Rapport

Gastroenteritis outbreak during a ‘Christmas dinner’ in a hotel in Oslo. December 2012.

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Norsk sammendrag

Folkehelseinstituttet (FHI) ble den 13. desember 2012 varslet av Mattilsynets distriktskontor i Oslo om flere syke etter julebord 7. og 8. desember på et hotell i Oslo. Rundt 30 personer rapporterte om sykdom. Hotellet selv mistenkte at østers var årsaken til sykdomsutbruddet, ettersom gjestene ved kontakt med hotellet oppga å ha spist østers. Utfra symptombildet hos pasientene og opplysninger om inntak av østers ble norovirus mistenkt.

Omtrent samtidig ble det rapportert om to andre utbrudd knyttet til julebord ved hotell i andre steder i landet. Ettersom ett av de andre hotellene tilhørte samme hotellkjede, ble det besluttet at Folkehelseinstituttet skulle bistå kommuneoverlegen og det lokale Mattilsynet i den epidemiologiske delen av utbruddsetterforskningen, med tanke på en eventuell sammenheng mellom de to utbruddene.

Metode:

Vi gjorde en restrospektiv kohortundersøkelse. Kohorten besto av personer som hadde spist julebord ved hotellet 7. og 8. desember 2012. Datainnsamling ble gjort elektronisk. Utbruddsgruppen ved FHI laget et spørreskjema i Questback med spørsmål om blant annet kjønn, alder, eventuell sykdom og symptomer, samt hvilke matvarer vedkommende hadde spist. Lenke til spørreskjemaet ble sendt til kontaktpersonene for de gruppene som hadde bestilt julebord, og videreformidlet av disse. Et liknende spørreskjema ble sendt til ansatte ved hotellet, med noen ekstra spørsmål om arbeidsoppgaver og hvilke dager de hadde vært på jobb (se resultater til slutt). Analyser av innsamlede data ble gjort i STATA.

Resultater:

170 gjester svarte på spørreskjemaet Av de som svarte oppgav 41 at de hadde vært syke (angrepsrate 24%). Ingen pasienter har oppgitt å ha vært hos lege, og ingen hadde tatt avføringsprøve. Vi inkluderte 37 syke og 126 friske i analysene. Vi beregnet angrepsrate per måltid, og 17/92 ble syke etter middag på fredag (angrepsrate 18%). Angrepsraten etter middag lørdag var noe høyere; 20/71 ble syke (angrepsrate 28%). Inkubasjonstiden (tiden fra man spiste til man ble syk) var fra 6-112 timer, median 36 timer. De fleste var friske igjen etter 2 dager, men noen (7=19%) hadde en sykdomsvarighet på 4 dager eller mer. Rapporterte symptomer var magesmerter (76%), diare (70%), kvalme (59%), feber (49%), og/eller oppkast (43%). Analysene av eksponeringsfaktorene (hva gjestene hadde spist) vi fikk via det elektroniske spørreskjemaet, peker på at østers var årsaken til utbruddet, slik hotellet selv mistenkte. Det å spise gravet laks, stekt og marinert scampi, skalldyr, rødløk, rakørret servert med potet og karamellpudding viste også en svakt forhøyet risiko for sykdom, men videre analyser av dataene viste at denne risikoen skyldtes at de som spiste slik mat også spiste østers. Risiko for å bli syk etter å ha spist østers var 10x høyre enn når man ikke spiste østers, og 76% av de syke hadde spist østers. Ni av de som var syke sa at de ikke hadde spist østers, men 2 rapporterte at de hadde vært i kontakt med noe som hadde omgangssyke, og 1 var usikker på om de hadde hatt kontakt med noe med omgangssyke. En mulig forklaring på

sykdom hos de som ikke spiste østers er at de har blitt smittet av andre som var syke, eller at de har spist mat som har vært i kontakt med østersene eller bestikk/boller/annet som har vært i kontakt med østersene og således har blitt kryss-kontaminert. Vi konkluderte at utbruddet var ikke relatert til ved hotell i andre steder i landet på grunn av annet agens.

Mattilsynet har fulgt opp østerssporet og tatt prøver fra to partier østers importert fra samme produsent. Det ble påvist norovirus i disse østersene. Disse østersene har blitt destruert. Østersene var importert fra Nederland, og det Nederlandske Mattilsynet har derfor sendt ut en RASSF melding (et internasjonalt varsel) om de berørte produktene. Produsenten har tilbakekalt østersene.

Resultatene av spørreundersøkelsen blant de ansatte støtter opp om resultatene av undersøkelsen blant gjestene. Angrepsraten blant ansatte som spiste østers var 25% (2 ble syke av 8 som spiste østers). Dette viser at de ansatte antakelig ikke hadde noen rolle i utbruddet. Rutiner for å holde sykt personell hjemme 48 timer etter at de har blitt friske dersom de har diare eller oppkast, må likevel understrekes.

Summary

The Norwegian Public Health institute (FHI) was notified on 13 December 2012 by the Food Safety Authority (FSA) regional office in Oslo because around 30 persons had fallen ill after a Christmas dinner on 7 and 8 December at a hotel in Oslo. The hotel suspected that oysters were the cause of the outbreak, based on reports from guests, and norovirus was suspected to be the infectious agent. At the same time, two other outbreaks occurred linked to Christmas parties at hotels elsewhere in the country, including one in a hotel belonging to the same hotel chain. It was therefore decided that FHI would assist the municipal health officer and the FSA in the epidemiological part of the outbreak investigation.

Methods:

We performed a retrospective cohort study. Data was gathered using an online questionnaire with questions on sex, age, illness, symptoms, and consumed food items. The questionnaire was sent electrically to contacts of the groups that had booked the Christmas parties. The contacts were asked to forward the link to the other members of the group. A similar questionnaire was sent to the staff of the hotel, with some additional questions about what kind of work they performed in the kitchen and which days they had been working (see results in the end).

170 responded to the questionnaire of who 41 responded they had been ill (overall attack rate 24%). We included 37 cases and 126 non-cases in the analyses. Cases occurred both after the dinner on Friday (17/92; attack rate 18%) as well as after dinner on Saturday (20/71; attack rate 28%). The incubation period was between 6 and 112 hours (median 36 hours). Most cases recovered within 2 days, but some (7=19%) remained ill for 4 days or more. Reported symptoms were abdominal pain (76%), diarrhoea (70%), nausea (59%), fever (49%), and / or vomiting (43%).

The analytical analyses indicate that oysters were the cause of the outbreak, just as suspected by the hotel. Although cured salmon, shell fish, fried scampi with scallops in lime marinade, smoked trout served at potatoes, shellfish, red onion and caramel pudding also showed a slightly elevated risk, multivariable regression analysis indicated that oysters were the main source of the outbreak. The risk of becoming ill after having eaten oysters was 10x higher compared to when one had not eaten oysters. The attack rate among those who ate oysters was 74%, and 76% of the cases had eaten oysters. Nine cases had not eaten oysters. Contact with someone being ill or cross contamination of food through contact with oysters or cutlery / bowls / others who have been in contact with oysters may have caused their illness.

We concluded that this norovirus outbreak was unrelated to the other outbreaks that occurred simultaneously in Norway, because the infectious agent was very likely different (bacterial in the other outbreaks).

The regional food safety authority traced back the oysters. As no oysters of the same batch were left over, oysters from two later batches from the same importer were tested for norovirus. They appeared positive. The remaining oysters were destroyed and an international message was sent through the Rapid Alert System for Food and Feed (RASFF) because the oysters had been distributed to various countries. The company recalled all oysters of the infected batch.

The results of the survey among employees of the hotel support the results of the guest survey. The attack rate among those who ate oysters was 25% (2 of 8 who ate oysters got sick). It is unlikely that the staff played a role in the spread of the outbreak. Nevertheless, there seems to be a need for emphasizing the importance of food-handlers staying at home until 48 hours after recovery of gastrointestinal illness among employees of the hotel.

Introduction

Overview of the event

After eating dinner at a Christmas party on 7 and 8 December 2012 a hotel in Oslo, around 30 people reported gastrointestinal illness to the hotel. The first case reported illness at 9 December. During the week-end, 694 guests had eaten dinner. Because all ill guests reported to have eaten oysters, the restaurant suspected the oysters to be the cause of the outbreak. Because of the kind of food that was suspected, as well as the incubation time, norovirus was suspected as the infectious agent. The hotel reported furthermore that 5-6 cooks had eaten oysters at the end of the night, but none of them had become ill. Two other employees had eaten oysters and became ill, but none of them had handled food.

At 13 December 2012, the Norwegian Public Health institute (FHI) was notified by the regional Food Safety Authority (FSA) in Oslo. Because during the same time, two other gastroenteritis outbreaks were ongoing in Norway, from which one was from the same hotel-chain, it was decided that FHI should assist the municipal health officer and the local FSA in the epidemiological investigating of this outbreak.

Outbreak investigation

Epidemiological investigations

Patients and possible risk factors

Design

We performed a retrospective cohort study among all guests at the hotel and among the personnel of the hotel (the latter being reported in Appendix 2: Results of epidemiological study among employees of the hotel).

Objective

The aim of the outbreak investigation was to determine the source of the gastroenteritis outbreak that occurred among guests who ate at the hotel in the weekend of 7-8 December 2012.

Case definition
A case was defined as someone

- who ate from the buffet in the weekend of 7-8 December, 2012
- and suffered from at least 1 of the following gastrointestinal symptoms between 07-12-2012 and 12-12-2012: diarrhoea, vomiting, nausea, and/or abdominal pain for more than 12 hours.

We excluded persons who reported gastrointestinal symptoms but who were ill for less than 12 hours (n=5). We also excluded one person who reported gastrointestinal symptoms after 12 of December and who reported to have been in contact with someone with gastrointestinal symptoms, and one respondent who reported not to have eaten from the buffet/who answered very limited number of questions.

Data sampling
The hotel provided a list with contact persons of the various groups who had eaten dinner at the hotel during the appropriate weekend. FHI called the contact persons and asked whether they could forward an e-mail to all participants in their group with the question to respond to an online questionnaire. The questionnaire was available online through Questback from Friday 14 December 2012 up to Tuesday 1 January 2013. Through the online questionnaire we collected information on sex, with which group they had been visiting the hotel, about illness (which symptoms and time of onset, doctor visits, samples taken), contact with others with symptoms and food consumption during the dinner.

Data analyses
Data was extracted from Questback to Excel on 2 January 2013. Analyses were performed in STATA 12. The descriptive analyses included description of the respondents (sex, age, group), time of symptom onset, the kind of reported symptoms, contact with ill persons and the consumed food items. The analytical analysis included both univariable analyses and multivariable analysis. We determined the number of people exposed to the various food items, number of ill people among exposed and unexposed, attack rate (AR) and risk ratios (RR) with 95% confidence intervals (95% C.I.) of all 71 variables using the cstable command in STATA. In case someone had only indicated the food products that one had consumed, we assumed that one had not consumed any of the other products for which no answer was provided.

We selected variables for the multivariable analysis based on that at least 40% of the cases had eaten the product, and that the p value of the univariable analysis was smaller than 0.2. Multivariable analysis was performed using logistic regression with odds ratio (OR) as outcome, as the binomial regression and general linear model with binomial outcome did not convert. Only variables that were statistically significant with a p value of 0.05, remained in the model.

Microbiological investigations

Patient samples
None of the patients had provided a stool sample for laboratory investigation.

Environmental samples

At the moment of notification of the outbreak, the hotel had already checked for available oysters to test, but none were available. The FSA therefore contacted the supplier of the oysters to ask for remaining oysters of the same batch, to be able to perform laboratory testing. No oysters of the same batch were left over, but the supplier had oysters from the same importer but from two later batches (from 11 and from 13 December). The samples (4 in total) were tested for norovirus with M-VL.1.

Tracing of products and Environmental investigations

Because the importer of the oysters is located near Kongsberg, the regional FSA in Kongsberg traced back the oysters using their standard procedures. Inspection of the hotel was performed by the regional FSA in Oslo, and was conducted on 12 December 2012. No samples for laboratory confirmation were obtained from the hotel kitchen.

Results

Epidemiological investigation

Patients

170 guests answered the questionnaire of the cohort study. The response rate is unknown because it is unknown how many people received the questionnaire, as the questionnaire was distributed by email by the contact persons of the different groups and contact persons mentioned that they did not have all email addresses. Respondents were between 20 and 74 years old. 36% of the respondents were male. There was no difference in sex and median age-group (45-49 years) between cases and non-cases. Respondents had visited the hotel with 13 different groups.

37 guests fitted the case definition (from 163 included in the analysis), which gave an attack rate of 23%. Most cases fell ill on Sunday 9 and Monday 10 December (Figure 1). Half of the cases fell ill 36 hours after dinner (minimum 6 hours, maximum 112 hours; time for dinner was assumed to be at 20h). Cases had eaten at the hotel both at Friday 7 (17 ill of 92 guests) and at Saturday 8 December (20 ill of 71 guests). The attack rates were respectively 18 and 28%.

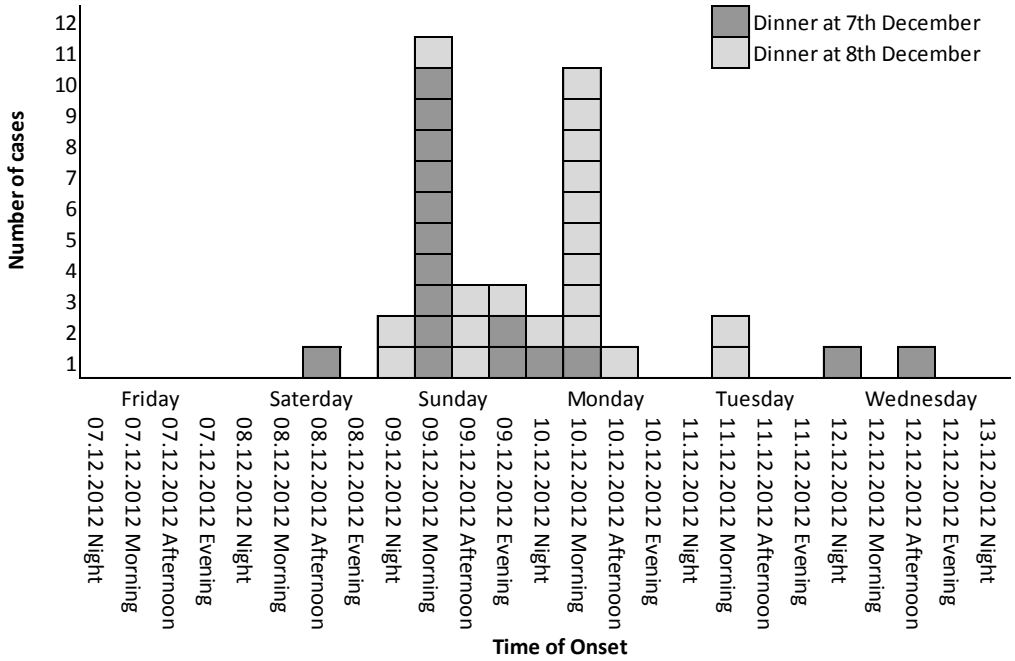

Figure 1: Distribution of date of onset of symptoms overtime by date of meal (Dark grey: 7 December, light grey: 8 December). Note that 1 case that had dinner at 7 December but did not report the time of onset, is assumed to have become ill in the morning.

Clinical picture

Half of the cases were ill for 2 days (minimum by definition >12 hours, maximum >4 days). For 78%, symptoms resolved within 3 days. The following symptoms were reported most often (Table 1): abdominal pain (76%), diarrhoea (70%) and nausea (59%). Nine cases did not suffer from diarrhoea, nor vomiting.

Table 1: Distribution of reported symptoms by cases fitting the first case definition.

Symptom	Frequency	Percentage of total
Abdominal pain	28	76
Diarrhoea	26	70
Nausea	22	59
Fever	18	49
Vomiting	16	43
Other symptoms*	8	22

*Other symptoms included, among others, head ache (n=2), stiff limbs (n=2) and muscle ache.

One cases reported to have visited a doctor, but this case did not deliver faeces for laboratory testing. Five cases reported to have been in contact with someone who suffered from gastroenteritis. Four of them became ill on 9 December and one on 11 December.

Analytical study

Univariable analysis

The number of cases and the attack rate of the different food items are presented in Appendix 1. For oysters, cured salmon, shell fish, fried scampi with scallops in lime marinade, smoked trout served at potatoes, shellfish, red onion and caramel pudding, the risk of becoming ill was

higher when one had eaten the product, compared to if one did not eat the product (p<0.2) and at least 40% of the cases had eaten those products (Table 2).

Table 2: Results of the univariable analysis. Only variables with a p value of <0.2 and which at least 40% of the cases had consumed are presented. 163 respondents were included in the analysis.

	Exposed			Unexposed			% of cases exposed	Univariable analysis	
	Total	Cases	AR%	Total	Cases	AR%		RR [95% CI]	P value
Oysters	38	28	74	125	9	7	76 %	10.2 [5.3-19.8]	<0.001
Shellfish	55	20	36	108	17	16	54 %	2.3 [1.3-4.0]	0.003
Smoked trout served on potatoes	46	17	37	117	20	17	46 %	2.2 [1.3-3.7]	0.006
Red onion	53	17	32	110	20	18	46 %	1.8 [1.0-3.1]	0.047
Fried scampi with scallops	77	22	29	86	15	17	59 %	1.6 [0.9-2.9]	0.090
Cured salmon	54	16	30	109	21	19	43 %	1.5 [0.9-2.7]	0.137
Caramel pudding	55	16	29	108	21	19	43 %	1.5 [0.9-2.6]	0.164
Baked pork ribs	114	22	19	49	15	31	59 %	0.6 [0.36-1.1]	0.114
Almond potato	120	22	18	43	15	35	59 %	0.5 [0.30-0.92]	0.026

Multivariable analysis
In the multivariable analysis, only the oysters remained in the model, which had an OR of 36 (CI 13-97) and a p-value of less than 0.001.

From those cases who reported not to have eaten oysters (n=9), 2 reported to have been in contact with someone with gastroenteritis within the last 4 days before the dinner, and 1 was unsure about whether or not to have been in contact with someone with gastroenteritis. The ones reporting not to have been in contact with someone with gastroenteritis had eaten at the restaurant on Friday. There was not one product that was eaten by all the cases that didn't eat oysters.

Microbiological investigation

Environmental samples
Oysters that came from the same supplier but from later batches were found positive for norovirus (three out of four samples). In the batch with expiration date 20.12.2012, norovirus GII was detected. In the batch with expiration date 24.12.2012, norovirus GI and GII were detected.

Tracing and Environmental investigations

Tracing
The oysters that were served by the hotel were supplied by a wholesaler in Oslo, to the hotel. The oysters (*Crassostrea gigas*) had been imported by an importer in Kongsberg from a

Dutch importer, and originated from Ireland. The oysters had been distributed to several countries.

Inspection of food services and manufacturing conditions

The oysters were stored in a refrigerated cupboard in the kitchen, but were not handled there. They were transported directly from the cupboard to the serving area (buffet), were they were opened and served to the guests by a waiter. The FSA did not find any deviations that could suspect cross- contamination to other food products or equipment.

Interpretation

Conclusions

The outbreak investigation indicates that the oysters, served on both days, were the cause of the outbreak in the hotel in December 2012. The oysters were eaten by 76% of the cases and had an attack rate of 74%. Those who ate oysters had a 10 times higher risk of becoming ill than those who did not eat oysters. Although having eaten cured salmon, shell fish, fried scampi with scallops in lime marinade, smoked trout served on potatoes, red onion and caramel pudding also showed a slightly elevated risk of disease, further analysis showed that this increased risk was possibly confounded by the fact that those who ate these products, also ate oysters. Nine people became ill without having eaten oysters. Some of them had been in contact with someone suffering from gastroenteritis prior to falling ill, and could possibly have contracted the disease from them. Another possible explanation for why these nine were ill can be that they have eaten food that has been in contact with oysters, or cutlery or bowls that have been in contact with oysters and thus have been cross-contaminated.

The symptoms reported by the cases in this outbreak are not completely within the normal range for reported symptoms in norovirus infections as described by Kaplan [1]: the percentage of cases who vomited was slightly lower (43%) than normally reported in norovirus outbreaks (>50%), and a slightly higher percentage than normally described had fever (49% compared to ‘one third’ reported by CDC). This is likely due to the fact that we used a sensitive case definition, while most outbreak investigations include only cases that suffer from at least vomiting or diarrhoea. In our study, 9 persons were ill without diarrhoea or vomiting, but 7 (78%) of them had eaten oysters. Our results therefore emphasized the dependence of the clinical picture in an outbreak on the choice of the case definition. Unfortunately, no stool samples were available for testing, and we can therefore not exclude the presence of a mixed infection in this outbreak. In spite of this, the fact that norovirus has been found in oysters supplied by the same importer, indicates that the infectious agent was norovirus. Raw oysters are a known source for norovirus outbreaks [2]. While bacteria are normally cleaned from oysters during cleaning procedures, norovirus can accumulate within the oyster [3]; the shells get contaminated from the water where they grow, and are even suspected to have specific receptors for norovirus. Norovirus is difficult to remove from oysters, even through cleaning [4]. Based on the infectious agent, we conclude that this norovirus outbreak was unrelated to the other outbreaks that occurred simultaneously in Norway (bacterial agent).

Implemented measures to stop the outbreak

After the notification of the outbreak, the FSA Kongsberg immediately informed the importer about the suspicion of the oysters being the source of the outbreak and requested an overview of oysters imported to Norway since 1 December. The wholesaler in Oslo withheld the oysters (from the batch of 11 December; as most of it was already distributed) while they were tested on 13 December. The importer did not yet recall earlier batches, because there were no reports of cases connected to the oysters in the Netherlands and test results on norovirus from the producer in the Netherlands were not positive. Furthermore, their test results of the UV-treated water in which the oysters were stored, were negative for *Escherichia coli*, faecal coliforms, ammonium and salmonella. When the results of the tested oysters in Norway were found to be positive, both the importer as well as the wholesaler ordered the contaminated batches to be destroyed. On 19 December, the FSA received documentation from the importer and the wholesaler which certified that no more oysters from this producer were available on the Norwegian marked. FSA has now demanded the importer to implement preventive measures, and the importer has informed FSA that they will only import oysters of which the batch has been tested for norovirus, and, which tested negative. This will be done for the coming time. In the meanwhile, prevention of norovirus infections in oysters will be discussed in the oyster-industry, as norovirus infections are a common problem in oysters.

Because the producer in the Netherlands had distributed the oysters also to other countries (Netherlands, Belgium, Denmark and German), a Rapid Alert System for Food and Feed (RASFF) message was distributed on 19-12-2012 by the Dutch FSA to notify the other countries about the infected batches.

Recommendations for preventing similar situations in the future

The rapid finding of norovirus in the oysters has led to the destruction and recall of infected oysters in different countries. This confirms the importance of timely notification through the RASFF of outbreaks caused by food items that are traded internationally. Timely RASFF messages enable producers / countries to recall the product from the market and to implement necessary control measures. Such timely data sharing should therefore continue.

In this outbreak, none of the cases had had a sample taken for laboratory confirmation. Although the laboratory results of the oysters, the incubation time and the symptoms more or less fit a norovirus outbreak, earlier laboratory confirmation from patient samples can guide the implementation of appropriate control measures, normally. In order to reach a 90% probability of detecting a norovirus outbreak, at least 3 samples should be tested using RT-PCR, and 6 samples when using an ELISA [5]. To avoid secondary transmission of norovirus, good hand and kitchen hygiene, including frequent hand washing with soap and running water, should be performed (see Smittevernboka at www.FHI.no). The incubation time that was found in this study indicates that there has been limited secondary transmission, but that the cases had been infected by eating the oysters.

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Appendix 1: Results of the univariable analysis of the guests

Food products are named in Norwegian, and are sorted per meal on their RR.

	Exposed			Unexposed			% of cases explained	Univariable analysis	
	Total	Cases	AR%	Total	Cases	AR%		RR [95% CI]	P value
Did you eat some of the following cold-served food items?									
Skalldyr	55	20	36	108	17	16	54 %	2.3 [1.32-4.04]	0.003
Sild	20	9	45	143	28	20	24 %	2.3 [1.28-4.14]	0.011
Rakørret server på potet	46	17	37	117	20	17	46 %	2.2 [1.25-3.74]	0.006
Rødløk	53	17	32	110	20	18	46 %	1.8 [1.01-3.08]	0.047
Kaviar	33	11	33	130	26	20	30 %	1.7 [0.92-3.01]	0.102
Stekt og marinert scampi og kamskjell i lime	77	22	29	86	15	17	59 %	1.6 [0.92-2.93]	0.090
Sennepssaus	37	12	32	126	25	20	32 %	1.6 [0.91-2.93]	0.108
Sitron	38	12	32	125	25	20	32 %	1.6 [0.88-2.83]	0.136
Rømme	38	12	32	125	25	20	32 %	1.6 [0.88-2.83]	0.136
Gravet laks	54	16	30	109	21	19	43 %	1.5 [0.88-2.70]	0.137
Brandade av røkt torsk	22	7	32	141	30	21	19 %	1.5 [0.75-2.98]	0.272
Kaviar	22	7	32	141	30	21	19 %	1.5 [0.75-2.98]	0.272
Hummersalat med marinert scampi	44	13	30	119	24	20	35 %	1.5 [0.82-2.62]	0.205
Laksepate	50	14	28	113	23	20	38 %	1.4 [0.77-2.44]	0.283
Laks Taktaki med soya	23	6	26	140	31	22	16 %	1.2 [0.55-2.51]	0.676
Majones	51	12	24	112	25	22	32 %	1.1 [0.58-1.93]	0.864
Cheviche av Breiflabb Asia inspirert	25	5	20	138	32	23	14 %	0.9 [0.37-2.00]	0.726
Reker	64	13	20	99	24	24	35 %	0.8 [0.46-1.52]	0.559
Agurk	16	3	19	147	34	23	8 %	0.8 [0.28-2.34]	0.691
Egg	32	6	19	131	31	24	16 %	0.8 [0.36-1.74]	0.552
Melone	12	2	17	151	35	23	5 %	0.7 [0.20-2.63]	0.604
Crème fraiche	12	2	17	151	35	23	5 %	0.7 [0.20-2.63]	0.604
Wasabi	4	0	0	159	37	23	0 %	0.0 [.-.]	0.272
Did you eat some of the following food items served at the salad buffet?									
Estragonkrem	5	4	80	158	33	21	11 %	3.8 [2.25-6.53]	0.002
Grønn salat	29	8	28	134	29	22	22 %	1.3 [0.65-2.50]	0.488
Julepålegg	22	6	27	141	31	22	16 %	1.2 [0.59-2.63]	0.582
St Christina skinke	11	3	27	152	34	22	8 %	1.2 [0.44-3.35]	0.708
Remulade	23	6	26	140	31	22	16 %	1.2 [0.55-2.51]	0.676
Sylte	23	5	22	140	32	23	14 %	1.0 [0.41-2.19]	0.906
Eple	5	1	20	158	36	23	3 %	0.9 [0.15-5.19]	0.884
Syltet fjellmandelpotet	21	4	19	142	33	23	11 %	0.8 [0.32-2.08]	0.669
Roastbiff av okse	41	8	20	122	29	24	22 %	0.8 [0.41-1.65]	0.573
Waldorf salat	32	6	19	131	31	24	16 %	0.8 [0.36-1.74]	0.552
Grønn asparges	11	2	18	152	35	23	5 %	0.8 [0.22-2.86]	0.711
Tomatsalsa	6	1	17	157	36	23	3 %	0.7 [0.12-4.45]	0.719
Glasert kylling med honning	13	2	15	150	35	23	5 %	0.7 [0.18-2.44]	0.512
Spekemat	65	8	12	98	29	30	22 %	0.4 [0.20-0.85]	0.010
Potetsalat	40	4	10	123	33	27	11 %	0.4 [0.14-0.99]	0.027
Tyttebær	34	3	9	129	34	26	8 %	0.3 [0.11-1.02]	0.030
Pickels	8	0	0	155	37	24	0 %	0.0 [.-.]	0.116
Miniappelsin	3	0	0	160	37	23	0 %	0.0 [.-.]	0.343
Did you eat some of the following hot-served food items?									
Pinnekjøtt	93	23	25	70	14	20	62 %	1.2 [0.69-2.23]	0.475
Kålrotstappe	94	22	23	69	15	22	59 %	1.1 [0.60-1.92]	0.802
Vossakorv	38	8	21	125	29	23	22 %	0.9 [0.45-1.82]	0.782
Stekt fisk	10	2	20	153	35	23	5 %	0.9 [0.24-3.12]	0.833
Rødkål	75	15	20	88	22	25	41 %	0.8 [0.45-1.43]	0.448

Medister kake	80	15	19	83	22	27	41 %	0.7 [0.40-1.26]	0.237
Julepølse	81	15	19	82	22	27	41 %	0.7 [0.39-1.23]	0.205
Surkål	75	13	17	88	24	27	35 %	0.6 [0.35-1.16]	0.131
Sprøbakt ribbe	114	22	19	49	15	31	59 %	0.6 [0.36-1.11]	0.114
Mandelpotet	120	22	18	43	15	35	59 %	0.5 [0.30-0.92]	0.026
Did you eat some food served at the oyster-station?									
Øysters	38	28	74	125	9	7	76 %	10.2 [5.30-19.75]	<0.001
Hummersuppekrem	48	14	29	115	23	20	38 %	1.5 [0.82-2.59]	0.203
Did you eat some of the following food items served for dessert?									
Jordbærmousse	24	8	33	139	29	21	22 %	1.6 [0.83-3.07]	0.178
Pepperkakemousse	9	3	33	154	34	22	8 %	1.5 [0.57-3.98]	0.433
Karamellpudding	55	16	29	108	21	19	43 %	1.5 [0.85-2.63]	0.164
Frukt	35	10	29	128	27	21	27 %	1.4 [0.73-2.52]	0.349
Multekrem	49	12	24	114	25	22	32 %	1.1 [0.61-2.04]	0.721
Marsipankake	36	8	22	127	29	23	22 %	1.0 [0.49-1.94]	0.938
Sukkerbrødbunn	5	1	20	158	36	23	3 %	0.9 [0.15-5.19]	0.884
Ferske bær / bæresaus	25	5	20	138	32	23	14 %	0.9 [0.37-2.00]	0.726
Krem	23	4	17	140	33	24	11 %	0.7 [0.29-1.89]	0.512
Riskrem	48	8	17	115	29	25	22 %	0.7 [0.33-1.34]	0.235
Rødsaus	32	5	16	131	32	24	14 %	0.6 [0.27-1.51]	0.287
Christmaskake	14	2	14	149	35	23	5 %	0.6 [0.16-2.27]	0.432

Appendix 2: Results of epidemiological study among employees of the hotel

A similar survey to that performed among the guests was also performed among employees of the hotel. Additional questions were asked about what kind of work one had performed and on which days one worked.

25 employees answered the questionnaire. Three persons reported gastrointestinal symptoms and one reported fever in the appropriate period. Two (1 with and 1 without gastrointestinal symptoms) had eaten at the buffet before becoming ill. The only things both are were oysters and baked pork ribs. They became ill on 9 December and their illness lasted for 2 or 3 days. Of the two others, one was ill already before eating from the buffet (3 December), and one reported not to have eaten from the buffet. They reported not to have had known contact with someone with gastrointestinal symptoms. Their illness resolved within 24 hours.

In total 20 persons ate from the buffet, of which nine ate oysters and 12 ate baked pork ribs. The oysters had an attack rate of 25% (1 person who ate oysters had been ill before and was excluded from the calculation of the attack rate). The attack rate of baked pork ribs was 17%.

Of the 25 respondents, 8 worked as a cook, 1 worked as a waitress and 16 reported not to have worked with food. Only one of the four persons with symptoms reported to have worked with food (a cook). This cook had been ill on Monday 3 December with diarrhoea, abdominal pain, nausea and fever, and symptoms had resolved within 12-24 hours. The cook worked on again from Tuesday 4 December.

The results of the study among employees of the hotel support the results of oysters being the likely cause of the outbreak. It is unlikely that any of the personnel contributed to the spread of the outbreak. Nevertheless, there seems to be a need for emphasizing the importance of food-handlers staying at home until 48 hours after recovery of gastrointestinal illness among employees of the hotel.