

# WATERBORNE OUTBREAK AMONG SPANISH TOURISTS IN A HOLIDAY RESORT IN THE DOMINICAN REPUBLIC, AUGUST 2002

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On 3 September 2002, the Spanish national centre of epidemiology (Centro Nacional de Epidemiología - CNE) were alerted to a high number of amoebiasis cases in Spanish tourists returning from a hotel in a holiday resort in the Dominican Republic. The cases were in patients who had travelled to the hotel on different days during the previous month. *Entamoeba histolytica* cysts were visualised by stool microscopy in the stools of several patients who had sought medical attention in the Dominican Republic.

The CNE informed the health authorities in the Dominican Republic and conducted an epidemiological investigation in conjunction with them and seven Spanish regional epidemiology services, because the cases were distributed throughout Spain. A descriptive study of the 76 cases initially found that the mean duration of the illness was 5.1 ±2.9 days and the exposure period was 3.6 ±2.2 days.

Following a retrospective cohort study, the attack rate was found to be 32.4% (95% CI=114.75–317.25). It is estimated that 216 Spanish tourists probably developed the illness.

Stool samples were collected in Spain from patients who still felt unwell, and these were analysed by direct microscopy, culture and ELISA. None of the samples were found to be positive for *Entamoeba histolytica*.

On 10 September, a hygiene inspection took place at the implicated hotel. A risk assessment of the water distribution system and laboratory testing of water and several food samples were undertaken by the local health authorities in the Dominican Republic.

Consumption of water from the resort water system was the only risk factor associated with the presence of symptoms (RR= 3.55; 95% CI =1.13–10.99).

To avoid similar outbreaks occurring again at the hotel, it is essential to ensure the use of safe drinking water, to implement measures to regularly monitor the water quality and to improve food handling hygiene standards. Basic food hygiene training for food handlers should be mandatory.

An international guideline for the management foodborne and waterborne outbreaks among tourists in holiday resorts should be drawn up, involving all competent authorities of both destination and tourist origin countries

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Waterborne disease, Spain, Dominican Republic, travel, *Entamoeba histolytica*

## Introduction

Gastrointestinal infections are regarded as the commonest travel associated illnesses. Despite the high incidence of water and foodborne disease in travellers, the majority of outbreaks in tourists are not detected by the communicable disease surveillance programmes in the tourists' countries of origin (1), nor are they detected by the regional health authorities where the implicated holidays resorts are located.

On 3 September 2002, a high number of complaints of illness in tourists returning from holidays in the Dominican Republic was notified to the Centro Nacional de Epidemiología (Spanish National Centre of Epidemiology, CNE) by a regional Spanish epidemiology service (the Servicio de Epidemiología de Asturias).

Seventy six cases were initially identified in patients who had all stayed at the same hotel, on an all inclusive package holiday (with all meals and beverages at the hotel included). Patients had travelled to and from the holiday resort on different days on August 2002. *Entamoeba histolytica* cysts were identified by stool microscopy in samples from several patients who sought medical attention in the Dominican Republic.

The CNE informed the health authorities in the Dominican Republic. The outbreak had not previously been notified by the medical service where the patients received medical care in the Dominican Republic.

## Epidemiological investigation

A preliminary investigation was conducted in conjunction with the health authorities in the Dominican Republic and seven Spanish regional epidemiology services (Asturias, Andalucía, Madrid, Cataluña, País Vasco, Murcia, and Castilla La Mancha), since there were cases from almost all over Spain. Regional authorities interviewed the 76 patients initially identified as suspect cases, using a specifically designed questionnaire. Patients were asked by telephone about relevant clinical features (when and how the illness began, stool characteristics, associated symptoms and their frequency and characteristics) and potential risk factors (consumption of unsafe foods, swimming in or drinking untreated fresh water, contact with other ill patients, recent or regular medication, underlying medical condition)(2). They were also advised to seek medical attention if they still felt unwell, and encouraged to provide clinical samples.

The Dominican Republic health authorities reviewed all medical histories from the hotel's medical service and the reference clinic,

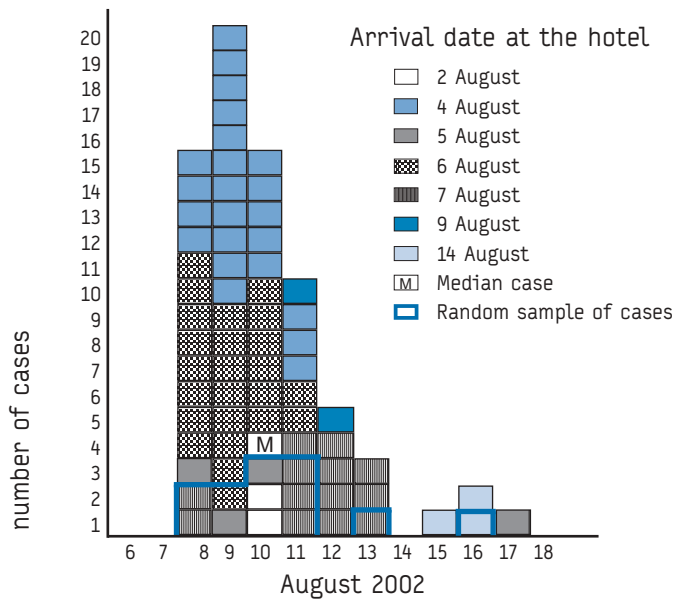
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FIGURE

Temporal distribution of cases per arrival date at the resort



looking for patients with a diagnosis of diarrhoea or gastroenteritis between 5 to 17 August. On 10 September, they undertook an environmental investigation of the implicated hotel, including a hygiene inspection, risk assessment of the water distribution system, and laboratory testing of water and several food samples.

The CNE carried out a retrospective cohort study to determine the magnitude of the event and to establish risk factors for development of illness. Taking into account the results of the initial descriptive study, the epidemic period was defined as being from 2 to 14 August 2002. A probable case was defined as a person who had visited the hotel during the epidemic period and developed diarrhoea (three or more loose stools per day) and abdominal pain plus one of the following symptoms: vomiting, fever and chills.

Results

Initial study

The 76 cases identified were interviewed. The mean age was 31.6 ±3.5 years. 61.8% of cases were male. Symptoms included diarrhoea (96%), abdominal pain (79%), vomiting (61%), fever (52%), chills (52%), nausea (49%), headache (33%), bloody diarrhoea (7%) and constipation (7%). The mean duration of the illness was 5.1 ±2.9 days.

Two cases were admitted to hospital within 24 hours of onset of symptoms.

The temporal distribution of cases according to arrival date at the resort is shown in the figure. This epidemic curve, which is clustered around a peak on 10 August 2002 (onset of symptoms for the median case), points to a common source of infection. However, after the peak, the curve shows a different pattern that could be the result of the maintenance of the infection source or a different exposure source.

TABLE

Association measures of the studied risk factors. Spain, August 2002

Risk factor	Exposed			Non-exposed			RR (CI 95%)	P value
	ill	healthy	total	ill	healthy	Total		
Jug water served during meals	9	8	15	3	17	20	3,55 (1,13-10,9)	0,03
Sodas elaborated with tap water	11	21	32	1	4	5	2,29 (0,3-11,11)	0,83
Ice (made from tap water)	10	16	26	2	9	11	2,12 (0,55-8,12)	0,41

No relation was found between patients' arrival date at the hotel and their onset of symptoms; nor was one found between duration of stay and presence of symptoms. However, since the incubation period could not be estimated (the appearance date of the infection source and the aetiology were unknown), a mean exposure period of 3.6±2.2 days was calculated with the assumption that the hotel was the source of exposure.

Patients ate exclusively at the different restaurants in the hotel, because they had chosen an all-inclusive holiday package, and there were no urban facilities close to the hotel. They all consumed tap water and ice from the hotel's private well.

There was no other untreated fresh water source (such as a lake or a stream) close to the resort Ninety four point two per cent of the patients had swum in the resort's swimming pool.

Cases had neither travelled to other developing countries in the previous two months before the date of arrival at the hotel, nor had they experienced gastroenteritis during the previous week. Seven patients had chronic pathologies and were taking prescribed medicines before and during their stay at the hotel. None of these underlying medical conditions has been described as able to influence susceptibility to gastrointestinal illness.

The Dominican Republic health authorities report highlighted the fact that holidaymakers from other European countries and the United States had also been affected. The estimated attack rate of acute diarrhoea in hotel guests who sought medical attention was 5.3 times higher in August than in July (2.1% in July, 11.2% in August). Among the 700 hotel's employees, there were no cases in July but nine people sought medical attention during the epidemic period in August: the attack rate for employees was 1.3%.

Analytical study

The CNE requested the list of reservations for the holiday resort from 2 to 14 August 2002 from the tour operator. The tour operator agreed to supply this information after receiving a legal request from the Agencia Española de Protección de Datos (Spanish agency for data protection). The list was provided on 22 December 2002, four months after detection of the outbreak.

Six hundred and seventy five people from Spain stayed at the hotel during that period. Contact telephone numbers for these tourists were not available, and taking into consideration the costs that would have been involved in contacting them and the period of time that had already passed, a 5% sample was randomly selected out of the cohort: 37 cohort members were interviewed.

Twelve cases were reported. Consequently, the estimated attack rate was 32% and it was estimated that 216 Spanish tourists probably developed the illness (95% CI=114.75-317.25).

The mean age of cases was 34.7±3.4 years.

The epidemic curve of the cohort is represented in the figure, where cases are represented as blue squares.

Water consumption from the resort's water system was the only risk factor associated with the presence of symptoms (TABLE): the water from the water supply was not present in juices or other soft drinks, but it was served in jugs in all restaurants during meals. People who drank this water from the jugs had a 3.55 times greater risk for developing the disease (RR= 3.55; CI 95% =1.13- 10.99).

## Microbiological and environmental investigation

The environmental investigation was carried out by the Dominican Republic health authorities on 10 September 2002.

The resort is served by a single water distribution system with a private well. The risk assessment identified a faulty connection of the sewage system to the water supply system related to the works in progress as a possible outbreak source.

The water from the private well is supposed to be regularly chlorinated (employees were reluctant to show the registers to the sanitary inspectors) but is not filtered. Bacterial cultures of water samples from kitchen taps and the water system supply were negative. Samples taken from the ice and meals (green salad, noodle salads, salmon, scrambled eggs, soft cheese and milk pudding) served at the buffet on that day yielded anaerobic mesophile microorganism and coliform bacteria.

On or around 14 August, the hotel partially shut down the water distribution system and began to serve bottled water and commercially prepared ice.

In Spain, 51 patients submitted stool samples that were analysed by direct microscopy, cultured and by antigen detection (ELISA). Different enteropathogens were identified in the clinical samples of three cases: *Giardia lamblia* in one case, *Echinococcus* in one case, and both *Salmonella enterica* and *Aeromonas hydrophila* in one case. These specimens were collected two weeks after the patients' return from the Dominican Republic. There were no positive findings of *Entamoeba histolytica*.

## Discussion

Waterborne outbreak classification criteria by Tillet et al (3), give epidemiological evidence precedence over water quality data. In this investigation, the microbiological agent could not be detected in the analysed samples but the epidemiological analysis suggests the outbreak was probably associated with water consumption from the hotel's private well.

This outbreak investigation was triggered by complaints from patients several days after their return from holiday. The delay in the recognition of the outbreak may have affected the probability of detecting the aetiological agent in clinical specimens and in water samples. Consequently, the microbiological findings should be considered with caution.

Several limitations must be taken into account in order to better interpret the epidemiological evidence. The initial alert suggested a large outbreak confined to holidaymakers. However, neither the magnitude nor the aetiology of the outbreak were clear. The returning tourists were very alarmed, because *E. histolytica* cysts were visualized in four patients' stool samples in the Dominican Republic. Recall and misclassification bias could have affected the results of the study, leading to an overestimate of the number of ill persons.

Due to the high attack rate of the illness, it was difficult to find adequate controls, and therefore a cohort study was designed. Nevertheless, it took over three months to obtain cohort information. The tour operator agreed to give the list of reservations during the study period only after a legal request by the Spanish data protection agency.

With a sample size of 37 persons, the power of the relative risk measure is considerably inferior than 80% at a 95% confidence level. However, the association is strong, statistically significant, and stable (regarding the width of the confidence interval).

*E. histolytica* was not detected in stool samples analysed at the Spanish reference centre. This could be explained if the cysts identified in the Dominican Republic were *E. dispar* (morphologically identical to *E. histolytica* but non-pathogenic and also endemic in the region) (4-6), and the illness was caused by other pathogens.

The mean exposure period of three days seems too short to be explained by protozoa, but compatible with multiple microbial agents from a faecal contamination. If the hypothesis of a punctual

contamination of the water system supply is true, the incubation period must be even shorter than three days according to figure 1.

The presence of anaerobic mesophile bacteria in the food items evidences a general lack of hygiene during food handling (7). Cross-contamination cannot be excluded. However, the risk assessment indicates a contamination in the water system supply due to the works in progress as the most probable outbreak origin. Around 14 August, the hotel partially shut down the water distribution system and began to serve bottled water and commercially prepared ice. No further cases occurred after that date, even though new tourists arrived at the hotel every day.

The investigation of this outbreak was made possible thanks to the efficient transfer of information between the health authorities in the Dominican Republic and Spain. However, it was not begun until some time after the end of the outbreak. Since foodborne and waterborne outbreaks among travellers visiting the Dominican Republic are common (8), and given the willingness of the Dominican Republic authorities to cooperate in the investigation, there is clearly a need to define an international policy to implement surveillance measures that can promptly detect this kind of outbreak (9).

## Recommendations

- To avoid similar future outbreaks in the implicated hotel, it is essential
  - To ensure the use of safe drinking water for direct human consumption and for food preparation in the hotel, and to implement measures to monitor the water quality exhaustively;
  - To improve hygiene standards for food handling, especially refrigeration (4°C) up until time of consumption.
  - Basic food hygiene training for food handlers should be guaranteed and training sessions should be repeated regularly because of the large staff turnover operating in the resort.
- To detect promptly and manage efficiently gastroenteritis outbreaks in tourists, it would be useful to define international guidelines involving all the competent authorities: ministers of health and tourism and local health departments of both destination and tourist origin countries.

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