by Larsson *et al.* [5], detected a major subtype, 3-13-15-NA-211, that allowed us to differentiate an epidemic strain from the sporadic cases. This profile differs from *S. enterica* serotype 4,12:i:- isolates from the beginning of 2010 and from 2007, as well as from other monophasic serotypes and serotype Typhimurium. To date, 53 of the 90 cases have been subtyped by MLVA, 32 of which had this specific subtype and have been retrospectively defined as 'epidemic cases'.

FIGURE 1

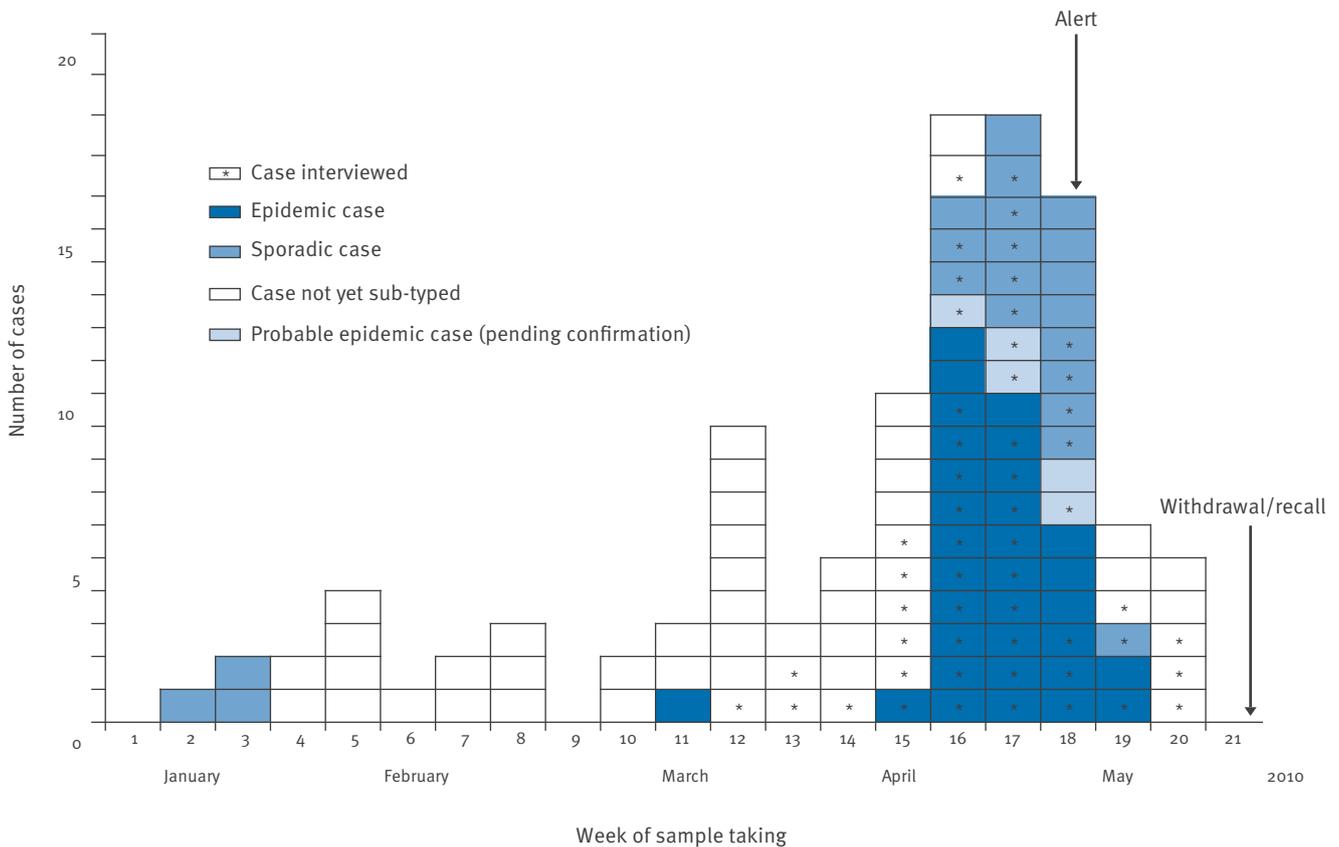
Number of *Salmonella enterica* serotype 4,12:i:- human isolates by month of sample collection, France, 2008-2010



Data as of 3 June 2010, National Reference Centre for *Salmonella*.

FIGURE 2

Number of human cases due to *Salmonella enterica* serotype 4,12:i:- by week of sample collection, France, 2010 (N=110)



Data reported by 3 June 2010.

Of the 53 subtyped cases, 36 have been interviewed. Of them, 24 (67%) were infected by the epidemic strain, two of whom were considered to be secondary cases and therefore excluded from further analysis. Twelve were considered to be sporadic. We noted that 20 of 24 epidemic cases shopped at a branch of supermarket chain A, compared with four of 12 sporadic cases (odds ratio 9.0, 95% confidence interval 1.41-61.7, $p=0.0047$). This reinforced the initial suspicions of an item purchased from supermarket chain A as the vehicle of transmission. Consumption of dried pork sausage was unusually high in both groups of cases (20 of 24 (82%) epidemic cases and nine of 12 (75%) sporadic cases), compared to previous outbreak investigations in France (range 33 of 67 (49%) to 21 of 33 (64%) in controls identified for outbreaks of *Salmonella* species linked to meat and cheese products since 2000 [6,7]).

Purchases of dried pork sausage made at branches of supermarket A in the three weeks prior to symptom onset were investigated by the French Directorate General for Food using data recorded through loyalty card numbers. Of the nine epidemic cases who used their card in the three weeks preceding symptom onset, all purchased the same type and brand of dried pork sausage produced by one manufacturer exclusively for supermarket A. *Salmonella* species had been isolated from a melee used to make a batch of this type and brand of sausage from this manufacturer in February 2010, but no failures in the production processes were identified. Later quality controls of this batch were negative for *Salmonella*. The isolate from the melee has been destroyed and is now unavailable for typing. Work is ongoing to identify any long term control measures to prevent future similar incidents.

Control measures

The batch of sausages ('use by' date up to 15 June) derived from this *Salmonella*-positive melee was subject to a national voluntary withdrawal and recall by the manufacturer on 27 May 2010, with a press release and posters in chain A supermarkets. A small proportion of the batch had been exported to Belgium, and the Belgian authorities were duly informed through the Rapid Alert System for Food and Feed (RASFF). Colleagues in other European countries were informed of this outbreak on 28 May via the Epidemic Intelligence Information System (EPIS) and Early Warning Response System (EWRS) of the European Centre of Disease Prevention and Control (ECDC). To date, no other European country has reported a current excess of cases of *S. enterica* serotype 4,12:i:-.

However, given that the suspected batch was delivered to supermarket A distribution platforms in the first two weeks of March, the relatively short turnover times at these platforms and at the supermarkets, and given that the last documented purchase from an epidemic case was made on 11 May (corresponding to a production date of 11 April at the latest), it is thought that the initial batch may not explain all the cases and that later batches may also have been contaminated. As a result,

the French producer implemented a withdrawal and recall on 7 June of all batches available for purchase and produced before 12 April, accompanied by a press release from the authorities.

Conclusion

Epidemiological investigations identified one or more contaminated batches of dried pork sausage, produced by one manufacturer and supplied to branches of supermarket A, although *Salmonella* species were not isolated from a sample of the sausages. Incriminated batches have been withdrawn and recalled. Preliminary data suggest that the number of cases by week is decreasing. The investigation of this outbreak was assisted by the use of MLVA subtyping which was found to have an appropriate discriminatory power to identify a specific epidemic subtype. This outbreak of *S. enterica* serotype 4,12:i:- occurred on the background of the emergence of monophasic *Salmonella* strains in France and the rest of Europe, and future outbreaks due to this serotype are likely.

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