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An outbreak of viral gastroenteritis associated with adequately prepared oysters

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SUMMARY

Over Christmas 1993, an outbreak of food poisoning occurred among guests in a hotel in South West Scotland. Evidence from a cohort study strongly suggested that raw oysters were the vehicle for infection, probably due to a Small Round Structured Virus (SRSV). Detailed enquiry about the source and preparation of the oysters revealed no evidence of any unsafe handling at any stage in the food chain, nor any evidence of bacterial contamination. It is suggested that the present standards of preparation and monitoring are inadequate to protect the consumer, and that bacteriophage monitoring may be a useful method of screening for viral contamination in future.

INTRODUCTION

Oysters, although a delicacy, are well known for their ability to cause food-borne infection in humans [1]. To reduce this risk strict quality control should be observed in oyster cultivation, usually including a period of depuration when oysters are held in tanks of disinfected water [2], but outbreaks due to viral gastroenteritis can still occur [1].

THE OUTBREAK

The outbreak was restricted to guests staying in a country hotel in South West Scotland. These guests were all booked in for a special three night Christmas break, arriving on 24 December 1993. The outbreak only came to light because one of the cases, a doctor, sent a stool specimen to the local microbiology laboratory and mentioned to her consultant bacteriology colleague that she knew of others in the hotel who had also been ill. By this time, all the guests had left the hotel.

Fifteen of the 35 residents developed symptoms, which all presented on Sunday 26 December. Unfortunately one of the cases died on 27 December of ischaemic heart disease having apparently just recovered from his food poisoning symptoms.

METHODS

The outbreak was investigated in the period between Christmas and New Year. Cases were defined as hotel guests developing either diarrhoea or vomiting since 24 December. A food specific questionnaire was sent out to all the guests who had

been resident in the hotel over the Christmas period. Questionnaire details were not obtained from the man who had died, or his relatives.

The questionnaire results were analysed using Epiinfo 5.01. The significance of association between illness and the consumption of foods was tested using the χ^2 test with Yates' correction and Fisher's exact two-tailed test. The Mantel–Haenszel method was used to test for associations in stratified analyses.

No attempt was made to obtain stool specimens from those affected, largely because the impending New Year holiday made this too difficult to organize. Nevertheless, Consultants in Public Health Medicine responsible for communicable disease control in the areas of residence of affected guests were contacted in case stool specimens had already been obtained. Unfortunately, only the doctor who initially highlighted the outbreak (see above) submitted a stool specimen.

The hotel kitchens were inspected, and stool specimens were obtained from all kitchen staff. Samples of leftover food from the Christmas meals were not available for analysis.

When it appeared likely that oysters were the vehicle of infection, the batch was traced to the suppliers and the original source, and data obtained about quality control from the local Environmental Health Departments. Samples of oysters were examined at PHLS Exeter laboratory for bacteriophages [3].

RESULTS

Of the 14 cases from whom questionnaires were returned, 10 (71%) had diarrhoea, 10 (71%) vomiting, 9 (64%) nausea, 7 (50%) abdominal pain, 6 (43%) headache and 5 (36%) fever. All became ill on 26 December (Fig. 1). The median duration of illness was 36 h (range 8–144 h). Sixty-one separate food items were identified as having been consumed prior to the onset of symptoms. Foods associated with illness ($P \leqslant 0{\cdot}05$) are shown in Table 1.

Oysters naturelle (raw) were strongly associated with illness (relative risk = 16·5, 95% confidence intervals 2·4–112·1). One case who did not eat oysters was the first person to be ill, with vomiting lasting only 8 h. It is also known that the man who died had eaten oysters. The oysters were eaten at about 20.00 h on 24 December, giving a median incubation period of 36 h (range 30–45 h).

Although pheasant appeared to be statistically significantly associated with illness, none of the three people who ate pheasant, but not oysters, were ill, and the man who was ill but had not eaten oysters had not eaten pheasant. The apparently negative association between chocolate mousse and illness appears also to be confounded by the fact that those who ate chocolate mousse tended not to eat oysters. Stratified analyses supported the assumption that the apparent association were due to confounding by oyster consumption (Mantel–Haenszel summary χ^2 stratified by oyster consumption: pheasant, $\chi^2 = 0{\cdot}25$, $P = 0{\cdot}6$; chocolate mousse, $\chi^2 = 1{\cdot}4$, $P = 0{\cdot}2$).

Hotel inspection

The standard of kitchen hygiene and food storage was excellent and none of the staff reported any illness.

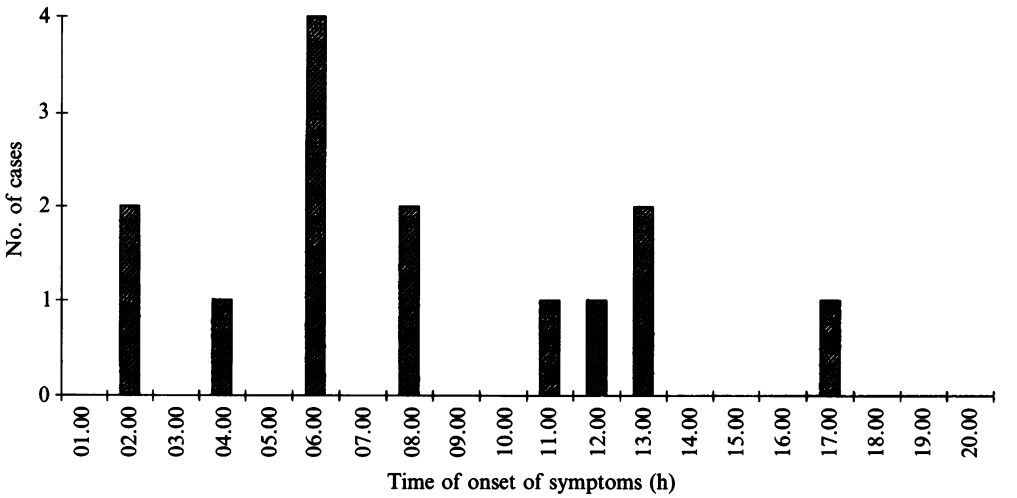

Fig. 1. Hour of onset of symptoms on 26 December 1993.

Table 1. *Food-specific attack rates of foods associated with illness*

	Ate			Did not eat				
Foodstuffs	Ill	Total	Attack rate (%)	Ill	Total	Attack rate (%)	Relative risk (95% CI)	*P*
Oyster naturelle	13	15	86·7	1	19	5·3	16·5 (2·4–112·1)	< 0·001
Braised pheasant, choux croute and figs	9	14	64·3	5	20	25	2·6 (1·1–6·0)	0·05
Chocolate mousse	0	7	0	14	27	51·9	—	0·03*

* Fisher's Exact Test two-tailed – all other *P* values by Yates Corrected method.

Investigation of oyster preparation

Both the producer and the distributor of the oysters were visited by the relevant Environmental Health Departments who ascertained that standards of oyster cultivation were considered satisfactory and temperature control and packaging were entirely adequate. No other food poisoning outbreaks had been reported from the same batch of oysters but it was not feasible to trace other consumers.

Microbiology

The only stool specimen from those affected was negative for the common food poisoning organisms. It had not been sent for electron microscopy.

A stool sample obtained from an asymptomatic kitchen worker grew *Campylobacter jejuni*. However, this person lived on a dairy farm and consumed raw milk.

Routine holding tank bacteriological sampling of oysters from the same batch had shown no growth of either *Salmonella* species nor *E. coli*. Nor was there any bacterial pathogen isolated from oysters of the same batch held in the hotel.

Examination of oysters at PHLS Exeter showed 'low numbers of F+ phage but

substantial populations (> 500 p.f.u./g) of somatic phage' (T. J. Humphrey, personal communication).

DISCUSSION

There is clear epidemiological evidence from the cohort study that oysters were the vehicle of infection in this outbreak. There was no direct microbiological evidence to indicate the causative organism, although the clinical features, incubation period and association with oysters all suggest SRSV infection [4].

It is interesting to note that only one oyster was served to each guest, although two of the guests consumed their partner's oyster in addition to their own. The fact that there were apparently no other outbreaks associated with this batch of oysters is perhaps not surprising. It is only because of a fortunate train of events that this outbreak came to light. Anecdotally, it is not unusual for people to be ill following oyster consumption, but few of them will report to their GP, and even if they do, any stool specimen taken is unlikely to be still positive for SRSV.

This outbreak strongly suggests that raw oysters pose a risk to the consumer, even when prepared and handled in the recommended way. Virus particles may persist within the oysters for many weeks despite depuration, and a number of outbreaks of viral illness have been associated with depurated shellfish [1]. The absence of traditional bacterial indicator organisms seems to be inadequate as a reliable indicator of the absence of pathogenic viruses [1]. Perhaps techniques such as bacteriophage assay might in future be demonstrated to be valid enough to be used as reliable indicators of the likely presence of human viral pathogens [3].

Since the viruses responsible for such outbreaks are specific to humans, and therefore almost always associated with sewage, it might be desirable to institute greater control over oyster beds in terms of their proximity to sewage outflows, and/or to the type of treatments acceptable in nearby sewage plants. This would require detailed study of the relationship between sewage discharges and estimates of viral loads (perhaps by bacteriophage assay) to be found in oysters. Even this might not be effective in the light of a recent outbreak in the USA which was associated with faecal contamination emanating from the toilet on an oyster fishery boat (R. Brogan, personal communication).

Another possibility might be to provide a 'health warning' to those who persist in consuming raw oysters. This could be in the form of a note in the menu to the effect that oysters are known to be associated with gastroenteritis, even when optimally prepared and handled.

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