Between August 2005 and March 2006 in France, 69 cases of *Salmonella enterica* serotype Manhattan (Salmonella Manhattan) were reported, 51 (74%) of them from southeastern France. At the time of the alert (November 2005), 13 cases and 33 controls were interviewed. Cases were more likely than controls to have eaten pork sausages (OR=5.9, confidence interval CI [1.3; 26.9]) and beef (OR=9.3, CI [1.3; 68.6]). At the same time, 19 strains of *Salmonella* spp. and *Salmonella enterica* were isolated from meat products in southeastern France, reported to Afssa (the French Food Safety Agency) in September and November 2005, of which 26 were from several districts in southeastern France. Trace-back investigations revealed that pork samples came from one supply chain, from one wholesaler whose pork products had tested positive for *Salmonella* spp. and *Salmonella enterica*.

Salmonella strains isolated from animals, foods or the environment.

Outbreak report

**Salmonella enterica** serotype Manhattan infection associated with meat products, France, 2005

H Noël1, M Domínguez2, FX Wétill3, A Brisabois1, C Duchazeaubeneix4, A Kerouanton3, G Delmas1, N Pihier4, E Couturier1

Introduction

In France, the National Reference Centre for *Salmonella* (NRC) collects human isolates through a voluntary network of medical laboratories and Afssa (the French Food Safety Agency) also collects

**Original Articles**

**Outbreak report**

**Outbreak of *Salmonella enterica* serotype Manhattan infection associated with meat products, France, 2005**

H Noël1, M Domínguez2, FX Wétill3, A Brisabois1, C Duchazeaubeneix4, A Kerouanton3, G Delmas1, N Pihier4, E Couturier1

Between August 2005 and March 2006 in France, 69 cases of *Salmonella enterica* serotype Manhattan (Salmonella Manhattan) were reported, 51 (74%) of them from southeastern France. At the time of the alert (November 2005), 13 cases and 33 controls were interviewed. Cases were more likely than controls to have eaten pork sausages (OR=5.9, confidence interval CI [1.3; 26.9]) and beef (OR=9.3, CI [1.3; 68.6]). At the same time, 19 strains of *Salmonella* Manhattan isolated from meat products in southeastern France, reported to Afssa (the French Food Safety Agency) in September and November 2005, had an indistinguishable PFGE profile to the 7 human isolates of *Salmonella enterica* serotype Manhattan isolated from a stool or blood specimen, since August 2005. At the time of the alert, the most recently identified cases were retrospectively interviewed by telephone using a trawling questionnaire that collected food consumption and purchase in the 7 days before onset of symptoms. The questionnaire also enquired about symptoms, other possible exposures such as contact with other cases of diarrhoea in the household, pets or wild animals, recent travel, etc. A case-control study was carried out. Three controls per case were matched by district and by age group (child, adult if older than 15 years). Controls were sourced from the medical laboratory or general practitioner that had identified the case, from among the cases’ family or friends, or at random from the telephone directory. Controls had no reported gastrointestinal illness in the two weeks before the interview.

**Methods**

**Epidemiological investigation**

Basic epidemiological data (age, sex, district of residence, address of the medical laboratory) for all isolates of *S. Manhattan* identified through the NRC were transmitted for investigation. A case was defined as a person living in France, with diarrhoea (at least 3 watery stools a day) or fever, and *S. Manhattan* isolated from a stool or blood specimen, since August 2005. At the time of the alert, the most recently identified cases were retrospectively interviewed by telephone using a trawling questionnaire that collected food consumption and purchase in the 7 days before onset of symptoms. The questionnaire also enquired about symptoms, other possible exposures such as contact with other cases of diarrhoea in the household, pets or wild animals, recent travel, etc. A case-control study was carried out. Three controls per case were matched by district and by age group (child, adult if older than 15 years). Controls were sourced from the medical laboratory or general practitioner that had identified the case, from among the cases’ family or friends, or at random from the telephone directory. Controls had no reported gastrointestinal illness in the two weeks before the interview.

**Key words:** *Salmonella enterica* serotype Manhattan, France, outbreak, meat products
They were asked detailed questions about food consumption and purchase in the 7 days before the interview. For analysis, meat products were grouped according to type and preparation (e.g. dried sausages, cooked sausages, raw sausages, cooked pork pieces). Analysis was performed using EpiData®, and frequencies were compared using Pearson’s χ² or 2-tailed Fisher’s exact test. Confidence intervals of the odds ratios were calculated using the Mantel-Haenszel method, stratified by district of exposure.

**European investigation**

Enter-net (the international network for surveillance of human gastrointestinal infections) was informed of the ongoing French outbreak and its members were requested to report any increase in number of cases of S. Manhattan or any cases possibly linked to the French outbreak.

**Veterinary investigation**

Food isolates of S. Manhattan recorded by Afssa since August 2005 were traced back by the district veterinary services.

**Microbiological investigation**

Human and food isolates of S. Manhattan were characterised by pulsed field gel electrophoresis (PFGE) [2]. DNA was digested by the enzyme XbaI. Each profile that differed by at least one clear band >100 kbp was considered as a distinct profile. The software BioNumerics® was used to analyse and compare the genomic profiles obtained.

**Results**

**Epidemiological investigation**

Between August 2005 and March 2006, 69 cases were reported, 51 (74%) of which were from 10 districts located in southeastern France [FIGURE 1, FIGURE 2]. Among the 69 cases, 38 were female. All age groups were affected; 74% were adults and among them, 27 (55%) were aged 65 years or older.

At the time of the alert (week 47/48), 13 cases were interviewed. Twelve lived or had spent a few days in one of the districts in southeastern France during the week before the onset of symptoms. Among the 13 cases, 9 were adults (3 more than 65 years old). The dates of onset of symptoms were from 2 September to 11 November 2005. The most frequently reported symptoms were diarrhoea (12/13, of which 4 68.6%) and surimi (OR=9.5, CI [2.0; 45.1]) [TABLE]. Because of the small number of cases, no multivariable analysis could be performed.

**Veterinary investigation**

Between September and November 2005, S. Manhattan was isolated from 19 food samples from 2 districts in southeastern France: 12 from pork, 6 from minced beef and 1 from veal [FIGURE 3]. Trace-back investigations revealed that 8 out the 12 pork samples originated from one wholesaler (establishment Y) [FIGURE 4]. It was noted that in August 2005, routine food controls on merguez sausages, Italian sausages and chipolatas manufactured in establishment Y were positive for S. Manhattan. Establishment Y supplied retail outlets in southeastern France. Slaughterhouse X, producing mainly pork (80%) but also beef (20%), was the supplier for establishment Y. The
Slaughterhouse’s facilities were inspected and revealed a widespread contamination with *Salmonella* spp. and *S. Manhattan*, as well as poor operational hygiene control practices.

Slaughterhouse X also supplied two other wholesalers (establishment W and establishment Z) and further investigations showed that since October 2005, pork products purchased by these wholesalers had been contaminated with *Salmonella* spp. Furthermore, nine *S. Manhattan* isolates were obtained in slaughterhouse X products distributed in retail outlets. These four establishments (X, W, Y, and Z) distributed their products in the districts where 75% of the interviewed patients lived.

**Microbiological investigation**

Seven human isolates of *S. Manhattan* received by the NRC in October and November 2005 from southeastern France had an indistinguishable PFGE profile to the 19 strains of *S. Manhattan* isolated from meat products reported in September and November 2005. The PFGE profile of 2 human isolates received in March and September 2005, and not linked to the outbreak, was different.

**European investigation**

In European countries, *S. Manhattan* is a rare serotype and only five European countries (Austria, Belgium, Denmark, Finland, and Scotland) had reported human, animal or food isolates of *S. Manhattan* in the previous two years. However none of these cases could be epidemiologically related to the French outbreak. Moreover, distribution of products from the incriminated slaughterhouse X was restricted to France.

**Preventive and control measures**

Production was suspended in establishment Y and its supplier, slaughterhouse X (on 6 and 15 December 2005, respectively) and X’s facilities were cleaned and disinfected on 17 and 18 December. After those control measures were taken, products were routinely analysed for *Salmonella* spp. before being released for sale or used in the manufacture of other products. No more *S. Manhattan* positive isolates in meat products occurred after implementation of these measures.

**Discussion**

From August 2005 to February 2006, a community-wide outbreak of *S. Manhattan* infections occurred in France. The investigation incriminated pork products from slaughterhouse X as being the most likely source of this outbreak. There is a concordance between the temporal (October-December 2005) and the geographical (southeastern France) occurrence of the majority of cases and the distribution of products from the slaughterhouse X. Furthermore, *S. Manhattan*, a rare serotype, was isolated from cases and from pork products, and seven human cases had the same PFGE profile as isolates from the pork products. Additionally, the consumption of pork sausages was associated with illness in the case-control study, and could explain the majority of cases.

There was no sampling frame for cases or controls. At the time of the alert, the most recently identified cases were retrospectively interviewed in order to lessen recall bias on food consumption and purchase. Controls were selected from different sources in order to recruit adequate numbers within a short timeframe. This enabled us to identify the incriminated food item(s) and rapidly implement control and prevention measures.

Decreasing numbers of cases and the absence of positive food isolates in early 2006 indicate the efficacy of the control measures. However, cases were reported from mid-December 2005 to March 2006, and could be explained by the shelf life of pork products (at least 2 months) distributed before implementation of control measures.

The main production of slaughterhouse X was pork, but beef was also produced (20% of production). The outbreak could be due in part to the distribution of contaminated beef. In the case-control study, there was an association between beef consumption and illness. Although beef and pork production were carried out in different units, cross-contamination of the beef unit could not be ruled out. Therefore, the beef production unit was cleaned and disinfected as well as the pork unit.

Among the cases, 77% reported surimi consumption, and its consumption was associated with illness. However, the hypothesis of surimi as a source of contamination was highly unlikely. First, surimi consumption by case was from a wide range of brands. Second, these brands had no raw material or processing plants in common. In addition, the production process includes a double pasteurisation, so surimi contamination by *Salmonella* spp. was considered unlikely. As far as we know, no salmonella outbreak due to contaminated surimi has been reported in the scientific literature.

Despite the wide contamination of products from slaughterhouse X, relatively few cases were identified. Consumption of food contaminated with *Salmonella* that has been properly cooked does not imply disease. Furthermore, it is likely that not all cases were reported through the surveillance system. In France in 2003, there were only 2 *S. Manhattan* food isolates, accounting for 0.2% of the salmonella isolates from pork and 0.1% from poultry. A recent British study showed that *S. Manhattan* accounted for 51.9% of all salmonella isolates in surimi in a commercial pig farm [3]. However, few human outbreaks due to
During the summer of 2005, four cases of active tuberculosis from the same occupational setting were investigated in Manchester, UK. The index case had been diagnosed in December of the previous year. At that stage the closest occupational contacts had been screened, all of whom were assessed as being free from active disease, and none had met nationally recommended criteria for chemoprophylaxis for latent tuberculosis infection (LTBI).

In June 2005, two work contacts developed progressive primary extrapulmonary (pleural) TB. Following a detailed risk assessment, the screening programme was widened to include 137 staff who worked at the job centre (employment agency) where the first four cases had been found. This screening programme was based on tuberculin Mantoux testing, CXR and gamma-interferon testing. Of these 137 contacts screened, one additional person was found to have active disease and six others were offered chemoprophylaxis for LTBI. The isolates from the index case and the first two secondary cases were indistinguishable on VNTR-MIRU (variable number tandem repeat – mycobacterial interspersed repetitive unit) typing at 15 loci. No samples were available for testing from the fourth case of active disease.

Management of this incident has benefited from the evolving fields of both genotyping and diagnostic testing for LTBI. However, further research into the epidemiological inferences made through genotyping, as well as the significance of a positive gamma-interferon test in assessing the risk of development of active disease, is still required.

**Euro Surveill. 2006;11(11): 273-5  Published online November 2006**

**Key Words:** Tuberculosis, cluster, epidemiology, latent infection, gamma-interferon testing, genotyping

**References**


**A Kirkpatrick1, C Bell2, M Petrovic1, M Woodhead1, A Barrett1, E Duffel1, A Verma4, F Reynolds1**

**INVESTIGATION OF A TUBERCULOSIS CLUSTER AT A JOB CENTRE IN MANCHESTER, UK**

**Introduction**

In December 2004 a case of sputum smear positive tuberculosis (TB) was diagnosed in an employee of a job centre (a branch of the United Kingdom government funded employment agency) in North Manchester. The isolate was confirmed to be fully sensitive *Mycobacterium tuberculosis*. In accordance with pre-existing national guidance [1] all household and close occupational contacts were screened. None of the three household contacts had active disease but two were offered chemoprophylaxis on the basis of their tuberculin Heaf test result, age and BCG status [1]. Ten close occupational contacts were all assessed as being free from active disease and none of them met the recommended criteria [1] for chemoprophylaxis for latent tuberculosis infection (LTBI).

In June 2005, however, two of these occupational contacts developed progressive primary extrapulmonary (pleural) TB. Initial screening had revealed Grade II and IV Heaf tests (neither had had BCG vaccination) and normal chest x rays (CXRs). Gamma interferon (GIF) testing was not performed, since at this time it was not available for routine use within Greater Manchester. Given the ages of these contacts, both of whom were adults in their late fifties and early sixties, neither were offered chemoprophylaxis: this was in accordance with national guidance. An incident management team (IMT) was subsequently convened to assess the need to expand screening in the workplace setting.

**Methods**

In order to guide the extent of further screening, a risk assessment was undertaken. This took into account the presumed infectious period of the index case, the duration of exposure for both staff and clients, the layout of the job centre, social activities, and use of canteens and smoking rooms. The two new cases were carefully assessed and were judged to be at low risk of being infectious, on the basis of their clinical presentation and the absence of any evidence that they were smear positive on sputum microscopy.

The centre was divided into three floors. The index case worked almost exclusively on the ground floor. The exact onset of symptoms...