



Kirsty Hewitt

Background

Pre-fellowship short bio

Prior to the FETP I was a Public Health Registrar in the Kent, Surrey and Sussex Deanery for four years. In this role I had worked in a range of public health organisations, including Brighton and Hove City Council, Surrey and Sussex Health Protection Team, and Brighton and Sussex Medical School. I also completed an MSc in Public Health at the London School of Hygiene and Tropical Medicine.

Before I joined the Public Health training programme I was a Scientist at the Centre for Infections in Colindale, where I worked in the Emerging Infections and Zoonoses department for six years.

FETP assignment

Throughout my fellowship I have been based with the Field Epidemiology Services team covering London and South East England. The team provides acute and strategic field epidemiology services for a population of over 17 million people, and supports the 7 health protection teams responsible for frontline services.

I have had a wide range of field epidemiology experience during my fellowship, and have had the opportunity to work on many outbreaks, including two PHE level 3 incidents. I have had the opportunity to work with national, regional and local level experts on a wide range of fascinating projects. I have greatly developed my skills in field epidemiology, particularly in outbreak investigation, data analysis and communication.

Fellowship projects

Outbreak(s)

1. Vulnerable babies most at risk during a multicentre outbreak of *Bacillus cereus* bacteraemia associated with Total Parenteral Nutrition (TPN) in England, May-June 2014

Introduction

A Public-Health-England-led investigation into a bacteraemia outbreak among babies in 11 English hospitals confirmed 19 cases of a single strain of *B. cereus* with onset 28/05/14 to 16/06/14. A rapid case-control study identified TPN from company X as the likely source: 81 potentially contaminated batches were identified and recalled; three tested, and the outbreak strain identified. We conducted a cohort study among recipients of recalled batches to test our

hypothesis that particular ingredients, allowing for case characteristics, may have been risk factors for illness.

Methods

Company X provided ingredient details for each of the TPN-X batches. We identified all babies exposed to TPN-X at English hospitals after 26/05/14 and excluded those without recorded batch numbers; cases were defined as having *B. cereus* fAFLP type Bc.44 isolated from a sterile site. We used a structured questionnaire completed by clinicians to collect information on babies' clinical characteristics, indicators of vulnerability e.g. premature birth, and batches received. We calculated "postmenstrual age" as days between mother's last menstrual period and receipt of TPN-X. We compared the risk of bacteraemia among those exposed and unexposed to various ingredients, and with different characteristics, calculating adjusted odds ratios (aORs) and 95% CIs using logistic regression.

Results

84 patients received ≥ 1 unit of TPN-X; 16 cases and 50 non-cases were included in the study. No ingredients were associated with illness. Each additional week of post-menstrual age reduced the odds of illness by 15% (aOR=0.85, 95% CI=0.77-0.95).

Discussion

Our study highlights the vulnerability of the youngest, most premature infants receiving TPN-X. TPN cannot be sterilised or tested for contamination prior to administration; so rapidly reporting potential contamination and recalling product is vital to prevent similar incidents.

Tasks undertaken personally:

This was a level 3 incident and I was involved at all stages, initially supporting the case control study and later leading work on the cohort study. My roles were as follows:

- Visiting one of the affected hospitals to conduct data collection from patient records
- Supervising case-control data entry

Cohort study: Writing the study protocol, data collection, cleaning and analysis, report writing, and manuscript writing.

I also contributed to the main outbreak report.

Outputs

There are separate outputs relating to the case control study and the cohort study for this incident.

The case control study was presented by one of our team's Consultant Epidemiologists at the PHE Applied Epidemiology conference in 2015. A manuscript is in preparation.

The cohort study has been accepted as a poster presentation for the ESCAIDE conference in 2016. The results were also presented at internal meetings including the Outbreak Control Team and the FETP induction day 2014. A manuscript has been drafted and is almost ready for submission.

An overall outbreak report has also been produced and I contributed to the cohort study section.

2. Norovirus outbreak at a high profile London hotel restaurant in April/May 2014 associated with cockles.

Introduction

An outbreak of gastrointestinal illness, notified by Environmental Health Officers (EHOs) to Public Health England, occurred among 229 staff and guests attending six pre-opening tasting events at a new fine-dining restaurant from 28/04/2014-01/05/2014. We investigated the outbreak to identify the source and prevent further cases.

Methods

We designed an electronic questionnaire, which the hotel sent to all invitees. We compared food exposures among cases with diarrhoea/vomiting within 14 days of the first event and non-cases, and calculated adjusted odds ratios (aORs) and 95% confidence intervals using logistic regression. Stool samples were screened for common gastrointestinal pathogens. EHOs inspected the restaurant and took environmental swabs after the kitchen had been thoroughly cleaned.

Results

169 people responded (74%) of whom 62 (35%) were cases, who included food handlers and diners present at each event. Attack rates ranged from 47% on 29/04/2014 to 14% on 01/05/2014. The only food item associated with illness was a plaice and cockle dish consumed on 28/04/2014 (aOR=15, $p<0.001$), accounting for 100% of cases that day. 15/20 faecal specimens were positive for norovirus genotype 1. No food samples were available for testing. All environmental samples were negative for pathogens. EHOs noted that served dishes involved unusual cooking methods and considerable handling by catering staff. Conclusions: Cases at the first event were likely to have become ill after consuming a plaice and cockle dish. Norovirus contamination has been demonstrated in cockles, which are a plausible vehicle of infection if undercooked. Although plaice cannot be excluded as the source of infection, it seems an unlikely source. Lower attack rates at later events may suggest infection due to cross-contamination.

Recommendations

Cockles should be cooked thoroughly and stringent hygiene measures adopted to prevent cross-contamination. Management and staff preparing dishes involving intensive food handling should be particularly alert for staff illness and adhere to infection control policies.

Tasks undertaken personally

I wrote the cohort study protocol and questionnaire, cleaned and analysed the data, and wrote the epidemiology report.

Outputs

I presented the results as a poster at the PHE Applied Epidemiology conference in 2016. A manuscript has been submitted for publication to PLoS Currents: Outbreaks.

3. Investigation of an outbreak of *Escherichia coli* O157 at Maycroft Manor care home, Brighton, June-July 2016

Introduction

On 27th June 2016 a GP notified the Surrey and Sussex Health Protection Team (SSHPT) of a possible outbreak of *E. coli* O157 at a care home Brighton, with one confirmed case in a care worker (onset 19/06/2016) and 9 symptomatic individuals among 86 residents and 100 staff. A recent increase in *E. coli* O157 PT34 had been reported nationally, with bagged mixed salad the suspected source. We provided hygiene advice and conducted a retrospective cohort study to identify whether salad or another food may be the source of infection in the care home.

Methods

Residents and carers completed paper questionnaires about residents' food choices during the period 13/06/2016-19/06/2016. We classified residents developing diarrhoea after 19/06/2016 as cases, those with onset between 19/06/2016-22/06/2016 as primary cases, and those with later onset dates as secondary cases. We described cases and non-cases, and compared their exposures, calculating relative risks (RR) and 95% confidence intervals (CIs) as measures of association. We calculated adjusted odds ratios (aOR) and 95% CIs using backwards stepwise multivariable exact logistic regression.

Results

80 residents completed questionnaires (response rate 93%), including 20 cases (attack rate 25%), with 6 'primary' cases (30%). We found no evidence of an association between salad leaf consumption and illness. Three foods were statistically associated with illness among primary cases: potato salad served on 13/06/2016 (aOR=11.2, p=95% CI 1.3-367.1), and vegetable soup (aOR=6.9, 95% CI=0.7-Inf) and sticky toffee pudding (aOR=4.7, 95% CI 0.6-Inf) served on 14/06/2016.

Discussion

We considered these foods unlikely sources as they were served 5-6 days before the onset of the first reported case, when the usual *E. coli* O157 incubation period is 3-4 days. 8 non-cases ate potato salad, 2 primary cases did not. All primary cases ate pudding and soup, however these were also eaten by 36 and 50 non-cases respectively. Potential explanations for these associations include chance, the occurrence of undetected cases in the home prior to 19th June, or incorrect onset dates for the primary cases.

Despite early intervention, cases continued to arise, and it is likely that there was substantial person-person transmission within the home after the initial introduction of the organism. Care home staff and residents should adhere to the hygiene recommendations given. SSHPT should consider an inspection of the care home and its infection control practices.

Tasks undertaken personally

I wrote the cohort study protocol and questionnaire, cleaned and analysed the data, and wrote the report. I also produced daily sitreps for the OCT during the early stages of the outbreak investigation.

Outputs

I wrote the cohort study report, and a short summary of the outbreak for inclusion in the report of the national investigation.

4. Outbreak of gastrointestinal illness following a birthday party in Kent, September 2013

Introduction

An outbreak of gastrointestinal illness occurred among guests at a party in Kent in September, which included a buffet meal with food left out all evening. 45 of 72 guests reported a short lived illness beginning a few hours after the party, with diarrhoea the main symptom. We conducted a retrospective cohort study to describe the outbreak and identify factors associated with illness, in order to identify the source and prevent further outbreaks occurring.

Methods

We compared exposures among party guests who became ill and who remained well, and calculated odds ratios and 95% confidence intervals using exact logistic regression.

Results

58% of guests responded to the survey, including 23 cases (AR=50% among responders). Consumption of chicken biryani was associated with illness (OR 23.5, 95% CI 3.34 - ∞), and this dish was eaten by 100% of cases. *Clostridium perfringens* was detected in faecal specimens from 2 cases. Low counts of *C. perfringens* were detected in a sample of the biryani, consistent with poor temperature control.

Conclusions

Epidemiological and microbiological evidence indicated that inappropriately stored chicken biryani was the source of infection. The caterer and party host were educated regarding appropriate temperature control for high risk foods.

Tasks undertaken personally

I wrote the study protocol and questionnaire.

Output

Outbreak report.

Surveillance project(s)

1. An evaluation of routine Cryptosporidiosis cluster surveillance in London and the South East

Introduction

A system using spatiotemporal analysis to detect cryptosporidiosis clusters in London and South East England was introduced in July 2012, aiming to detect outbreaks that might be missed by temporal analysis alone. Fortnightly reports were sent to eight Health Protection Teams (HPTs). We evaluated the system to determine its public health impact and recommend improvements.

Methods

We evaluated the system for timeliness and accuracy of outbreak detection, usefulness, and acceptability, using a structured questionnaire completed by HPT users. Clusters detected by the system from 01/07/2012-28/02/2014 were cross-referenced against local case-management systems to determine the number of confirmed outbreaks detected or missed, and when these were first reported. We calculated the sensitivity and positive predictive value (PPV) of the system.

Results

Eight HPTs responded; four reported outbreaks identified by other means. Of 240 potential clusters detected by the system, 60 were investigated by HPTs. Of these 60, 15 were confirmed outbreaks (PPV=25%). Four outbreaks were missed by the system (sensitivity =79%), which identified clusters a mean of three days after the HPT was first aware of them. Information provided by the system did not lead to any additional public health action. 52% of clusters included cases from multiple HPTs, but these were seldom investigated further.

Six HPTs found this surveillance of little use, and predominantly used it for reassurance that outbreaks had not been missed. HPTs spent a median of 30 minutes investigating each reported cluster.

Discussion

The system had high sensitivity, but poor timeliness and PPV. No outbreaks were identified solely due to this surveillance, and resources were used to investigate false signals. However, it did highlight the potential for cross-boundary clusters to be missed by existing systems.

This surveillance should be stopped. Alternative methods of detecting small outbreaks, especially those across operational boundaries, should be explored.

Tasks undertaken personally

I wrote the protocol and questionnaire, collected data, analysed data and wrote the report.

Outputs

I wrote an evaluation report, and presented the findings at the FES Applied Epidemiology conference in 2016, and at an internal FES team meeting.

2. Routine on call work at FES South East and London

The FES South East and London team operates a weekly on call rota. Work involves being responsible for dealing with acute incidents as they arise, as well as reviewing weekly exceedance reports to identify potential increases in reports of particular infections. When exceedances arise the on call team reviews recent surveillance data to determine whether any increases are due to artefacts in reporting, or represent a true increase, and investigate accordingly. The on call team also collates reports of incidents of potential national significance from the Health Protection Teams in London and South East, and reports on their behalf to the weekly national teleconference.

Outputs

I wrote a summary report of work undertaken while on call.

Research

Investigating factors associated with hantavirus seropositivity in people in contact with wild and domesticated rats in England, 2013-14

Introduction

Hantaviruses are zoonotic viruses transmitted through contact with rodent excreta. They cause several diseases in humans, including haemorrhagic fever with renal syndrome (HFRS) and hantavirus pulmonary syndrome (HPS). Until recently UK cases were thought to be imported, however at least 12 indigenously acquired cases have been reported since 2012, all in people with rodent exposure. We conducted a seroprevalence study in people with exposure to wild or pet rats in order to determine the prevalence of previous exposure to hantavirus in this population, and risk factors for infection.

Methods

We recruited three study groups between July 2013 and June 2014: 1. Fancy rat owners and breeders, 2. Veterinary workers, 3: People with occupational exposure to wild rat populations (farmers, waste water workers, pest control workers). Participants provided a blood sample and completed a questionnaire about exposure to rats. The Rare and Imported Pathogens Laboratory tested the serum for hantavirus antibodies. We compared exposures among those who tested positive and negative, calculating odds ratios and 95% confidence intervals, and used multivariable logistic regression to calculate adjusted ORs.

Results

We recruited 551 participants across the three study groups. 32% of 85 fancy rat owners tested positive, (32%), while the seroprevalence in each of the other study groups was below 4%. The odds of seropositivity were over 6 times higher among those who reported regular exposure to pet rats (aOR=6.4, 95% CI 2.4-17.0). Those exposed to rats at work had 60% lower odds of seropositivity (aOR=0.4, 95% CI 0.2-1.01). Among fancy rat owners, those reporting febrile

illness in the past two years had over four times the odds of seropositivity of those who did not (aOR=4.2, 95% CI 1.2-14.6).

Discussion

Regular exposure to rats was the most important predictor of seropositivity, due to the high seroprevalence among the fancy rat owners. The apparent protective effect of exposure to rats at work (aOR=0.4, 95% CI 0.2-1.01) is likely due to the lower seroprevalence among the other study groups, who were occupationally exposed to wild or pet rats. The high seroprevalence among fancy rat owners indicates a potential public health risk from contact with fancy rats. People who keep fancy rats should practise strict hygiene measures and avoid direct contact with excreta. Further research is needed to determine the prevalence of hantaviruses in the fancy rat population, and the incidence of clinical symptoms in those exposed.

Tasks undertaken personally:

I wrote the protocol for the questionnaire analysis, cleaned and merged the different datasets (serology results, main questionnaire and farmer questionnaire), analysed the data and wrote the report.

Outputs

Questionnaire analysis report. Manuscript (in preparation).

Scientific communication

- One oral presentation at a national conference (PHE Applied Epidemiology conference)
- Two posters, one at ESCAIDE, one at PHE Applied Epidemiology conference
- Two manuscripts drafted, one submitted, and a third planned.
- Named as an author on two oral presentations (PHE Applied Epidemiology and ESCAIDE)

Teaching experience

1. Learning needs assessment for Environmental Epidemiology module

I carried out a learning needs assessment for participants in the 2016 Environmental Epidemiology module, working with another fellow. Previous years' participants noted that they did not have sufficient background epidemiology knowledge to fully benefit from the module. We designed a questionnaire for participants to gather knowledge about their understanding of basic epidemiological and statistical terms. At this point the fellow I was working with was deployed on a mission, so I analysed the data and wrote the report in her absence. Based on

the findings of the needs assessment I identified background reading material for participants to address their knowledge gaps.

2. Surveillance lecture for MSc in Clinical Microbiology, Barts and the London Medical School

I gave a lecture on surveillance to a group of 22 students taking the MSc in Clinical Microbiology at Barts and the London, during their Public Health module. The students were clinicians and biomedical scientists. The content included defining surveillance, describing a surveillance system, criteria for surveillance, surveillance vs. research, how to set up a surveillance system, types of surveillance system, evaluating surveillance systems. This lecture had previously been given by the Regional Epidemiologist, and I developed a new lecture using previous material, as well as EPIET material and my own slides, and delivered the lecture. I also wrote 6 questions for the students to test their learning after the lecture.

3. Case study: Norovirus outbreak at 'Dinner' by Heston Blumenthal

I jointly led a case study session at FES Victoria with a EUPHEM fellow, about the investigation into a norovirus outbreak at the 'Dinner' by Heston Blumenthal restaurant. We presented the outbreak and worked through the slides in an interactive case study format.

Next steps

I will be returning to the Public Health training programme to complete my training.

References - List of the publications and communications

Manuscripts

Hewitt K and Weil L, Chow Y, Anderson C, Verlander NQ, Patel BC, Goodchild P, Maguire H. Cockles at the rehearsal: A complex investigation into a large Norovirus outbreak at the test launch of a high profile London restaurant in mid- 2014, associated with cockles. Submitted to PLoS Currents: Outbreaks.

Hewitt K, Simone B, Crook P, Trienekens S, Sinclair C, Mook P, Anderson C, Balasegaram S, Godbole G, Shetty N, Verlander NQ, Turbitt D, Maguire H. Vulnerable infants most at risk in an outbreak of *Bacillus cereus* blood stream infections associated with total parenteral nutrition (TPN) in England, May - June 2014. Manuscript is drafted and will be submitted when the accompanying paper about the investigation is published.

Hewitt K, Close R, Duggan J. Factors associated with hantavirus seropositivity among people in contact with wild and domesticated rats in England, 2013-14. Manuscript in preparation.

Conferences (presenting author in bold)

Hewitt K, Maguire H, Crook C, Simone B, Turbitt D. Vulnerable babies most at risk in outbreak of *Bacillus cereus* bacteraemia associated with Total Parenteral Nutrition (TPN) in England, May-June 2014. ESCAIDE 2016.

Hewitt K, Mook P, McCarthy N. Evaluating temporospatial clustering as an aid to detecting cryptosporidiosis outbreaks in London and South East England, July 2012-February 2014. PHE Applied Epidemiology Conference 2016.

Hewitt K, Weil L, Chow Y, Anderson C, Verlander V, Patel B, Goodchild P, Maguire H. Norovirus outbreak at a high profile London hotel restaurant in April/May 2014 associated with cockles. PHE Applied Epidemiology Conference 2016.

Mikhail A, Hunter A, Blake A, Pomeroy L, Simone B, Mook P, Crook P, Hewitt K, Hallihan N, Goodchild P, Ready D, Allen D, Adak B, Nichols T, Chow Y, Anderson S. The perils of gourmet eating: outbreak of gastroenteritis due to enteric viruses at a high-end London restaurant, January 2014. ESCAIDE 2014

Maguire H, **Crook P**, Anderson C, Mook P, Balasegaram S, Simone B, Hewitt K, Sinclair C, Treinekens S, Puleston R, Shetty N, Godbole G, Grant K, Elviss N, Lamagni T, Hoffman P, Charlett A, Verlander N, Oliver I, Turbitt D, Catchpole M. Multicentre outbreak of *Bacillus cereus* bacteraemia in neonatal intensive care units associated with parenteral nutrition, investigated using case-control and cohort methodology, England 2014. PHE Applied Epidemiology Conference 2015.