Outbreak report

CROSS-BORDER INVESTIGATION OF A *SHIGELLA SONNEI* OUTBREAK IN A GROUP OF NORWEGIAN TOURISTS AFTER A TRIP TO RUSSIA

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In early September 2006, the Norwegian Institute of Public Health was alerted to an outbreak of *Shigella sonnei* infections (shigellosis) among 23 Norwegian passengers who had taken a bus tour from Kirkenes, Norway to Murmansk, Russia. The trip lasted from 27 to 31 August, and the group stayed in various hotels and visited several restaurants in both Kirkenes and Murmansk during this period. Stool samples from three ill passengers yielded *S. sonnei*; an additional 10 passengers had gastrointestinal symptoms with diarrhoea or loose stools with abdominal pain. An investigation was initiated in collaboration with the department of epidemiological surveillance in Murmansk. We sent a questionnaire to the work e-mail addresses of all passengers asking about symptoms and exposures. Two restaurants and a hotel visited by the Norwegian tourists in Murmansk were inspected and sampled. Of all the food and beverage items mentioned in the questionnaire, only cured meat consumed in restaurant A in Murmansk on 28 August was associated with the risk of developing illness. Inspections of the restaurants in Murmansk identified some hygienic shortcomings and inadequate routines. However, *S. sonnei* could not be isolated from food samples or the personnel. Improved routines were implemented.

Introduction

Shigellosis has been notifiable in Norway since 1977 and is primarily an imported disease, mostly from countries in the Middle East and South-East Asia. Approximately 150 cases are notified annually, with *Shigella sonnei* being the predominant serogroup. Shigellosis can be transmitted via contaminated food or water, and outbreaks occur predominantly in families, in child day-care institutions or in connection with imported food items, especially raw vegetables [1]. Outbreaks of shigellosis are rare in Norway. In 1994, imported iceberg lettuce from Spain was the source of an international outbreak of *S. sonnei* [2], and a domestic *S. sonnei* outbreak occurred in a kebab restaurant in Oslo in 2001 [3]. There have been three outbreaks involving Norwegian citizens abroad: one among tourists visiting Tunisia in 2003 and two large *S. sonnei* outbreaks among Norwegian soldiers stationed in Afghanistan in 2004 [4] and in 2006.

On 5 September 2006, the Norwegian Institute of Public Health (NIPH) was notified by a municipal medical officer of an outbreak of gastroenteritis among a group of 22 employees of company A. The group had met on 27 August and travelled by bus from the city of Kirkenes (6,000 inhabitants) in north Norway to Murmansk (320,900 inhabitants) in north-west Russia, a distance of 250 kilometres. The group left Kirkenes on the morning of 28 August, stayed for two days in Murmansk, and returned to Kirkenes on

the evening of 30 August. Company A reported that half of the participants developed diarrhoea after their return. Stool samples taken from three hospitalised participants yielded *S. sonnei*. NIPH started an investigation in collaboration with the local public health authorities in Kirkenes and Murmansk with the aim of describing the outbreak, identifying the source and implementing control measures.

Methods

We carried out a retrospective cohort study. A case was defined as a person who: (1) participated in the bus tour organised by company A from Kirkenes to Murmansk and back from 28-30 August; and (2) had diarrhoea and/or abdominal cramps (i.e. loose stools or bowel movements at least once during any 24-hour period) during the trip or within 72 hours after returning to Norway. The investigation focused on common food exposures after the participants arrived in Kirkenes on 27 August. We collected information on the travel route, restaurants and hotels visited by the group during 27-30 August. A questionnaire was sent by e-mail to all bus passengers (22 employees of company A) and the bus driver. The questionnaire focused on demographic information and symptoms, and included a detailed list of food and drinks that were served during each group meal (breakfast, lunch, dinner) at a hotel in Kirkenes (hotel X) and in Murmansk (hotel Y), as well as two restaurants in Murmansk (restaurants A and B) and Kirkenes (restaurants C and D). The data were entered and analysed using Epi Info version 3.3.2 and Episheet (Nov 2005 version). We calculated food-specific attack rates and relative risks (RR) with 95% confidence intervals, and Fisher exact p-values for every dining place visited and every food and drink consumed. Stool samples were collected from the hospitalised cases at the University Hospital of North Norway and were tested for enteric pathogens. All *S. sonnei* isolates were sent to the National Laboratory for Enteric Pathogens at the NIPH for serogroup verification. Multiple-locus variable-number tandem repeat analysis (MLVA) was used to genotype the isolates. On 15 September, the NIPH contacted the department of epidemiological surveillance in Murmansk and asked about information on possible locally ongoing outbreaks. Based on epidemiological findings, the Centre for Hygiene and Epidemiology in Murmansk conducted an environmental inspection and took food and drinking water samples from the two restaurants and the hotel visited by the tourist group. Stool and serum samples were taken from foodhandlers, including kitchen staff, barkeepers, and waiters, and tested for enteric pathogens. The local Food Safety Authority in Kirkenes was informed about the outbreak, and they checked the records from recent inspections at hotel X.

Results

Epidemiological investigation

During the outbreak period, there were no cases of *S. sonnei* reported to the Norwegian Surveillance System for Communicable Diseases (MSIS) among people living in or visiting the region of Kirkenes. Moreover, the municipal health physician in the Kirkenes region and the laboratory of medical microbiology at the University Hospital of North Norway had no reports of domestic cases of shigellosis in this region.

Twenty of the 23 people contacted by e-mail returned the electronic questionnaire (87%). Among these 20 respondents, ages varied between 35-64 years, and 16 (80%) were men. Thirteen cases (11 males and two females) were identified (attack rate 65%). The median age of the cases was 50 years. The first case fell ill on the morning of 30 August, and most others fell ill during the afternoon or evening of 30 August and in the early morning of 31 August. Three people became ill in the first two days of September (Figure). Besides diarrhoea, abdominal cramps were one of the most common symptoms, reported by 62% of the cases. Low grade fever was reported by 31% of the cases. None had bloody diarrhoea. Three cases (7%) were hospitalised. Illness duration varied between 1 and ≥ 7 days, with a median of 6 days. Five cases were still ill at the time of the interview. No secondary cases were reported.

The percentage of cases exposed to the separate meals (breakfast, lunch, dinner) consumed in different dining locations varied between 15% and 100%. All 13 cases participated in the lunch in the bus, the dinner in restaurant A on 28 August, and the dinner in restaurant B on 29 August. Relative risk analysis for the separate meals showed no association with illness when analysed individually for each dining location. No relative risks could be calculated for the lunch in the bus and the dinner in restaurant B as everyone in the cohort was exposed.

Further analysis by food items showed that cured meat consumed in restaurant A on 28 August was significantly associated with illness (relative risk ∞ , $p=0.02$). It was not possible to calculate a relative risk for kebab, as all participants were exposed (Table). The cured meat was served cold as a starter and was consumed by all 13 cases and three of six non-cases. Based on information on time of illness onset and the attack rates by food item, we suspected cured meat consumed at restaurant A to be the most likely food vehicle for this outbreak. This information was sent to the epidemiological department in Murmansk on 21 September.

FIGURE

Cases of gastroenteritis among travellers from company A by time of illness onset (n=12)[†] in Kirkenes and Murmansk, 27 August to 3 September 2006

[†]One of the 13 cases mentioned in the text is not included in the figure because the date of illness onset is unknown

Laboratory investigation

Four cases submitted stool samples to the laboratory of medical microbiology at the University Hospital of North Norway. Three out of four samples showed presence of *S. sonnei* and all tested negative for bacterial and viral pathogens such as *Salmonella*, *Yersinia*, *Campylobacter*, *Yersinia*, rotavirus and adenovirus. The sample that was negative for *S. sonnei* was taken from a case under antimicrobial treatment. All three isolates had an identical MLVA-profile.

Environmental investigation

The Food Safety Authority (FSA) in the Kirkenes region indicated that there were no reports of gastrointestinal illness in this period linked to hotel X, where the Norwegian tourists had stayed. Moreover, this hotel had been inspected shortly before by the regional FSA and had received good reports.

TABLE

Proportion of cases exposed, number of cases by exposure status, and relative risks (RR) for food items consumed during dinner at restaurant A, Murmansk, 28 August, 2006 (n=19) [‡]

Food item	Cases exposed	Exposed		Not exposed		RR	95% CI	p-value
		Ill	Total	Ill	Total			
Cured meat	100 %	13	16	0	3	∞^*	-	0.02
Vegetable noodle soup	92 %	12	18	1	1	0.67	0.48-0.92	1.00
Kebab	100 %	13	19	0	0	-	-	-
Dessert	54 %	7	12	6	7	0.68	0.39-1.20	0.24
Table water in jar or glass	54 %	7	8	6	11	1.60	0.88-2.92	0.15
Other drinks	100 %	13	18	0	1	∞^*	-	0.32

[‡]19 of the 20 people who responded to the questionnaire had taken part in the dinner at restaurant A on 28 August 2006

The department of epidemiological surveillance in Murmansk reviewed recent data on infections with *S. sonnei* in their region and asked recent cases with laboratory-confirmed shigellosis if they had frequented the same restaurants and hotels as the Norwegian group. No cases had been registered in August. However, there were 13 *S. sonnei* cases in Murmansk in September and one in October. Of the 13 cases diagnosed in September, one had visited restaurant B and one hotel Y, while the other cases had eaten in other places than those visited by the Norwegian group. The environmental inspections showed bad hygienic conditions and inadequate routines in restaurants A and B, and hotel Y. No specific information was collected on how the suspected food items were processed or prepared. Contamination with faecal indicator bacteria was shown in six out of 26 food samples, of which four were taken in hotel Y, one in restaurant A and one in restaurant B. Environmental samples and samples taken from tap water were within the normal range. It was not possible to sample the suspected cured meat served on 28 August in restaurant A because there were no leftovers. Stool and serum samples were obtained from 78 foodhandlers (nine from restaurant A, 22 from restaurant B, and 47 from hotel Y) and all tested negative for *S. sonnei*. One foodhandler at hotel Y had an unspecific serologic reaction for *Shigella flexneri* infection. At the time of inspection, there were no reports of gastrointestinal illness in foodhandlers working in the inspected premises and all indicated they had not experienced fever or digestive problems during the previous month.

Control measures

Administrative measures were taken and five penalty fines and regulatory orders were imposed. This encouraged the restaurants to implement appropriate control or prevention measures and correct the hygienic breaches identified. Two restaurants (A and B) and hotel Y were revisited in the week following the first inspection, and this second visit showed improved hygiene practices. According to the department of epidemiological surveillance, the outbreak was probably caused by poor hygienic conditions in one of the restaurants or hotels visited by the Norwegian group. No specific food vehicle or infected foodhandler could be identified microbiologically.

Discussion

This report describes an outbreak of shigellosis among a group of Norwegians after a bus tour to Russia. Investigation of this outbreak in collaboration with colleagues in Russia led to a rapid implementation of control measures. The environmental inspection at the different sites showed inadequate hygiene practices, and measures were immediately taken to improve the hygiene. The results of our investigation suggest that cured meat served in a restaurant in Murmansk, Russia on 28 August was the probable source of the outbreak. This food item could explain all the cases, and the time of consumption falls within the most likely time of exposure based on back-calculation of the median incubation time of shigellosis (48 hours, range 12-96 hours) [1,5]. Cured meat served as a cold cut platter is a plausible food vehicle of a shigellosis outbreak. Unlike for *Salmonella*, humans are the only host for *Shigella*, with food that is served raw or handled after cooking being the most likely vehicle of transmission. However, we cannot exclude other potential sources of infection during the stay in Murmansk as we only studied common meals consumed by the group, and for some food items the whole group was exposed, which is typical for group travel. Due to small numbers in the cohort, and since all were exposed to several of the meals and food items, relative risk analysis was not fully conclusive. A dose response analysis was not performed. Another limitation in this outbreak

investigation was a potential misclassification of symptomatic cases that were not laboratory-confirmed.

Food eaten after the return to Kirkenes was less likely to be the source of the outbreak, since one case had already fallen ill on the morning of 30 August before arrival in Kirkenes. While the cases could have become infected in Kirkenes at the beginning of the journey, this was considered unlikely, as no other cases of shigellosis were reported in the region at the time, and no gastrointestinal illnesses were linked to hotel X.

Recent surveillance data from Murmansk showed that the shigellosis outbreak in this group was not part of a larger outbreak in Murmansk. Another outbreak of shigellosis occurred in Murmansk in 1997 and involved *S. flexneri* 3a. That outbreak was limited to Murmansk city, the neighbouring municipality Kola and possibly the municipality of Sevoromorsk. The sources of the outbreak were sour milk products (cream and cottage cheese) from a dairy farm near Murmansk [6]. In 2000, Finland reported that a tourist group contracted *S. sonnei* gastroenteritis while staying overnight in a hotel in south-eastern Finland near the Russian border. The epidemiological investigation suggested that the source of the infection was in the hotel, but failed to reveal the origin [7].

This outbreak investigation illustrates the importance of good international networks and open communication in cross-border outbreak investigations. Timely exchange of information on possible sources of outbreaks and close collaboration between health departments and food safety authorities is important for an efficient alert and response when a foodborne outbreak is suspected in tourists. With increasing international travel, outbreaks and imported infections are more likely to occur in travellers, highlighting the need for early detection and cross-border collaboration in outbreak investigations and surveillance. Other authors have also highlighted the importance of prompt detection and efficient management of gastroenteritis outbreaks, and the difficulty of detecting these outbreaks at an early stage [8].

Norway, together with the other Nordic countries, has a long tradition of collaboration in communicable disease epidemiology and control with the Baltic countries and north-western part of the Russian Federation through the EpiNorth network. Since 1999, EpiNorth has collected epidemiological data of different notifiable diseases from the countries in the Barents region, including several regions in north-west Russia [9]. The incidence of shigellosis in the Murmansk region varied between 30.5 and 93.5 per 100,000 population in the last five years, but was lowest in 2005 with 258 registered cases. The incidence rate is much higher in the Murmansk region than in Norway, which had an incidence rate of 3.7 per 100,000 population the same year, of which 90% were acquired during travel abroad. Risk estimates for contracting travel-associated shigellosis from different regions in the world have been carried out for Swedish travellers. The risk of shigellosis being notified in returning travellers was estimated to be 16 per 100,000 travellers to Russia and former USSR countries [10]. The existing links through EpiNorth with epidemiological units in different counties in north-west Russia, among them the Murmansk region, clearly facilitated the close collaboration in the investigation of this outbreak.

Conclusion

A joint approach, sufficient resources and close collaboration among regional and national health-care departments and food

safety agencies is needed if gastroenteritis outbreaks in tourist groups are to be investigated. This approach is important when investigating cross-national outbreaks within Europe, but it is equally important to establish close links between European countries and the Russian Federation. The Russian Federation is the largest neighbour of the European Union (EU) and has been brought even closer to the EU by the 2004 enlargement. It is especially important for countries that directly neighbour the Russian Federation, such as Norway, Finland, Estonia, Latvia, Lithuania and Poland, to establish close links in order to collaborate in the field of infectious disease surveillance and the thorough investigation of cross-border outbreaks.

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