Public Health England

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Zoonoses Newsletter

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This newsletter is produced on behalf of the UK Public Health Network for Zoonoses.

The purpose of this network is to strengthen links, share expertise, and contribute to the effective prevention and control of zoonotic infections in the UK. Membership includes representatives from Public Health England, Public Health Wales, Health Protection Scotland, Public Health Agency Northern Ireland, the Health and Safety Executive, and the Chartered Institute of Environmental Health.

STEC linked to raw pet food

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Shiga toxin-producing *Escherichia coli* (STEC) are a group of bacteria associated with human disease and are defined by the presence of one or both phage-encoded Shiga toxin genes; *stx1* and *stx2.* In the UK the most common type of STEC is serogroup O157 and around 700 cases of this serogroup are reported annually in England. While this compares to around 10,000 *Salmonella* and 60,000 *Campylobacter* cases [1], STEC O157 are of significant public health concern due to the potential severity of disease. Symptoms can range from mild diarrhoea to abdominal cramps, vomiting and severe bloody diarrhoea. In 5-15% of cases, infection can lead to the development of haemolytic uraemic syndrome (HUS), a severe multisystem syndrome [2]. Although extremely rare, HUS can be fatal, particularly in infants, young children and the elderly.

In this issue

STEC are zoonotic and healthy ruminants, particularly cattle and sheep, are the main reservoir of infection. STEC has a very low infectious dose and transmission to humans occurs through consumption of contaminated food or water, direct or indirect contact with infected animals or their environment and through person to person spread. Each transmission route can cause sporadic infection as well as outbreaks.

In August 2017, a cluster of 4 cases infected with genetically related strains of STEC O157 was identified. The strains possessed the *stx2a* toxin subtype, a toxin type known to be associated with more severe disease. One case died following the development of HUS. A multi-agency investigation included re-interviewing cases, and the sampling and testing of implicated products. Interviews indicated that 3 of the cases had been exposed to dogs fed on a raw meat based diet, specifically tripe, and in 2 cases the tripe had been purchased from the same supplier.

Sampling and microbiological screening of raw pet food was undertaken and indicated the presence of STEC in the products. STEC was isolated from 1 sample of raw tripe but this was different to the strain causing illness in humans. Nevertheless, isolation of STEC provided evidence for microbiological contamination of tripe and its pathogenic risk to human health and that it was a plausible transmission route in the outbreak. This adds to the evidence of raw pet food as a risk factor for zoonotic transmission of gastrointestinal pathogens.

It is widely accepted that raw meat, including animal by-products used in pet feeds, can contain pathogens which are harmful to health. A recent microbiological study of commercial raw pet feed products found *E.coli* serotype O157:H7 in 23% of tested product, as well as *Listeria monocytogenes* (54%) and *Salmonella* species (20%) [3].

Raw pet foods have the potential to cause human disease if contaminated products are consumed, handled or via secondary transfer from contact with contaminated surfaces e.g. kitchen surfaces or dog bowls. Feeding a raw meat based diet to companion animals has recently increased in popularity due to both increasing availability and beliefs that they provide health benefits to animals. The Animal Plant Health Agency (APHA), the responsible

agency for approval and monitoring of raw pet food producers, reported an increase in manufacturers from 5 in 2013, to 90 (with 23 awaiting approval) by February 2018 [4]. These data suggest an upward trend in the potential risk to humans from raw pet food. The Incident Management Team concluded that the best approach to reduce the risk of infection is to improve awareness of risk and promote good hygiene practices when handling raw pet food. Subsequently, PHE developed a series of infographics to promote awareness of good hygiene when handling raw pet food [5].

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4. **Advisory Committee on Animal Feeding-stuffs**. 75th Meeting of ACAF on 15 February 2018. Minutes of meeting. 2018
5. **Raw pet foods: handling and preventing infection**

Outbreak of *Cryptosporidium parvum* infection associated with a pet facility in the North East

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Cryptosporidia are protozoan parasites that cause acute gastrointestinal symptoms, predominantly diarrhoea. The incubation period for infection can typically range from 1 to 12 days and symptoms usually last up to 2 weeks (sometimes longer) after onset. *Cryptosporidia* have been identified in a variety of animals including cattle, sheep, horses, cats and dogs. Transmission to humans from animals or other humans occurs after exposure to cryptosporidium oocysts directly or indirectly by the faecal-oral route. Infection can occur after direct contact with faeces, or indirectly through contaminated drinking water, food, milk and through recreational water use in swimming pools and natural water features. The source of infection in many cases is never identified, but many of the cases presenting in the UK are associated with foreign travel.

On 11 April 2018, Environmental Health Officers (EHOs) reported a case of *Cryptosporidium* infection to the NEHPT. The case had been exposed to sick lambs at a pet facility. At the same time a local newspaper reporter called saying they had heard via an anonymous source that a number of people were ill, having had exposure to sick lambs at the premises. Following a teleconference between NEHPT and the Local Environmental Health Team (LEHT) an investigation was launched by the LEHT. The pet facility was found to mainly trade as a pet shop but it also had a section for animal petting with mostly small animals such as rabbits, guinea pigs, reptiles/snakes and on occasion other larger animals.

Health Protection Management and Risk Assessment

Photo credit: EIZ

EHOs inspected the premises and interviewed ownership and management staff. They were satisfied with the current layout; there was good signage for the public and plenty of well stocked hand washing facilities. There was not deemed to be any current risk to public health. In regards to staff welfare there was less satisfaction with staff knowledge, training and internal infection control policies and procedures. This issue was followed up by EHOs at subsequent visits to ensure good practice going forward.

It was established that the premises took a consignment of 8 lambs on 30 March 2018. The pet facility staff reported that 2 of these animals arrived at the premises sick with diarrhoea, were immediately isolated and cared for by staff and at no point were these sick animals put on public display. The remaining 6 lambs were on public display from 31 March to 7 April. Initially it was thought that only 1 feeding session with the public had taken place on 7 April. However, this was revisited with the premises on 19 April when a member of the public tested positive for *Cryptosporidium*, having fed lambs on 31 March. The premises then confirmed that there were additional feeding sessions (1 session each day) on 31 March, 1, 2 and 3 April. The lambs were removed from public feeding on 4 April when the first staff members became ill but as the lambs showed no signs of illness they returned for a further single session on 7 April. They were then removed permanently from any public area overnight when more staff became ill and the lambs showed early signs of scouring. No records were kept of public attendance at the feeding sessions though it is estimated that around 15-30 people attended each day.

On 20 April a multiagency Outbreak Control Team (OCT[1]) met and subsequently coordinated the response by health and local authorities to the outbreak.

Case Definitions

Confirmed case: Handled lambs at the premises between 30 March and 7 April, with onset of diarrhoea 1-14 days later and *C. parvum* isolated in a faecal sample at the Cryptosporidium Reference Laboratory in Swansea.

Probable case: Handled lambs at the premises between 30 March and 7 April, with onset of diarrhoea 1-14 days later and *Cryptosporidium* species isolated in a faecal sample at a local laboratory.

Possible case: Handled lambs at the premises between 30 March and 7 April, with onset of diarrhoea 1-14 days later and no microbiological confirmation.

Case Finding

The OCT agreed that additional cases should be identified early to assess the size and cause of the outbreak and evaluate the effectiveness of initial control measures. Case finding was undertaken by:

- obtaining full lists of staff from the premises and determining whether any had been ill
- making contact with a local agricultural college, whose students had been on placement at the premises to obtain lists of those who worked there and determine if any were ill
- informing local acute trusts, infection control teams and EHO departments

Initially GPs were not informed directly as the original public exposure was thought to be small. When more information became known the OCT decided that, as most cases would already have recovered or be at the end of their illness, there was no benefit in informing GPs at that stage.

Collection and Processing of Microbiological Samples

Patient samples were collected by a combination of GPs and postal sampling provided by EHOs. Samples from GP surgeries were processed in local NHS microbiology laboratories and postal samples were sent to the regional laboratory in Newcastle. Isolates from positive culture results were sent to the Cryptosporidium Reference Laboratory in Swansea for

[1] *The OCT included the following members: Consultant in Health Protection, Consultant in Public Health from the Local Authority, Environmental Health Service Manager, Environmental Health Officer, PHE Regional Communications Manager, Epidemiological and Information Scientist, and a Senior Nurse in Health Protection.*

confirmation and further typing, including genotyping. Animal sampling was undertaken by local vets and processed at their contracted local veterinary laboratory. Any positive animal samples were sent to the Cryptosporidium Reference Laboratory for confirmation, typing and comparison to human isolates. All microbiological specimens suspected to be connected to this outbreak, were given the same ILOG reference number to facilitate coordination and collation of results from the different laboratories.

Control Measures

The following control measures were implemented in the management of this outbreak:

- infection control and exclusion advice was provided to cases
- hygiene advice was provided to the premises
- handwashing facilities were assessed and were satisfactory
- lambs had been taken off public display after the feeding session on 7 April and so no further intervention with animals was required
- on follow up visits and reassessment, EHOs were satisfied that there was no ongoing risk to public health and the premises could continue to be open to the public

Epidemiological and Microbiological Results

There were a total of 7 confirmed and 17 possible cases in this outbreak that met the case definition. Almost all of the cases reported were in staff members or volunteers and only 1 member of the public met the case definition. All 7 confirmed cases were female. Of the possible cases 12 were female and 5 male. Not all cases were able to be interviewed but where known age range was 16-55 years and dates of onset ranged from 4 to 18 April, with exposure to the premises between 30 March and 6 April.

All 7 confirmed cases were typed at the Cryptosporidium Reference Laboratory as *C. parvum* subtype IIaA17G1R1. *Cryptosporidium* isolated from 2 lamb samples were also confirmed as *C. parvum* subtype IIaA17G1R1.

In summary, a total of 24 cases (7 confirmed and 17 possible) met the case definition and were associated with the pet facility premises during this outbreak. The outbreak was investigated as early as possible by the partners involved and effective control measures were put into place. *C. parvum* subtype IIaA17G1R1 was confirmed in humans with 2 lamb samples confirmed as the same subtype. This, together with the epidemiological links, is suggestive of a common source.

Rabies updates

Michele Olphonce, Rabies and Immunoglobulin Service (RIgS) Nurse, Public Health England (PHE) National Infection Service

Illustration: V Markidou

Rabies is an acute infection caused by several members of the Rhabdoviridae family of viruses. Across the world most human rabies cases occur following a deep bite from a rabid dog but exposures to infected cats, wild carnivorous species like foxes, raccoons, skunks, jackals and wolves, and insectivorous and vampire bats can also lead to human rabies infection.

The UK has been free from rabies in terrestrial animals since 1922. However, 2 rabies-related viruses, European Bat Lyssavirus 1 and 2 (EBLV-1 and EBLV-2) have been detected in bats in the UK. EBLV-2 has previously been found in Daubenton's bats (*Myotis daubentonii*) and more recently, in 2018, the presence of EBLV-1 in 2 British serotine bats (*Eptesicus serotinus*) was reported for the first time [1].

Bats are a protected species and cannot be destroyed to determine rabies status if caught. In the event of potential human exposure to bats, regardless of the species of bat involved, a risk assessment is required. When assessing the risk of infection, exposure history is more important than the physical examination because bat bites, especially in the UK, are often felt and not seen, they usually do not leave a mark and they may not bleed. If someone is bitten by a bat in the UK, rabies post-exposure treatment is offered.

A patient information leaflet **'Bat contact and rabies risks'** was launched on 28 September 2018, World Rabies Day.

Human rabies infection

In November 2018, an individual in the UK sadly died from rabies infection following a cat bite in Morocco [2]. Human rabies is extremely rare in the UK. No human cases of rabies acquired in the UK from animals other than bats have been reported since 1902. A single case of human rabies acquired from a bat was reported in 2002 in Scotland; this individual had sustained a number of bat bites. Five cases of human rabies associated with animal exposures abroad occurred in the UK between 2000 and 2017.

Rabies pre- and post- exposure guidance: recent updates

Updated rabies guidance was launched by PHE in July 2018 [3, 4]. Changes to the rabies pre- and post-exposure prophylaxis guidance were reviewed by the PHE Rabies Expert Group and agreed by the Joint Committee on Vaccination and Immunisation (JCVI).

The pre-exposure guidance reflects changes in the Green Book and includes information on requesting vaccine for bat handlers and advice on where to obtain vaccine for occupational health risk groups.

In the post-exposure guidance, updates include: the definitions of exposure categories, the risks from animals and risk levels of countries, the number of vaccine doses for immunocompetent individuals (reduced to 4), the recommendations on the use of rabies immunoglobulin and the guidance on the management of immunocompromised individuals.

References

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2. **PHE warns travellers of rabies risk**.
3. **The Green Book (Immunisation against infectious disease)**
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Diphtheria

Dr J. Claire Cameron, Strategic Lead, Immunisation, NHS National Services Scotland, Health Protection Scotland

Diphtheria, a vaccine preventable disease in humans, may be caused by toxigenic *Corynebacterium diphtheriae*, C. *ulcerans* or less frequently C. *pseudotuberculosis*. It is an acute infectious disease, affecting the upper respiratory tract, or the skin (cutaneous diphtheria).
Although still rare, there has been an increase in cases in recent years, across the UK, including Scotland.

Photo credit: EIZ

Animals can be a reservoir of *C. ulcerans* and infections in humans can be associated with contact with animals, including companion animals. In the past, consumption of raw dairy products also played a greater role in diphtheria infections.

Since the beginning of 2017, there have been 3 reported *C. ulcerans* cases in humans in Scotland; 2 cutaneous and 1 respiratory presentation. No direct links could be demonstrated between these individuals, but all were aged 60 years and over and had close continued contact with animals.

In addition, there has been management of human contacts where the index case was a dog, potentially highlighting the need for further consideration of guidance in these situations.

Further information

In addition to the cases in Scotland, a further 5 cases of diphtheria were reported in England in 2017; 4 *Corynebacterium diphtheriae* and 1 *C. ulcerans*. For more information see HPR:
Diphtheria in England: 2017 Health Protection Report

Public health control and management of diphtheria (in England and Wales) 2015 Guidelines

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Cute, cuddly and Crypto – a large *Cryptosporidium* outbreak investigation

Helen Kermode, Kevin Carroll, Tracey Wood, Alison Mason, Lisa Harvey-Vince. Surrey & Sussex Health Protection Team (SSHPT), PHE

Illustration: V Markidou

Cryptosporidium is a highly contagious parasitic infection that affects people and cattle. It is found in lakes, streams, rivers, untreated water and sometimes swimming pools. *Cryptosporidium* can cause diarrhoea in neonatal farm animals but it is often sub-clinical. Infected animals frequently shed oocysts in numbers greatly above the minimum infectious dose for people so efficient hygiene precautions are needed to prevent faecal oral transmission from seemingly healthy animals.

The outbreak begins…

On 9 April 2018, the SSHPT received a call from a school reporting that 8 out of 30 children plus an accompanying staff member who had been on a trip to a working farm on 29 March had become unwell. Two of the children had been hospitalised. This was followed by a similar call from another local school and further calls from the public reporting diarrhoea and vomiting symptoms associated with visiting the farm. There was also a great deal of social media activity. The farm is a working farm which opens to the public each year for about a month during the lambing season and is regulated by the Health & Safety Executive (HSE). HSE had visited the farm in 2014 and a lack of compliance with the industry code of practice was identified but there was no follow up. The farm café is inspected regularly by the local authority (no concerns) and there is mains water supply to the farm. The farm confirmed that 16 schools and nurseries had visited the facilities in 2018 since their opening on 17 March, along with up to 1,000 members of the public per day.

The first laboratory confirmation of *Cryptosporidium* from the farm was received on 10 April. A joint visit to the farm by HSE, the local authority and SSHPT was conducted on 11 April and several issues were identified, including:

- inadequate hand washing facilities for the number of visitors; handwashing was not easily accessible and there was poor signage in animal contact areas, including where visitors could bottle feed lambs
- no definite route around the farm – visitors walking in all directions
- lots of run-off from animal pens and visible faecal matter; visible contamination on visitors
- inadequate staffing (mostly volunteers) for the number of visitors; visitors seen walking around unchallenged whilst eating, drinking and vaping
- farm owner reported some schools used hand gels despite farm's advice to wash hands

The farm agreed to voluntarily close the following day pending the outcome of an OCT meeting. There were 3 confirmed and 11 probable cases of *Cryptosporidium* for which the farm was the only likely source. The OCT agreed that HSE should serve immediate prohibition on the farm and that the farm should not re-open until they were compliant with a subsequent improvement notice.

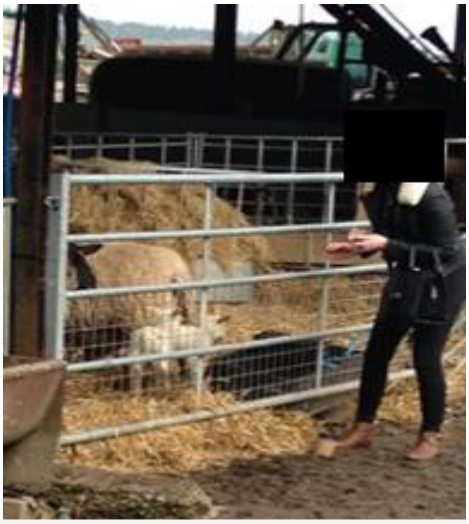

Photo credit: Surrey and Sussex HPT

Case Management and Collaboration with Other Agencies

- a protocol was drawn up for local environmental health teams to deal with new calls from the public and to follow up on existing cases
- all of the schools that had visited the farm were contacted and sent a link to an online questionnaire for completion by anyone experiencing symptoms and the results were fed back to the HPT. Cases were contacted and given advice, particularly on hand hygiene and avoiding swimming for 2 weeks after becoming symptom-free as they may still be shedding *Cryptosporidium* in this period. Sampling was arranged if still symptomatic.
- local swimming pools were contacted and asked to display warning signs produced by **Pool Water Treatment Advisory Group (PWTAG)**
- local hospitals were alerted and asked to send ALL positive *Cryptosporidium* samples to the Cryptosporidium Reference Laboratory in Swansea for further testing
- APHA visited the farm and took animal samples. They detected *Cryptosporidium* in faeces from all of the 8 lambs tested

Results from the Reference Laboratory – the Microbiology

Unfortunately, technical difficulties meant that genotyping was not possible on the animal samples. All positive human samples were identified as *C. parvum* and a proportion of the samples were further typed by gp60 sequencing. Thirty-six of these cases had the unique gp60 genotype IIaA15G2R2. The vast majority of these cases had visited the farm and there were no other exposures. This genotype has been associated with several previous outbreaks involving lambs.

The Extent of the Outbreak

A steady stream of cases continued over the next few weeks. Over the same period there were 3 further, smaller, cryptosporidium outbreaks in the South East on other working farms which opened to the public during lambing.

	All cases in Surrey & Sussex during 2018 lambing period	Linked to Farm
Confirmed	149	118
Probable	82	80
Possible	3	2
Total	**243**	**200**

In light of the large number of cases and the risk that this could happen again in future years a South East wide de-briefing session was held, which was attended by all agencies involved in the outbreaks. All agreed that this was a valuable opportunity to reflect and an action plan has been drawn up to help work towards preventing future outbreaks.

Key Points identified

- school risk assessments for farm visits were generally inadequate, particularly with regard to use of hand gels
- lack of awareness by working farms about the National Farm Attractions Network Code of Practice
- joint visit with PHE supporting the enforcing agency was useful
- early involvement of all agencies and early and frequent OCT meetings are crucial for successful outbreak management

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Zoonotic infections associated with animal bites

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Commensal zoonotic bacteria have the potential to cause serious infections in humans. The following 3 cases all presented over a 6 month period and gave a history of an animal bite, although sometimes this was not immediately apparent. Reviewing these cases as a series highlights the challenges faced in diagnosing zoonotic pathogens and lessons learnt by clinicians when managing them.

Case 1

A 50-year-old man presented with a swollen right knee and reduced mobility. His GP had diagnosed gout but his condition deteriorated, and 3 days later the patient attended the emergency department with a temperature of 38.5°C, and a hot and erythematous right knee with effusion. Investigations showed a C-reactive protein (CRP) of 375mg/L (normal range <6mg/L) and total white cell count (WCC) of $12.95x10^9$/L (normal range 4.0-11.0). His knee aspirate had numerous white cells but no organisms were seen on Gram stain. The cultures were subsequently negative. He was commenced on intravenous (IV) flucloxacillin for a presumed septic arthritis, but his CRP continued to climb (peak of 472mg/L) and he became progressively more unwell.

The patient was then reviewed by the Microbiology/Infectious Diseases team. He reported keeping 2 snakes, and a lizard that had previously been colonised with a *Salmonella* sp. On further questioning he stated that 2 days prior to the onset of his symptoms he was bitten on the hand by a field mouse he had caught. On examination the bite looked well healed with no sign of infection. He had multiple swollen, painful joints, but no rash or physical stigmata of infective endocarditis. With this picture and a history of mouse bite a clinical diagnosis of rat bite fever was considered. His treatment was changed to IV ceftriaxone, and the fluid from the knee aspirate was referred for 16S rDNA PCR. The patient improved on ceftriaxone and his temperature quickly settled. The 16S rDNA PCR was subsequently reported to be positive for *Streptobacillus moniliformis* and the diagnosis of rat bite fever was confirmed [1]. A trans-oesophageal echocardiogram excluded infective endocarditis. The patient was discharged on oral amoxicillin to complete 6 weeks of treatment and was well on review.

Case 2

A 1-year-old child was admitted with a 1-day history of fever (38.9°C), and lethargy, but with no focal symptoms. The child was commenced on IV co-amoxiclav as empirical therapy. Blood cultures taken in the emergency department on initial presentation flagged positive after 13 hours of incubation, and a Gram positive coccus in chains was seen on microscopy. An optochin resistant, alpha-haemolytic streptococcus was grown the next day, which was subsequently identified as *Streptococcus minor* by matrix assisted laser desorption ionization-time of flight mass spectrometry (MALDI-TOF MS). As this organism is a commensal found in the oral cavity of canines [2], the history was re-taken. On further questioning, it appeared that there was a dog in the family home which the child would often play with. It was unclear whether the dog had bitten the child, but on examination a number of scratches were noted on the child's arms and legs, although none appeared infected. The child received a short course of co-amoxiclav and made an uneventful recovery.

Illustration: V Markidou

Case 3

A 14-year-old child presented to the emergency department following the partial amputation of the tip of their right index finger, secondary to a horse bite 8 days previously. The child had initially presented to a different emergency department, where the wound had been cleaned and dressed and the child commenced on oral flucloxacillin. The wound had subsequently become painful, hot, and swollen. On the examination, the child was systemically well with no fever, but there was pus in the wound. A plain X-ray of the finger demonstrated a comminuted and displaced fracture through the tip of the distal phalanx, but there was no evidence of osteomyelitis. The child was switched to oral co-amoxiclav and the wound was debrided by the plastic surgery team. A wound swab grew an oxidase positive Gram negative bacillus, subsequently identified as *Actinobacillus equuli* by MALDI-TOF MS. This is a commensal organism carried in the oral cavity of horses that is also known to be a pathogenic cause of septicaemia in equines [3] and other animals. The infection responded to debridement and the child received a 6 week course of oral co-amoxiclav due to concerns of underlying bony involvement.

Discussion

In all 3 cases there was a clear history of exposure to animals which corresponded with the microbiological findings. However, this only became apparent in 2 cases on further history taking following the involvement of a specialist infection team. The 3 organisms identified are all recognised commensals of the different animals identified in the histories, but caused serious infections in the patients involved.

Rat bite fever is rarely diagnosed as the organism is fastidious and slow growing. There are on average 1-2 cases reported in the UK per year [4]. A high index of suspicion is needed in anyone presenting with fever and myalgia or arthralgia that has been bitten or scratched by a rodent. The carriage rate in laboratory rats has been shown to be up to 100%. Serious invasive infections are rare, however, without treatment the mortality rate has been reported to be around 10% showing the need for correct diagnosis [1]. In our case, the patient continued to deteriorate until the correct clinical diagnosis was identified following careful history taking. Once an active antibiotic was commenced the patient quickly improved.

For the child with the *S. minor* infection the identification of the pathogen in blood allowed for a focused history, which identified the likely origin of the infection. Prior to the introduction of MALDI-TOF MS into the routine diagnostic laboratory for the identification of bacteria, it is

highly likely that this isolate would not have been identified by conventional phenotypic and biochemical methods, and would probably have been dismissed as a contaminant. The correct identification of the organism prevented the child from needless further invasive investigations to identify an alternative diagnosis, and guided the length of treatment needed.

In the third case, although the source of the infection was clear the identification of the specific organism allowed clinicians to choose an appropriate antimicrobial, and guide the duration of treatment. It also highlights the importance of using a broad-spectrum agent, such as co-amoxiclav, when dealing with animal bites to cover for a wider range of zoonotic commensal organisms.

These cases demonstrate that a wide variety of zoonotic commensal bacteria, often carried in the oral cavity, can cause severe and serious infections when humans come into contact with them as part of a traumatic injury. The importance of thorough history taking on initial presentation cannot be underestimated, in order to provide clues to the identity of the infecting pathogen, and ensure that there is no delay in initiating the appropriate treatments. In patients with zoonotic exposure the use of broader spectrum therapy to cover zoonotic commensals is appropriate, until the specific pathogen can be confirmed. Without the correct diagnosis, treatments can be sub-optimal, resulting in progression of these infections which can be serious, and potentially fatal.

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Livestock-Associated MRSA: An emerging issue for One Health in the UK?

Angela Kearns (Head Staphylococcus Reference Service), Healthcare Associated Infections and Antimicrobial Resistance Division, NIS, PHE

The term livestock-associated methicillin-resistant *Staphylococcus aureus* (LA-MRSA) was coined following the identification of a novel MRSA lineage in pigs, pig farmers and their families in the Netherlands and France in the early 2000's. LA-MRSA belonging to multi-locus sequence type clonal complex 398 (CC398) has subsequently been identified in diverse livestock species (pigs, veal calves, poultry, horses and dairy cows) in Europe and worldwide, particularly in countries with intensive livestock farming practices. In most instances, it is found in the nose or on the skin of livestock without causing clinical signs of infection.

LA-MRSA has also been identified in humans in direct contact with LA-MRSA positive animals, following zoonotic transmission. Such individuals can become colonised, with LA-MRSA being found asymptomatically in the nose or on the skin. However, as with other types of MRSA such as healthcare- and community-associated MRSA, if LA-MRSA enters the body through breaches in the skin, it can cause a local skin infection or, more rarely, invasive disease such as pneumonia or bacteraemia. Of public health concern, CC398 LA-MRSA are commonly multi-drug resistant (MDR; resistant to more than 2 antibiotic classes in addition to β-lactams), limiting the therapeutic options.

Photo credit: EIZ

LA-MRSA in livestock

Despite the expansion and increasing reservoir of CC398 LA-MRSA in mainland Europe, there have only been occasional reports of CC398 LA-MRSA from livestock in the UK including pigs (n=11), poultry (1 turkey and 1 pheasant), horses (n=2) and cows (n=2) [1]. Genomic studies show these represent multiple independent incursions of CC398 LA-MRSA into the UK. An unrelated and rarely reported LA-MRSA lineage (CC30) was identified in 3 pigs in Northern Ireland in 2015.

LA-MRSA in retail meat and animal products

In mainland European countries, LA-MRSA has been detected in up to 44.5% of raw meat samples tested. CC398 LA-MRSA has been recovered from up to 4.8% raw pork, 8% chicken and 18.2% turkey meat on retail sale in the UK. CC398 LA-MRSA has also been

identified in bulk milk from dairy cattle in 5 geographically dispersed farms in the UK. There has also been a single report of CC9 LA-MRSA (a lineage prevalent in livestock and retail meat in Asia) identified in chicken meat in the UK.

LA-MRSA in humans

Varying LA-MRSA colonisation rates have been reported among individuals with occupational exposure to livestock in mainland Europe: up to 86% pig farmers, 37% poultry farmers, 37% cattle farmers, 45% veterinarians and 6% slaughterhouse workers [2].

Overall only 1 out of 2283 (0.0004%) MRSA recovered from humans in the East of England was identified as CC398 LA-MRSA. To date, CC398 LA-MRSA has been reported from 13 patients in the UK. All cases were from screening/carriage sites or superficial infections and none reported occupational exposure as a known risk factor.

In an attempt to estimate the LA-MRSA carriage rate in an "at risk" UK population, in collaboration with PHE's Emerging Infections and Zoonoses (EIZ) team who are responsible for the Serum Archive for Emerging Zoonoses (SAfEZ), adult volunteers with frequent occupational or recreational contact with animals attending 2 national Veterinary shows and a Pig and Poultry Fair in 2015/6 were screened for MRSA carriage. The results of these national surveys will be published shortly.

In summary, occasional reports of CC398 LA-MRSA across multiple animal species combined with its presence in the human food chain and in humans suggest it may be an emerging problem across the 1 health landscape, but currently of low prevalence in the UK.

Further information

- UK government has published **2 leaflets which provide information and guidance on LA-MRSA for those who work with livestock or in abattoirs**
- Food Standards Agency published a **Risk Assessment on Meticillin-Resistant Staphylococcus aureus (MRSA), with a focus on Livestock-associated MRSA, in the UK food chain**

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2. EFSA (European Food Safety Authority) and ECDC (European Centre for Disease Prevention and Control), 2018. The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2016. *EFSA J* **16(2)**:5182.

Chica the cat (2000–2018)

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Photo credit: EIZ

Chica the cat died peacefully on 10 September 2018; she was 18 years old. Chica was a very special cat. She was left homeless in 2008 when her then owner sadly died from inhalation anthrax after making animal hide drums in his studio workshop in East London. Chica had been the sole permanent resident of the workshop where the contaminated skins were stored and drums crafted. Although Chica showed no signs of being unwell, as a precaution she was decontaminated and removed to the Heathrow Animal Reception Centre (ARC) where she was kept in isolation for 60 days.

Inhalation anthrax is very rare and there are few documented cases of anthrax occurring as a result of making drums from untanned animal hides [1]. In 2008, Chica's owner was the first reported case in England and Wales for more than 30 years [2]. There was another single case of disseminated anthrax reported in Scotland in 2006 following the use or handling of animal hide drums [3]. There have been no cases of inhalation anthrax in the UK since 2008. The risk associated with imported animal hides used for drum making and drumming remains very low.

After the incident was declared over, a member of the anthrax incident management team volunteered to rehome Chica. In January 2009, once her 60 days was complete, Chica was picked up from the ARC and bought home to North London. For almost 10 years Chica lived quietly with her adopted family including 3 'sister' cats. She loved cuddles, enjoyed sitting on laps and sleeping in her favourite sunny spots around the house and garden. Chica was a much loved pet and she will be sadly missed by her family.

References

1. Bennett *et al* (2018) Drumming-associated anthrax incidents: exposures to low levels of indoor environmental contamination. *Epi & Infect* **146:**1519-1525.
2. Anaraki S *et al* (2008) Investigations and control measures following a case of inhalation anthrax in East London in a drum maker and drummer, October 2008. *Eurosurveillance* 13(51): pii=19-76.
3. Riley A. (2007) Report on the management of an anthrax incident in the Scottish Borders. Melrose: National Health Service Borders.

The Human Animal Infections and Risk Surveillance (HAIRS) group

The HAIRS group is a multi-agency and cross-disciplinary horizon scanning group, chaired by PHE's Head of Emerging Infections and Zoonoses. The group has met every month since February 2004 and acts as a forum to identify and discuss infections with potential for interspecies transfer (particularly zoonotic infections). Further information is available at **www.gov.uk/government/collections/human-animal-infections-and-risk-surveillance-group-hairs**

New / Updated Risk Assessments

- HAIRS risk assessment: **Chikungunya virus**
- HAIRS risk assessment: **squirrel Bornavirus**

New reports/ guidelines

- **UK Zoonoses Report 2016**
- **Lyme disease NICE guideline**
- **Raw pet foods: handling and preventing infection**
- **Monkeypox guidance**
- **Chronic wasting disease: risk assessments**

Selected Publications on Zoonoses

Early start of the West Nile fever (WNF) transmission season 2018 in Europe. There was an unusually early start to the transmission season in 2018 together with an increase in the number of locally-acquired human cases in Europe. The period of monitoring for WNF is mid-June to November, however this year the first disease onset occurred at the end of May.

- *In the UK, 2 imported cases of West Nile virus infection were reported in the third quarterly (Q3, 2018) report - see **Health Protection Report***

Emergence of monkeypox as the most important orthopoxvirus infection in humans. Review of monkeypox outbreaks and epidemiology which pulls together both official and unofficial data on reported cases since 1970. There are large data gaps, but it appears that case numbers have been increasing over the last 5 decades. Possible explanations include declining population immunity following the end of routine smallpox vaccination, improved diagnostic testing and surveillance, and increased exposure to animal reservoir species.

- *In 2018, **2 cases of monkeypox were imported into the UK** from Nigeria and **third case occurred in the UK** in a healthcare worker.*

Novel orthopoxvirus and lethal disease in cat, Italy. A novel orthopoxvirus induced skin lesions and caused a fatal infection in a cat. This virus was closely related to ectromelia virus and distantly related to cowpox virus. Rodents may be the main reservoir and further investigation is required, including into the zoonotic potential of the virus.

***Brucella suis* infection in dog fed raw meat, the Netherlands.** *B. suis* biovar 1 infection was diagnosed in a dog without typical exposure risks; the most likely source of infection was the dog's raw meat–based diet (hare carcasses imported from Argentina).

Commercial frozen mice used by owners to feed reptiles are highly externally contaminated with *Salmonella* Enteritidis PT8. Outbreaks of salmonellosis, especially in children, have been linked to reptile contact and contaminated feeder mice. This study investigated the location of *Salmonella* contamination of frozen feeder mice obtained from a supplier involved in a 2016 UK outbreak. *S.* Enteritidis was isolated from 17/59 (28.8%) batches tested. The high level of external contamination of the rodent carcasses is likely generated during the production process, and is a risk to those handling this type of pet food.

Wild and domestic bird faeces likely source of psittacosis transmission – A case-control study in Sweden, 2014-2016. Thirty-one cases were notified during the study period and all lived in Southern Sweden. Two risk factors were associated with psittacosis infection: cleaning wild bird feeder or owning domestic birds. Exposure to bird faeces appeared to be the main route of transmission. Recommendations include; change to design of bird feeders to limit faeces accumulation, avoidance of dust production from dried bird faeces and reiterating good hygiene practices (washing hands).

Public health response to an imported case of canine melioidosis. A case of subclinical urinary *Burkholderia pseudomallei* was reported in a dog in the USA that had been adopted from Thailand. The worldwide movement of animals has become more common and may lead to importation of *B. pseudomallei* or other zoonotic infections to non-endemic areas and subsequent human infections.

Severe pneumonia caused by toxigenic *Corynebacterium ulcerans* infection, Japan. Although a well-described zoonosis, pneumonia complications associated with *C. ulcerans* are rarely described. Two cases recently diagnosed in Japan presented with severe pneumonia complicated by diffuse pseudomembrane formation. Both cases had cats, some of which also tested positive for toxigenic *C. ulcerans*.

Prion disease in dromedary camels, Algeria. Retrospective analysis determined 3.1% of animals with physical and behavioural neurologic signs were positive for a novel prion. As dromedaries are widespread throughout parts of Africa, Middle East and Asia and an integral part of life in those areas, investigations are ongoing into the geographic distribution of the disease and its possible origins.

CPD, Meetings and Conferences

- **International Meeting on Emerging Diseases and Surveillance** (IMED), Vienna, Austria, 9-12 November 2018. *The abstracts for oral and poster presentations from this meeting are available online* **http://imed.isid.org/**
- **Introductory course on the epidemiology and surveillance of infectious diseases PHE Colindale, 4-8 February 2019** *For further information contact:* Yvette.Howell@phe.gov.uk Telephone: 020 8327 7427
- **East of England Zoonoses and One Health Seminar***,* William Harvey Lecture Theatre, University of Cambridge Medical School. Wednesday 20 March 2019. A seminar for everyone with an interest in zoonoses and One Health, including those working in Health Protection, Environmental Health, Microbiology, Veterinary Science or Medicine and Public Health. *Enquiries to David Edwards,* EastofEnglandHPT@phe.gov.uk
- **Public Health Research and Science Conference 2019** PHE/ NIHR 9-10 April 2019 University of Manchester. **https://www.phe-events.org.uk/**

We welcome suggestions on topics for inclusion in future issues of the Newsletter

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