HM Government

The Human Animal Infections and Risk Surveillance (HAIRS) Group

2016 Report

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About the HAIRS group

The joint Human Animal Infections and Risk Surveillance (HAIRS) group is a cross-government group, chaired by the Public Health England (PHE) Emerging Infections and Zoonoses section. The group acts as a forum to identify, discuss and assess infections with potential for interspecies transfer (particularly zoonotic infections): www.gov.uk/government/collections/human-animal-infections-and-risk-surveillance-group-hairs

Report prepared by PHE on behalf of the HAIRS group.
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Preface

Formed in 2004, the Human Animal Infections and Risk Surveillance (HAIRS) group is a multiagency, multidisciplinary cross-government horizon scanning and risk assessment group covering England, Wales, Scotland and Northern Ireland. This report summarises the work done by the group in 2016, and is a collaborative publication from members representing the following agencies:

- Public Health England
- Department for Environment, Food and Rural Affairs
- Department of Health
- Food Standards Agency
- Animal and Plant Health Agency
- Health Protection Scotland
- Scottish Government
- Public Health Agency, Northern Ireland
- Department of Agriculture, Environment and Rural Affairs, Northern Ireland
- Public Health Wales
- Welsh Government

The work of the group prior to 2016 is summarised in previous reports, available at: https://www.gov.uk/government/collections/human-animal-infections-and-risk-surveillance-group-hairs

HAIRS members – end of 2016

ENGLAND

Public Health England (PHE)

Dilys Morgan (Chair)	Head of Emerging Infections and Zoonoses
Amanda Walsh (Secretariat)	Senior Scientist, Emerging Infections and Zoonoses
Catherine O'Connor (Secretariat)	Scientist, Emerging Infections and Zoonoses
Kevin Brown	Deputy Director of Virus Reference Department
Jolyon Medlock	Head of Medical Entomology and Zoonoses Ecology

Department of Health (DH)

Sally Wellsteed	Global and Public Health

Animal and Plant Health Agency (APHA)

Steve Wyllie	Head of One Health
Andrew Frost	Veterinary Advisor
Charlotte Featherstone	Project Leader for Non-Statutory Zoonoses
Cameron Stewart	Veterinary Officer & Specialist in Veterinary Public Health
Paul Duff	Leader of Diseases of Wildlife Scheme

Department for Environment, Food and Rural Affairs (Defra)

Fin Twomey	Head of Animal Public Health

Food Standards Agency (FSA)

Manisha Upadhyay	Senior Scientific Officer, Microbiological Risk Assessment
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NORTHERN IRELAND

Public Health Agency

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Department of Agriculture, Environment and Rural Affairs (DAERA)

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Gill Hawkins	Consultant in Health Protection

Scottish Government

Colin Macaldowie	Deputy Chief Veterinary Officer

WALES

Public Health Wales (PH WALES)

Robert Smith	Clinical Scientist (Zoonoses)

Welsh Government

Adrienne Mackintosh	Veterinary Advisor, Chief Veterinary Office
Arjen Brouwer	Veterinary Advisor, Chief Veterinary Office

Past HAIRS members (2015 - 2016)

Elizabeth Kelly	Defra
Ruth Parry	DH
Paddy McGuckian	DAERA
Clare Wild	APHA

Dedicated to the memory of our colleague Charlotte Featherstone

Charlotte Featherstone (née Garrett) was born in Northern Ireland on 12th November 1975. She graduated from the University of Cambridge in 2000 with a Vet MB and a Masters in Zoology. As a student, Charlotte was completely dedicated to her studies. During her time at University, she joined the Tropical Biology Association, formed to build the capacity of conservation scientists and institutions in tropical regions to manage and safeguard biodiversity for the long term. Through the association, Charlotte travelled to Naivasha in Kenya as part of her elective year. Recognising the interactions between people and animals, this inspired her passion to understand zoonotic diseases and developed into a commitment to share information, teach, inspire and help others.

After graduation, Charlotte began her career as a veterinary surgeon in mixed practice, working in Easingwold in Yorkshire, caring for a wide variety of farmed livestock and pets. When the Foot and Mouth epidemic of 2001 spread to Yorkshire, Charlotte immediately went to assist her veterinary colleagues and farmers to help control and eradicate the disease, before returning to work as a farm animal vet at the Skeldale practice in Thirsk.

One day, while responding to a call out from Skeldale, Charlotte crashed her car into a muddy field near the village of Crayke. The practice called a local farmer Stan Featherstone to rescue her and he pulled her out of the field with his tractor. A week later they were an item and Charlotte got to marry her knight in shining armour. It wasn't too long before their son Robbie arrived followed by their daughter Kathryn.

In 2003, Charlotte joined the Veterinary Laboratories Agency, as a Veterinary Investigation Officer in Thirsk. She became proficient in the diagnosis of disease and investigating poor performance, especially in pigs, cattle and sheep. She successfully completed a Masters in Veterinary Public Health from the University of Glasgow in April 2011, and later that year, was asked to lead the Non-statutory Zoonoses project, part of the agency's Surveillance Programme.

Charlotte played a key role as a member of the Human Animal Infections and Risk Surveillance group (HAIRS) that meets specifically to identify and assesses emerging infection risks to human health. In a time before One Health as a concept was formed, Charlotte was already playing a pivotal role in trying to improve animal and human health and well-being through the prevention of risks and the mitigation of effects of crises that originate at the interface between humans, animals and their various environments.

Charlotte always had time for her colleagues and championed many causes with her compassionate nature always shining through. She would insist that she was just part of a team, but she was a star and we will miss her twinkling smile and softly spoken northern Irish accent and the light she brought to our lives.

Charlotte Featherstone, MA VetMB MVPH, 1975-2017

(adapted with permission from Amanda Carson and Angus Wear, APHA)

Executive Summary

The Human Animal Infections and Risk Surveillance (HAIRS) group continued to meet monthly during 2016 and had another busy year discussing emerging issues affecting human and animal health in the UK and internationally. During this period, the topics and incidents considered by the group have ranged from high profile outbreaks to rare disorders affecting restricted populations.

Vector-borne diseases (VBD) continue to be discussed and assessed by the group, especially during 2016. Spain reported the first human cases of locally-acquired Crimean-Congo haemorrhagic fever (CCHF) in Western Europe, with the index patient probably acquiring the infection in northwest Spain, near Madrid. A secondary nosocomial case also occurred, but no further transmissions were detected. CCHF virus (CCHFV) had been detected in ticks in Spain previously. Other sporadic cases are thought possible, though the probability of CCHF infection in Spain is low. A risk assessment was undertaken by the HAIRS group, and the risk to the UK population was deemed to be very low.

Aedes albopictus was identified for the first time by PHE surveillance when eggs were identified in a mosquito trap at a service station along the M20 in Kent. Control measures were implemented and no further evidence of *Ae. albopictus* mosquitoes was found. VBD risk assessments were revised to take account of this finding, but as long as the mosquito is not established in the UK, the risk of disease transmission remains very low.

Other tick-borne infections and exotic tick identifications, along with the first human tick-borne encephalitis case acquired in the Netherlands, were also considered. In addition, the spread of *Culex modestus* in the Thames Estuary and along the Essex coast in coastal habitats, and the resulting risk of West Nile Virus, were discussed.

This report describes these and many other topics discussed by the HAIRS group during 2016, and includes the outcomes of those discussions.

Major topics and incidents discussed by the HAIRS group

The following section includes a summary (in alphabetical order) of the major topics and incidents discussed by the HAIRS group during 2016. Discussions on some topics will have continued in 2017 and will be covered in the next HAIRS report. Both subjects newly presented to the group, either as a result of an incident, disease trend, or new research and subjects previously discussed by the group for which new evidence, information or data became available which might have affected previous risk assessments, are included in this section.

Chronic Wasting Disease in Norway – first report in a European country	
Status: New incident	Raised by: Scottish Govt/APHA

Chronic Wasting Disease (CWD) is a prion disease of cervids, first described in the USA in the 1950s. In August 2015, APHA carried out a risk assessment into the incursion of CWD through various legal trade routes. At this point, disease was restricted to USA, Canada and South Korea and therefore the most likely routes – movement of live animals – were discounted, due to trade restrictions. Other routes were identified including the import of deer urine for use in hunting lures. There were no trade regulations for this product, and the European Commission subsequently agreed to a ban any imports.

Image of lone *Rangifer tarandus* by Western Arctic National Parkland CC 2.0

In April 2016, Norway reported an adult doe reindeer (*Rangifer tarandus*) found dead in the south of the country that tested positive for a transmissible spongiform encephalopathy-like (TSE-like) prion, which was later confirmed as causing a condition similar to that caused by the CWD prion in North America [1]. The animal was found in an area of wild (free ranging) reindeer, rather than among the herded animals which are owned and traded by the Sami people. As a result, Norway put in place wide scale surveillance and testing and found a further four reindeer in the same region over the next months. Two moose (*Alces alces*) were also found dead and tested positive for TSE-like prions; however, in this case, the pathological presentation was more similar to a familial TSE and is not considered to be similar to CWD.

From an animal health perspective, the risk assessment considers the different pathways for introduction of disease into the UK deer population and subsequent exposure to and spread within UK cervids and other livestock [2]. The conclusion was that for CWD from the USA, there is a very low to low risk of the disease being introduced to the UK (depending on the pathway), a high risk of spread to other cervids and a very low risk of spread to other livestock species [2]. For the TSE-like prion disease in moose, the risk of incursion into the UK cervid population would be considerably lower because of the different tissue distribution and the possible atypical presentation of the prion disease but there is high uncertainty [3]. From a food safety perspective, consumption of venison in the UK mainly consists of UK origin cervid meat. Therefore the risk assessment considers the risk if disease were present in the UK already. There are many areas of uncertainty in the different steps of the assessment, but the overall risk assessment considered there was a very low risk to public health considering consumption patterns and slaughter house requirements.

Therefore, the overall risk level is very low if not negligible, given the unlikely scenario of disease already present in the UK cervid population, the presumed species barrier for aerosol transmission to other livestock and humans, and low consumption patterns.

Outcome

HAIRS discussed CWD several times during 2016. It was initially considered that the topic was not for HAIRS as there did not appear to be any human implications, but in view of the uncertainties the group agreed to keep a watching brief for more scientific evidence or epidemiological change. Following further developments, public health, animal health and food safety risk assessments were conducted/updated in 2017.

References

1. Benestad SL *et al*. First case of Chronic Wasting Disease in Europe in a Norwegian free-ranging reindeer. *BMC Vet Res.* 2016;47:88. https://veterinaryresearch.biomedcentral.com/articles/10.1186/s13567-016-0375-4
2. Defra. What is the risk of chronic wasting disease being introduced into Great Britain? An updated Qualitative Risk Assessment. 2016 April 06. https://www.gov.uk/government/publications/qualitative-risk-assessment-risk-of-chronic-wasting-disease-being-introduced-into-great-britain
3. Defra. What is the risk of a cervid TSE being introduced from Norway into Great Britain? Qualitative Risk Assessment. 2016 September 30. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/557205/qra-tse-reindeer-norway.pdf

Crimean-Congo haemorrhagic fever – an emerging tick-borne disease in Spain	
Status: New incident	Raised by: PHE

Image of *Hyalomma* tick by Alan Walker CC 3.0

Crimean-Congo haemorrhagic fever (CCHF) is a viral haemorrhagic fever caused by the CCHF virus (CCHFV), a virus of the Nairovirus group. CCHFV is spread by the bite of an infected Ixodid tick, most commonly of the *Hyalomma* genus. Immature ticks acquire the virus by feeding on infected small animals and are then persistently infected, capable of infecting other animals. CCHF has a broad geographic distribution related to the distribution of *Hyalomma marginatum*, and consequently has the widest distribution of any known haemorrhagic fever, being endemic in many countries in Africa, Asia, Eastern Europe and the Middle East.

Human infections are acquired by the bite of an infected tick, contamination with tick body contents (for example, if you squash a tick between your fingers), or direct contact with the blood, tissues or body fluids of infected humans or animals. The most commonly reported presentation of CCHF in humans is a febrile illness, whilst a more severe presentation with haemorrhagic symptoms and multi-organ failure occurs in some cases. Approximately 30% of all cases are fatal.

The Madrid Regional Ministry of Health reported the first human cases of locally-acquired CCHF in Western Europe in September 2016 [1]. The index patient was thought to have acquired the infection in the Castilla-León region of Spain (northwest – near Madrid). A secondary nosocomial case was also reported in a nurse who cared for the index patient. No further transmissions were detected.

CCHFV was first detected in ticks in the Extremadura region of Spain (western Spain bordering Portugal) in 2010; thus, the occurrence of autochthonous CCHF was not unexpected. Other sporadic cases are possible, though the probability of CCHF infection in Spain is low [2].

Public Health England has specialised laboratory facilities to provide a definitive diagnosis at PHE Porton. Two imported CCHF cases have been confirmed in the UK; one fatal case in 2012 and one in 2014. PHE and APHA participate in various ‘Big Tick‘ projects aimed at raising awareness about the dangers of ticks and tick-borne diseases in the UK and mapping the geographic risk [3].

Outcome

In 2016, the HAIRS group reviewed emerging evidence of CCHF in Europe. A risk assessment was undertaken, and the risk to the UK population was deemed to be very low. This was published in June 2017.

Risk assessment

Qualitative assessment of the risk that Crimean-Congo haemorrhagic fever presents to the UK population https://www.gov.uk/government/publications/hairs-risk-assessment-crimean-congo-haemorrhagic-fever

References

1. Comunidad de Madrid. Health confirms two cases of Crimean-Congo haemorrhagic fever virus. 2016 September 01. http://www.madrid.org/cs/Satellite?c=CM_Actualidad_FA&cid=1354608643850&language=es&pagename=ComunidadMadrid%2FEstructura&pid=1109265463020
2. European Centre for Disease Prevention and Control. Rapid risk assessment: Crimean-Congo haemorrhagic fever in Spain. 2016 September 11. https://ecdc.europa.eu/en/news-events/new-rapid-risk-assessment-crimean-congo-haemorrhagic-fever-spain
3. The Big Tick Project. 2017. http://www.bigtickproject.co.uk/about/

First detection of *Aedes albopictus* in UK

Status: New incident	Raised by: PHE

Native to south-east Asia, over recent decades *Aedes albopictus,* the Asian Tiger mosquito, has benefited from the global trade in used tyres, and as a consequence has established in many countries world-wide. Within Europe, the species was first imported into Albania in 1979 and into Italy in the late 1990s, where it was able to establish [1]. Since that time, the species has gradually increased its distribution to 28 European countries, predominantly via vehicle movements along highway networks [1].

Image of *Aedes albopictus* mosquito by James Gathany

As a result of the European presence of *Ae. albopictus* and returning travellers from countries with virus circulation, there have been locally acquired cases of chikungunya in Italy, France and Croatia, and locally acquired dengue in France and Madeira [2].

Modelling of the UK's climate has shown that *Ae. albopictus* would be able to establish populations in the UK [3, 4]; and the species has been successfully able to establish in the climatically similar Netherlands. There have been no locally acquired cases of chikungunya or dengue in the UK, because there are no established populations of the vector and, until 2016, no reports of the species being detected in the UK [5].

PHE surveillance for invasive mosquitoes along highway networks in the South of England identified the presence of *Ae. albopictus* for the first time in September 2016. Immature life stages (eggs) were identified in a mosquito trap at a service station along the M20 in Kent, which serves ex-continental Europe traffic. PHE enhanced surveillance was initiated, and control plans were implemented by the local authority within a 300 metre radius of the service station.

Control efforts centred around the removal of suitable habitats and the treatment of remaining container habitats with a silicon based mosquito control product. No further *Ae. albopictus* were found. The occurrence was most likely the result of one female mosquito arriving via vehicular transport at the service station, whereupon eggs were laid in the mosquito trap.

Outcome

The detection of this invasive mosquito was not unexpected given its proven ability to move via vehicular transport within Europe. The UK's ability to remain free of established populations of *Ae. albopictus*, and therefore free of locally acquired cases of dengue or chikungunya virus, is contingent on robust surveillance to enable early detection, and a rapid control response. To reflect new and emerging evidence, both the Zika virus and chikungunya virus risk assessments were updated.

Risk assessments

Qualitative assessment of the risk that Zika virus presents to the UK population
https://www.gov.uk/government/publications/hairs-risk-assessment-zika-virus

Qualitative assessment of the risk that chikungunya virus presents to the UK population
https://www.gov.uk/government/publications/hairs-risk-assessment-chikungunya-virus

References

1. Medlock JM *et al*. A review of the invasive mosquitoes in Europe: ecology, public health risks, and control options. *Vector Borne Zoonotic Dis*. 2012;12(6):435–47. http://online.liebertpub.com/doi/abs/10.1089/vbz.2011.0814
2. Schaffner F *et al*. Public health significance of invasive mosquitoes in Europe. *Clin Microbiol Infect*. 2013;19(8):685–92. http://www.sciencedirect.com/science/article/pii/S1198743X14614130?via%3Dihub

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4. Caminade C *et al*. Suitability of European climate for the Asian tiger mosquito *Aedes albopictus*: recent trends and future scenarios. *J R Soc Interface.* 2012;9:2708–17. http://rsif.royalsocietypublishing.org/content/early/2012/04/25/rsif.2012.0138
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Mycobacterium lepromatosis and M. leprae in red squirrels in the British Isles	
Status: New incident	Raised by: PHE
External experts consulted: Anna Meredith, University of Edinburgh; Diana Lockwood, London School of Hygiene and Tropical Medicine	

Mycobacterium lepromatosis was first reported in red squirrels in Scotland in 2014 and on the Isle of Wight in 2015. In 2016, a study on the presence of *Mycobacterium* species in squirrels in Scotland, England and Ireland confirmed the much wider geographical distribution of *M. lepromatosis* and, for the first time, *M. leprae* in red squirrel populations in the British Isles [1].

Image of a red squirrel by Peter Trimming CC 2.0

In red squirrels, the infection usually presents as a granulomatous dermatitis on skin around the face, head and ears and less frequently on skin on the body. The disease is relatively rare or sporadic, although on the island of Brownsea, near Poole in Dorset, the prevalence appears to be higher. Neither *M. lepromatosis* or *M. leprae* have been detected in grey squirrels or any other populations of red squirrels outside the British Isles to date.
Both pathogens are known to cause clinical illness in humans; however, neither is endemic in the human population in the UK. A risk assessment was completed to assess the overall risk to the UK population from infected red squirrels. This concluded that the probability is very low for the general population, and low for high risk groups (such as those who have direct contact with red squirrels via conservation or care activities).

Outcome

The HAIRS group recommended that individuals with direct exposure to infected red squirrels in the UK should be advised of the potential risk from squirrel leprosy and what measures they should take to minimise the risk of transmission. In addition, newly diagnosed leprosy cases reported in the UK which are identified as potentially locally acquired should be asked whether they had contact with red squirrels.

Risk assessment

Qualitative assessment of the risk that *Mycobacterium lepromatosis* and *M. leprae* in red squirrels present to the UK human population (published June 2017)
https://www.gov.uk/government/publications/hairs-risk-assessment-leprosy-in-red-squirrels

References

1. Avanzi C *et al*. Red squirrels in the British Isles are infected with leprosy bacilli. *Science*. 2016;354(6313):744-747. http://science.sciencemag.org/content/354/6313/744.long

Salmonella risks associated with raw pet food

Status: New incident	Raised by: PHE, APHA

In recent years, there has been an increase in the popularity of feeding raw pet-food products to domestic cats and dogs. This appears to be partially fuelled by a belief among pet owners that a raw diet is healthier than processed pet food and also an increased availability of commercially produced raw products.


Image of cat eating raw food by Hotash CC 2.0

As the name suggests, raw pet-food commonly consists of uncooked, chopped or minced raw meat/offal potentially from a range of animal species, sometimes mixed with fruit or vegetables that is then packaged, labelled and frozen. The process does not include any treatment step, other than freezing, and so the finished product cannot be considered microbiologically sterile. Therefore, there are infection risks associated with a variety of pathogens if proper handling and disinfection of feeding areas does not take place.

Raw pet-food production is regulated by the European Animal By-Products regulation which sets out production and monitoring standards [1]. The regulation requires production to be carried out in approved premises and includes a requirement for random samples of raw pet-food to be taken during production and/or storage to verify the absence of *Salmonella*.

An increase in the number of *Salmonella* positive results arising from this testing has been noted in recent years. This increase appears to reflect the growth in the raw pet-food sector and the increased volume of raw product being manufactured and tested. Investigations into the cause of these failures tend to point towards a microbiological burden present in the incoming raw ingredients which, as this is not removed in the production process, pass through into the final product.

Salmonella infection in dogs is largely sub-clinical, with dogs shedding the bacteria in their faeces without displaying any signs of disease. Colonised pets can act as a source of infection to other pets and humans, particularly where proper hygiene is not practiced [2]. In addition, there is a potential risk to health through pet owners handling raw product or through contact with sub-clinically infected animals as well as those with clinical signs of disease.

The risks associated with handling contaminated raw pet-food are broadly in line with raw meat products for human consumption, but it is not clear if pet owners fully appreciate this. For all pet owners feeding a raw pet-food diet, basic hygiene principles relating to safe handling, cleaning/disinfection of feeding areas and good hygienic practices for handling of faeces can help reduce the risk of zoonotic transmission.

Outcome

The HAIRS group noted that although it was the presence of *Salmonella* spp., that first triggered discussion, the risks from raw pet food include a number of other pathogens that are likely to be present in unprocessed products. They agreed that additional best practice guidance covering sourcing of raw materials, production processes and labelling should be instigated. Officials are currently supporting the Pet Food Manufacturers Association in the production of Industry Best Practice Guidance. This is expected to be available in 2017. The situation will continue to be monitored.

References

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Tick detections and *Babesia canis*	
Status: Update	Raised by: PHE

Image of *Dermacentor reticulatus* tick by Accipiter CC 3.0

Dermacentor reticulatus (the ornate cow tick) is found across central Europe and has been reported in the UK for more than 100 years. It is known to be present in West Wales, and north and south Devon, with reports from Essex since 2009. Historically, the typical UK habitat is primarily grassland, including coastal sand dunes and headlands grazed by livestock. It rarely bites humans.

Dermacentor reticulatus ticks had previously been reported in coastal Essex and it was suspected that their range would expand, possibly via horses. The UK tick reporting scheme operated by PHE is designed to identify unusual ticks. There are a number of routes via which non-UK ticks could enter the UK (on livestock imports, on wild birds, in cargo etc), and as such there is a risk that other exotic (or zoonotic) tick borne pathogens could enter the UK and cause disease. A previous Defra risk assessment assessing the threat posed by exotic ticks entering the UK found the combined risk to be negligible under the current conditions [1], and a HAIRS risk assessment for newly emerging tick-borne pathogens in the UK population found the risk to be very low/low.

Over the last 2 years there have been a number of reports in other parts of coastal Essex associated with grazing marshes. It is likely that herds of cattle and flocks of sheep used for grazing protected coastal habitats are now moving these ticks around. A cluster of canine babesiosis cases (*Babesia canis*) was detected in Harlow during 2016 [2,3]. *Babesia canis* is not zoonotic. Ticks were removed from affected dogs and tested positive for *B. canis* by PCR. All dogs were walked in the same area of Harlow and none had any history of travel outside the UK. PHE and APHA investigated a park area used by dog walkers and of 17 questing *D. reticulatus* ticks found, 14 tested PCR positive for *B. canis* demonstrating that there was a local infected tick population. Since then, additional records of this tick have been found in the region around Harlow, and the occasional case of canine babesiosis is reported. A review of the distribution and range expansion of *D. reticulatus* has recently been published [4].

Outcome

The group will continue to monitor the situation, even though *Babesia canis* is not zoonotic, because of the potential risk of other infections of human significance associated with imported ticks.

Risk assessment

Qualitative assessment of the risk that newly emerging tick-borne bacteria present to the UK population https://www.gov.uk/government/publications/hairs-risk-assessment-emerging-tick-borne-bacteria-in-the-uk

References

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Zika virus outbreak in the Americas

Status: New incident	Raised by: PHE

Zika virus is an emerging mosquito-borne virus that was first identified in Uganda in 1947 but caused little global interest until 2007 when an outbreak occurred in Micronesia. The same strain caused a subsequent outbreak in French Polynesia in 2013.

Brazil first reported cases of Zika virus infection in 2015. An association between Zika virus infection and Guillain-Barre syndrome was noted, and in October 2015, Brazil reported an association between Zika virus infection and foetal neurological abnormalities including microcephaly. The WHO International Health Regulations Committee on Zika virus met in February 2016 and declared a Public Health Emergency of International Concern. The Emergency Committee met again in March 2016 when it considered that there was increasing evidence of a causal relationship with Zika virus.

The majority of people infected do not exhibit symptoms. For those with symptoms, Zika virus generally causes a mild, short-lived (2 to 7 days) disease. Serious complications and deaths from Zika virus are not common. Although the primary route of transmission is via the *Aedes* mosquito, mounting evidence showed that sexual transmission of the virus was possible [1]. Travel-associated Zika virus infections were confirmed in UK travellers but no locally acquired cases, aside from a single likely sexual transmission, were reported during 2016.

Outcome

In response to the rapid and extensive spread of the virus to new geographical areas, the HAIRS group recommended a risk assessment to review the risk that Zika virus presents to the UK population. In the absence of a suitable vector in the UK, the risk was assessed to be very low and related only to travel to affected areas of the world. However, the situation would continue to be monitored closely, particularly for developments in Northern Europe. The risk assessment was first published in February 2016, updated in May 2016 to include the risk of sexual transmission and in July 2016 to incorporate new evidence on sexual transmission.

Risk assessment

Qualitative assessment of the risk that Zika virus presents to the UK population
https://www.gov.uk/government/publications/hairs-risk-assessment-zika-virus

References

1. World Health Organization. Prevention of sexual transmission of Zika virus. 2016 September 6. http://www.who.int/csr/resources/publications/zika/sexual-transmission-prevention/en/

Other topics and incidents discussed by the HAIRS group

The following section includes a summary (in alphabetical order) of other topics and incidents discussed by the HAIRS group at monthly meetings during 2016. Discussions on some topics will have continued in 2017 and will be covered in the next HAIRS report.

Animals in care homes	
Status: Update	Raised by: PHE/APHA

The use of companion animals in care homes and hospices has created some controversy. A review of current literature, however, suggests that there are positive health benefits to the elderly and chronically ill from having access to companion animals in healthcare facilities [1]. These include:

- reduction in risk from cardiovascular problems including hypertension
- improvements in social interactions within groups
- improving psychological and social health

As a result, many hospitals and long-term care facilities allow family pets to visit ill or convalescing patients or will support animal-assisted therapy programs; this may include resident animals in long-term care facilities.

Whilst there are positive outcomes from human-animal interactions, there are potential risks and disadvantages linked to pet therapy including cost, dislike of animals, phobias or cultural inhibitions and potential risks from zoonoses, allergies and bites. In addition to the potential for spreading zoonoses, companion animals carry the risk of contributing to the spread of infections, such as MRSA, already present in the healthcare environment; animals can become heavily colonised and act as a reservoir of infection. As such, they should not be allowed to come into contact with open wounds [2].

However, providing reasonable care is taken, the psychological and physical benefits of therapeutic interactions may outweigh the risks in certain situations. As some animals may be difficult to control and pose a risk to patients or staff through their behaviour, a local risk assessment agreed with infection control is essential.

Outcome

The HAIRS group recognises that this is an important issue. A sub-group has been convened to develop more detailed guidelines under which animals could be permitted, recognising their therapeutic value to patients and care home residents.

References

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Colistin mediated resistance	
Status: New incident	Raised by: PHE

Colistin is an antibiotic of last resort for patients with infections that are resistant to all other antibiotics. In November 2015, a newly reported gene conferring resistance to colistin (*mcr-1*) was reported in pigs, pork and chicken meat, and people in China [1]. The gene was present on plasmids and was thus mobile and transferable. It was subsequently identified in Algeria, Canada, Denmark, France, Laos, the Netherlands, Thailand, Tunisia, South America and the UK.

Image of pigs by US Dept of Agriculture CC 2.0

Following the report from China in 2015, PHE began screening over 17,700 archived isolates for the presence of the *mcr-1* gene. APHA identified the gene in colistin-resistant *E. coli* and *Salmonella* isolates taken from pig farms in England. These preliminary investigations suggested that *mcr-1* was present in enteric bacteria from pigs in the UK [2]. Following the detection, the Pig Veterinary Society advised that use of colistin in pigs must be supported by laboratory sensitivity tests [3] as it is an antibiotic of last resort. No further colistin resistance in isolates from pig farms has been detected.

Outcome

The view of the HAIRS group was that the immediate risk to public health posed by these findings was very low. The *mcr-1* gene will be routinely screened for in samples sent to the PHE reference laboratory.

References

1. Liu Y-Y *et al*. Emergence of plasmid-mediated colistin resistance mechanism MCR-1 in animals and human beings in China: a microbiological and molecular biological study. *Lancet Infect Dis.* 2015;16(2):161-168. http://www.thelancet.com/journals/laninf/article/PIIS1473-3099(15)00424-7/abstract
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***Culex* mosquitoes distribution update**	
Status: Update	Raised by: PHE

The mosquito *Culex modestus* is an important vector of West Nile virus (WNV) in Europe [1]. Prior to 2010, the species was considered to be absent from the UK, and consequently WNV risk assessments were based on the lack of this key bridge vector. In 2010, the PHE mosquito surveillance scheme identified *C. modestus* in North Kent where the mosquito was found in large numbers, particularly on the Hoo Peninsula and the Isle of Sheppey, and in 2012 individual specimens were recorded in Poole Harbour and also in the Cambridgeshire fens suggesting a wider distribution [2].

Image of *Culex modestus* mosquito by Marcello Consolo CC BY-NC-SA 2.0

PHE has continued to conduct surveillance in Kent and Essex, and in 2014, it was found at 3 further sites in North Kent (between Swanscombe and east of Canterbury), and for the first time in Essex close to Basildon [3, 4]. The species has now been reported at locations in Essex near Rainham, at Wallasea Island, and near Colchester at Fingringhoe. Adult trapping has also continued further afield at Strumpshaw and Chippenham Fen, and at Dungeness and Rye Harbour, but the species has not been recorded at these locations [5]. No further specimens were found at Poole Harbour.

Culex modestus is now known to have a widespread distribution in the Thames Estuary and along the Essex coast in coastal habitats. Mosquitoes were collected in 2013 and tested for WNV and found to be negative [4]. Mosquito surveillance will continue to be conducted to monitor the distribution of this species, particularly as the area has high numbers of migrant birds, to assess the potential for WNV incursions in the area.

Outcome

In 2012, HAIRS members developed the risk assessment for West Nile virus. The risk assessment determined a very low probability of infection for the general public. In light of the new discovery, the West Nile Risk Assessment is currently being reviewed and updated and enhanced surveillance discussed.

References

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EBLV-2 in Daubenton's bats in England	
Status: New incident	Raised by: PHE

European Bat Lyssaviruses (EBLV) belong to the Lyssavirus genus which contains at least 14 species, including rabies virus. Six species are found in Europe, but only one, EBLV-2 is present in bat populations in the UK, specifically in *Myotis daubentonii* (Daubenton's bats).

Image of *Myotis daubentonii* by Gilles San Martin CC BY-SA 2.0

Passive surveillance for lyssaviruses in UK bats has been ongoing since 1987 with the first detection of EBLV-2 in a Daubenton's bat in the UK in 1996. As of the end of 2016, 14 cases of EBLV-2 had been detected in Daubenton's bats since surveillance began [1]. EBLV-2 has existed in the UK Daubenton's bat population for at least two decades and presents a low but real risk to bat handlers and the public. PHE also works with the Bat Conservation Trust to ensure that regular bat handlers are vaccinated.

In September 2016, 2 Daubenton's bats, 1 at Bolton Abbey in Yorkshire and 1 in Northumberland, were found to be EBLV-2 positive.

Outcome

The detection of further bats in the UK with EBLV-2 was not unexpected. PHE has systems in place to ensure risk assessment of any exposed individuals for whom post-exposure treatment can be initiated if appropriate.
The HAIRS group acknowledges that the presence of lyssaviruses in the UK is an important potential public and animal health hazard and monitors any developments closely.

References

1. Johnson N *et al*. Two EBLV-2 infected Daubenton's bats detected in the north of England. *Vet Rec.* 2016;179:311-312. http://veterinaryrecord.bmj.com/content/179/12/311.4

First human tick-borne encephalitis case acquired in the Netherlands	
Status: New incident	Raised by: PHE

Tick-borne encephalitis (TBE) is a viral infection caused by a member of the Flaviviridae family. TBE virus (TBEV) is endemic across a range of countries including China, Japan, Russia and within Europe its range is extending. It is a public health problem in many countries. Cases have occurred in areas in central, eastern and northern Europe. Vaccination against TBE is recommended for anyone who plans to live or work in endemic areas, including Europe.


Image of *Ixodes ricinus* by Richard Bartz CC BY-SA 2.5

Routine vaccination is available for those living in endemic areas. The main vector in Europe is *Ixodes ricinus*, and the life cycle includes wild mammalian hosts, particularly rodents.

Although it can produce an asymptomatic infection in some people, a significant proportion have an illness leading to a severe encephalitis syndrome. There is variation in clinical presentation depending on the virus subtype. The case fatality rate is 1-2% for the European type.

In the Netherlands, TBEV antibodies were detected in roe deer samples collected in 2010 from the Sallandse Heuvelrug National Park. TBEV RNA was then detected in ticks collected from the same area in 2015, confirming the presence of TBE in the Netherlands [1]. In early summer 2016, a TBEV positive tick was found in a second National Park, Utrechtse Heuvelrug, and in July 2016, the Netherlands reported its first locally acquired human TBEV infection following a tick bite in the same area [2].

TBEV is not found in the UK although a close relative, louping ill virus, is found in some areas [3]. As of December 2016, 6 imported cases of TBE have been reported in the UK since 2011.

Outcome

HAIRS members previously undertook a preliminary risk assessment for tick-borne encephalitis in 2006. TBEV is not established in the UK because the required co-feeding of different tick stages does not seem to occur. The risk assessment is being updated to reflect the latest evidence and epidemiology.

References

1. Jahfari S *et al*. Tick-borne encephalitis virus in ticks and roe deer, the Netherlands. *Emerg Infect Dis.* 2017;23(6):1028-1030. https://wwwnc.cdc.gov/eid/article/23/6/pdfs/16-1247.pdf
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Giant African land snails and *Angiostrongylus cantonensis*

Status: New incident	Raised by: PHE

Angiostrongylus cantonensis is a parasitic worm of rats, also known as the rat lungworm [1]. Snails and slugs become infected by ingesting the larvae passed in rat faeces. Human infections have been reported from parts of Africa, Asia, the Caribbean, Pacific Islands and the USA but not the UK.

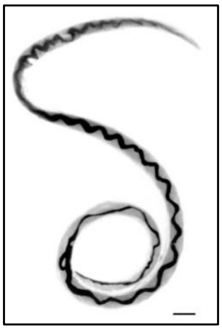

Image of *Angiostrongylus cantonensis* by John Lindo *et al*.

Risk factors for human infection include the ingestion of raw/undercooked infected snails or slugs; including pieces of snails and slugs accidentally chopped up in vegetables, vegetable juices, or salads.

Most infected people do not develop symptoms but on rare occasions, eosinophilic meningitis can develop. Person-to-person transmission is not known to occur.

Giant African land snails are one of many types of snails that can be infected. Giant African land snails are considered to be an easy pet as they are simple to look after. In schools, they can be observed and studied in their tank without frequent handling.

Outcome

The HAIRS group were alerted to concerns about giant African land snails and the link to meningitis in humans following a BBC2 documentary on snails imported into Florida, USA that have since become widespread. The group reviewed the available evidence and concluded that most giant African land snails available in the UK are captive bred within the UK and not imported, thus the risk to the general UK population is very low.

References

1. Cowie RH. Biology, Systematics, Life Cycle, and Distribution of *Angiostrongylus cantonensis*, the Cause of Rat Lungworm Disease. *Hawaii J Med Public Health*. 2013;72(6 Suppl 2):6–9. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3689493/

Increase in cowpox infections in cats	
Status: New incident	Raised by: PHE

Cowpox virus, like other members of the *Orthopox* genus, is a large DNA virus that can cause both localised and/or generalised systemic infection in its host. The most notorious member of the *Orthopox* genus is smallpox (variola virus).

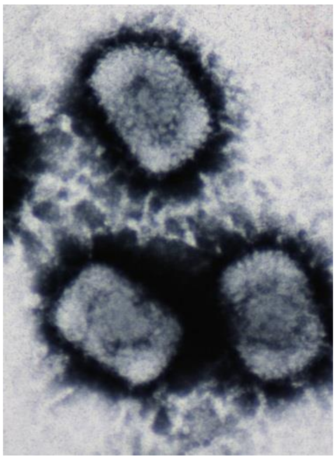

Image of cowpox virus by Dr. Graham Beards CC BY-SA 4.0

Although cowpox was originally recognised by the characteristic lesions or pustules seen on the teats of cattle, the main reservoirs of cowpox in Europe these days are small rodents, particularly bank voles, field voles and field mice. Transmission to other species, including cats and humans, occurs through contact with infected rodents, and spread from infected cats to humans has been well documented.

Generally cowpox infections are mild and resolve spontaneously. However, a report in the Veterinary Record [1] suggested an increase in unusual skin presentations of feline cowpox, and some of the same authors also reported an increase of pulmonary cowpox in cats [2]. In both reports, it was recognised that cases of cowpox in cats increased in the autumn when the host rodents are at their most numerous.

Most of the reported recent human cases have been through contact with an infected cat. Infection is generally localised (and therefore under-reported), but if the patient is immunosuppressed a generalised systemic cowpox infection can result, which is often fatal. In the UK, there is an average of 1 documented case of cowpox each year. In 2015 a 17 year-old renal transplant patient died following systemic cowpox infection acquired from an unrecognised infection of the family cat [3].

Outcome

PHE was contacted by the Veterinary Times enquiring about zoonotic risk for vets and owners. The following response was issued:- *"Human infection with cowpox is uncommon and there is a very low risk to public health. It usually presents as a single skin lesion on the hand or lower arm which resolves over a few weeks in most cases. Severe illness occurs extremely rarely in persons with underlying vulnerabilities. Contact with animals, particularly domestic cats, is the commonly reported source of infection in human cases. Perso- to-person spread does not occur. PHE has a very close working relationship with veterinary colleagues and will offer advice on human infections when needed. The main advice to prevent cowpox infection in humans is handwashing after handling animals and to seek veterinary advice for ill animals."*

References

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***Linguatula serrata* in dogs imported into the UK**	
Status: New incident	Raised by: APHA

Linguatula serrata is a potentially zoonotic parasitic worm that lives in the nasal airways of dogs and other carnivorous mammals [1]. It is also known as the tongue worm, and is found in several countries in Asia, the Americas, Europe, the Middle East and North Africa. The adult worm lives in the nasal passages of animals and the eggs are transferred when coughed or sneezed out. In recent years, the number of cases in dogs imported into the UK has increased.

Humans can be infected by infected animals via contact with eggs in nasal discharge or faeces. Livestock can also be infected. In June 2016, a UK case was reported in an imported dog from Romania [2].

Image of *Linguatula serrata* by Dennis Tappe & Dietrich Buttner

Outcome

APHA informed PHE of the rare diagnosis and requested public health advice. Strict hygiene precautions were recommended for the duration of the dog's treatment. The group discussed the diagnosis and agreed that it was currently a rare occurrence. Nonetheless, a letter describing the incident was published in Veterinary Record in order to raise awareness amongst veterinarians [2].

References

1. University of Michigan. Animal Diversity Web. http://animaldiversity.org/accounts/Linguatula_serrata/
2. Mitchell S *et al*. Tongue worm (*Linguatula* species) in stray dogs imported into the UK. *Vet Rec.* 2016;179:259-260. http://veterinaryrecord.bmj.com/content/179/10/259

Outbreak of *Salmonella* Enteritidis PT8 associated with reptile feeder mice

Status: Update	Raised by: PHE

Image of Feeder mice by Rhea C CC BY-ND 2.0

Following the introduction of whole genome sequencing for the routine surveillance of *Salmonella* at PHE, an outbreak of *Salmonella enterica* serovar Enteritidis Phage Type 8 (*S*. Enteritidis PT8) was detected. Although PHE became aware of the outbreak in early 2015, analysis of archived samples showed that it may have begun as early as 2011. An outbreak control team (OCT) was subsequently formed in September 2015 to investigate the outbreak and recommend control measures. PHE issued a press release at the end of 2015 [1] and signposted existing PHE hygiene advice, developed in response to a previous outbreak of Salmonella in reptile keepers in 2008, which was due to infected feeder mice imported from outside the EU. In addition, advice for consumers at the point of sale regarding the safe handling of reptiles and their feed was developed and provided to major retailers and smaller independent shops.

Analytical and microbiological studies provided strong evidence that exposure to reptiles, or their feed, were linked to infection. This was confirmed by the detection of the outbreak strain in feeder mice sampled from a retailer in England, and subsequently, from mice submitted to APHA by the importer who supplied the retail premises. The mice originated from a breeder located in another EU Member State. The company produced a large number of rodent carcases each month and it was understood that Salmonella had been found through their on-site testing.

Control measures taken by the rodent farm in 2015 included acidifying the drinking water on the rearing farm for a period of 2 weeks, and implementing routine sampling of mice. UK *Salmonella* experts based at APHA Weybridge considered that these measures were unlikely to significantly reduce or eliminate the presence of *Salmonella* species in this situation, and in autumn 2016, the OCT recommended the adoption of a package of measures including:

- culling, and restocking with stock known to be free of *Salmonella* spp. or other pathogens
- disinfection of premises with environmental sampling to demonstrate effectiveness
- review controls on feed, water and facility hygiene
- regular audit and microbiological sampling

The importer commissioned reports from veterinary and animal hygiene experts in 2016. Even though the operator implemented their recommendations, further cases of disease continued to be identified in people in the UK. By the end of 2016, over 270 cases had been linked to this outbreak.

Whole Genome Sequencing has now confirmed that cases have occurred in other Member States, and PHE are working with colleagues in those countries via ECDC.

Outcome

In 2016, there was ongoing liaison with the importer and the UK's Reptile Trade Association (REPTA) to discuss and agree further control measures. These included working with retailers to promote hygiene messages and the development of a communications strategy to reinforce existing UK public health advice regarding handling, defrosting and feeding mice to reptiles.

References

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Squirrel bornavirus	
Status: Update	Raised by: PHE

Bornavirus is a single-stranded RNA virus that infects many animal species. 3 fatal cases of human encephalitis were reported in 2015 in Germany associated with a novel bornavirus species found in captive variegated squirrels (*Sciurus variegatoides*, native to Central America).

Image of Prevost's squirrel by Josh More CC BY-NC-ND 2.0

During 2016, the virus was detected in a second subfamily of squirrels, Prevost's squirrels (*Callosciurinae prevostii*, native to Asia) in Germany [1], and also for the first time outside of Germany in a private collection in the Netherlands [2]. The squirrels in the Netherlands had been previously transferred from a breeder in Germany, but there was no epidemiological link to the holdings in Germany with the positive squirrels. The virus has not been detected in samples from a small number of UK red squirrels (*Sciurus vulgaris*).

The possibility for human infection through scratching or biting exists and it is recommended that routine testing of squirrels in contact with humans be conducted.

Outcome

Following enquiries made by the group, there are not thought to be variegated squirrel populations in the UK (at least not in large zoological collections), but there are small collections of Prevost's squirrels. Although, theoretically, exposure could occur in the UK in individuals with direct and close contact with Prevost's squirrels, it is not known if there are infected animals of this species in the UK or if there is any transmission risk from such animals.
The situation will be monitored for new information on both human and animal infections, in particular, human infections related to Prevost's and other squirrel species. The HAIRS group recommended a review of the risk assessment published in 2015 to reflect emerging evidence. The risk to the UK population was still deemed to be very low.

Risk assessment

Qualitative assessment of the zoonotic potential for variegated squirrel Bornavirus (update published in 2017)

https://www.gov.uk/government/publications/hairs-risk-assessment-squirrel-bornavirus

References

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Usutu virus risk assessment	
Status: Update	Raised by: APHA

Usutu virus (USUV) is a flavivirus which causes significant avian mortality, especially amongst Eurasian blackbirds in Europe. It is transmitted to birds by mosquitoes, particularly *Culex pipiens*, and has recently emerged in many countries in Europe. Human disease has very rarely been described – only 13 worldwide to date [1].

Image of Blackbird by Hedera Baltica CC BY-SA 2.0

In 2015, the first detection of USUV in wild birds in France was reported following increased fatalities of blackbirds in the Haut-Rhin department [2]. In 2016, USUV was detected in live and dead birds in the Netherlands for the first time [1]. Wild bird surveillance carried out by APHA in the UK has not detected USUV in tested dead wild birds from 2005 to 2015 [3]. Over 1,000 mosquitoes in North Kent have been tested and all were negative [4]. There have been no locally acquired USUV human infections in the UK.

Outcome

USUV was discussed in 2016 following virus detections in France. The HAIRS group updated the risk assessment to reflect this new evidence, but concluded that the risk to the UK population remains very low. The group will continue to monitor and review new evidence as it becomes available.

References

1. Rijks JM *et al*. Widespread Usutu virus outbreak in birds in the Netherlands, 2016. *Eurosurv*. 2016;21(45):30391. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5144937/

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Vector competence studies	
Status: New incident	Raised by: PHE

Vector competence has become increasingly topical with the spread of vector borne diseases, including Zika virus. A study published in 2016 demonstrated competence of a UK mosquito, *Ochlerotatus detritus*, for West Nile virus [1]. This was a laboratory based study assessing the competence of the mosquito for 3 arboviruses: dengue virus, chikungunya virus and West Nile virus.

To date, there has been no evidence of mosquito-borne virus transmission of public health concern in the UK. As papers describing laboratory studies of mosquito competence for a range of pathogens may be misinterpreted, the group considered that an agreed statement would be useful in response.

Outcome

This paper and the wider topic were discussed at the time of publication. The group concluded that vector competence from laboratory based studies does not mean there will be transmission in natural settings. Besides being laboratory competent for a pathogen, a mosquito species needs to both sustain pathogen development under natural temperature ranges and have a sufficient daily survival rate to transmit the pathogen. Population density and vector-host contact rate need to be high enough to sustain the transmission cycle and, in cases where the pathogen has nonhuman reservoir hosts, the mosquitoes must blood-feed on both these animal hosts and humans.

References

1. Blagrove MS *et al*. Evaluation of the vector competence of a native UK mosquito Ochlerotatus detritus (Aedes detritus) for dengue, chikungunya and West Nile viruses. *Parasit Vectors.* 2016;9:452. https://parasitesandvectors.biomedcentral.com/articles/10.1186/s13071-016-1739-3

Zoonoses guidelines	
Status: Update	Raised by: PHE

The guidelines for the investigation of zoonotic disease in England and Wales was originally published in 2009. It aimed to clarify the roles and responsibilities of different organisations relating to zoonotic incidents. The document was updated in July 2016 to reflect changes in organisational structures and responsibilities.

Outcome

Guidelines for the investigation of zoonotic disease in England and Wales published in July 2016

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/535155/Guidelines_for_Investigation_of_Zoonotic_Disease.pdf

Appendix A: HAIRS Risk Assessment Processes

The current activities and risk assessment processes used by the group are outlined below.

1) Hazard identification

Potential hazards (either potentially zoonotic agents or emerging infections) are identified by members of the HAIRS group through systematic horizon scanning activities or from laboratory or case reports. Members of the HAIRS group also act as a focus through which concerns of their respective agencies/organisations can be considered by the group. Horizon scanning undertaken by individual agencies and organisations will vary depending on individual remit; however, they will incorporate monitoring of a wide range of official reports, scientific publications and grey literature (such as ProMED mail, Health Map or media reports).

Depending on the perceived urgency of the situation, significant results of horizon scanning/epidemic intelligence activities are either disseminated immediately within the group or are discussed as a standing agenda item at the monthly meeting. All potential hazards discussed by the HAIRS group are logged in a database.

The requirement for a comprehensive risk assessment in response to a report is discussed at a time proportionate to the perceived risk. For an initial assessment, an overview of information currently available is assembled and provided to all members for consideration. There is usually limited information on novel or emerging agents so parallels with related agents and/or expert opinion are often important at this early stage to ensure that the most appropriate information is considered.

If, after review and discussion by the group, a formal risk assessment is not deemed necessary, the agent/syndrome is considered a negligible risk and recorded as such in the hazard identification log. The group may decide to take no further action and "sign off" the incident or continue to monitor the emerging situation and literature on the agent to ensure the accuracy of the currently assigned risk. However, for all incidents/agents discussed, if changes in epidemiology occur that may affect the public health significance, the initial assessment will be re-examined.

2) Risk assessment

If a risk assessment is deemed necessary, this is carried out by the most appropriate member(s) of the group in consultation with the rest of the HAIRS group and, if appropriate, recognised experts.

The appropriate risk assessment procedure is chosen depending on the issue under consideration: zoonotic potential assessment [1] or emerging infection (EI) assessment [2]. If an immediate response is required, or the incident/agent does not fit into one of these categories, a risk statement will be agreed by the group. A new zoonotic potential assessment set of algorithms were developed during 2016 and are currently being piloted.

Each procedure has an algorithm with a set of questions which are answered in sequence. For assessing zoonotic potential, separate pathways are used for a new animal disease with pathogen identified and for a novel syndrome of unknown aetiology. For determining the EI risk to UK population, the questions are designed to determine probability and impact, which are addressed separately.

To ensure an accurate assessment of the risk, a thorough and systematic examination of the scientific literature is undertaken, guided by questions used within the respective algorithm of the appropriate risk assessment. A bibliography outlining the sources of all information used in the risk assessment is included. For many incidents, particularly those for which limited information has been published, the literature search is widened to include case reports, non-peer reviewed studies and other grey literature. For circumstances for which there is still insufficient information, expert opinion is sought.

To reduce the inherent subjective nature of qualitative risk assessments, particularly in instances for which limited information is available, an assessment of the quality of evidence is carried out. Categorising the evidence in this manner allows for a degree of confidence in the estimation of risk to be recorded. Once the algorithms have been completed, the level of confidence in the output is assessed by examining the quality of evidence in the information tables which underpin the risk assessment.

3) Risk management

The actions taken following the completion of a risk assessment will be proportionate to the interpretation of the results attained. In terms of risk management, the HAIRS group may act as risk managers or refer issues to other groups. For issues assessed as low risk or for which direct action is not warranted, the group may “sign off” or “risk manage” the incident, or continue to monitor the situation and reassess the risk at appropriate intervals.

For incidents assessed as being of potential threat to public health, the group will alert other appropriate groups and/or agencies to the situation and to the need for risk management action. In circumstances in which the evidence used to assess the risk of an incident is deemed unsatisfactory, the risk is reviewed by the group and management decisions are made on a case-by-case basis.

Members of the group will act as points of contact for the agencies and departments responsible for risk management. Thus, the HAIRS group will not act directly as risk managers but may contribute advice and expertise to the risk management process.

4) Risk communication

Communication of risk assessments may take various forms dependent upon the manner in which the potential risk was raised, the determined risk or the context surrounding the situation/incident. Risk assessments may be placed in the public domain on the HAIRS group webpage. Risk assessments are communicated to ACDP and the UK Zoonoses, Animal Diseases and Infections Group (UKZADI). For specific incidents, a narrative risk statement or summary may be appropriate.

In addition, abridged versions of risk assessments are also published in the public domain in the HAIRS group Annual Reports. The group contributes to the monthly "Infectious Disease Surveillance and Monitoring System for Animal and Human Health: Summary of notable events/incidents of public health significance" which is published on the GOV.UK website and distributed widely.

5) Review and revision

To ensure the accuracy of risk assessments produced by the HAIRS group, all assessments are informally reviewed at least annually. If a revision to the current risk estimate is required, the assessment is reviewed and updated using new information that has become available since the last review. Risk assessments will also be reviewed on an *ad hoc* basis as determined necessary by HAIRS members. The date the risk assessment is completed (or the most recent review and update) is clearly noted on all risk assessment documents.

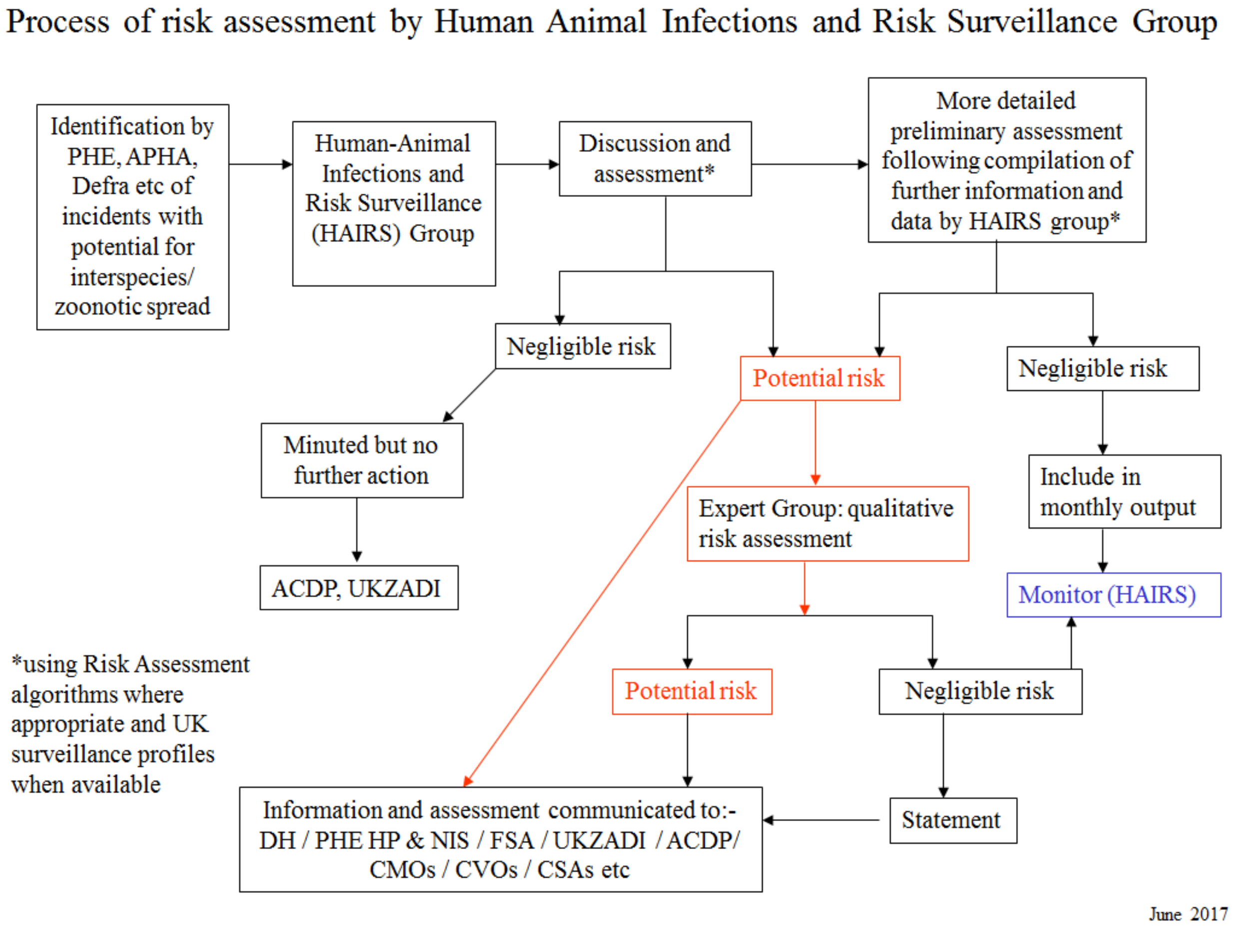
Additional information

For further information on the risk assessment process and examples, please see: https://www.gov.uk/government/collections/human-animal-infections-and-risk-surveillance-group-hairs

References

1. Palmer S, Brown D, Morgan D. Early qualitative risk assessment of the emerging zoonotic potential of animal diseases. *Br Med J*. 2005; 331:1256-60. http://www.bmj.com/content/331/7527/1256
2. Morgan D *et al*. Assessing the risk from emerging infections. *Epidemiol Infect.* 2009; 137(11):1521-1530. http://www.ncbi.nlm.nih.gov/pubmed/19538820

Figure 1: Process of risk assessment used by the HAIRS group



ACDP=Advisory Committee on Dangerous Pathogens, APHA=Animal and Plant Health Agency, CMO=Chief Medical Officer, CSA=Chief Scientific Advisor, CVO=Chief Veterinary Officer, Defra=Department for Environment, Food and Rural Affairs, DH=Department of Health, FSA=Food Standards Agency, HAIRS=Human Animal Infections and Risk Surveillance Group, NIS=National Infection Service, PHE=Public Health England, UKZADI=United Kingdom Zoonoses, Animal Diseases and Infections group.

Appendix B: Glossary of abbreviations

ACDP	Advisory Committee on Dangerous Pathogens
APHA	Animal and Plant Health Agency
CCHF	Crimean-Congo haemorrhagic fever
CCHFV	Crimean-Congo haemorrhagic fever virus
CMO	Chief Medical Officer
CSA	Chief Scientific Advisor
CVO	Chief Veterinary Officer
CWD	Chronic Wasting Disease
DAERA	Department of Agriculture, Environment and Rural Affairs, Northern Ireland (previously known as the Department of Agriculture and Rural Development, DARD)
Defra	Department for Environment, Food and Rural Affairs
DH	Department of Health
DNA	Deoxyribonucleic acid
EBLV	European Bat Lyssavirus
ECDC	European Centre for Disease Control
EFSA	European Food Safety Authority
FSA	Food Standards Agency
HAIRS	Human Animal Infections and Risk Surveillance group
HPS	Health Protection Scotland
mcr-1	Mobilised colistin resistance gene
MLST	Multilocus sequence typing
NHS	National Health Service
OGL	Open Government Licence
PCR	Polymerase Chain Reaction
PETS	Pet Travel Scheme
PHE	Public Health England
PH Wales	Public Health Wales
ProMED	Programme for Monitoring Emerging Diseases
TBE	Tick-borne encephalitis
TBEV	Tick-borne encephalitis virus
TSE-like	Transmissible spongiform encephalopathy-like
UK	United Kingdom
UKZADI	United Kingdom Zoonoses, Animal Diseases and Infections group
USUV	Usutu virus
WHO	World Health Organization
WNV	West Nile virus