Health Protection Agency

Foodborne illness at The Fat Duck restaurant

Report of an investigation of a foodborne outbreak of norovirus among diners at The Fat Duck restaurant, Bray, Berkshire in January and February 2009

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- The Fat Duck restaurant
- The Royal Borough of Windsor and Maidenhead Unitary Authority
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1. Executive summary

An investigation was conducted by Thames Valley Health Protection Unit (TVHPU) and its partners into an outbreak of food poisoning among diners who ate at The Fat Duck restaurant in Berkshire in January and February 2009. The publication of this investigation report has been delayed due to the swine flu pandemic event that began late in April 2009 and continued throughout the summer. As a major public health emergency, swine flu required a sustained and priority response from the Health Protection Agency (HPA), which meant that reports on less urgent investigations had to be postponed.

The Fat Duck is an internationally acclaimed restaurant owned and run by Heston Blumenthal, an award-winning chef. Diners travel from all over the world to sample its famous 'Tasting Menu', which includes many exotic dishes prepared using the principles of 'molecular gastronomy'.

In late February 2009 TVHPU was notified about a party of diners at the restaurant who became ill with symptoms of diarrhoea and vomiting within 48 hours of eating there. This prompted an investigation in partnership with environmental health officers of the Royal Borough of Windsor & Maidenhead Unitary Authority (RBWMUA). It quickly became apparent that the restaurant had been aware of illness among diners there since early January 2009, and that they had contracted a private environmental health consultancy company to assist it with their investigation in mid-February. Neither the restaurant nor the private company had contacted statutory agencies in the local authority or the HPA to report their concerns until the evening of 24 February, the day before TVHPU became aware of the problems. By that time, the restaurant had already voluntarily closed and undertaken 'deep cleaning' processes in the kitchen area.

An investigation was undertaken by TVHPU and the RBWMUA environmental health officers. NHS Berkshire East Primary Trust (BEPCT) was also involved. There were 529 reports of illness among diners who ate at the restaurant between 6 January and 22 February 2009, and there were at least six reported cases of apparent secondary spread to household members of primary cases from diners. Most of the affected diners became ill within 24-48 hours of having a meal at the restaurant, with diarrhoea, vomiting and nausea. Symptoms usually lasted three days. Ten diners had laboratory confirmed diagnoses of norovirus infection. The symptoms reported by most of the cases, the time from dining to onset of illness, and laboratory investigations of diners with symptoms, are all consistent with norovirus being responsible for this outbreak. Similar illness was also reported among members of staff over the same time period with laboratory confirmed norovirus in six of them. This incident represents one of the largest outbreaks of norovirus associated with a restaurant reported in the medical literature.

Norovirus is highly infectious and can be transmitted by contact with infectious individuals, contact with contamination in the environment such as kitchen utensils, work surfaces and soft furnishings, or consumption of contaminated food. It has been estimated that over 10% of cases in England and Wales are food borne. Foods can become infected with norovirus via two main routes:

1. Oysters and other shellfish can become contaminated with norovirus originating from human sewage, and this is more likely to happen during the winter months.
2. Individuals infected with norovirus can readily transfer the virus onto foods they prepare. The virus will remain viable and capable of causing illness in those foods that are not subsequently thoroughly cooked such as salads, canapés and cakes. The more intensively that food is handled the more likely it is to become contaminated by infected food handlers.

The investigation had several elements:

1. Epidemiological

The approach to this was a case control study of diners. The Fat Duck restaurant provided the outbreak control team with email contact details of parties of diners in their restaurant since January who had complained of illness. This was used to invite diners to participate in an online survey. Individuals in parties where at least one person reported illness were invited to complete the web-based questionnaire. In total 223 emails were sent to complainants from 215 parties which comprised a total of 591 diners. Respondents were defined as cases if they reported at least two symptoms of nausea, vomiting or diarrhoea/loose stool. Those respondents who did not report any symptoms were classified as controls. Individuals reporting symptoms or illness but not meeting the case definition were excluded from analyses.

Altogether 529 individuals reported illness following dining at the restaurant. Of 319 respondents to our survey who reported any illness, 240 (75%) met the case definition used for gastroenteritis. The number of individuals affected increased progressively over the study period, suggesting either a rising rate of illness over this time period or more likely the impact of publicity regarding the outbreak or a combination of these. All three symptoms of nausea, vomiting and diarrhoea were each present in over 70% of those meeting the case definition. The incubation time (the period between eating and becoming ill) was typically 24-48 hours. Six cases of illness were identified among

household contacts of cases, suggesting secondary person–to-person spread.

The main finding of this analytical study was that consumption of the Tasting Menu was associated with an increased probability of illness. Within this menu, there were associations of shellfish-containing dishes 'Oyster, Passion Fruit Jelly, Lavender' and 'Sound of the Sea' and one other 'Jelly of Quail, Langoustine Cream, Parfait of Foie Gras' with illness.

2. Microbiological

Diners reporting illness who had eaten at the restaurant in the week before closure were contacted and those who were symptomatic were asked to provide stool samples. Eighteen stool specimens were tested: all were negative for any bacterial infection but 10 were positive for norovirus. The positive norovirus results were obtained from diners in five parties dining at the restaurant in mid-to-late February.

Among staff, six samples were positive for norovirus. These staff with norovirus infection all ate staff meals provided by the restaurant. Two shared the same accommodation, three tasted the food they were preparing and one prepared seafood (razor clams, cockles and oysters). One had reported illness in December and February.

Stool specimens from diners and staff with a diagnosis of norovirus were sent to the HPA's Centre for Infections (CfI) for genotyping. Nine norovirus-positive stool samples from diners and five from staff members were analysed further by reverse transcriptase polymerase chain reaction (RT-PCR) and genetic sequencing. All staff samples had genogroup II with genotypes GII-2, -4 and -6 each identified. Diner samples included two individuals with both genogroup I and genogroup II and seven with genogroup II strains. These included genotypes GII-3, -4 and -6. Finding multiple strains of norovirus from diners is consistent with and typical of a shellfish source.

3. Staff interviews

At the time of the investigation the restaurant employed 57 staff who were regularly present at the restaurant, with roles ranging from chefs, kitchen staff, front-of-house staff, sommeliers, administrators and kitchen porters. The restaurant also runs chef and experimental kitchen stagier placement programmes where chefs attend for work experience. All current staff were interviewed by telephone: 17 reported having had symptoms of gastrointestinal infection with onset during January or February 2009. Among those staff reporting illness, six reported working while unwell, including one who reported vomiting in the restaurant toilets (on a day that the restaurant was closed). Nine staff reported returning to work before being asymptomatic for 48 hours, contrary to national guidance for food-handlers. The restaurant's own records only identified three staff members being absent with gastrointestinal symptoms during January and February 2009.

4. Environmental and food processing

RBWMUA environmental health officers undertook a complete review of food storage, preparation and kitchen facilities. This included discussions with staff members in relation to the use of the facilities in their day-to-day work. Environmental samples were also taken. In total 80 environmental samples were collected from various sites in the restaurant over a three-day period. This included all kitchen and food preparation areas and front of house. All of these were negative, but the restaurant had carried out deep cleaning of the premises on 22, 23 and 24 February 2009. This involved the use of a sanitising agent and steam cleaning of carpets. This immediately preceded the notification of illness among diners to TVHPU.

A total of 20 food samples retrieved from the restaurant were tested for bacteriology and virology. No bacterial pathogens were found. Two samples of food retrieved from the restaurant had indicators of poor hygiene: cooked razor clams and langoustine cream, in which *Escherichia coli* and Enterobacteriaceae bacteria were detected. Their levels were reported as borderline quality in the case of the langoustine cream and unsatisfactory for the cooked razor clams. These food samples were not tested for norovirus.

The restaurant had started using a new supplier for razor clams from Torbay, Devon, in January 2009, and a sample of razor clams was obtained directly from the new supplier. Norovirus genogroup II was identified from raw razor clams at the limit of detection, signifying low-level contamination with norovirus. Follow up of the oyster supply from Colchester, Essex identified that three other outbreaks of norovirus, potentially linked to this same supplier, had been reported to Colchester Borough Council during the period mid-January to mid-February 2009. Subsequent sampling of oysters harvested from the implicated site in the River Colne on 18 March 2009 tested positive for norovirus (genogroups I and II). Investigations to date show no specific environmental incident at the implicated harvest site that would account for this, but these can be difficult to establish.

At the time of the investigation of the restaurant premises, there were adequate handwashing facilities. Several containers of alcohol rub were seen in the food preparation areas. This type of rub is not effective

against norovirus so that it would not be an alternative to handwashing.

As regards routine cleaning within the restaurant, this involved cleaning agents that are known to be ineffective against viruses.

Putting together all these findings, the main conclusions of the investigations were that:

- There was a large outbreak of food poisoning among diners at The Fat Duck restaurant in January and February with over 500 reporting illness, which represents more than 15% of those dining at the restaurant over this period.
- The organism responsible was norovirus.
- The norovirus was probably introduced via shellfish because diners who ate shellfish dishes were more likely to report illness; oysters were served raw; razor clams may not have been appropriately handled or cooked; tracing of the shellfish to source showed evidence for contamination; and outbreaks of illness in other establishments have been associated with oysters from the same source.
- The outbreak continued for at least six weeks because of ongoing transmission at the restaurant.
- Such transmission could have occurred either through continuous contamination of the foods prepared in the restaurant or by person-to-person spread between staff and diners, or a mixture of both mechanisms.
- Several weaknesses in procedures at the restaurant may have contributed to ongoing transmission. These included a delayed response to the incident, staff working when they should have been off sick, and the wrong environmental cleaning products being used.
- Delays in notification of illness among diners may have affected the ability of the investigation to identify the exact reason for the norovirus contamination.

The restaurant reopened on 12 March 2009 with recommendations to review the food management system to minimise risk of cross-contamination, to improve internal surveillance, to identify early warnings of increased staff or customer illness, to ensure prompt notification to environmental health at RBWMUA, and to use a variety of education tools to support understanding in those staff whose first language is not English.

Wider recommendations to other restaurants and food handlers are that norovirus is an important cause of food-poisoning and is easily spread so there needs to be scrupulous attention to personal and food hygiene, especially when handling shellfish. Also, restaurants that suspect food-poisoning among staff or diners should quickly seek advice and support from their local authority's environmental health team and their local health protection unit. This can prevent incidents becoming prolonged outbreaks and reduce the number of diners and staff affected. This investigation confirms the well-known risks that raw shellfish pose.

2. Notification, setting and outbreak management process

2.1 Notification

On 25 February 2009, the Thames Valley Health Protection Unit (TVHPU) was notified by Hampshire and Isle of Wight Health Protection Unit (HIOW HPU) of four individuals who had developed symptoms of diarrhoea and vomiting within 48 hours of having a meal at The Fat Duck restaurant in Bray, Berkshire. TVHPU contacted the Royal Borough of Windsor and Maidenhead Unitary Authority (RBWMUA) in whose jurisdiction the restaurant was located. The RBWMUA had received a report late the previous evening (24 February) from The Fat Duck regarding complaints of illness associated with eating at the restaurant.

2.2 Initial assessment

Initial information was collected on 26 February from a meeting held between the RBWMUA environmental health officer and the management team of the restaurant. This indicated approximately 66 complaints of illness among diners to the restaurant during January and February 2009. The restaurant management had employed an independent specialist environmental health consultancy, Food Alert Ltd, to review food management and complaints processes in and reports of illness among diners in January and February 2009. Food Alert Ltd had sent a postal questionnaire to complainants.

RBWMUA briefed TVHPU following this meeting on 26 February and staff from RBWMUA and TVHPU met on 27 February at the RBWMUA offices to review the situation.

2.3 Setting

The Fat Duck restaurant in Bray, Berkshire opens for lunch (Tuesday to Sunday) and dinner (Tuesday to Saturday) with a single sitting at each time. Approximately 1,750 customers attend the restaurant each month. It is renowned for using an approach based on the principles of 'molecular gastronomy' and preparing and serving unusual dishes in innovative ways. The restaurant serves an Á la Carte Menu and a Tasting Menu made up of 16 courses. Approximately 90% of diners choose the Tasting Menu. It is one of three UK restaurants with three Michelin stars, and was voted 'Best Restaurant in the World' by *Restaurant* magazine in 2005. It attracts diners from around the world.

The restaurant has been open since 1994 and is subject to a food safety inspection by officers from the Royal Borough of Windsor and Maidenhead Unitary Authority (RBWMUA) as required by the Food Standards Agency. The last inspection was undertaken in September 2007. The restaurant was due its next inspection in March 2009.

2.4 Outbreak management

At the review meeting on the afternoon of Friday 27 February between TVHPU and RBWMUA an outbreak was declared based on the number of diners affected (over 60) within a period of six weeks. An incident control team (ICT) was formed with representatives from the Health Protection Agency (HPA), Royal Borough of Windsor and Maidenhead Unitary Authority (RBWMUA) and Berkshire East Primary Care Trust (PCT). The first meeting was held on 2 March 2009 by teleconference. Further detail on the meetings and membership of the ICT is given in the appendix. The schedule of meetings and the timing of other actions in the investigation and control of this outbreak are summarised in Figure 1. The wider timeline of the outbreak and the investigation is shown in the diagram below.

The following report describes each aspect of the investigation with the full information available at the end of the investigation. Reports of illness increased rapidly during the investigation following media coverage of the closure of the restaurant. Interim results of the investigation and analyses were available to the ICT to guide the investigation and control measures. Interim results are not reproduced in this report where superseded by fuller information.

The wider timeline of the outbreak and the investigation.

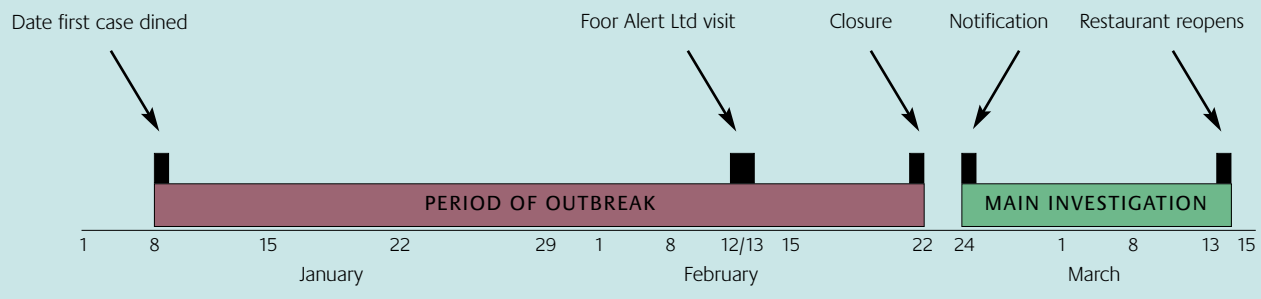
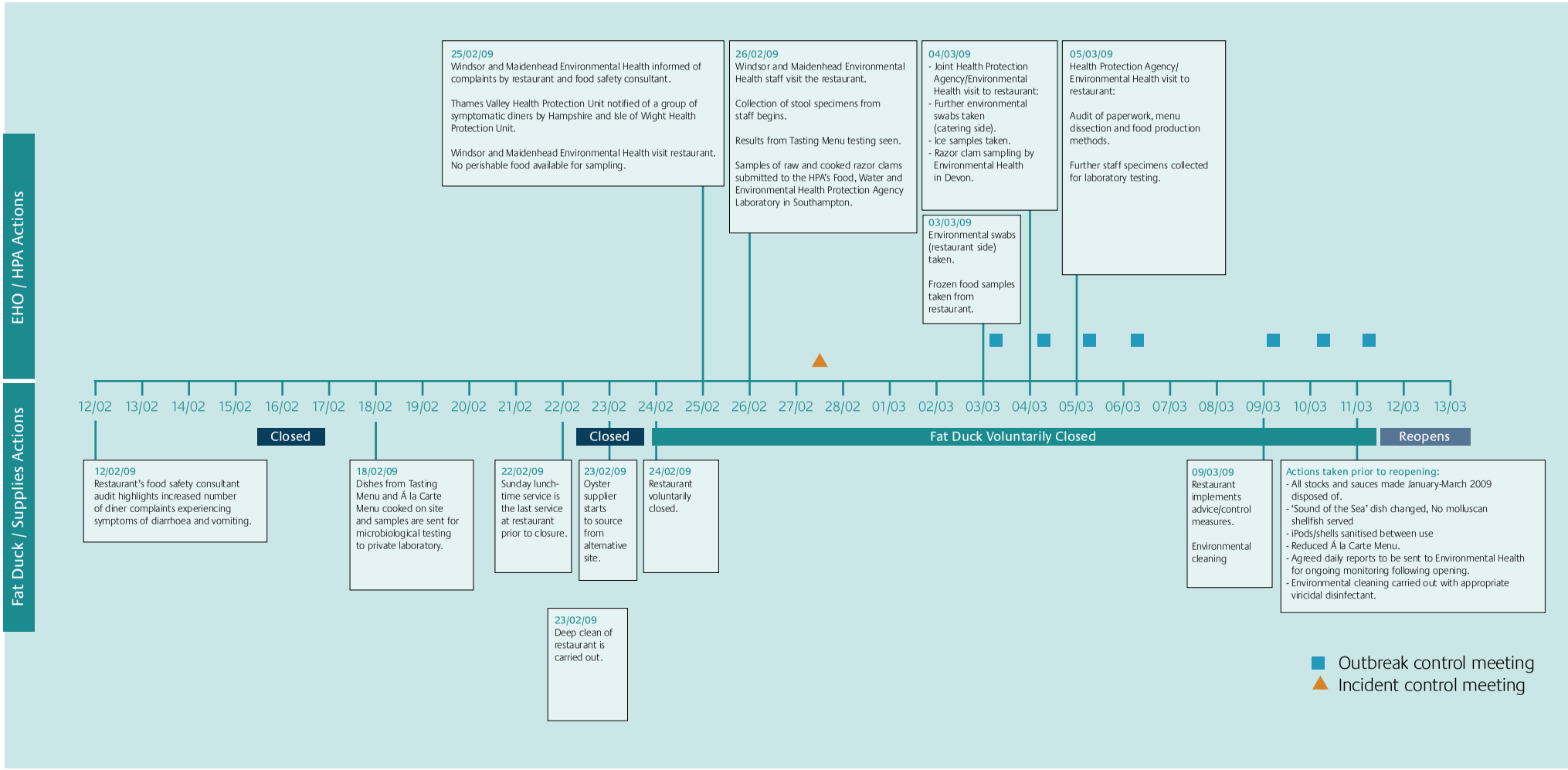


Figure 1. Timeline of events, February-March 2009



Source: TVHPU

3. Description of the outbreak

The description combines information reported by diners and the restaurant to RBWMUA or the HPA and responses to a web-based survey among guests from parties including one or more complainants. All figures are based on data from the survey. Fuller details of this survey and analysis are given in the appendix with the main approach described here.

A total of 529 individuals reported illness after dining at the restaurant between 6 January and 22 February 2009.

3.1 Methods for descriptive epidemiological study

The study aimed to:

1. Describe the illness among diners at The Fat Duck restaurant.
2. Describe the pattern of illness over time.
3. Assess evidence for secondary spread.

Survey

A survey was undertaken among parties that included at least one complainant to the restaurant using a web-based questionnaire. The restaurant had obtained email addresses for those who had complained and were unable to give emails for parties without complainants. Participation was sought by sending an email with a link to the survey to complainants with a request to forward it to other members of their party. In total 223 emails were sent to complainants from 215 parties which comprised a total of 591 diners.

A formal case definition was used to identify those with a history strongly suggestive of viral gastroenteritis (cases), those with no symptoms suggestive of this (controls) and those for whom it was less clear if they had suffered from gastroenteritis.

Case definition

Study population

Individuals in parties with at least one complaint who ate at The Fat Duck restaurant between 6 January and 22 February 2009

Case

An individual reporting at least two of the following symptoms not more than seven days after eating at The Fat Duck restaurant:

a. Nausea b. Vomiting c. Diarrhoea or loose stool

Control

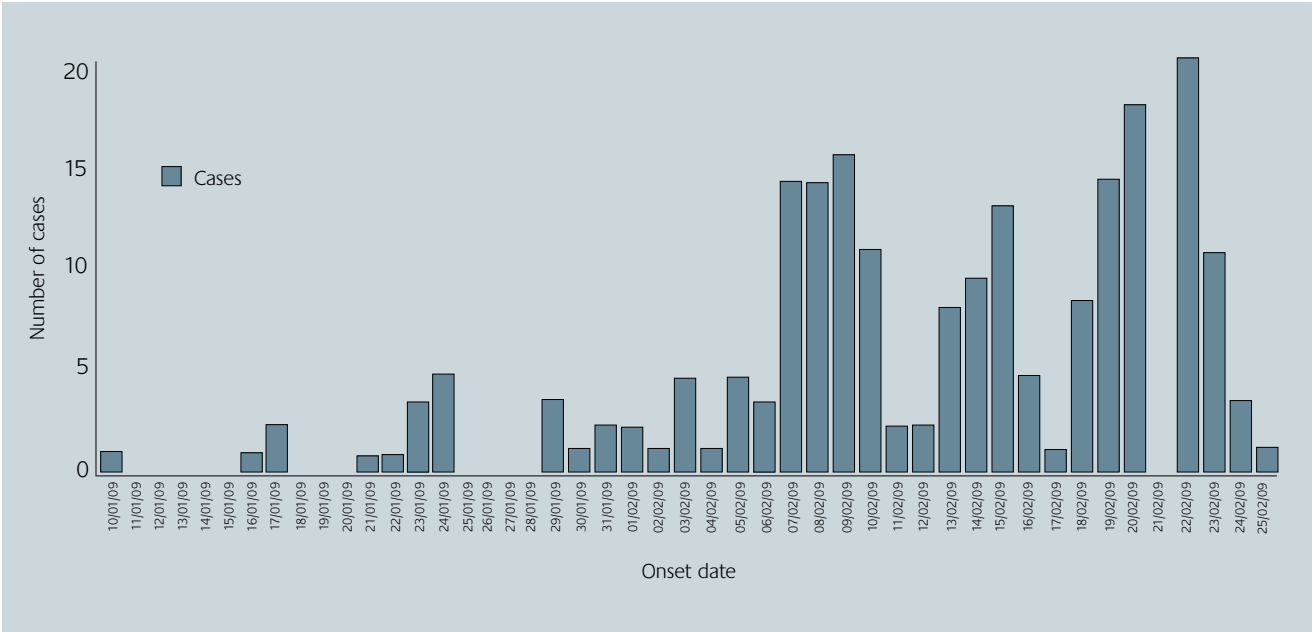
An individual not reporting illness or any symptoms. Individuals reporting some symptoms or illness but not meeting the case definition were excluded from analyses. Those with the case definition symptoms but without a date of onset of illness were counted as cases.

There were 386 valid individuals from 591 diners in the study population, a response rate of 65%. Of these 386 individuals 240 met the case definition and 79 met the control definition. The remaining 67 respondents reported illness but did not report two of the case definition symptoms or else reported symptom onset more than seven days after eating at the restaurant.

3.2 Descriptive epidemiology results of survey

The onset of illness among cases responding to the survey and reporting date of onset ranged from 10 January to 25 February (Figure 2). This increasing number of cases over time is compatible with a rising rate of illness over this time, the impact of publicity regarding the outbreak or a combination of these.

Figure 2. Date of onset of symptoms among cases dining at The Fat Duck restaurant between 6 January and 22 February 2009 who reported the date of onset for their symptoms (n=199).



The median time between eating and becoming unwell was 33 hours. Of the 199 cases with data to calculate this with 135 reported onset of illness between 24 and 48 hours after eating (Figure 3).

Figure 3. Time between eating and becoming ill among diners reporting illness after eating at The Fat Duck restaurant between 6 January and 22 February 2009.

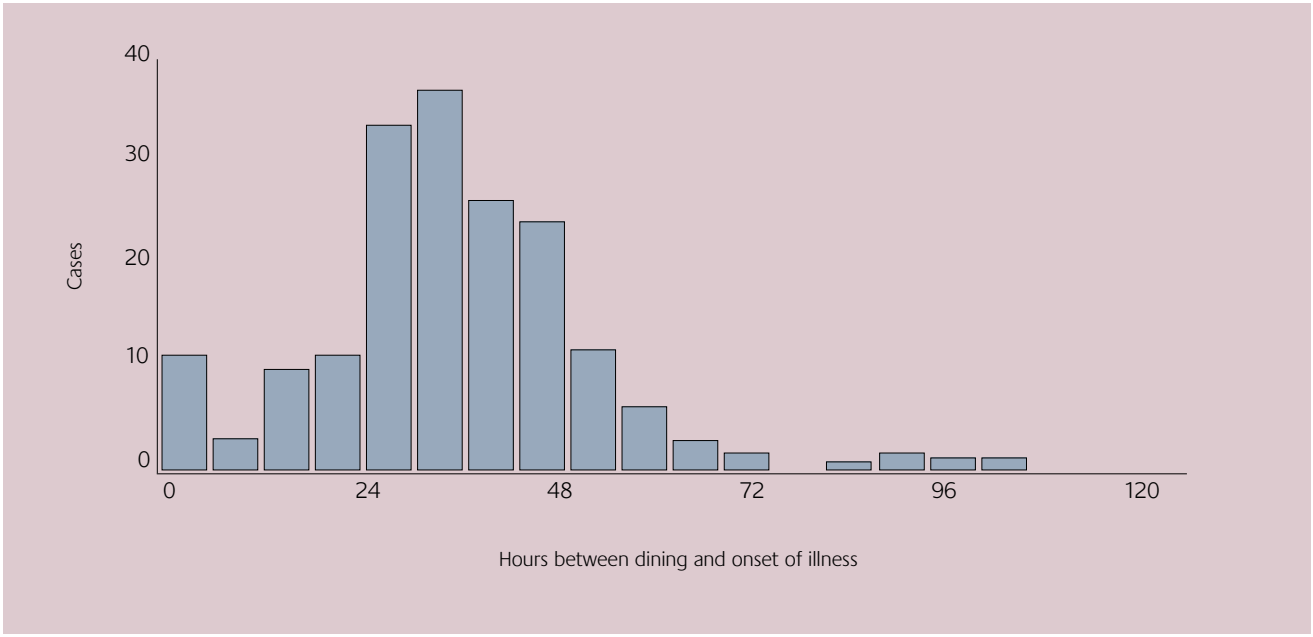


Table 1: Symptoms reported by cases (n=240)

Symptom	Number reporting
Diarrhoea (three or more in 24 hours)	197
Nausea	188
Vomiting	175
Loose stools (one or two in 24 hours)	68
Headache	103
Fever	102
Abdominal pain	155
Muscle ache/flu-like symptoms	114
Weight loss	75
Blood in stool	5

The main gastrointestinal symptoms reported by the 240 cases were diarrhoea, nausea, vomiting and abdominal pain (Table 1). The median reported duration of illness was three days. Thirty-three of the cases (14%) saw a doctor for their symptoms as well as six other individuals reporting illness but not meeting the case definition.

Six individuals who reported illness described similar illness in members of their households who had not dined at the restaurant. These episodes followed their own illness and are consistent with secondary person-to-person spread.

Summary of descriptive epidemiology

Altogether 529 individuals reported illness following dining at the restaurant. Of 319 respondents to our survey reporting any illness 240 (75%) met the case definition used for gastroenteritis. All three case definition symptoms (nausea, vomiting and diarrhoea) were present in over 70% of those meeting the case definition. The incubation time (the period between eating and becoming ill) was typically in the range of 24-48 hours. The six cases of similar illness among household contacts suggest secondary person-to-person spread.

4. Investigation

4.1 Microbiology from diners reporting illness

Diners reporting illness who had eaten at the restaurant in the week before closure were contacted to ascertain whether or not they still had symptoms. Those who were symptomatic were asked to provide stool samples. Bacterial and viral tests were requested. Bacterial testing was carried out at the appropriate local NHS trust laboratory. Viral testing was carried out either in the local laboratory or sent to a laboratory that had appropriate facilities.

Bacteriology results were available from 18 diners. All were negative. Of these 18 diners 10 were positive for norovirus, four were negative and no virology results were available for four. The positive norovirus results were obtained from diners in five parties dining at the restaurant on 18, 20, 21 and 22 February.

4.2 Staff interviews

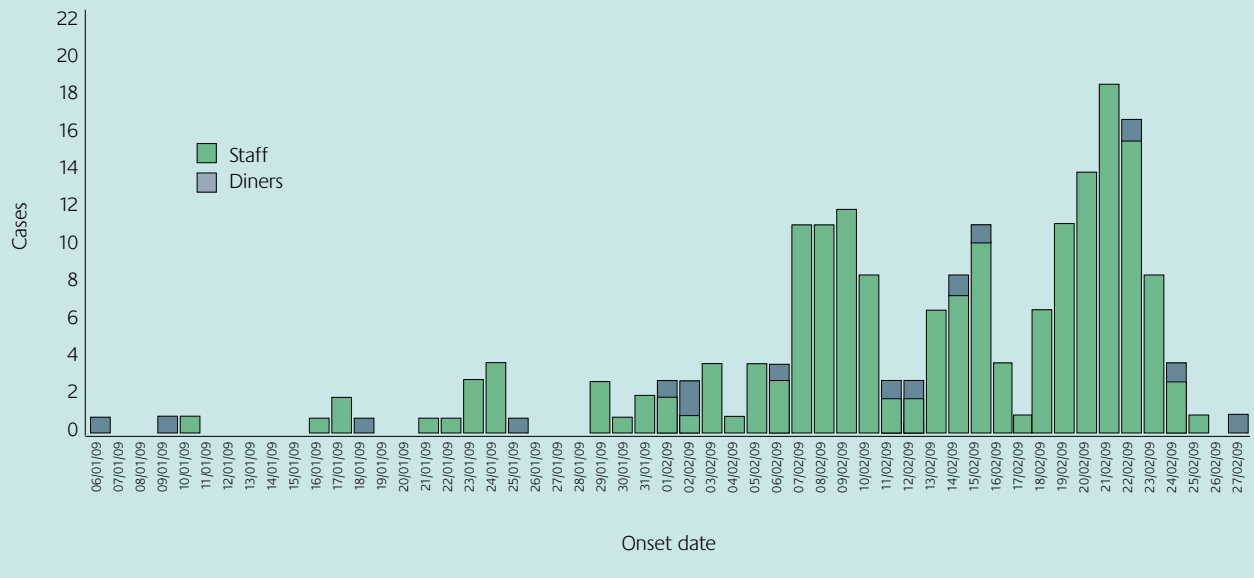
The restaurant manager provided the TVHPU with a list of staff. At the time of the investigation the restaurant employed 63 staff, 57 of whom were regularly present on site, including chefs, kitchen staff, front of house staff, sommeliers, administrators and kitchen porters. The restaurant also runs chef and experimental kitchen stagier placement programmes where chefs attend for work experience. The human resources manager at the restaurant acted as a liaison between staff members and the TVHPU.

The staff members regularly present on site were contacted via telephone by the TVHPU and asked questions from a standard questionnaire (see Appendix) regarding:

1. Their role within the restaurant.
2. Food consumption while at work.
3. Symptoms they had experienced (type, date of onset, duration, exclusion/absence from work and any secondary spread within their household or close contacts).
4. Risk factors for gastrointestinal infection unrelated to work prior to symptom onset were also collected (e.g. consumption of unpasteurised dairy products or contact with animals).

All 57 current staff were interviewed. Two former staff members who had been working at the restaurant during the outbreak but had left employment could not be contacted. Of the staff members interviewed, 17 reported having had symptoms of gastrointestinal infection with onset during January or February 2009. One staff member reported similar symptoms with onset in December 2008 and recurrence in February 2009 and one was unable to recall the onset date during January 2009. The onset dates for other cases are given in Figure 4. Among those staff reporting illness six reported working while unwell. One of these reported vomiting in the restaurant toilets on a Monday when the restaurant was closed. One of those who reported working while ill tested positive for norovirus. Nine reported returning to work prior to being asymptomatic for 48 hours (against national guidance) and all without negative laboratory tests (against the restaurant's policy). The restaurant's own records identified only three staff members being absent with gastrointestinal symptoms (two with vomiting and one with sickness/upset stomach) during January and February 2009.

Figure 4. Date of onset of illness among staff members (n=15) and diners (n=199) at The Fat Duck Restaurant, January-February 2009.



4.3 Stool sampling from staff

Stool samples were obtained from 60 of 63 staff, starting with those who had suffered symptoms and had key food handling roles and according to staff availability to give samples. Of these samples 44 were tested for virology and six of these were positive for norovirus. The remaining samples were not tested as these results were sufficient to confirm substantial norovirus infection among staff.

Of the staff who tested positive for norovirus:

- All ate staff meals provided twice daily by the restaurant (different menu from restaurant).
- Two shared the same residential accommodation on a daily basis.
- Three tasted the food they were preparing.
- One prepared seafood (e.g. razor clams, cockles and oysters).
- One reported illness in both December and February.

4.4 Food preparation processes and hygiene

Food supplies, food preparation and food hygiene

The menus (see Appendix), food items, methods of preparation and food hygiene practices were examined in detail by the officers from RBWMUA together with a complete review of food storage, preparation and kitchen facilities. Staff were interviewed to determine food hygiene practice and to understand the preparation methods of each dish and their use of the facilities in their day-to-day work. Because the restaurant was closed this investigation was by interview rather than observation.

These interviews highlighted the complexity of work undertaken requiring substantial manipulation of food. Review of menus identified foods with raw shellfish as known risks for gastroenteritis. Some cleaning products being used were identified as having weak activity against norovirus.

The food safety management system, including hazard analysis and critical control points (HACCP), which was in place was generic. Further work was being undertaken by the environmental health consultancy Food Alert Ltd to make it more appropriate to the specific complexities of food production at the restaurant.

At the time of the investigation of the premises, there were adequate handwashing facilities. Several containers of alcohol rub were seen in the food preparation areas. This type of rub is not effective against norovirus so it would not be an alternative to handwashing.

Environmental microbiology

The restaurant had carried out deep cleaning of the premises on 22, 23 and 24 February 2009, including the use of a sanitising agent and steam cleaning of carpets, before environmental sampling could be undertaken. Environmental sampling was still carried out to allow detection of contamination or provide some assurance that the environment had been decontaminated appropriately and effectively.

Eighty environmental samples were collected from various sites in the restaurant over a three-day period. This included all kitchen and food preparation areas and front of house, and focused on hand contact and food preparation surfaces, particularly areas where high-risk food items were stored, handled and prepared.

These samples were sent to the HPA's Wessex Environmental Microbiology Services (WEMS) from where they were forwarded to CfI for virology. Twenty-six of these samples, from high-risk areas, were tested for norovirus [Appendix]. All were negative for norovirus.

Microbiology on foods from restaurant

The restaurant regularly sent finished samples of dishes ('end of product testing') to a private laboratory named EUROFINS Laboratory Limited, a UK Accreditation Service accredited laboratory, most recently on 20 February 2009. Permission was granted by the restaurant for the HPA to contact the laboratory to discuss the tests and results obtained. The food samples were negative for bacterial pathogens. Virology testing was not a part of the end of product testing process, with no validated methods for norovirus testing being available for many end products.

Food sampling was carried by the RBWMUA environmental health officers on a number of foods obtained from the restaurant. There was limited food to sample, (particularly fresh food) since the restaurant had closed on 24 February 2009 and had last served food at lunchtime on 22 February 2009. Food samples therefore consisted largely of frozen items such as stocks, sauces and purees. All food samples retrieved by the investigating team were sent to the WEMS which coordinated the forwarding of shellfish samples to the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) and environmental swabs to CfI, for norovirus testing.

A total of 20 food samples retrieved from the restaurant by the investigating team were tested for bacteriology. No bacterial pathogens were found. Two samples of food retrieved from the restaurant had indicators of poor hygiene; the cooked razor clams and langoustine cream showed detection of *Escherichia coli* and Enterobacteriaceae. Their levels were reported as borderline quality in the case of the langoustine cream and unsatisfactory for the cooked razor clams. Preparation of the langoustine cream included the addition of fresh herbs

to the warm finished product which may have introduced Enterobacteriaceae but would not be expected to produce elevated counts of *Escherichia coli*, which is an indicator organism for faecal contamination. Most food samples were not suitable for norovirus testing. More detail on food microbiology is given in the appendix.

4.5 Food supply chain investigation

A list of suppliers was provided to RBWMUA by the restaurant.

The Tasting Menu had been unchanged from 2007 apart from the addition of the razor clam dish in 2008. The suppliers had been the same with the exception of one additional supplier of razor clams introduced in January 2009. A sample of razor clams was obtained directly from the suppliers in Torbay, Devon and forwarded via WEMS for testing in CEFAS. Norovirus genogroup II was identified from raw razor clams at limit of detection signifying low-level contamination with norovirus. This sample had come via France from the same bed in Holland as supplies to the restaurant but at a later time than these supplies.

Follow up regarding the supplier of oysters from Colchester, Essex included contact with Environmental Health at Colchester Borough Council, the Food Standards Agency and CEFAS. This identified that three other outbreaks potentially linked to the same oyster supplier during the period mid-January to mid-February 2009 had been reported to Colchester Borough Council. Subsequent sampling of oysters harvested from the implicated site in the River Colne on 18 March 2009 tested positive for norovirus (genogroups I and II). The tested samples had not undergone depuration. Colchester Borough Council reported no failures in depuration methods at this supplier between mid-January and mid-February, when the restaurant was receiving its usual oyster supplies. Investigations of this harvest site are ongoing by the relevant regulatory bodies. Investigations to date show no acute environmental incident at the implicated harvest site but these can be difficult to establish. Reports from both Colchester Borough Council Environmental Health and CEFAS confirmed that a similar problem had occurred several years earlier when norovirus had been found at high levels within the local community.

4.6 Norovirus strain characterisation

Specimens with a diagnosis of norovirus were sent to CfI for genotyping. Nine norovirus-positive stool samples from diners and five from staff members were analysed further by reverse transcriptase polymerase chain reaction (RT-PCR) and nucleic acid sequencing.

Among the staff samples genogroup II noroviruses of genotypes GII-2, -4 and -6 were identified. Among the diners, noroviruses of both genogroup I and genogroup II were identified in two individuals and genogroup II strains were identified in a further seven. These included genotypes GII-3, -4 and -6. The positive sample from razor clams was of genogroup II. Two of the three oyster samples were positive for both genogroup I and genogroup II noroviruses and one for genogroup I. No further typing was undertaken on strains from shellfish. More detail on sampling and laboratory results are given in the appendices.

4.7 Analytical epidemiology

The survey described above also gave data for an analytical epidemiological study to assess evidence for association of illness with risk factors such as which foods had been eaten and when diners had eaten at the restaurant. A series of closed and open questions on menus and specific foods eaten at the restaurant were included in the survey (see Appendix) to allow this analysis.

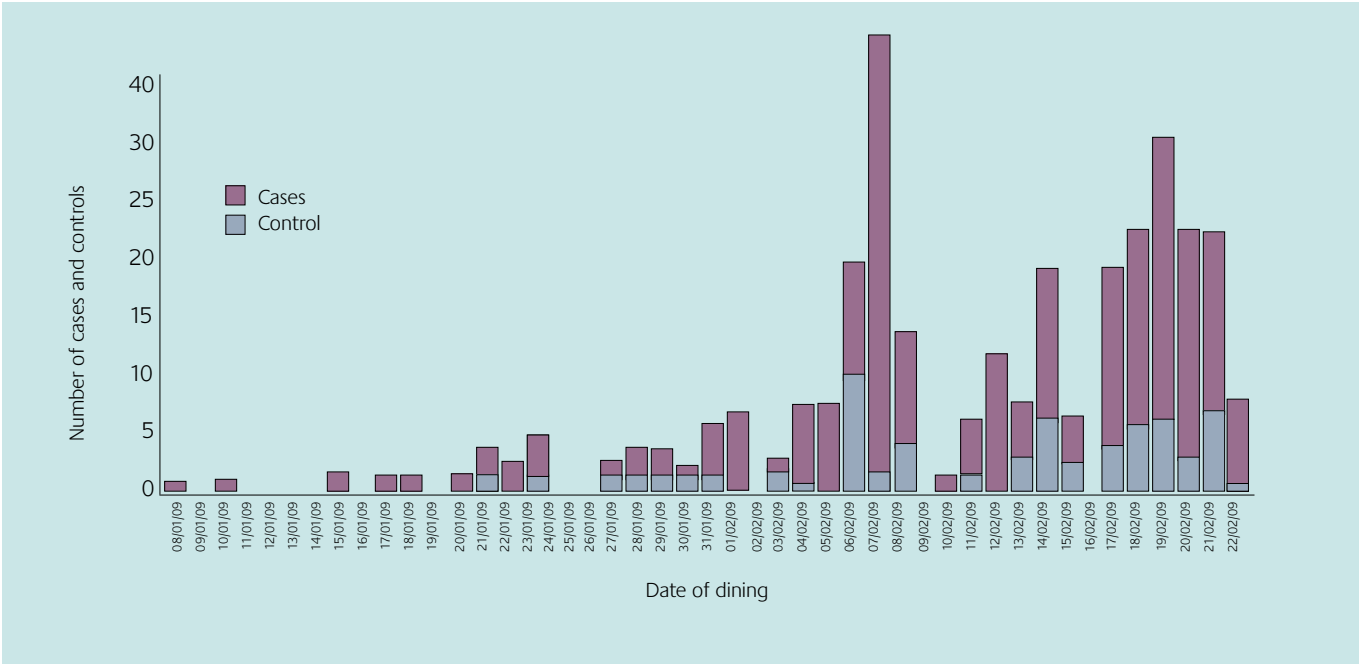
Univariate logistic regression analysis was performed for each dish. Where a dish was reported to have been eaten in part a value of 0.5 was given for consumption compared to 1 if eaten in full and 0 if not eaten. All available data was used in univariate analyses. Multivariate analysis was performed for those exposures showing statistical evidence (at $p<0.1$) on univariate analysis with a stepwise exclusion approach to simplify the initial full model.

Although the onset dates of identified cases show an increasing number of reports from diners over time (Figures 2 and 5) there is no strong evidence for increased attack rates over this time with the proportion of those ill being similar in parties which responded to the study following illness early or late in the period of the outbreak (Figure 5 and $p>0.5$ in a likelihood ratio test of the association of time modelled as a continuous variable and illness).

There was no evidence of illness varying between lunch or dinner service but there was a substantially increased risk among the 88% who reported eating from the Tasting Menu compared to those eating the À la Carte Menu (odds ratio 2.7 [95% confidence interval 1.1-6.4]). No individual foods on the À la Carte Menu showed statistical evidence for association with reported illness in analysis restricted to the small number of respondents eating from this menu.

Consumption of several foods from the Tasting Menu was associated with illness. The strongest associations on univariate analysis are shown in Table 2. The association of

Figure 5. Cases and controls by date of dining at The Fat Duck restaurant between 6 January and 22 February 2009.



these three dishes were also the most robust to adjustment in a multivariate model. The 'Oyster, Passion Fruit Jelly, Lavender dish with the strongest association remained statistically significant in the final multivariate model. Weaker associations between other dishes and illness were also less robust to adjustment.

Table 2: Food items on the Tasting Menu associated most strongly with illness in univariate logistic regression analysis.

Food items	Odds ratio	95% CI	P-value
Oyster, Passion Fruit Jelly, Lavender	18	4.8-68	<0.001
Sound of the Sea	8.4	2.6-26.6	<0.001
Jelly Of Quail, Langoustine Cream, Parfait Of Foie Gras	7.1	2.4-21.5	<0.001

In summary, the findings of this epidemiological study are that eating at the restaurant appears to have posed a risk of infection throughout the period from late January until closure on 22 February. Consumption of the Tasting Menu was associated with an increased probability of illness. There is evidence for the association of two shellfish-containing dishes 'Oyster, Passion Fruit Jelly, Lavender' and 'Sound of the Sea', with illness and weaker evidence for one other dish 'Jelly of Quail, Langoustine Cream, Parfait of Foie Gras'. Other associations observed were weaker and have a high probability of being due to confounding.

5. Outbreak control

The restaurant closed voluntarily from 22 February 2009 and started actions to reduce the risk of further illness among future diners.

5.1 Recommendations and interventions during closure

During the investigation the ICT highlighted the main areas for attention to reduce the risk of further infection of diners including:

1. Gaps in staff sickness policy and its implementation.
2. Specific approaches to reduce risk in the complex food preparation at the restaurant within the review of the food management system at the restaurant by Food Alert Ltd.
3. Selection of cleaning agents with better efficacy against non-enveloped viruses such as norovirus.

5.2 Reopening of the restaurant

The ICT agreed that the restaurant could reopen subject to the completion of the following interventions and monitoring:

1. Temporary removal of high-risk food items from the menu such as raw oysters and bivalve shellfish.
2. Disposal of residual quantities of food stocks that could pose a risk for recurrent norovirus infection.
3. Daily contact by the restaurant with RBWMUA to report on any complaints of illness among diners or staff illness.
4. Putting in place a restaurant policy for an exclusion period of 72 hours for staff with symptoms of gastrointestinal illness, raising awareness of this staff sickness policy with staff and maintaining accurate staff illness records.
5. Full decontamination of the whole premises including serving vessels with appropriate cleaning products and review of routine cleaning products to ensure that they are fit for purpose.
6. Ensuring that staff understand the staff sickness protocols by means of proper induction, sickness policy implementation and making sure that staff are registered with an accessible GP.
7. Basic training of key staff in the principles of hazard analysis and critical control points (HACCP).
8. Certified HACCP course to be attended by the executive chef and other head chefs who have responsibility for the maintenance of the food safety management system.
9. Continual review and update of the food management system specific to the complexity of the menu served at the restaurant to minimise risk of cross-contamination.
10. Emphasis on handwashing regimens with an emphasis on the use of alcohol hand gels as being an addition to handwashing and not a substitute.
11. Systems to ensure improved internal surveillance to identify early warnings of increased staff or customer illness and prompt notification to Environmental Health at RBWMUA.
12. Using a variety of education tools such as the FSA CD-ROM, to support understanding in those staff whose first language is not English.

The restaurant reopened on 12 March 2009.

6. Discussion

A large outbreak of illness occurred among diners who ate at The Fat Duck restaurant with 529 of those eating between 6 January and 22 February 2009 reporting illness, in excess of 15% of diners over this period. There were also some reports of apparent secondary spread from those who became ill following consumption at the restaurant to household members.

Most of the affected diners (based on the sample responding to the survey) became symptomatic within 24-48 hours of having a meal at the restaurant with the predominant reported symptoms being diarrhoea, vomiting and nausea lasting a median of three days. Ten diners and six staff members had laboratory confirmed diagnoses of norovirus infection. There were at least six reported cases of apparent secondary spread from diners (not laboratory confirmed). These findings are indicative of a norovirus outbreak. Staff and customers of the restaurant were exposed to the virus over a period of at least six weeks.

None of the food or environmental samples was positive for any specific pathogen (within the limitations of testing on samples taken following a cleaning of the premises). However, the investigation was substantially delayed due to the late reporting by the restaurant and the absence of reports from diners direct to the RBWMUA or HPA until after the restaurant closure was covered in the media. These samples were taken after the time when people were infected by dining at the restaurant. Many important foodstuffs were not available including samples of shellfish which were implicated by several stands of evidence from the investigation. Two food samples from the restaurant showed evidence of bacterial contamination consistent with poor hygiene or incomplete cooking.

An analytical epidemiological study identified an increased risk of illness associated with consumption of dishes containing shellfish, with weaker evidence for association of illness with consumption of a dish containing langoustine cream from which indicator bacteria were isolated.

Although no samples were available at the restaurant tracing the supply chain of the shellfish allowed testing of both razor clams and oysters from the beds in which the restaurant supplies originated. Both were positive for norovirus, with the clams testing at the limits of detection for genogroup II norovirus and several samples of oysters testing positive for genogroup I and II norovirus. These oysters had not undergone depuration, though depuration is not an effective method for eliminating norovirus from oyster flesh.

Genotyping of the isolates from diners and staff at the restaurant showed multiple different genotypes. The multiple genotype infections among diners was highlighted by CEFAS as being typical of oyster-related outbreaks of norovirus. This pattern of genotype among cases following consumption of raw oysters, the presence of *Escherichia coli* in prepared razor clams as evidence for incomplete cooking or poor hygiene, the presence of norovirus in samples from the same sources of shellfish, albeit not the same batches, and the epidemiological association of shellfish consumption with illness makes a compelling case for the role of infection from shellfish in this outbreak.

Direct infection from shellfish could have produced this outbreak. However, there is also some evidence to support other possible routes of transmission through food. The complex nature of food preparation in this restaurant, with extensive handling of foods, would require excellent food management systems to assure safety. Several staff members were ill and may have been infectious with norovirus while at work. Alcohol gel, which is not fully effective against norovirus, was widely used. The cleaning agents used during the outbreak may not have given effective virucidal activity. Two food samples were contaminated with *Escherichia coli* and Enterobacteriaceae, a possible indicator of a breakdown in food hygiene practices. These were cooked razor clams and langoustine cream which were each ingredients of dishes for which consumption was associated with reported disease. Contamination of other foods in the restaurant is therefore a likely second route of transmission.

Norovirus can spread from a contaminated environment and directly from person to person. Some staff reported symptoms while at work, which may have contaminated the environment including the restaurant toilets. The adequacy of the cleaning regimen during the outbreak was not tested. As a result it is not possible to rule out infection of diners from the restaurant environment or direct person-to-person spread from staff. However, the high attack rate over so long a period among diners who spent only a few hours in this environment means that environmental and direct person-to-person spread are both unlikely to be major contributors to this outbreak, and certainly not the sole or main routes of transmission.

The delayed notification of this outbreak reduced the availability of samples to clarify the cause of the outbreak. It also increased the work needed to provide multiple sources of evidence to produce an overall picture of probable routes of transmission in the absence of any definitive evidence from one source. More importantly it resulted in a greater number of diners being exposed and becoming infected with norovirus than would have occurred if effective investigation and intervention had started earlier. The limited and relatively late reporting direct from diners to RBWMUA or the HPA until after publicity regarding the restaurant closure is striking in the presence of such a large outbreak. This may reflect the geographically dispersed clientele but may also reflect a low reporting rate for norovirus among diners becoming ill after eating out.

Following notification of the outbreak the restaurant management cooperated with the investigation of the incident control team assisting in the compilation of lists of diners and implementing control measures as advised. Good cooperation from both diners who were ill and the other diners in their parties who remained well allowed the conduct of an epidemiological investigation. Use of the internet facilitated the implementation of this study among the widely distributed diners at the restaurant.

Investigating agency cooperation through the incident control team involved substantial and diverse inputs from these agencies. The collaborative deployment of these resources allowed a relatively clear identification of the factors causing this outbreak and the main issues to reduce risk of recurrence following reopening of the restaurant. This was achieved even though notification was late and no definitive evidence was available to demonstrate the route or routes of infection.

A wide range of factors that may have contributed to increased risk at the restaurant were identified and recommendations made to reduce this risk allowing the reopening of the restaurant. As well as the issues specific to this restaurant this outbreak again highlights the risk associated with consumption of raw or undercooked molluscan shellfish. The scale of illness in this outbreak was particularly large.

7. Conclusion

- A large outbreak of illness occurred among diners who ate at The Fat Duck restaurant, with 529 of those eating between 6 January and 22 February 2009 reporting illness and some reports of apparent secondary spread in these diners.
- The symptoms reported by cases, time between eating at the restaurant and becoming ill, and laboratory investigations where available identify norovirus as the agent causing illness in this outbreak, further supported by similar illness and laboratory confirmation among restaurant staff.
- There was substantial transmission of this infection to diners at the restaurant over a prolonged period.
- The main route of infection is likely to have been through food consumption as outlined below although some direct environmental transmission may have occurred.
- The evidence for infection from consumption of shellfish in this outbreak is:
  1. Raw oysters, an established high-risk food for norovirus were served. Razor clams cooked on site for sampling showed evidence of bacterial contamination consistent with incomplete cooking.
  2. Diners who reported consumption of these shellfish dishes were more likely to report illness than those who did not consume shellfish.
  3. Multiple different strains of norovirus were isolated from diners, which is typical of a shellfish source.
  4. Tracing of the shellfish to source showed evidence for contamination of shellfish from different batches coming from the same sources as supplied the restaurant and identified outbreaks of illness in other establishments associated with oysters from the same source around the same time.
- Contamination of other food during preparation may have contributed to infection of diners. The basis for this is:
  1. The food preparation processes on the premises were complex, requiring a lot of handling increasing the risk of contamination. The highest standards of hygiene are necessary to remove the risk of norovirus infection in this setting. No breaches of hygiene standards were identified in the preparation processes as described by staff.
  2. Several staff members were infected with norovirus and may have been infectious while at work.
  3. Alcohol gel may have been used more commonly than handwashing and is not fully effective in removing norovirus infection.
  4. Food testing showed marginal evidence for poor hygiene in preparation of a langoustine cream. There was also some epidemiological association of illness and consumption of the dish containing this ingredient.
  5. The cleaning agents used during the outbreak may not have given effective viricidal activity.
- The delay in notification of reports of illness by the restaurant led to a significant delay in investigating the incident. Cases could have been prevented had notification been received in a timely manner and action been taken sooner. A significant number of cases may have been prevented if the concerns raised by the environmental health consultancy Food Alert Ltd on 12/13 February had been acted upon and promptly reported.
- The investigation allowed identification of factors contributing to the outbreak and implementation of measures to reduce risk of recurrence following reopening.

8. Appendix

8.1 Notification details

At 8pm on 24 February 2009 the RWBM UA received a verbal report from an environmental health consultant, Food Alert Ltd, acting on behalf of The Fat Duck restaurant. The RBWMUA was advised that the restaurant had decided to close voluntarily due to complaints of diarrhoea and vomiting from diners who had eaten at the restaurant.

- After closing as normal on the evening of 22 February 2009, the restaurant decided not to reopen on 24 February due to the increasing number of complaints
- At 12.41pm on 25 February 2009 TVHPU received its first notification of illness associated with the restaurant. HIOW HPU telephoned to report a member of the public had informed them that four people from a group of five had developed diarrhoea and vomiting shortly after having a meal at the restaurant. These people were resident in the HIOW HPU area.
- At 3.10pm on 25 February 2009 TVHPU contacted RBWMUA, which informed the HPU that it was already in the process of gathering more information on cases of reported illness associated with the restaurant following the initial notification from Food Alert the previous evening.
- On 26 February 2009 RBWMUA informed TVHPU that approximately 66 individuals had complained of

8.2 Outbreak control team membership and meetings

Member	Attended	
• Alyson Smith (ASm), consultant in health protection TVHPU – chair	12	
• Carol Hodges (CH), office manager, TVHPU - loggist	12	
• Wendy Foster (WF), food and safety officer, RBWM	11	
• Luisa Saldana (LS), surveillance officer TVHPU	11	
• Muhammad Abid (MA), CCDC Thames Valley Health Protection Unit (TVHPU)	10	
• Chikwe Ihekweazu (CI), SE regional epidemiologist (Sandra Johnson rep)	9	(2 rep)
• Jharna Kumbang (JK), SpR TVHPU	9	
• Angela Snowling (ASn), DPH, Berkshire East Primary Care Trust (Claire D'Cruz rep)	9	(2 rep)
• Bob Adak (BA), HPA Centre for Infections (CfI) (Dilys Morgan, rep)	8	(1 rep)
• Teresa Cash (TC), HPA Comms, Health Protection Agency South East (HPASE) (Claudette Malone rep)	8	(1 rep)
• Noel McCarthy (NMcC), CCDC TVHPU	7	
• Tabitha Hosey (TH), environmental health officer (team leader commercial services), The Royal Borough of Windsor & Maidenhead (RBWM)	7 7	
• Caroline Willis (CW), Wessex Environmental Microbiology Services (WEMS)	6	
• Kate McPhedran (KMcP), health protection practitioner TVHPU	4	
• Eamonn O'Moore (EO'M), interim director TVHPU	3	
• Jill Morris (JiM), CCDC TVHPU	3	
• Lukasz Koltowski (LK), F1 TVHPU	3	
• Vaishnavee Sreeharan (VS), F2 TVHPU	2	
• Sam Ejide (SE), CCDC TVHPU	2	
• Janette Mills (JM), senior health protection practitioner TVHPU	2	
• Miren Iturriza (MI), HPA Centre for Infections	2	
• Ian Williams (IW), environmental health officer (TVHPU secondment)	1	
• David Lamph (DL), food microbiologist WEMS	1	
• Anne Maduma-Butshe (AM-B), health protection practitioner TVHPU	1	
• Vanessa Baugh (VB), health protection practitioner TVHPU	1	
• Chris Little (CL), CfI	1	
• Fraser Gormley (FG), CfI		
Core team Other experts Observers		
See table on following page for meeting attendance.		

vomiting, diarrhoea, fever and abdominal cramps after having meals at the restaurant. These cases had been reported directly to the restaurant. The first report of illness was received by the restaurant for a diner who ate on 9 January 2009.

The reports of illness from Food Alert Ltd and HIOW HPU were the first reports of illness associated with the restaurant received by RBWMUA and TVHPU respectively, the first of these to the RBWMUA on 24 February being two days after the last service in the restaurant.

The management of the restaurant had been aware of an increase in the number of reported complaints of diarrhoea and vomiting starting in January 2009. The management had engaged a commercial environmental health consultant who visited the restaurant on 12 and 13 February to conduct an audit of all the procedures of the restaurant. This included a review of the complaints process. The consultant also looked at the number of complaints received by the restaurant from diners and identified a number of complaints of individuals feeling unwell after dining at the restaurant. The consultant had developed a questionnaire to elicit further information. This had been sent by post to the diners that had reported symptoms of diarrhoea and/or vomiting after eating at the restaurant.

Attendance at meetings

Date of meetings:	ATTENDEES:																										
	ASm	CH	WF	LS	MA	CI	JK	ASn	BA	TC	NMcC	TH	CW	KMcP	EO'M	JiM	LK	VS	SE	JM	MI	IW	DL	AMB	VB	CL	FG
27/02/2009			✓		✓		✓					✓										✓					
03/03/2009	✓	✓	✓	✓	✓	rep	✓	✓	✓	✓	✓	✓	✓	✓		✓			✓	✓		✓					
*04/03/2009	✓	✓	✓	✓	✓	rep	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓			✓		✓		
05/03/2009	✓	✓	✓	✓	✓	✓	✓	✓	rep	✓	✓	✓		✓			✓	✓						✓			
06/03/2009	✓	✓			✓		✓										✓	✓			✓						
09/03/2009	✓	✓	✓	✓	✓	✓	✓		✓	rep		✓	✓		✓												
10/03/2009	✓	✓		✓	✓	✓	✓				✓																
11/03/2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓											✓	✓
16/03/2009	✓	✓	✓	✓	✓		✓	✓	✓		✓		✓		✓						✓						
25/03/2009	✓	✓	✓	✓		✓		✓	✓	✓	✓		✓	✓													
01/04/2009	✓	✓	✓	✓		✓		rep		✓			✓		✓												
07/04/2009	✓	✓	✓	✓		✓		rep	✓	□			✓	✓													
17/04/2009	✓	✓	✓	✓	✓	✓		✓	✓	✓				✓													

*Also attended in part by:
Tony Baker, managing director, The Fat Duck restaurant
Ashley Palmer-Watts, head chef, The Fat Duck restaurant
Steven Carroll, Food Alert Ltd

8.3 Menus

MENU SAMPLE FOR TASTING MENU
ONE HUNDRED AND THIRTY POUNDS

NITRO-GREEN TEA AND LIME MOUSSE (2001)
OYSTER, PASSION FRUIT JELLY, LAVENDER
POMMERY GRAIN MUSTARD ICE CREAM, RED CABBAGE GAZPACHO
JELLY OF QUAIL, LANGOUSTINE CREAM, PARFAIT OF FOIE GRAS
OAK MOSS AND TRUFFLE TOAST
(Homage to Alain Chapel)

SNAIL PORRIDGE
Joselito ham

ROAST FOIE GRAS "BENZALDEHYDE"
Almond fluid gel, cherry, chamomile

"SOUND OF THE SEA"

SALMON POACHED IN LIQUORICE GEL
Artichokes, vanilla mayonnaise and "Manni" olive oil

BALLOTINE OF ANJOU PIGEON
Black pudding "made to order", pickling brine and spiced juices

HOT AND ICED TEA (2005)

MRS MARSHALL'S MARGARET CORNET

PINE SHERBET FOUNTAIN (PRE-HIT)

MANGO AND DOUGLAS FIR PUREE
Bavarois of lychee and mango, blackcurrant sorbet,
blackcurrant and green peppercorn jelly

PARSNIP CEREAL

NITRO-SCRAMBLED EGG AND BACON ICE CREAM (2006)
Pain perdu, tea jelly

PETITS FOURS
Mandarin aerated chocolate, Violet tartlet, Carrot and orange lolly

This menu is designed to be enjoyed by the whole table
A selection of wines by the glass are available to accompany this menu at £90 and £165 per person

An optional 12.5 per cent service charge will be added to your bill
These prices are subject to change

MENU SAMPLE FOR A LA CARTE
NINETY EIGHT POUNDS

STARTERS

CRAB BISCUIT
Roast foie gras, crystallised seaweed and oyster vinaigrette

CAULIFLOWER RISOTTO
Carpaccio of cauliflower and chocolate jelly

LASAGNE OF LANGOUSTINE
Pig's trotter and truffle
(Eight pounds and twenty five pence supplement)

ROAST SCALLOP
Scallop tartare, caviar and white chocolate veloute

RADISH RAVIOLI OF OYSTER
Goat cheese and truffle, rissole of fromage de tete

MAIN

POT ROAST LOIN OF PORK, BRAISED BELLY
Gratin of truffled macaroni
(Nine pounds and seventy five pence supplement)

SADDLE OF VENISON
Celeriac, marron glace and sauce poivrade; civet of venison with pearl barley and red wine
Venison and frankincense tea

SOLE VERONIQUE
Champagne fluid gel, triple cooked chips

BEST END OF LAMB
Ice-filtered lamb jelly, braised tongue and cucumber
Hot pot of lamb neck, sweetbread and oyster

ROAST TURBOT
Mushroom carpaccio, mussels, artichokes and jelly of verjus
Turbot and langoustine royale
(Six pounds and twenty five pence supplement)

DESSERTS

DÉLICE OF CHOCOLATE
Chocolate sorbet, cumin caramel

CHANTECLERC APPLE
Fromage blanc, apple milk caramel and vanilla ice cream

MANGO AND DOUGLAS FIR PUREE
Bavarois of lychee and mango, blackcurrant sorbet and green peppercorn jelly

BLACK FOREST GATEAU

GALETTE OF RHUBARB, NEROLI SCENTED YOGHURT
Crystallised coconut and rhubarb sorbet

CHEESE
(Available as an additional course at thirteen pounds and fifty pence)

An optional 12.5 per cent service charge will be added to your bill
These prices are subject to change

8.4 Norovirus – overview and relevant scientific literature

Norovirus is the most common known cause of infectious intestinal disease (Food Standards Agency) in Western Europe and North America (Mead et al 1999; Food Standards Agency, 2000; De Wit et al, 2001). It has been estimated that there are over 600,000 cases of norovirus infection in England each year (IID Study Report, 2000), with infection rates peaking during the winter months. Norovirus is highly infectious and can be transmitted in a variety of ways including: contact with infectious individuals; contact with contamination in the environment, i.e. utensils, work surfaces, soft furnishings etc; and consumption of contaminated food. It has been estimated that over 10% of cases in England and Wales are food borne (Adak et al, 2005).

Norovirus is unlike other causes of food poisoning such as *Salmonella enterica, Campylobacter jejuni* and *Escherichia coli* O157 in that it is not a zoonosis, its reservoir of infection is humans. Foods can become infected with norovirus via two main routes.

Contaminated molluscan shellfish

Oysters and other molluscan shellfish can become contaminated with norovirus originating from human sewage. Oyster beds located downstream of sewage plants are susceptible to faecal contamination. Sewage can become heavily contaminated with norovirus during the winter months due to the fact that norovirus is the most common gastrointestinal pathogen and it causes most disease between November and March. Oysters are filter feeders and 'graze' on particles swept through estuarine waters. When contaminated matter is taken in by these molluscs the virus finds its way into muscle tissue. Commercial oyster farmers employ a technique known as depuration to reduce the levels of pathogenic microorganisms in oysters. This involves keeping the oysters in clean water for an extended period of time. This has the effect of flushing pathogens out of the gastrointestinal tract of the animals and has been shown to effectively remove bacterial pathogens. However, it is a comparatively ineffective means of removing norovirus because the virus particles become incorporated in the oysters' flesh. Therefore if contaminated oysters are not cooked thoroughly before consumption they can carry live norovirus, which can then cause illness.

It should be noted that oysters harvested from sewage contaminated waters will feed on the faecal residues originating from large numbers of infected people within the population living and working in the catchments of upstream treatment plants. The sewage released from these plants would be expected to contain the wide range of norovirus genotypes co-circulating in the human population. As a result norovirus contaminated oysters have been found to contain a range of norovirus sub-types (Kageyama et al, 2004; Ueki et al, 2005; Le Guyader et al, 2006). This means that different individuals affected in oyster associated outbreaks of norovirus infection will tend to excrete a multiplicity of norovirus strains (Le Guyader et al, 2006). It should be stressed that this contrasts sharply with the situation found in most outbreaks of salmonellosis or infections due to other food-borne zoonoses where foods tend to be contaminated with a single tightly defined molecular sub-type of a pathogen and the individuals affected will excrete a single pathogenic strain (Threlfall et al, 1998; Killalea et al, 1996; Horby et al, 2003).

Infected food handlers

Individuals infected with norovirus can readily transfer the virus onto foods they prepare. The virus will remain viable and capable of causing illness in those foods that are not subsequently thoroughly cooked, such as salads, canapés and cakes. The more intensively that food is handled the more likely it is to become contaminated by infected food handlers. People eating these foods can then become ill. It is for this reason that it is recommended that food handlers are excluded from work for at least 48 hours following the cessation of diarrhoea or vomiting (PHLS guidance). In addition any food handlers that continue to work while infected pose a risk to other members of staff.

Norovirus can thus be transmitted to individuals via oysters and/or through other foods contaminated by infected food handlers in those restaurants where contaminated oysters are being served.

Hygiene measures

Norovirus can remain viable on hands and surfaces for a significant period of time, making it possible to spread the infection both directly and indirectly through cross-contamination. Handwashing with soap and water is most important, while alcohol rubs should be used as an adjunct to handwashing and not a replacement. Although alcohol-based hand rubs are generally very effective against bacteria and enveloped viruses, providing an overall 99.99% reduction, non-enveloped viruses such as norovirus are more resistant and typically are reduced by 90-99% with a 30 second contact time. A product providing less than 99% reduction is not considered an effective hand disinfectant. Person-to-food contamination with norovirus has been described and the evidence obtained from the investigations of this outbreak of inappropriate hand hygiene taking place makes this a possibility.

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8.5 Epidemiological Report

EPIDEMIOLOGICAL STUDY FAT DUCK RESTAURANT BERKSHIRE - THAMES VALLEY

I. AIMS

The study aimed to:

1. Describe the pattern of symptoms and temporal pattern of illness.
2. Assess evidence for secondary spread. systematic comparison of exposure among cases and non-cases.

II. METHODS

2.1 Survey

A survey was undertaken among parties including at least one complainant to the restaurant using a web-based questionnaire. The restaurant had obtained email addresses for those who had complained and advised that they did not have emails for parties without complainants. This context contributed to the choice of this strategy.

Participation was sought by sending an email with a link to the survey (a specific link for each party to allow grouping of responses) to complainants with a request to forward it to other members of their party. In total 223 emails were sent to complainants from 215 parties, which comprised a total of 591 diners.

The questionnaire covered information to fulfil the study aims including basic demographic details, closed and open questions on foods eaten at the restaurant, illness in the period after eating at the restaurant and details of contacts with similar symptoms. It was set up using the commercial survey service Survey Monkey using a secure encrypted channel (SSL using https://) to protect participant information being transmitted via the internet. The survey is visible at https://www.surveymonkey.com/s.aspx?sm=7TXGS1QjS_2fYppAouktZKxg_3d_3d.

The questionnaire was sent out on 12 March. A reminder was sent on 27 March to complainants from parties for which no responses had been received. On 6 April a second reminder was sent to complainants where there were fewer responses than party size. Data collection was closed on 20 April.

2.2 Case definition

The case definition for the analytical component was finalised after data collection in light of individuals who reported no 'illness' but then indicated the presence of several symptoms. The case definition was symptom based.

Case

An individual reporting at least two of the following symptoms within seven days of eating at The Fat Duck restaurant between 6 January and 22 February 2009 as a member of a party including at least one complainant.
a. Nausea. b. Vomiting. c.Diarrhoea or loose stool.

Control

An individual not reporting illness or any symptoms after eating at The Fat Duck restaurant between 6 January and 22 February 2009 as a member of a party including at least one complainant.

Individuals reporting symptoms or illness but not meeting the case definition were excluded from analyses.

2.3 Analysis

Data was reviewed to remove duplicates, correct clear data entry errors and evaluate data quality.

Data description by tabulation and graphs was used to describe the symptom pattern, incubation time, epidemic curve and assess any temporal patterning of attack rate.

Association between consumption of particular menus or dishes with illness was assessed by tabulation and logistic regression analysis. Conditional logistic regression was performed for cases and controls from parties which included both case and control respondents in line with the recruitment approach based on dining parties with cases. Unmatched logistic regression analysis (allowing inclusion of parties with only cases or only controls) was also performed to allow inclusion of a greater number of case and control respondents from parties which did not include both cases and controls. Each analysis used all available data.

Multivariate analysis was performed for those exposures showing statistical evidence (at $p<0.1$) on univariate analysis. Since many exposures had evidence for association in the unmatched analysis a stepwise approach was used to simplify an initial multivariate model with these exposures. The approach was to first exclude those exposures which reversed their direction of association in the multivariate model and then remove those factors that retained an association but with $p>0.1$. One exposure was removed at each iteration of this process.

2.4 Interim analysis

A preliminary interim analysis was performed on 23 March 2009 on uncleaned data available up to that day.

2.5 Secondary spread

Substantial reporting of illness among contacts of cases was identified on interim analysis, and some free text

comments suggesting that these included those who had also eaten at the restaurant as well as the true secondary cases that these questions had sought. Those reporting illness in contacts were emailed to confirm which reports represented true secondary spread.

III. RESULTS

3.1 Preliminary analysis

Data from 374 responses showed incubation times and symptom patterns consistent with norovirus infection. It showed no evidence for substantial variation in attack rate during late January and early February. Eighty three responses described illness among their contacts. This analysis also indicated an association of illness with consumption of the 'Sound of the Sea' seafood dish and with 'Quail Jelly with Langoustine Cream and Foie Gras Parfait'.

Table 2: Symptoms reported by cases (n=240)

Symptom	Number reporting
Diarrhoea (three or more in 24 hours)	197
Nausea	188
Vomiting	175
Loose stools (one or two in 24 hours)	68
Headache	103
Fever	102
Abdominal pain	155
Muscle ache/flu-like symptoms	114
Weight loss	75
Blood in stool	5

3.2 Secondary cases

A follow up email was sent to 103 survey respondents reporting similar illness in their contacts in response to the survey question 'Identifying spread to other people who did not eat at the restaurant will help us in confirming which type of infection caused the symptoms.
Q24 Did anyone in close contact with you (for example household members) become unwell with vomiting or vomiting and diarrhoea in the week after your own symptoms started?' The email queried again whether these ill contacts had not eaten with the restaurant Fifty-one respondents replied, with only six confirming that the ill contacts had not been at restaurant indicating that the large majority of these cases may represent co-primary cases rather than secondary spread.

3.3 Descriptive epidemiology

There were 441 responses to the survey. Out of these 24 were duplicate entries and 31 reported to have dined outside the study period leaving 386 individuals who reported dining at The Fact Duck restaurant between 6 January and 22 February 2009. Of these, 240 individuals met the case definition and 79 met the control definition. Sixty-seven respondents met neither definition (Table 1).

Study population, respondents, cases and controls.

Diners in study population	Respondents	Diners 6 Jan and 22 Feb 2009	Cases	Controls	Not meeting case or control definition
591	441	386	240	79	67

Figure 1. Time between eating and becoming ill among diners reporting illness after eating at The Fat Duck restaurant between 6 January and 22 February 2009.

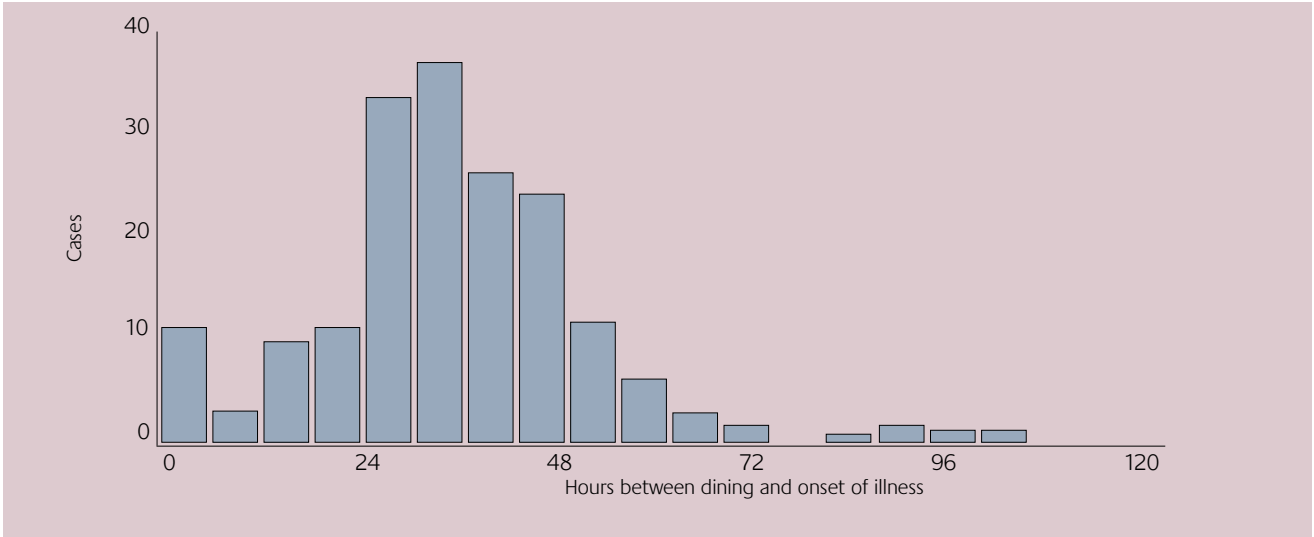


Figure 2.
Duration of illness reported by cases dining at the Fat Duck restaurant from 6 January until 22 February (n=227).

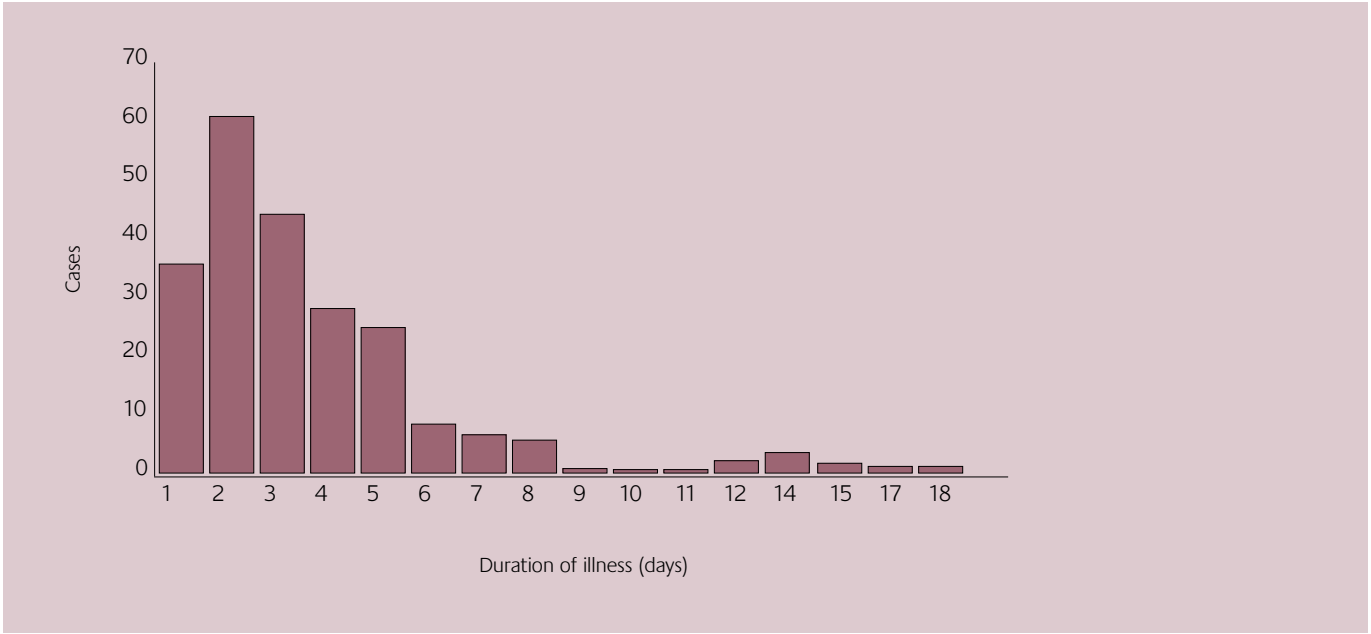
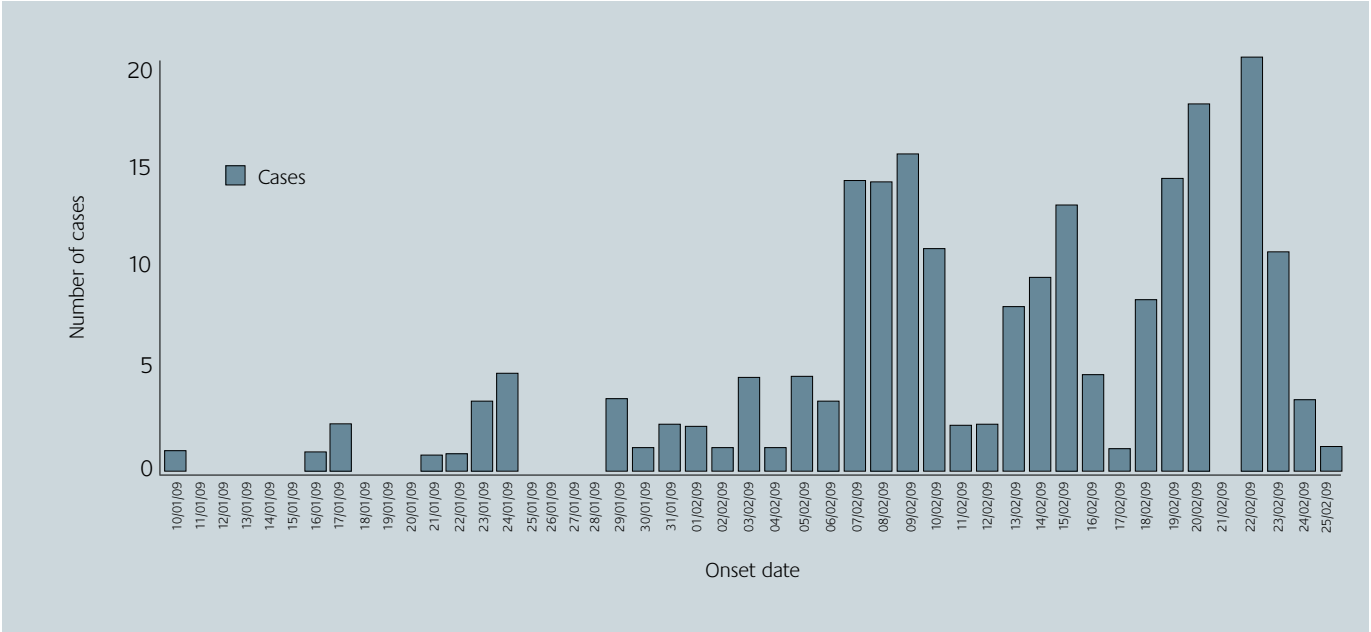
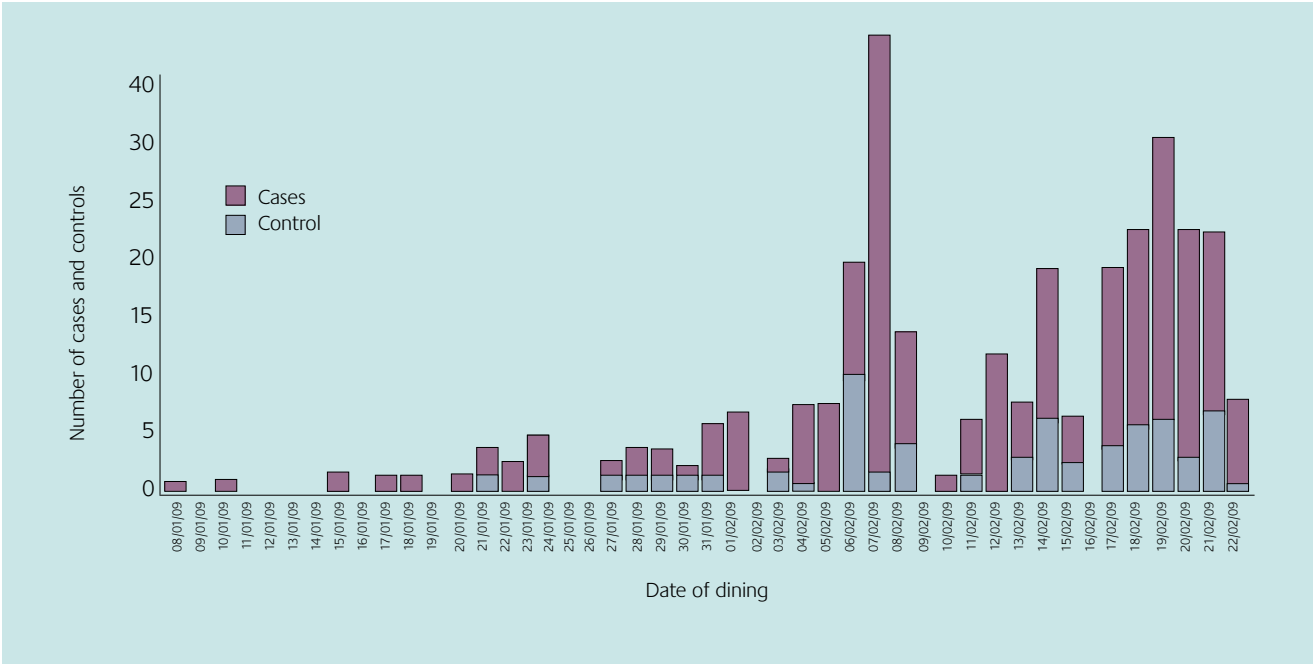


Figure 3. Date of onset of symptoms among cases dining at the Fat Duck restaurant between 6 January and 22 February 2009.



Although cases increase over time this may be affected by both the attack rate of illness and differential complaint rates among those ill shortly before the publicity regarding the outbreak. Among the parties studied there is no strong evidence for increased attack rates over the time studied (likelihood ratio test p>0.5 and Figure 4).

Figure 4. Cases and controls by date of dining at The Fat Duck restaurant between 6 January and 22 February 2009.



3.4 Analytical epidemiology

There was no evidence of illness varying between lunch or dinner service but a substantially increased risk among those eating from the Tasting Menu compared to those eating the Á la Carte Menu (Table 3 and p=0.037). The large majority of diners consume the Tasting Menu. No individual foods on the Á la Carte menu showed statistical evidence for association with reported illness.

Table 3: Cases and controls by date of dining at The Fat Duck restaurant between 6 January and 22 February 2009.

Menu eaten	Cases	Controls	Total
Tasting	215	66	281
Á la Carte	12	10	22
Both	13	2	15
Total	240	78	31

The consumption of foods on the tasting menu by cases and controls is summarised in Table 4.

Tables 5 and 6 show significant associations between food and illness from analysis restricted to the 68 cases and 59 controls who were members of one of the 47 parties including both cases and controls. This analysis uses conditional logistic regression conditioned on dining party consistent with the study design. There is evidence at the statistical cut off of $p<0.1$ for three dishes (all with $p< 0.05$) on univariate analysis, the 'Sound of the Sea' seafood dish, the 'Jelly of Quail, Langoustine Cream, Parfait of Foie Gras' dish and the 'Nitro-Scrambled Egg and Bacon Ice Cream'. The strongest association is with the 'Sound of the Sea' dish, which is also the most robust to multivariate analysis (Table 6).

Table 4: Food items consumption reported by cases and controls at The Fat Duck restaurant, 6 January to 22 February 2009.

	CASE			CONTROL		
	Ate	Ate part	Not eaten	Ate	Ate part	Not eaten
Food items						
Oyster, Passion Fruit Jelly, Lavender	222	4	2	57	3	11
Snail Porridge	215	6	5	60	6	3
Salmon Poached in Liquorice Gel	217	7	2	60	5	3
Parsnip Cereal	217	2	5	63	1	5
Roast Foie Gras Benzaldehyde	209	8	8	56	3	8
Nitro Scrambled Egg and Bacon Ice Cream	215	7	4	59	3	7
Jelly Of Quail, Langoustine Cream, Parfait Of Foie Gras	211	11	4	54	8	7
Sound of the Sea	209	15	2	54	8	7
Nitro-Scrambled Egg and Bacon Ice Cream						
Nitro Green Tea Lime Mousse	225	1	0	69	0	0
Pommery Grain Mustard Ice Cream Red Cabbage Gazpacho	225	1	0	70	0	0
Oak Moss Truffle Toast	225	1	0	67	2	0
Ballotine of Anjou Pigeon	217	3	6	62	3	3
Hot and Iced Tea	221	3	0	68	0	1
Mrs Marshalls Margaret Cornet	228	0	0	69	1	0
Pine Sherbet Fountain PreHit	226	0	0	67	1	0
Mango and Douglas Fir Puree	223	1	0	66	1	1
Petits Fours	214	5	7	61	2	5

Table 5: Food items on the Tasting Menu associated with illness at p<0.1. Univariate analysis within matched design.

Food items	Conditional odds ratio	95% CI	P-value
Jelly Of Quail, Langoustine Cream, Parfait Of Foie Gras	9.7	1.04–90.2	0.046
Sound of the Sea	13.8	1.4–133.9	0.023
Nitro-Scrambled Egg and Bacon Ice Cream	9.1	0.98-84.6	0.053

Table 6: Food items on the Tasting Menu associated with illness. Multivariate analysis within matched design.

Food items	Conditional odds ratio	95% CI	P-value
Jelly Of Quail, Langoustine Cream, Parfait Of Foie Gras	1.7	0.10-27.8	0.704
Sound of the Sea	7.7	0.57-103.18	0.123
Nitro-Scrambled Egg and Bacon Ice Cream	4.2	0.26–68.8	0.321

The relatively small numbers and limited exposure variation (since most people ate most dishes) leads to non-convergence in many analyses in a matched analysis. Standard logistic regression analysis allows inclusion of the other 172 cases and 20 controls. The results of this are presented in Table 7.

The two dishes containing shellfish ('Oyster, Passion Fruit Jelly, Lavender' and 'Sound of the Sea') show the strongest associations followed by the 'Jelly of Quail, Langoustine Cream, Parfait of Foie Gras' dish. Although many other dishes show some evidence for association on univariate analysis this is not robust to multivariate analysis. In a model including all of the factors with evidence for association the associations with 'Snail Porridge', 'Roast Foie Gras', and 'Parsnip Cereal' are completely lost (reversed). Full stepwise elimination leaves only the 'Oyster, Passion Fruit Jelly, Lavender' with a significant association.

Table 7: Food items on the Tasting Menu associated with illness. Logistic regression ignoring matching with all available data – results with p<0.1

Food items	Conditional odds ratio	95% CI	P-value
Oyster, Passion Fruit Jelly, Lavender	18	4.8-68	<0.001
Sound of the Sea	8.4	2.6-26.6	<0.001
Jelly Of Quail, Langoustine Cream, Parfait Of Foie Gras	7.1	2.4-21.5	<0.001
Salmon Poached in Liquorice Gel	5.8	1.3-25.5	0.019
Nitro Scrambled Egg and Bacon Ice Cream	5.4	1.7-17	0.004
Snail Porridge	3.4	0.9-11.9	0.055
Parsnip Cereal	3.4	0.9-11.7	0.052
Roast Foie Gras Benzaldehyde	3.4	1.3-9.1	0.012

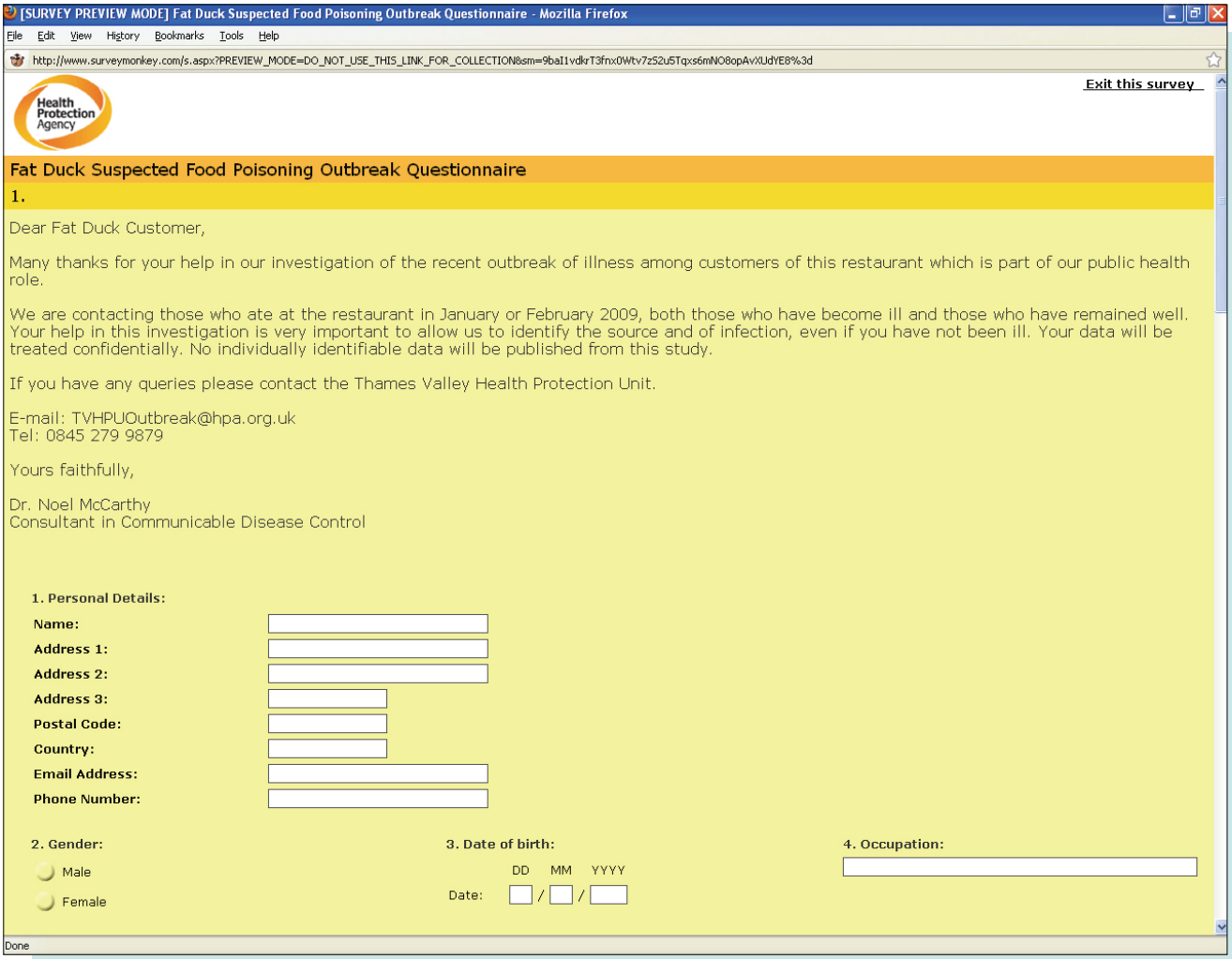
IV Conclusion

The findings of the epidemiological study are consistent with a large norovirus outbreak among diners at The Fat Duck restaurant during January and February 2009, with most of those reporting illness describing symptoms, incubation times and duration of illness consistent with norovirus acquired at the restaurant. Eating at the restaurant appears to have posed a risk of infection throughout the period from late January until closure on 22 February and possibly earlier in January. There is some epidemiological evidence for association of two shellfish-containing dishes ('Oyster, Passion Fruit Jelly, Lavender' and 'Sound of the Sea') and one other ('Jelly Of Quail, Langoustine Cream, Parfait Of Foie Gras') with illness. Other associations observed have a high probability of being due to confounding while these main associations are robust to the analytical approach taken.

8.6 Questionnaire from internet survey

The survey is accessible at the following websjte with the format as shown in the screen shot below. The content of the survey is given in the following pages.

https://www.surveymonkey.com/s.aspx?sm=c3uCnPT5E6GbX5pZOr3YXA_3d_3d



Fat Duck Suspected Food Poisoning Outbreak Questionnaire

1.

Dear Fat Duck Customer,

Many thanks for your help in our investigation of the recent outbreak of illness among customers of this restaurant which is part of our public health role.

We are contacting those who ate at the restaurant in January or February 2009, both those who have become ill and those who have remained well. Your help in this investigation is very important to allow us to identify the source and of infection, even if you have not been ill. Your data will be treated confidentially. No individually identifiable data will be published from this study.

If you have any queries please contact the Thames Valley Health Protection Unit.

E-mail: TVHPUOutbreak@hpa.org.uk
Tel: 0845 279 9879

Yours faithfully,

Dr. Noel McCarthy
Consultant in Communicable Disease Control

1. Personal Details:

Name:
Address 1:
Address 2:
Address 3:
Postal Code:
Country:
Email Address:
Phone Number:

2. Gender:

- Male
- Female

3. Date of birth:

Date: DD / MM / YYYY

4. Occupation:

5. Please specify the date you dined at the Fat Duck restaurant:

Date: DD / MM / YYYY

Page 1

Fat Duck Suspected Food Poisoning Outbreak Questionnaire

6. Did you eat lunch or dinner?

- ○ Lunch
- ○ Dinner

7. Please specify which menu you ate from?

- ○ Tasting Menu (Go to question 8)
- ○ A la Carte Menu (Go to question 10)
- ○ Both (Answer questions 8 & 10)

8. The Tasting Menu: What did you eat? The first 5 items are served together as "Homage to Alain Chapel". Each dish after these 5 are served as a separate course. Please indicate below what you ate. Question 9 will allow you to specify items that you did not eat if you ate part of a dish.

	Eaten	Not eaten	Ate part of dish	Don't know
Nitro-Green Tea & Lime Mousse	○	○	○	○
Oyster, Passion Fruit Jelly, Lavender	○	○	○	○
Pommery Grain Mustard Ice Cream, Red Cabbage Gazpacho	○	○	○	○
Jelly Of Quail, Langoustine Cream, Parfait Of Foie Gras	○	○	○	○
Oak Moss & Truffle Toast	○	○	○	○
Snail Porridge	○	○	○	○
Roast Foie Gras "Benzaldehyde"	○	○	○	○
Sound of the Sea	○	○	○	○
Salmon Poached in Liquorice Gel	○	○	○	○
Ballotine of Anjou Pigeon	○	○	○	○
Hot and Iced Tea	○	○	○	○
Mrs Marshall's Margaret Cornet	○	○	○	○
Pine Sherbet Fountain (Pre-Hit)	○	○	○	○
Mango and Douglas Fir Puree	○	○	○	○
Parsnip Cereal	○	○	○	○
Nitro-Scrambled Egg and Bacon Ice Cream	○	○	○	○
Petits Fours	○	○	○	○

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Fat Duck Suspected Food Poisoning Outbreak Questionnaire

9. If you only ate part of one of the food items in The Tasting Menu, please specify which part you did NOT eat for each dish:

Nitro-Green Tea & Lime Mousse	
Oyster, Passion Fruit Jelly, Lavender	
Pommery Grain Mustard Ice Cream, Red Cabbage Gazpacho	
Jelly Of Quail, Langoustine Cream, Parfait Of Foie Gras	
Oak Moss & Truffle Toast	
Snail Porridge	
Roast Foie Gras "Benzaldehyde"	
Sound of the Sea	
Salmon Poached in Liquorice Gel	
Ballotine of Anjou Pigeon	
Hot and Iced Tea	
Mrs Marshall's Margaret Cornet	
Pine Sherbet Fountain (Pre-Hit)	
Mango and Douglas Fir Puree	
Parsnip Cereal	
Nitro-Scrambled Egg and Bacon Ice Cream	
Petits Fours	

Page 3

Fat Duck Suspected Food Poisoning Outbreak Questionnaire

10. A la Carte Menu: What did you eat? Please indicate below what you ate. Question 11 will allow you to specify items that you did not eat if you ate part of a dish.

	Eaten	Not eaten	Ate part of dish	Don't know
Starter: Crab Biscuit	○	○	○	○
Starter: Cauliflower Risotto	○	○	○	○
Starter: Lasagne Of Langoustine	○	○	○	○
Starter: Roast Scallop	○	○	○	○
Starter: Radish Ravioli Of Oyster	○	○	○	○
Main: Pot Roast Loin Of Pork, Braised Belly	○	○	○	○
Main: Saddle Of Venison	○	○	○	○
Main: Sole Veronique	○	○	○	○
Main: Best End Of Lamb	○	○	○	○
Main: Roast Turbot	○	○	○	○
Dessert: Délice Of Chocolate	○	○	○	○
Dessert: Chanteclerc Apple	○	○	○	○
Dessert: Mango & Douglas Fir Puree	○	○	○	○
Dessert: Black Forest Gateau	○	○	○	○
Dessert: Galette of Rhubarb, Neroli Scented Yoghurt	○	○	○	○
Dessert: Cheese	○	○	○	○

Other (please specify)

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Fat Duck Suspected Food Poisoning Outbreak Questionnaire

11. If you only ate part of one of the food items in the a la carte menu, please specify which part you did NOT eat for each dish:

Starter: Crab Biscuit	
Starter: Cauliflower Risotto	
Starter: Lasagne Of Lanoustine	
Starter: Roast Scallop	
Starter: Radish Ravioli Of Oyster	
Main: Pot Roast Loin Of Pork, Braised Belly	
Main: Saddle Of Venison	
Main: Sole Veronique	
Main: Best End Of Lamb	
Main: Roast Turbot	
Dessert: Délice Of Chocolate	
Dessert: Chanteclerc Apple	
Dessert: Mango & Douglas Fir Puree	
Dessert: Black Forest Gateau	
Dessert: Galette of Rhubarb, Neroli Scented Yoghurt	
Dessert: Cheese	

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Fat Duck Suspected Food Poisoning Outbreak Questionnaire

2.

12. Was there any other food offered that you did NOT eat?

- ○ Yes
- ○ No (Go to question 14)

13. Please list any of these other foods offered that you did NOT eat:

Item 1:
Item 2:
Item 3:
Item 4:
Item 5:

14. Have you had any illness after the meal?

- ○ Yes
- ○ No (Questionnaire complete, please go to the end of questionnaire (Q 26) and then enter "Done" to submit)

15. Please specify all of the symptoms you have experienced:

- ☐ Abdominal pain
- ☐ Blood in stool
- ☐ Diarrhoea (3 or more in 24 hours)
- ☐ Fever
- ☐ Headache
- ☐ Loose stools (1 or 2 in 24 hours)
- ☐ Muscle ache/flu-like symptoms
- ☐ Nausea (feeling sick)
- ☐ Vomiting (being sick)
- ☐ Weight Loss

Other (please specify)

16. When did your symptoms start?

	DD	MM	YYYY	HH	MM	AM/PM
Please specify:	/	/		:		

17. How long did the illness last?(Days)

Please specify:

18. Did you see a Doctor about this illness?

- ○ Yes
- ○ No (Go to question 24)

Fat Duck Suspected Food Poisoning Outbreak Questionnaire

19. Please specify the name and address of the Doctor:

Dr Name:

Surgery/Hospital Name:

Address 1:

Address 2:

Address 3:

County

Postal Code:

Email Address:

Phone Number:

20. Have you had a stool sample (faeces) taken?

- Yes
- No (Go to question 24)

21. Has a result been obtained?

- Yes
- No (Go to question 23)

22. If yes, please give results if known:

We are providing extra testing of samples from people affected by this outbreak. We may contact them to confirm the laboratory results and may arrange for further testing at the national reference laboratory if the sample is still available.

23. Do we have your permission to contact your doctor to discuss your sample results?

- Yes
- No

Identifying spread to other people who did not eat at the restaurant will help us in confirming which type of infection caused the symptoms.

24. Did anyone in close contact with you (for example household members who did not eat at the restaurant) become unwell with vomiting or vomiting and diarrhoea in the week after your own symptoms started?

- Yes
- No

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Fat Duck Suspected Food Poisoning Outbreak Questionnaire

25. If yes, How many people?

Specify:

26. Please fill in the surname of the head of your party (the person who booked)

Thank you for taking your time to complete this questionnaire.

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8.7 Microbiology results for diners

Diners	Party	Date of dining	Onset date	Lab results	Genogroup	Genotype
D1	1	20/02/2009	122/02/2009	Norovirus	I & II	-
D2	1	20/02/2009	22/02/2009	Norovirus	II	6
D3	1	20/02/2009	24/02/2009	Norovirus	II	4
D4	1	20/02/2009	22/02/2009	Norovirus	I & II	4 & 3
D8	4	22/02/2009	23/02/2009	Norovirus	II	-
D9	4	22/02/2009	23/02/2009	Norovirus	-	-
D12	2	18/02/2009	20/02/2009	Norovirus	II	-
D14	3	20/02/2009	22/02/2009	Norovirus	II	-
D17	5	21/02/2009	23/02/2009	Norovirus	II	4
D18	5	21/02/2009	23/02/2009	Norovirus	II	6

8.8 Staff questionnaire

STAFF QUESTIONNAIRE

SUSPECTED FOOD POISONING OUTBREAK QUESTIONNAIRE
THE FAT DUCK RESTAURANT

Please complete the form carefully by giving details or marking boxes, as appropriate
All replies will be completely confidential.

If you require more space please continue on another page, writing the question number by your answer.

Personal Details

Name (first)……Surname……

Sex: M ☐ F ☐ Date of Birth: ……

Address: ……

……Postcode: ……

Tel No: Home: …… Work: ……

Role at the Fat Duck: ……

How long have you been employed at the Fat Duck?

Other activities, outside of work, that may involve handling food and/or child care:

……

……

GP Name and Address: ……

……Postcode: ……

The Fat Duck Restaurant

Do you routinely eat food at The Fat Duck during your working hours?

Yes ☐ No ☐ If yes, what did you eat……

Do you have tasters of the food whilst working?

Yes ☐ No ☐ If yes, what did you eat……

Did you notice anything wrong with food available? Yes ☐ No ☐ Not Sure ☐

If Yes, please state any comments: ……

……

Your Health

Have you had any illness during January or February 2009: Yes ☐ No ☐

If No please go to **'Other People'**, if Yes, complete below:

Symptoms (please circle all you have experienced, and delete those you have not had)

Nausea (feeling sick) Vomiting (being sick) Headache Fever Abdominal pain

Muscle ache/flu-like symptoms Loose stools (1 or 2 in 24 hours) Weight Loss

Diarrhoea (3 or more in 24 hours) Blood in stool Other ……

1. When did your symptoms start?: ……. a.m. / p.m. on ……. day Date: ……/ ……/ 200…

2. How long did the illness last? ……. days

3. Did you spend time off work due to this illness? Yes ☐ No ☐ If Yes, how long? ….days

4. Did you attend work whilst feeling unwell? Yes ☐ No ☐

If yes, what symptoms did you have at work?

If no, how many days were you symptom free before returning to work?

5. Did you see your GP/Family Doctor about this illness? Yes ☐ No ☐

6. Have you had a stool sample taken? Yes ☐ No ☐

7. If yes has result been obtained?……Causative organism?……

8. Were you admitted to hospital for this illness? Yes ☐ No ☐

If Yes, for how long? Date: ……/……/200… to ……/……/200..

Hospital Name and Address: ……

……Postcode: …… Tel No. ……..

9. When did your symptoms end?: ……. a.m. / p.m. on ……. day Date: ……/ ……/ 200…

Other People:

9. Who else lives in your household?

Do any of these people work at the Fat Duck?

Has anyone in your household been unwell?

If Yes, give details:

Name	Address	Date of Birth	Relationship to You	Occupation	Telephone No.

11. If you know, when did the first of these people become ill?
a. Name: …… Ill at: …… am/pm on: ……. day Date: ……

Have they completed a questionnaire? Yes ☐ No ☐ Don't Know ☐

b. Name: …… Ill at: …… am/pm on: ……. day Date: ……

12. Do any household members attend a nursery / child minder/ school? Yes ☐ No ☐

a. If Yes, please give name of child: …… Type of premises:……

Premises Name and Address: ……

……Postcode: ……..

b. Other child: …… Type of premises:……

Premises Name and Address: ……

……Postcode: ……..

Other Exposures

14. Did you spend any nights away from home in the 2 weeks before your illness? Yes ☐ No ☐

If yes, were you:-

Staying locally: Yes ☐ No ☐ In the UK: Yes ☐ No ☐
Abroad: Yes ☐ No ☐ Both UK & Abroad: Yes ☐ No ☐

15. Please list: Place visited Dates From & To

……. ……..

……. ……..

If Yes, where? …… Date: ……

16. Have you taken part in water based activities in the 2 weeks before your illness? Yes ☐ No ☐

Public Pool ☐ River ☐ Sea ☐ Lake ☐ Other ☐

If Yes, where? ……

17. Have you visited a farm in the 2 weeks prior to your illness? Yes ☐ No ☐

If Yes, where? ……

18. Had you eaten at another restaurant/café in the two weeks prior to being unwell? Yes ☐ No ☐

If Yes, where and when? ……

19. Do you keep pets? Yes ☐ No ☐ If Yes, what? ……

20. Any other animal contacts (particularly poultry)? Yes ☐ No ☐ If Yes, what?……

21. Have you recently consumed water from a:

Well? Yes ☐ No ☐ Spring? Yes ☐ No ☐ Borehole? Yes ☐ No ☐

If Yes, where from? ……

22. Have you eaten any un-pasteurised dairy products in the 2 weeks prior to your illness? Yes ☐ No ☐ If Yes, what?……

I understand that any information given in this form may be used in evidence should formal action be taken.

Signature: …… Date: ……

Thank you for helping us by completing this questionnaire.

8.9 Staff investigations and results

Staff	Onset date	Returned to work while feeling unwell	Lab results	Genogroup	Genotype
S1	24/02/2009	N	Norovirus	-	-
S2	09/01/2009	N	Norovirus	II	6
S3	14/12/2008	N	Norovirus	II	-
S4	15/02/2009	N	Norovirus	II	2
S5	06/02/2009	Y	Norovirus	II	-
S6	--/01/2009	N	Norovirus	II	4

8.10 Food microbiology

Table : Samples from food remaining at the Fat Duck restaurant and sampled by RBWMUA.

Date Collected	Sample Type	Test	Result	Interpretation	Notes
26/02/09	Raw cockles	*E. coli* /g Vibrio /g *Salmonella*	<3 <20 Not detected	Satisfactory	Unable to send for norovirus testing due to small quantities
	Raw razor clams*	*E. coli* /g Vibrio /g Salmonella	<3 <20 Not detected	Satisfactory	
	Cooked razor clams	Enterobacteriaceae /g *E. coli* /g Vibrio /g Salmonella *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g	4.9×10^4 <3 <20 Not detected <20 <10 5.7×10^4	Unsatisfactory Enterobacteriaceae count, indicating poor hygiene	Norovirus testing not appropriate on cooked foods
	Cooked cockles	Enterobacteriaceae /g *E. coli* /g Vibrio /g Salmonella *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g	<10 <3 <20 Not detected <20 <10 2.2×10^3	Satisfactory	
03/03/09	Quail consomme	Enterobacteriaceae /g *E. coli* /g *Clostridium perfringens*/g *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g Salmonella in 25g	<10 <20 <10 <20 <20 <2.0 x 10^2 Not detected	Satisfactory	
	Raw foie gras	Salmonella in 25g Campylobacter in 25g	Not detected Not detected	Satisfactory	
	Snail butter	Enterobacteriaceae /g *E. coli* /g *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g Salmonella in 25g	2.2×10^3 <20 <20 <20 5.5×10^4 Not detected	Acceptable	
	Violet tart mix	Enterobacteriaceae /g *E. coli* /g Staphylococcus aureus /g Listeria /g Aerobic colony count /g Salmonella in 25g	<10 <20 <20 <20 <2.0 x 10^2 Not detected	Satisfactory	
	Praline rose mix	Enterobacteriaceae /g *E. coli* /g *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g Salmonella in 25g	<10 <20 <20 <20 <2.0 x 10^2 Not detected	Satisfactory	
	Raw pea puree	Enterobacteriaceae /g *E. coli* /g *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g Salmonella in 25g	<10 <20 <20 <20 <3.4 x 10^4 Not detected	Satisfactory	
	Cooked snails	Enterobacteriaceae /g *E. coli* /g *Clostridium perfringens*/g *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g Salmonella in 25g	<10 <20 <10 <20 <10 <2.0 x 10^2 Not detected	Satisfactory	

Date Collected	Sample Type	Test	Result	Interpretation	Notes
	Jabuga ham	Enterobacteriaceae /g *E. coli* /g *Clostridium perfringens*/g *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g Salmonella in 25g	<10 <20 <10 <20 <20 1.0×10^3 Not detected	Satisfactory	
	Cooked snails	Enterobacteriaceae /g *E. coli* /g *Clostridium perfringens*/g *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g Salmonella in 25g	<10 <20 <10 <20 <10 $<2.0 \times 10^2$ Not detected	Satisfactory	
	Langoustine cream	Enterobacteriaceae /g *E. coli* /g Vibrio /g Salmonella *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g	4.3×10^3 20 <20 Not detected <20 <10 7.6×10^4	Borderline levels of Enterobacteriaceae and E.coli, indicating possible hygiene problems	
	Seaside stock	Enterobacteriaceae /g *E. coli* /g Vibrio /g Salmonella *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g *Clostridium perfringens*/g	<10 <20 <20 Not detected <20 <10 $<2.0 \times 10^2$ <10	Satisfactory	
	Tomato jam	Enterobacteriaceae /g *E. coli* /g *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g Salmonella in 25g	<10 <20 <20 <20 $<2.0 \times 10^2$ Not detected	Satisfactory	
	Parsnip milk	Enterobacteriaceae /g *E. coli* /g *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g Salmonella in 25g	<10 <20 <20 <20 $<2.0 \times 10^2$ Not detected	Satisfactory	
	Seaside sand	Enterobacteriaceae /g *E. coli* /g *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g Salmonella in 25g	<10 <20 <20 <20 1.6×10^3 Not detected	Satisfactory	
	Dried pancetta	Enterobacteriaceae /g *E. coli* /g *Clostridium perfringens*/g *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g Salmonella in 25g	<10 <20 <10 <20 <20 $<2.0 \times 10^2$ Not detected	Satisfactory	
	Cooked foie gras	Enterobacteriaceae /g *E. coli* /g *Clostridium perfringens*/g *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g Salmonella in 25g Campylobacter in 25g	<10 <20 <10 <20 <20 $<2.0 \times 10^2$ Not detected Not detected	Satisfactory	

Date Collected	Sample Type	Test	Result	Interpretation	Notes
	Parsnip chips	Enterobacteriaceae /g *E. coli* /g *Staphylococcus aureus* /g Listeria /g Aerobic colony count /g Salmonella in 25g	<10 <20 <20 <20 3.8×10^3 Not detected	Satisfactory	
04/03/09	Ice	Coliforms in 100ml *E. coli* in 100ml Enterococci in 100ml Sulphite reducing clostridia in 100ml	1 Not detected Not detected Not detected		

8.11 Environmental testing summary and results

Table : Environmental samples tested for norovirus with results.

Date submitted	Site of swabbing	Norovirus result
04/03/09	iPod shell	Not detected
	iPod shell	Not detected
	Mens toilet door (leather part)	Not detected
	Mens toilet door (hand height)	Not detected
	Ladies toilet door (leather part)	Not detected
	Ladies toilet door (hand height)	Not detected
	Office floor	Not detected
	Office light switch	Not detected
	Ladies toilet inside door handle	Not detected
	Mens toilet inside door handle	Not detected
	Banister to upstairs	Not detected
	Cutlery drawer inside	Not detected
	Radiator by table 5	Not detected
	Blind by table 5	Not detected
	Skirting by table 5	Not detected
	Menu cover	Not detected
	Food drier	Not detected
	Air conditioning unit vent table 5	Not detected
	Air conditioning unit vent table 4	Not detected
	Vac pack machine	Not detected
	Stair banister knob	Not detected
	Wooden blocks	Not detected
	iPod ear pieces	Not detected
	Ladies flush	Not detected
	Mens flush	Not detected
	Food drier bottom	Not detected

8.12 Source tracing of food products (shellfish)

Test results from oysters in Colchester.

Food	Sample	Species	Results	Test date
Shellfish	A straight from the water, Pyefleet spit	*Crassostrea gigas*	Norovirus Genogroup I & II	23/03/2009
Shellfish	B racks, on Pyefleet spit, Colchester Oyster Fisheries	*Crassostrea gigas*	Norovirus Genogroup I	23/03/2009
Shellfish	C straight from the water at south Geedon, Colchester Oyster Fisheries	*Crassostrea gigas*	Norovirus Genogroup I & II	23/03/2009

Microbiology results for raw razor clam sample from Torbay Council.

Sample Type	Test	Result	Interpretation	Notes
Razor clams	Salmonella	Not detected		
	Vibrio	Not detected		
	E. coli	<20		
	Norovirus	DETECTED		Genogroup II (at limit of detection)

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