First report of a *Salmonella enterica* serovar Weltevreden outbreak on Réunion Island, France, August 2007

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An outbreak of gastroenteritis involving 26 guests of a wedding dinner occurred in August 2007 in Réunion Island, a French Overseas Department. *Salmonella* was isolated in 61.5% of cases and the two isolates serotyped were of serovar Weltevreden. We believe this to be the first food-borne outbreak due to *S. enterica* serovar Weltevreden described in Réunion Island. The epidemiological and environmental investigations of this outbreak did not provide enough evidence to identify a single vehicle of infection. It is necessary to improve surveillance of salmonellosis by multidisciplinary cooperation between clinicians, epidemiologists, microbiologists and veterinarians on Réunion Island.

Introduction

Salmonellosis is estimated to affect three billion people and to cause 200,000 deaths every year [1]. *Salmonella enterica* is one of the most common causes of bacterial gastroenteritis worldwide and is often implicated in food-borne outbreaks. More than 2,500 serovars of *S. enterica* have been identified [2]. *S. enterica* serovar Weltevreden (hereafter referred to as *S.* Weltevreden) has been reported as a frequent and increasingly common cause of human infection in the restricted area of Southeast Asia [2,3]. The French National Reference Centre for *Salmonella* (Centre National de Référence des *Salmonella* – CNR-Salm) at the Institut Pasteur, Paris has identified sporadic cases of *S.* Weltevreden infection in Réunion Island and in other islands in the Indian Ocean (Weill FX, personal data) but no outbreak due to this serovar has previously been described on Réunion. In France, including French Overseas Departments, collective (at least two cases) food-borne poisoning is subject to mandatory disease notification and must be reported to the relevant Direction régionale or Direction départementale des affaires sanitaires et sociales (DRASS or DDASS). An outbreak investigation is then conducted by the DRASS environmental unit and by veterinarians from the Direction des services veterinaries (DSV), sometimes in collaboration with the epidemiologists from the Cellule interrégionale d'épidémiologie (CIRE) of the Institut de Veille Sanitaire (French Institute for Public Health Surveillance). The management of such outbreaks is the responsibility of the public health medical doctor of the relevant DRASS.

On 30 August 2007, 11 cases of acute gastroenteritis were reported to the DRASS of Réunion Island. All cases were guests of a wedding dinner which had taken place on the evening of 25 August. An outbreak investigation was conducted among the dinner participants to identify risk factors and the vehicle of infection. We report the results of this investigation.

Methods

An outbreak-associated case of gastroenteritis was defined as a person who had eaten at the wedding dinner on 25 August 2007 and developed diarrhoea (two or more liquid stools per 24 hours) or fever (≥38 ºC) in addition to at least one of the following three symptoms: nausea, vomiting, or abdominal pain within the 24 hours after the dinner. Eligible cases were defined as confirmed if *S.* Weltevreden was microbiologically isolated from stools, as probable if *Salmonella* was isolated from stools without serotyping, and as clinical cases when data on biological confirmation were unavailable.

An active case detection was conducted to assess the total number of cases. An unmatched case-control study was conducted to try to identify the vehicle for transmission. To do so, we proceeded to a telephone interview with a standardised questionnaire. These interviews were limited to voluntary guests who accepted to give their telephone numbers. Guests who accepted to answer the questionnaire and did not mention any symptoms after the dinner were considered as controls. Data were collected and analysed with WinTiac® version 1.6 software. Food-specific odds ratio (OR) and 95% confidence intervals (95% CI) were calculated for the consumption of food items. The Chi 2 test was used to compare proportions between groups (5% significance level). Serotyping of *Salmonella* isolates and antimicrobial drug susceptibility were performed at the CNR-Salm, as previously described [4]. Kitchen facilities were inspected but no food items could be sampled because of the long delay (five days) between the dinner and the notification of the outbreak.

Results

Descriptive findings

On 25 August 2007 at 8.30 PM, 285 guests were present at the wedding dinner. The meal was prepared by several guests at their homes and was brought to a communal building where the wedding took place. Food items were then warmed up in the communal kitchen and served by several guests to others. Most of those who had prepared and served the food refused to participate in the investigation. Active case detection found 26 persons who presented symptoms according to the case definition and were considered as cases. Among them, 10 cases were considered as

clinical, 14 were probable and two were confirmed. The mean age of cases was 30 years and the male to female ratio was 1:1. Diarrhoea was reported by all of the 26 cases, 16 experienced vomiting and 15 had fever. Other clinical symptoms were abdominal pain (n=1) and headache (n=1), the latter not included in the case-definition. None of the cases were hospitalised and all the patients recovered. The epidemic curve shows that the median time of illness onset was on Sunday 26 August 2007 at 8.00 AM [5.00 AM - 10.30 AM] (Figure). The median time of incubation was 11 hours and 50 minutes [8h50-14h00].

Microbiologic and environmental findings

Stool specimens from 18 persons were microbiologically tested, and in 16 of these (61.5% of the 26 cases) *Salmonella* was confirmed by culture. Two isolates were further analysed by serotyping, both were *S.* Weltevreden. These two isolates were susceptible to all 32 antimicrobial drugs tested.

No testing could be done on food items. However, an interruption of the hot and cold chain of food preparation was strongly suspected to have contributed to the outbreak.

Case control study

For the case control study, we included 26 cases and 26 controls. In univariate analysis, three exposures were statistically associated with risk of illness (Table). The most relevant food exposure was the chicken eaten by 88% of the cases and 58% of the controls (OR=5.62; CI 95% 1.34 to 23.56; p=0.01). The two other significant food items were: peas (OR=5.13; CI 95% 1.57 to 16.77; p=0.005) and rice (OR=4.03; CI 95% 1.08 to 15.09; p=0.03). However, none of these three food items could be considered as an independent vehicle of the food poisoning after adjustment with the Mantel–Haenszel method.

Discussion

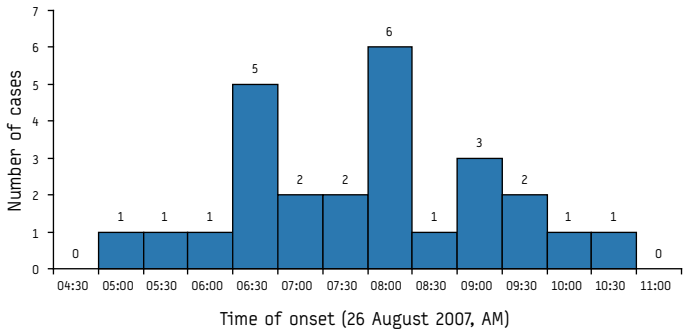
We believe this to be the first food-borne outbreak due to *S. enterica* serovar Weltevreden described in Réunion Island. The outbreak involved 26 guests of a wedding dinner. The serovar Weltevreden was isolated in two samples. These were the only two isolates serotyped because of the poor contribution of local laboratories in sending stool specimen to the CNR-Salm in Paris due to distance and cost of transport. However, the homogeneity of the clinical presentation of cases in the cluster, the shape of the epidemic curve, the isolation of *Salmonella* in 61.5% of cases (88.9% of tested stools) and the identification of the same serotype in the two tested specimens allowed us to strongly suspect this serotype as the cause of the outbreak.

The results of the case-control study suggested that none of the three food items statistically associated with the risk of illness (chicken, peas and rice) could be considered as an independent vehicle of infection after adjustment. There are several methodological limitations in the case-control study that should be noted. The small sample size available for the case-control study due to poor contribution of guests limited our ability to draw strong conclusions. Furthermore, environmental investigations such as testing of food items could have strengthened our findings, but were not conducted because samples were no longer available.

Before 1970, *S.* Weltevreden constituted less than 4% of the total number of cases of human salmonellosis in the world [3]. It was the most common serovar to cause human infections in India during the early 1970s [5], and the one most frequently

Figure

Distribution of cases of gastroenteritis among dinner guests by time of onset of symptoms, Réunion Island, 26 August 2007 (n=26)



Table

Frequency of selected exposures among cases and controls, outbreak of gastroenteritis, Réunion island, August 2007

Food item consumed	Cases (n=26) n (%)	Controls (n=26) n (%)	OR (IC 95 %)	p
Salmon petit four	24 (92 %)	21 (81 %)	2,86 (0,5-16,3)	0,42
Pork petit four	24 (92 %)	24 (92 %)	1 (0,13-7,69)	1
Pizza	24 (92 %)	24 (92 %)	1 (0,13-7,69)	1
Duck galantine	23 (88 %)	21 (81 %)	1,83 (0,39-8,59)	0,7
Pork roast	25 (96 %)	20 (77 %)	7,5 (0,83-67,5)	0,1
Minced cabbage	24 (92 %)	19 (73 %)	4,42 (0,82-23,79)	0,14
Raw vegetable	22 (85 %)	23 (88 %)	0,72 (0,14-3,58)	1
Chicken	23 (88 %)	15 (58 %)	5,62 (1,34-23,56)	0,01
Swordfish in combava sauce	13 (50 %)	14 (54 %)	0,86 (0,29-2,55)	0,78
Rice	22 (85 %)	15 (58 %)	4,03 (1,08-15,09)	0,03
Peas	19 (73 %)	9 (35 %)	5,13 (1,57-16,77)	0,005
Chili sauce	12 (46 %)	11 (42 %)	1,17 (0,39-3,5)	0,78
Fruit mousse cake	17 (65 %)	22 (85 %)	0,34 (0,09-1,31)	0,1

isolated from humans in Thailand during the years 1993-2002 [3]. Similar findings have been reported from Malaysia between 1983 and 1992 [6]. Thong et al. [7] found the same subtypes of *S.* Weltevreden among isolates infecting humans and those in raw vegetables, suggesting that this is a potential reservoir of this serovar in Malaysia. *S.* Weltevreden was the most common serovar in isolates from seafood, water, and duck in Thailand [3]. In a recent study in the United States, *S.* Weltevreden was the most common serovar found in seafood mainly imported from Thailand and Malaysia [8]. These observations could point to a water-related source for *S.* Weltevreden.

The results of the outbreak investigation described in this paper suggest that *S.* Weltevreden could be associated with a food-borne outbreak in Réunion Island in the Indian Ocean, as it was observed in other countries [9,10]. A better knowledge of the epidemiology of this serovar in humans and in animals is needed in this area to identify the source of transmission. Clusters of collective food-borne poisoning are subject to mandatory disease notifications in France and its Overseas Territories. Between 1996 and 2005, 72 food-borne outbreaks have been notified to the DRASS of Réunion. Among these outbreaks, 16 (22.2%) were due to *Salmonella* (Typhimurium=4; Enteritidis=1; unknown species=11) [11]. However, these data are certainly incomplete because of the recognized under-reporting of such events in Réunion. For a better knowledge of *Salmonella* epidemiology on the island and in the South-West Indian Ocean, it is necessary to raise awareness among physicians of the need of rapid notifications of food-borne outbreaks and to improve collaboration between epidemiologists, clinicians, microbiologists and veterinarians for future outbreak investigations.

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