HM Government

The Human Animal Infections and Risk Surveillance (HAIRS) Group

2013-2015 Report

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Public Health England, Wellington House, 133-155 Waterloo Road, London SE1 8UG
Tel: 020 7654 8000 www.gov.uk/phe
Twitter: @PHE_uk Facebook: www.facebook.com/PublicHealthEngland

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

Prepared by PHE on behalf of the HAIRS group.
For queries relating to this document, please contact: zoonoses@phe.gov.uk

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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 between 2013 and 2015, and is a collaborative publication from members representing the following agencies:

- Public Health England[1]
- Department for Environment, Food and Rural Affairs
- Department of Health
- Food Standards Agency
- Animal and Plant Health Agency[2]
- Health Protection Scotland
- Scottish Government
- Public Health Agency, Northern Ireland
- Department of Agriculture, Environment and Rural Affairs, Northern Ireland[3]
- Public Health Wales
- Welsh Government

The work of the group prior to 2013 is summarised in previous reports, available at: https://www.gov.uk/government/collections/human-animal-infections-and-risk-surveillance-group-hairs

[1] Prior to 1 April 2014, Public Health England was known as the Health Protection Agency. In this report the agency will be referred to by its current name.
[2] Prior to 1 October 2014, the Animal and Plant Health Agency was known as the Animal Health and Veterinary Laboratories Agency. In this report the agency will be referred to by its current name.
[3] Prior to 8 May 2016, the Department of Agriculture, Environment and Rural Affairs, Northern Ireland was known as the Department of Agriculture and Rural Development, Northern Ireland. In this report the agency will be referred to by its current name.

HAIRS members – end of 2015

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)

Ruth Parry	Scientific Policy Manager, Emerging Infections and Zoonoses

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
Clare Wild	Veterinary Head of Zoonoses and Reportable Diseases

Department for Environment, Food and Rural Affairs (Defra)

Elizabeth Kelly	Head of Zoonoses Team

Food Standards Agency (FSA)

Manisha Upadhyay	Senior Scientific Officer, Microbiological Risk Assessment
Drazenka Tubin-Delic	Head of Incidents

NORTHERN IRELAND

Public Health Agency

Michael Devine	Consultant Health Protection

Department of Agriculture, Environment and Rural Affairs (DAERA)

Paddy McGuckian	Veterinary Officer (Zoonoses)

SCOTLAND

Health Protection Scotland (HPS)

Dominic Mellor	Consultant in Veterinary Public Health

The Scottish Government

Colin Macaldowie	Deputy Chief Veterinary Officer

WALES

Public Health Wales (PH WALES)

Robert Smith	Clinical Scientist (Zoonoses)

The Welsh Government

Arjen Brouwer	Veterinary Advisor, Chief Veterinary Office

Past HAIRS members (2013 - 2015)

Maree Barnett	DH
David Brown	PHE
Paul Cook	FSA
Paul Hutchinson	APHA
Hilary Kirkbride	PHE
Lesley Larkin	APHA
Linda Smith	APHA
Sheila Voas	Scottish Government

Executive summary

In February 2014, the HAIRS group celebrated its ten year anniversary. Since 2004 HAIRS members have met on a monthly basis to discuss emerging issues affecting human and animal health in the UK and internationally. During this period, topics and incidents considered by the group have ranged from high profile outbreaks to rare disorders affecting restricted populations. Previous reports prepared by the HAIRS group can be found here.

In the past three years (2013 to 2015), the HAIRS group has continued to assess an extensive range of incidents and syndromes covering an array of infectious agents. The increasing recognition of the importance of vectors and vector borne disease to human and animal health within the United Kingdom has become apparent over this period. From the first detections of *Borrelia miyamotoi* infected ticks in the UK to the continued expansion of *Culex modestus* mosquitoes, discussions on vector distribution and their associated pathogens are a regular feature of HAIRS meetings.

Incidents of undiagnosed morbidity and mortality and novel pathogens remain a priority for assessment by the HAIRS group. Following reports of canine mortality in the New Forest region of England in 2012, the group regularly reviewed emerging evidence for this disorder which remains of unknown aetiology. Squirrels have been the source of several discussions by the group in the last few years with the detection of a *Mycobacterium lepromatosis* - like pathogen in red squirrels in the UK and the report of human fatalities associated with infection with a novel bornavirus from non-native variegated squirrels in Germany.

This report describes these and many other topics discussed by the HAIRS group since 2013, 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 between 2013 and 2015. Discussions on some topics will have continued in 2016 and will be covered in the next HAIRS report. Included in this section are (a) subjects newly presented to the group either as a result of an incident, disease trend, or new research and (b) subjects previously discussed by the group for which new evidence, information or data became available which might have affected previous risk assessments.

***Borrelia miyamotoi* – an emerging tick-borne bacterial disease in the UK**		
Status: New Topic	Raised by: PHE	Time period discussed: 2013 +
External experts consulted: Kayleigh Hansford, PHE		

PHE's ongoing vector-borne disease surveillance systems detected *Borrelia miyamotoi* in ticks in the UK for the first time. *Borrelia miyamotoi* belongs to the relapsing-fever group of species in the spirochaete genus of *Borrelia*, and is related to the *Borrelia* bacteria which cause Lyme disease. It was first detected in *Ixodes persulcatus* ticks in Japan in 1995, then later in other Ixodid species in North America, Europe and Asia.

Ixodes ricinus

The most commonly reported presentation of *Borrelia miyamotoi* in humans is a febrile illness, whilst a more severe presentation of meningoencephalitis has been reported in immunocompromised patients [1]. To date, all reported cases have made a full recovery following treatment with antibiotics. The geographic distribution of human infection with *B. miyamotoi* is likely to be similar to the distribution of Lyme borreliosis. However, the risk of infection is likely to be lower, owing to its lower prevalence in ticks [2]. No human infections with *B. miyamotoi* have yet been detected in the UK.

Currently, there are no commercially available diagnostic tests that detect *B. miyamotoi* infection. PHE undertakes diagnostic testing for Lyme disease and screens for other tick-borne diseases in patients with a strong clinical history of tick-associated illness.

Diagnostic tests for the detection of *B. miyamotoi* infection in patients in the UK are currently under development.

In 2014, three of 954 ticks from southern England were tested and found to be positive for *B. miyamotoi.* The ticks were collected from three geographically distinct locations, with the positive collections conducted during 2009 and 2013, suggesting that *B. miyamotoi* is widespread in southern England and may have been present for a number of years [3]. Studies are underway to collect ticks from different parts of the country to better assess the distribution and prevalence of Borrelia species (including *B. miyamotoi*).

Outcome

The HAIRS group recommended a risk assessment to review the risk that *B. miyamotoi* and other tick-borne bacterial species present to the UK that was published in November 2016.

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

1. Hovius JW *et al*. A case of meningoencephalitis by the relapsing fever spirochaete *Borrelia miyamotoi* in Europe*. Lancet.* 2013; 382(9892):658. http://www.ncbi.nlm.nih.gov/pubmed/23953389
2. Wagemakers A *et al*. *Borrelia miyamotoi*: a widespread tick-borne relapsing fever spirochete. *Trends Parasitol.* 2015;31(6):260-9. http://www.ncbi.nlm.nih.gov/pubmed/25892254
3. Hansford KM *et al. Borrelia miyamotoi* in host-seeking *Ixodes ricinus* ticks in England. *Epidemiol Infect.* 2015; 143:1079-1087. http://www.ncbi.nlm.nih.gov/pubmed/25017971

***Culex modestus* – an emerging mosquito species in the UK**		
Status: Update	Raised by: PHE	Time period discussed: 2014 +

During 2010, the PHE mosquito surveillance scheme reported *Culex modestus*, a potential vector for West Nile virus, in large numbers in one of their traps in North Kent. The mosquito was confirmed on both the Hoo Peninsula and the Isle of Sheppey. Small numbers were also reported in Poole Harbour and the Cambridgeshire fens in 2012. In 2013, a more in-depth survey laid traps at six sites across North Kent. *Culex modestus* was found at all sites and constituted >90% of adult mosquitoes collected. Immature *Cx. modestus* were found at all sampled sites as well as adults [1, 2].

Further surveying was conducted in 2014 and 2015 with *Cx. modestus* found between Thanet and Dartford in Kent and around Basildon in Essex. Mosquitoes collected in 2013 were tested for West Nile virus and all were negative. A further expansion of the geographical range of *Cx. modestus* in England is possible (and under investigation), and this species is now considered to be abundant and dominant in North Kent. The significance of *Cx. modestus* in the Thames Estuary, in an area of high numbers of migrant birds, requires careful consideration in relation to the West Nile virus risk.

Outcome

The HAIRS group recognise the importance of continued surveillance and the incorporation of this emerging situation in any vector-borne disease contingency plans. PHE will provide regular feedback on *Cx. modestus* surveillance activities.

References

1. Medlock JM *et al*. Potential vector for West Nile virus prevalent in Kent. *Vet Rec.* 2014; 175:284–5. http://veterinaryrecord.bmj.com/content/175/11/284.4.extract
2. Vaux AG *et al*. Enhanced West Nile virus surveillance in the North Kent marshes, UK. *Parasit Vectors*. 2015;10;8:91 http://www.ncbi.nlm.nih.gov/pubmed/25884920

Ebola virus disease – canine contacts of human cases		
Status: New topic	Raised by: PHE	Time period discussed: 2014

In October 2014, a cross-government contingency planning exercise was held based on a scenario of an imported human Ebola virus disease (EVD) case. During and following this exercise, concerns were raised about the management of companion animals, particularly dogs, in contact with confirmed human cases of EVD. Although one study [1] suggested that dogs can be infected by Ebola virus, there is no evidence to suggest that dogs develop clinical signs, or spread infection to humans. By mid-October a cross-government risk assessment was undertaken and measures to handle canine contacts of human EVD cases in the UK were agreed. These advised the following:

- where there is a dog in the household of a clinically well contact of a human EVD case, no restrictions need be placed on the dog
- if an owner develops symptoms and testing is being undertaken for EVD, the dog can remain within the household (restricted to the house and/or enclosed secure outdoor space) until the owner's test results are known
- for a dog in the household of a confirmed EVD human case, any action to be taken will be subject to risk assessment on a case-by-case basis

In order to ensure the above steps could be implemented promptly on the confirmation of a human EVD case, the following were prepared: (a) a cross-government operational guidance document for the management of pet animals in contact with confirmed EVD human cases, (b) a high risk containment facility for canine contacts of human confirmed EVD cases was created by Defra and APHA, and (c) a process to ensure secure transport of canine contacts to the high risk containment facility from anywhere in the country. In February 2015, a cross-government exercise was successfully undertaken to assess the facilities in place to safely handle canine contacts of a confirmed human EVD case. These facilities were not required during the 2014-2016 EVD outbreak, although other countries (USA and Spain) did manage two such exposures.

Outcome

The HAIRS group reviewed the available data on the potential zoonotic implications of EVD and agreed that dogs may be able to be infected with Ebola virus (although clinical signs in dogs exposed to Ebola virus have not been reported) but there was no evidence to suggest that they may able to transmit the virus to humans.

References

1. Allela, L *et al*. Ebola virus antibody prevalence in dogs and human risk. *Emerg Infect Dis*., 2015;11(3):385-390 http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3298261/

Exotic pets in the UK and their potential public health implications		
Status: New topic	Raised by: PHE	Time period discussed: 2014
Study undertaken by Emma White and Katrina Maguire on behalf of HAIRS		

In recent years, there has been an apparent increase in both the availability and diversity of exotic animals being kept as pets within the UK. While all animals carry microorganisms, the range of potential pathogens UK pet owners may be exposed to greatly increases if exotic species are considered.

A literature review and internet searches were undertaken in order to determine:

i. which species were being sold to the public in the UK, and
ii. any specific pathogens that may be associated with those species and any recorded incidents of zoonotic transmission

Image of pet African pygmy hedgehog by Alix Clinkingbeard CC 2.0

A wide variety of exotic pet species were found to be available for public purchase in the UK via online pet shops and forums. The species ranged from reptiles (eg skinks) to mammals (eg Coati Mundi). An overview of results are presented in Table 1.

The literature review identified reported cases of human disease, both in the UK and internationally, which were thought to be acquired from an exotic pet, from exotic animals at petting farms/wildlife zoos or through occupational exposure to exotic animals. For reptiles and amphibians, the most frequently reported zoonotic infection was salmonellosis (multiple species). In rodents and mammals a greater range of zoonotic infections were reported, including monkeypox (prairie dogs), rabies (skunk), baylisascariasis (racoon), hepatitis E (pig), cryptosporidiosis (pygmy hedgehog) and hantavirus (fancy rats).

The lists compiled for the range of species and the potential associated infections were not conclusive but indicative. Reports of serious infection associated with exotic pets are rare in the UK, although when they do occur they can have a significant impact on the health of the handler, for example hantavirus (see following section). For all pet owners within the UK, basic hygiene principles can help reduce the risk of zoonotic transmission. The animal welfare issues are also significant, but were not considered.

Outcome

The HAIRS group agreed that the risk potentially presented by exotic pets would be included in the next revision of the English and Welsh Guidelines for the investigation of Zoonotic Disease (published in 2016) [1]. The situation will continue to be monitored.

Table 1. Exotic pet species available to purchase in the UK and associated infections/pathogens

Animal group	Animal types	Main infections/organisms
Amphibians	Frog	*Salmonella* Typhimurium
Reptiles	Alligator, turtles, terrapins, bearded dragon, iguanas, snakes, geckos, tortoises	Mixed flora from bite wounds *Salmonella* serovars eg Pomona, Houtenae, Arizonae, Marina, Montevideo and others *Salmonella* infections associated with feeder mice
Rodents	Rats, guinea pigs, hamsters, mice	Cowpox virus, Lymphocytic choriomeningitis virus leptospirosis, rat bite fever, hantavirus *Salmonella* Typhimurium
Mammals	Raccoon	*Baylisascaris procyonis*
	Skunk/polecat	Rabies
	African pygmy hedgehog	*Salmonella* Tilene, *Trichophyton erinacei* (ringworm)
	Prairie dog	Tularemia, monkeypox
	Primates	Cercopithecine herpesvirus 1 (herpes B virus), hepatitis, rabies, *Salmonella*, *Shigella flexneri*, Simian foamy virus, mixed flora from bite wounds
Birds	Cockatoo, cockatiel, parrot, macaw, love birds	*Cryptococcus* spp., psittacosis
Invertebrates	Scorpions, spiders, millipedes etc	No case reports (but non-infectious incidents possible following stings or contact)
Fish	Tropical fish	*Salmonella* Java, *Mycobacterium marinum*

References

1. PHE. Guidelines for the Investigation of Zoonotic Disease (non-foodborne) in England and Wales v2, July 2016. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/535155/Guidelines_for_Investigation_of_Zoonotic_Disease.pdf

Hantavirus in the UK associated with fancy rats		
Status: New topic	Raised by: PHE & APHA	Time period discussed: 2013+

Two major clinical presentations of hantavirus disease in humans have been recognised: haemorrhagic fever with renal syndrome (HFRS) in Europe and Asia and hantavirus cardiopulmonary syndrome (HCPS) in the Americas. Both the presentation and severity of the disease largely depend on the causative hantavirus species. There are more than 40 recognised hantaviruses of which at least 21 are confirmed to be human pathogens.

Image of pet fancy rats by Semiplume CC 2.0

The rodent hosts of three types of hantavirus (Dobrava, Puumala and Seoul (SEOV)), which cause mild to severe forms of HFRS, are present in the UK. However, evidence of hantavirus infection in UK rodents, collected both from surveys and epidemiological investigations after reports of human cases, has only been found conclusively for SEOV. In 2012, a novel hantavirus (Tatenale) was also detected in a field vole in England [1].

Between January 2012 and December 2015, eleven confirmed symptomatic cases of hantavirus infection were reported in UK residents with no travel history. Nine were individuals exposed to fancy rats (rats that are kept as pets and exhibition animals), other pet rats or rats bred to produce feeding material for reptiles. Two UK-acquired confirmed human cases were exposed to wild rats, including one incident where the rats were tested and shown to be positive for SEOV infection [2].

A cluster of linked human cases occurred in Wales in 2015. The first case was a young man who had several hundred rats which he bred as food for his snakes and to sell, mostly via the internet. During his illness, a relative had looked after the rats and he subsequently also became unwell. Around the same time, a third case was identified who had recently started work at a commercial rat breeder. Case three had indirect links with case one, via a rat sold online. Rats from each of the affected premises were tested with an overall PCR positivity rate of 53% (48/91).

The incident raised a number of issues including:

- reptile owners may breed rats as food for their pets, and may be at risk of exposure to hantavirus

- the level of rat contact/exposure within households may be underestimated – there were indications of high risk exposures and free-ranging of rats in all areas of the home
- internet sales are often very difficult to trace
- there are implications for the pet shop trade if rats, both live and frozen, are sold for reptile feed
- while the risk from frozen rats is likely to be low, it is known that within households they may be thawed with resultant contamination of the kitchen environment

Outcome

During the period 2013 to 2015, HAIRS members updated the risk assessment for hantavirus on two occasions to reflect the emerging evidence, and APHA published a letter in the Veterinary Record to inform vets about the testing procedures available for rodents [3].
The current risk assessment determines a very low probability of infection for the general population, and a moderate risk for rat handlers and those who have close contact with rats.
As a result of the recent incidents, communication of the risk to human and animal health professionals has also been undertaken and a seroprevalence study was conducted in high risk groups (see Feature Article 2 in the UK Zoonoses Report 2013), and a public-facing leaflet was produced.

Risk assessment

Qualitative assessment of the risk that Hantaviruses present to the UK population.
https://www.gov.uk/government/publications/hairs-risk-assessment-hantavirus

References

1. Pounder KC *et al*. Novel hantavirus in field vole, United Kingdom. *Emerg Infect Dis*. 2013;19(4):673–675 http://dx.doi.org/10.3201/eid1904.121057
2. Jameson LJ *et al*. The continued emergence of hantaviruses: isolation of a Seoul virus implicated in human disease, United Kingdom, October 2012. *Euro Surveill*. 2013;18(1) http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=20344
3. Featherstone CA *et al*. Hantavirus and pet rodents. *Vet Rec* 2013;172:370. http://veterinaryrecord.bmj.com/content/172/14/370.1.extract

Additional information

- Reducing the risk of human infection from pet rodents. Leaflet. https://www.gov.uk/government/publications/pet-rats-mice-hamsters-reducing-the-risk-of-infection

Hepatitis E – the continued emergence		
Status: Update	Raised by: PHE	Time period discussed: 2013+
External experts consulted: Bengü Said, PHE		

Hepatitis E is an infection of the liver caused by hepatitis E virus (HEV). Disease manifestations can vary from no apparent symptoms to liver failure. In rare cases it can prove fatal. Since 2010 there has been a substantial increase in the numbers of reference laboratory confirmed hepatitis E cases in Great Britain. The epidemiology of the infection has changed, primarily due to an increase in UK-acquired cases. In 2015, 82% of cases were indigenously-acquired, compared to 41% between 2003 and 2009. Molecular characterisation of the viruses causing indigenous infections shows that they belong to genotype 3 virus and cluster into two distinct phylogenetic groups or clades. The emergence of a novel group of genotype 3 clade 2 viruses has been responsible for the increase in cases [1].

A 2013 study commissioned by Defra of UK pigs at slaughter showed a HEV seroprevalence of 92.8% in 640 pigs tested [2]. Where samples could be analysed, UK pigs generally had the genotype 3 clade 1 virus. The increase in indigenous cases and the observed viral shift or emergence of viruses not commonly circulating prior to 2010, suggest that the risk of acquiring HEV has changed. Recently, a joint PHE and NHS Blood and Transplant study provided data on the impact of HEV on blood safety [3], and suggested that the HEV genotype 3 is widespread in blood donors. Selective screening to reduce exposure to HEV in immunosuppressed patients was introduced in 2016.

Outcome

The HAIRS group acknowledges that this is an important issue that is being discussed by a range of other relevant bodies. The group recommended that the prevalence of infection in occupationally-exposed individuals in England should be investigated as part of the Serum Archive for Emerging Zoonoses research (see later in report).

References

1. Ijaz S *et al*. Indigenous hepatitis E virus in England and Wales from 2003 to 2012: Evidence of an emerging novel phylotype of viruses. *Journal of Inf Dis* 2014; 209(8): 1212-1218. http://www.ncbi.nlm.nih.gov/pubmed/24273173
2. Grierson, S *et al*., Prevalence of hepatitis E infection in pigs at the time of slaughter, United Kingdom, 2013. Emerg Infect Dis 2015; 21(8). http://wwwnc.cdc.gov/eid/article/21/8/14-1995_article
3. Hewitt PE *et al.* Hepatitis E virus in blood components: a prevalence and transmission study in southeast England. *Lancet* 2014; 384(9956):1766-1773. http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(14)61034-5/abstract

Idiopathic cutaneous and renal glomerular vasculopathy in UK dogs

Status: New incident	Raised by: PHE & APHA	Time period discussed: 2014+
External experts consulted: David Walker, Anderson Moores Veterinary Specialists		

Since November 2012, a rare disorder of unknown aetiology 'idiopathic cutaneous and renal glomerular vasculopathy' (iCRGV) has been affecting dogs in the UK [1]. iCRGV appears to cause a high mortality, with dogs presenting with skin lesions, predominantly of distal limbs, acute kidney injury (AKI), and variably, anaemia, thrombocytopaenia and hyperbilirubinaemia. While initially cases appeared to be restricted to the New Forest area in Hampshire, they have since been detected in a number of areas across the UK. To May 2016, more than 70 dogs with clinicopathological findings that fulfil the current diagnostic criteria for iCRGV have been reported and further unconfirmed cases have also been described. Investigations into potential aetiological agents for this disorder have been comprehensive, and known causes of AKI in dogs have been excluded [2].

Initially discussed in June 2013, the HAIRS group monitored the emerging situation closely. Given the severity of the disorder in dogs and the continued canine cases, PHE, together with the private veterinary surgeon leading the canine investigations, undertook a study to assess the health implications for owners of affected dogs. Twenty-one owners of dogs affected by iCRGV were interviewed and asked about any illness they may have had prior to, during, or after their dog become unwell. No definitive links were established between the disease in dogs and illness in their owners.

Outcome

Close collaborative links have been established between the lead researchers into this syndrome and members of the HAIRS group. The group decided that while this disorder in dogs did not appear to present a public health risk, the situation should be monitored closely and the risk should be reviewed if/when further information becomes available.

References

1. Walker D *et al*. Suspected idiopathic cutaneous and renal glomerular vasculopathy in dogs. *Vet Rec* 2014;174(5):124. http://veterinaryrecord.bmj.com/content/174/5/124.1.extract
2. Holm, LP *et al.* Cutaneous and renal glomerular vasculopathy as a cause of acute kidney injury in dogs in the UK *Vet Rec* 2015;176(15):384. http://veterinaryrecord.bmj.com/content/early/2015/03/13/vr.102892.abstract

***Mycobacterium bovis* – first reported incident of cat to human transmission**		
Status: New incident	Raised by: PHE	Time period discussed: 2013
External experts consulted: Danielle Gunn-Moore, University of Edinburgh		

Mycobacterium bovis infection in cats is a rarely reported disease, with fewer than 30 confirmed cases reported each year in the UK. Between December 2012 and March 2013, an unusual cluster of cases were reported in Berkshire. In total, seven confirmed and two probable cases were reported. The cats belonged to nine separate households, and six resided within 250 metres of each other and were all seen by a single veterinary practice.

The majority of the cats presented with severe systemic infection including discharging lymph nodes and pulmonary signs. Six of the nine cats were euthanised or died. Isolates from all seven of the confirmed cases belonged to a rare, distinct *M. bovis* genotype (10:u) [1] which was first detected in the area in cattle in 2008. Unfortunately, the source(s) of infection for this cluster could not be determined.

Because of the unusual size of the cluster of feline cases, TB screening was offered to all human household members and others in close contact with the infected cats (n=39). Three of 24 people screened tested positive for latent TB infection and two people who had contact with the same cat were subsequently diagnosed with active *M. bovis* disease. Both active cases had significant contact with the affected cat while it had signs of systemic infection. Molecular typing carried out by PHE and APHA determined that isolates from the cats and human cases were indistinguishable. This result, coupled with the timeline of onset of disease in the cat and its human contacts indicated that transmission of *M. bovis* from the infected cat was the likely source for these two individuals. This is the first documented cat-to-human transmission of *M. bovis.*

Outcome

The HAIRS group, in collaboration with experts from PHE, Defra, APHA and the University of Edinburgh, produced a qualitative risk assessment on the risk that cats infected with *M. bovis* present to human health. The group concluded that the risk of transmission of *M. bovis* infection from cats to their human contacts is very low. Previously, in the absence of any reported cases, the risk of transmission had been considered negligible ie no public health action required. Based on the revised risk assessment, it is suggested that household and close contacts of cats with confirmed *M. bovis* infection should be assessed and receive public health advice. This

recommendation was incorporated into the public health guidance on how to manage incidents of *M. bovis* infection in animals [3].

Risk assessment

Qualitative assessment of the risk that cats infected with Mycobacterium bovis present to human health. https://www.gov.uk/government/publications/hairs-risk-assessment-mycobacterium-bovis-in-cats

References

1. Roberts T *et al*. An unusual cluster of *Mycobacterium bovis* infection in cats. *Vet Rec* 2014;174(13):326 http://veterinaryrecord.bmj.com/content/174/13/326.2.extract
2. PHE. *Mycobacterium bovis* and cat-to-human transmission in the UK. *Health Protection Report* 2014; 8(12) https://www.gov.uk/government/publications/hairs-risk-assessment-mycobacterium-bovis-in-cats
3. PHE. Bovine tuberculosis: guidance on management of the public health consequences of tuberculosis in cattle and other animals (England). https://www.gov.uk/government/publications/bovine-tuberculosis-tb-public-health-management

Novel bornavirus in variegated squirrels in Germany: a newly detected species		
Status: New incident	Raised by: PHE	Time period discussed: 2015

Animal Borna disease (BD) is classically described as a chronic, progressive meningoencephalomyelitis, causing both neurological and behavioural signs in horses and sheep. Milder manifestations and a wider host range have been noted, although the incidence of clinical BD in species other than horses and sheep appears low.

Image of a variegated squirrel by Cathy & Sam CC 2.0

Neither the reservoir nor the mode of transmission for natural infection is known. Epidemiological evidence suggests that rodent-borne transmission in a manner similar to orthopox or hantaviruses is plausible, but unproven. Experimentally, rodents shed large amounts of Borna disease virus (BoDV) in urine and faeces. It is considered likely that the olfactory route is an important route of transmission, at least in horses. Borna disease in a horse in the UK has only once been described, in an animal imported from Germany [1], and it was considered likely that it had been infected prior to importation. A small number of cats with neurological disease in the UK were reported to be positive by PCR and antibody for BoDV in 1998 [2].

Evidence for human infection with BoDV remains controversial. It is known that, experimentally, BoDV can infect human neural cells and impairs neurogenesis [3], but human infection has not yet been convincingly demonstrated [4]. There has been evidence both for and against the presence of BoDV in patients with a range of neuro-psychiatric syndromes and in unaffected controls, and no large scale studies have clarified any role for BoDV in human encephalitis.

Three fatal cases of encephalitis were reported between 2011 and 2013 in Germany which were associated with a novel *Bornavirus* species, provisionally named variegated squirrel 1 bornavirus (VSBV-1). All three patients were breeders of variegated squirrels (*Sciurus variegatoides,* native to Central America). The novel virus was detected in brain samples from all three patients and tissues from one squirrel which had been owned by two of the breeders. There is strong support for VSBV-1 being the cause of the human infection, but an European Centre for Disease Prevention and Control (ECDC) risk assessment [5] considered that proof of a causal relationship had not been established.

In March 2016, it was reported that variegated squirrels and Southern Asian tree squirrel species in German zoos and other collections had tested positive for VSBV-1 [6]. It is currently unclear if the animals were infected in Germany or if the virus was introduced via importation of infected animals. As far as the HAIRS group could ascertain, there are no variegated squirrel populations in the UK.

Outcome

In 2015, the HAIRS group reviewed emerging evidence of novel Bornavirus in variegated squirrels. A risk assessment was undertaken, and the risk to the UK population was deemed to be very low.

Risk assessment

An assessment of the zoonotic potential of novel squirrel Bornavirus. https://www.gov.uk/government/publications/hairs-risk-assessment-squirrel-bornavirus

References

1. Priestnall SL *et al*. Borna disease virus infection of a horse in Great Britain. *Vet Rec* 2011;168(14):380. http://veterinaryrecord.bmj.com/content/168/14/380.2.extract
2. Reeves NA *et al*. Natural Borna disease virus infection in cats in the United Kingdom. *Vet Rec* 1998;143(19):523-6. http://veterinaryrecord.bmj.com/content/143/19/523
3. Brnic D *et al.* Borna disease virus infects human neural progenitor cells and impairs neurogenesis. *J Virol.* 2012;86(5):2512-22. http://jvi.asm.org/content/86/5/2512.abstract
4. Carbone K. Borna disease virus and human disease. *Clin Micro Rev* 2001;14(3):513-27. http://www.ncbi.nlm.nih.gov/pubmed/11432811
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6. Friedrich Loeffler Institut. Further cases of Variegated Squirrel 1 Bornavirus. 2016 January 3. https://www.fli.de/en/news/short-messages/short-message/?tx_news_pi1%5Bnews%5D=171&cHash=eea6fb9dcde2e5b85097e04c921cc123

***Rhipicephalus sanguineus* associated with dogs entering the UK**		
Status: New topic	Raised by: PHE	Time period discussed: 2014+
External experts consulted: Kayleigh Hansford, PHE		

Rhipicephalus sanguineus is a vector of Mediterranean spotted fever, canine babesiosis and ehrlichiosis. Its European distribution is largely confined to the Mediterranean basin, but infestations in kennels and dog owners' houses in temperate zones are also possible. Concerns have previously been raised over the potential for *R. sanguineus* to be imported into the UK on travelling dogs following the harmonisation of the Pet Travel

Scheme rules in January 2012, which meant that treating dogs for ticks before entering the UK was no longer compulsory [1-3]. No importation events associated with *R. sanguineus* (or travelling or imported dogs) were detected via PHE's Tick Surveillance Scheme (TSS) prior to 2012, although there was evidence of previous importation and infestation events from other sources [2].

The TSS received its first record of *R. sanguineus* in May 2012 when two live male ticks were removed by APHA colleagues from a dog imported from Greece [3]. Since then a further 19 importation events have been detected (Table 2). One hundred and fifty-seven live *R. sanguineus* (50 males, 58 females, 52 nymphs and two larvae) are known to have been imported into the UK involving two events in 2012, four in 2013, five in 2014 and nine in 2015.

Table 2. Importation events involving *Rhipicephalus sanguineus* ticks reported to PHEs Tick Surveillance Scheme between January 2012 and December 2015

Location which dog arrived from/travelled	Number of importation events	Number of ticks
Cyprus	7	97
France	1	3
Greece	3	4
Portugal	1	1
Spain	6	45
Thailand	1	6
Turkey	1	1
Total	**20**	**157**

In addition to the increased detection of imported ticks, three house infestations have been identified (two during 2014, one during 2015) which are likely to have been a result of the importation of this species into the UK on recently travelled or imported

dogs [4]. At least one of these properties has also experienced continued tick activity indoors despite repeated pest control intervention, acaricide application on the pet dogs and daily tick checking of the dogs to remove feeding ticks [5].

The risk of importation of this tick into the UK was raised at HAIRS, where enhanced surveillance and awareness raising were agreed as priorities. In order to help raise awareness, PHE published a Public Health Matters blog and developed an information poster that can be used by vets, animal reception centres and others to educate dog owners on the potential risks posed by *R. sanguineus* when travelling with or importing dogs into the UK. Guidance for pest control technicians has also been developed on how to deal with possible house infestations with *R. sanguineus*.

Outcome

The HAIRS group acknowledged that with an increasing number of dogs travelling and being imported into the UK, it is likely that importation and infestation events involving *R. sanguineus* (and other potentially important tick species) will continue to increase. Further investigation into importation routes into the country, continued collaborative working between public, animal and environmental health and continued dissemination of awareness materials will be key parts of the continued response to this emerging issue. It was recommended that possible bacterial pathogens carried by *R. sanguineus* should be included in the risk assessment of tick-borne bacterial species present to the UK.

References

1. Abbott EM *et al*. Removal of tick controls for animals entering the UK. *Vet Rec* 2011;169(15):394. http://veterinaryrecord.bmj.com/content/169/15/394.1.short
2. Jameson LJ *et al.* Surveillance for exotic ticks on companion animals in the UK. Vet Rec 2010;166(7):202-3. http://veterinaryrecord.bmj.com/content/166/7/202.extract
3. Featherstone C *et al*. Tick surveillance in the UK. Vet Rec. 2012;171(9):225. http://veterinaryrecord.bmj.com/content/171/9/225.1.extract
4. Hansford KM *et al*. Brown dog tick infestation of a home in England. Vet. Rec. 2015;176(5), 129–30. http://veterinaryrecord.bmj.com/content/176/5/129.1.extract
5. Hansford, KM *et al*. Overwintering of the brown dog tick in residential properties in England - raising awareness. Vet Rec. 2015;177(6):156. http://veterinaryrecord.bmj.com/content/177/6/156.extract

Additional information

- PHE – Tick surveillance scheme. https://www.gov.uk/guidance/tick-surveillance-scheme#imported-ticks
- Anyone suspecting that they have found an imported tick can contact the Tick Surveillance Scheme via email (tick@phe.gov.uk) for more information

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 during monthly meetings between 2013 and 2015. Discussions on some topics will have continued in 2016 and will be covered in the next HAIRS report.

Bovine leukaemia virus and its potential association with breast cancer		
Status: New incident	Raised by: APHA	Time period discussed: 2015

Enzootic bovine leukosis (EBL) is a disease of cattle caused by the bovine leukaemia virus (BLV). Transmission in cattle occurs via a number of routes particularly biting flies and blood-borne iatrogenic spread via reuse of needles. There is no vaccine. EBL is a notifiable animal disease and the UK has been officially free of the disease since 1999. Several European countries are also officially free, although there have been recent cases detected in Germany and France. In contrast, prevalence in the USA is around 100% for all cattle herds.

A recently published study suggested that BLV is associated with breast cancer in humans [1]. This was a case-control study of archived fixed embedded breast tissues from 239 women (cases diagnosed with breast cancer and controls with no history of breast cancer diagnosis) in the United States, collected between 2002–2008. Exposure to BLV was determined by PCR detection of BLV DNA localised within mammary epithelium. The presence of BLV-DNA in breast tissues was strongly associated with diagnosed and histologically confirmed breast cancer (odds ratio=3.07).

Outcome

The paper was discussed at the time of publication. The HAIRS group had concerns about the methodology used and their interpretation which meant that firm conclusions could not be drawn. The group concluded that there was insufficient evidence at that time to support a link between BLV and breast cancer.

References

1. Buehring GC *et al*. Exposure to Bovine Leukemia Virus Is Associated with Breast Cancer: A Case-Control Study. *PLoS ONE* 2015;10(9):e0134304. http://www.ncbi.nlm.nih.gov/pubmed/26332838

Brucella species in marine mammals

Status: Update	Raised by: Scottish Government	Time period discussed: 2013
External experts consulted: Geoff Foster, SAC Consulting: Veterinary Services (part of Scotland's Rural College); Paul Jepson, Institute of Zoology; Judy Stack, APHA National Reference Laboratory for Brucellosis		

Brucella species were first reported in marine mammals in the UK in 1994. In England, Scotland and Wales, necropsies are undertaken on between 90-150 marine mammals per year. *Brucella* spp are occasionally isolated and over the last 20 years between two and 20 cetaceans or seals have been culture positive each year. Marine mammal associated species of Brucella have been reported in humans on only four occasions, including a laboratory exposure in England with a Scottish isolate [1].

Image of Common Seal by Caroline Granycome CC 2.0

In 2013, the HAIRS risk assessment from 2008 was reviewed to reflect continuing UK research on *Brucella* in marine animals.

Outcome

The HAIRS group concluded that, while the potential exists for UK marine mammal workers to be exposed to marine specific *Brucella* spp., the risk of infection remains very low. The group will continue to monitor and review new evidence as it becomes available.

Risk Assessment

An assessment of the zoonotic potential of marine mammal Brucella species. https://www.gov.uk/government/publications/hairs-risk-assessment-marine-mammal-brucella-species

References

1. Brew SD *et al*. Human exposure to Brucella recovered from a sea mammal. *Vet Rec* 1999;1444(17):483. http://www.ncbi.nlm.nih.gov/pubmed/10358880

Risk to the UK from chikungunya virus		
Status: Update	Raised by: PHE	Time period discussed: 2015

The HAIRS risk assessment for chikungunya virus was previously updated in 2008. Since then the geographic distribution of the virus changed significantly, with widespread transmission in the Caribbean and the Americas (>1.7 million cases since late 2013) (see map here) and autochthonous cases reported in Europe [1]. An increasing number of imported human cases have been reported in the UK (from 24 cases in 2013 to 295 cases in 2014), particularly from the Caribbean [2], requiring enhanced travel advice.

There have been no cases of locally acquired chikungunya infection in the UK. Local transmission in the UK is contingent on the presence of competent mosquitoes (primarily *Aedes aegypti* and *Ae. albopictus*) which have not been reported in the UK (correct as of December 2015). The current spread of competent vectors elsewhere in Europe is rapid, with new regions colonised each year. Incidents of local virus transmission in France highlight the risk from established exotic mosquitoes and imported cases. Therefore, the risk assessment considers both the current situation and a potential situation where competent mosquito species are established in the UK.

Outcome

The HAIRS group reviewed the risk assessment and concluded that the current probability of human infection with chikungunya virus in the UK population, in the absence of competent vectors, is very low. The current impact on human health in the UK would also be very low.

If competent mosquito species should establish in the UK, the potential probability of human infection would be raised to moderate and the impact on human health within the area where the vector is present would be high.

Risk Assessment

HAIRS. 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. Delisle *et al*. Chikungunya outbreak in Montpellier, France, September to October 2014. *Eurosurveillance* 2015;20(17) http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=21108
2. PHE Chikungunya: epidemiology in England, Wales and Northern Ireland. 2014 https://www.gov.uk/government/statistics/chikungunya-epidemiology-in-england-wales-and-northern-ireland

Eurasian beaver population in River Otter, Devon

Status: New incident	Raised by: Defra	Time period discussed: 2014-15

Image of Eurasian beaver by Tim Ellis CC 2.0

In recent years, a captive breeding population of beavers has become established in the UK. Within certain parts of Europe, beavers are known to carry the tapeworm *Echinococcus multilocularis*, which is one of the most pathogenic parasitic zoonoses in central Europe. Humans are intermediate hosts, and can become infected by swallowing *E. multilocularis* eggs. Infection usually involves the liver, but can spread to other organs of the body (including the brain). The UK is particularly vulnerable to the importation of this infection, due to the large population of urban foxes (one of the definitive hosts for the adult stage of the parasite) and the ubiquitous presence of suitable intermediate hosts (such as voles) [1].

The UK is currently classified as *E. multilocularis*–free. However, *E. multilocularis* was detected at post-mortem in a captive Eurasian beaver (*Castor fiber*) in Devon in May 2010. This beaver had been present in the UK for four years following importation from Germany in late 2006. The prevalence of *E. multilocularis* among the wild Bavarian beaver population is difficult to assess, but prevalence rates of 2.5% - 5% have been suggested [2].

In February 2014, a breeding population of more than 10 beavers was detected on the River Otter in Devon. Their origin was unknown. In March 2015, two adult pairs and one kit (juvenile) were trapped and confirmed to be Eurasian and free from *E. multilocularis.*

Outcome

The HAIRS group monitored the situation from first reports of the presence of the wild beavers in Devon to testing of a subset. The group concluded that the risk of *E. multilocularis* to the UK from beavers is likely to be lower than the risk of accidental or deliberate non-compliance with Pet Travel Scheme regulations (which requires dogs and cats brought into the country to be treated against *E. multilocularis*).

References

1. Barlow AM *et al*. *Echinococcus multilocularis* in an imported captive European beaver (*Castor fiber*) in Great Britain. *Vet Rec* 2011;169(13):339. http://veterinaryrecord.bmj.com/content/169/13/339.1

2. Kosmider, R. *et al*., *Echinococcus multilocularis* introduction and establishment in wildlife via imported beavers. *Vet Rec* 2013; 172(23): 606. http://veterinaryrecord.bmj.com/content/172/23/606.2.extract

Klebsiella pneumoniae in pigs in the UK

Status: Update	Raised by: APHA	Time period discussed: 2014

Pigs infected with *Klebsiella pneumoniae* subsp. pneumoniae (Kpp) normally develop a pneumonia-like illness. A change in presentation of the disease was reported in 2014 (following initial notifications in 2011) when a few unusual cases of septicaemia in pre-weaned piglets with *K. pneumonia* infection were reported [1].

In August 2014, a Kpp outbreak was reported in East Anglia. It was initially typical with sporadic sudden deaths of piglets around three weeks old. However, following diagnosis of Kpp in piglets on the unit, eight sows in the same farrowing batch became severely ill and five died. Severe toxic mastitis was confirmed following the euthanasia of a sow, and Kpp was isolated in pure growth. Cases with the same unusual clinical presentation were subsequently reported in south west England [1].

Kpp is a recognised human commensal and pathogen. Infections are generally described in immunocompromised individuals with nosocomial exposures. To date, PHE have not been made aware of any cases of human Kpp infections associated with infection on pig farms.

Outcome

After discussions and further investigations, the HAIRS group determined that there was no evidence to support a change in the human health implications of *K. pneumonia* infections in pigs.

References

1. APHA. Klebsiella pneumoniae infection causes mastitis in pigs. *Vet Rec* 2014 Dec 20-27;175(24):617-20. http://veterinaryrecord.bmj.com/content/175/24/617.full.pdf+html

Further information

- APHA – Klebsiella septicaemia – information for pig keepers and vets. http://ahvla.defra.gov.uk/documents/surveillance/diseases/klebsiella-vets.pdf

Livestock-associated methicillin resistant *Staphylococcus aureus*		
Status: Update	Raised by: Defra, DAERA, PHE	Time period discussed: 2013-15

In 2013, APHA identified livestock-associated meticillin-resistant *Staphylococcus aureus* (LA-MRSA) MLST-Clonal Complex (CC) 398 on a mixed poultry farm in East Anglia. The premises was depopulated, cleansed and disinfected. In May 2014, LA-MRSA CC398 was isolated from a post-weaning piglet in Northern Ireland [1]. In December 2014, LA-MRSA CC398 was again isolated from two 10-day old piglets with skin disease from a breeder-finisher farm, located in eastern England [2]. Eleven litters were affected and, of 60 piglets with the condition, six died.

A research study reported the isolation of this organism from retail pork products (mince and sausage) labelled as of UK origin [3]. The findings indicated that the microbial lineage is probably established in UK pig farms and demonstrated a potential pathway for the transmission of LA-MRSA CC398 from livestock to humans in the UK. However, further phylogenetic analysis studies are required to confirm.

In September 2015, DAERA reported that LA-MRSA CC398 had again been reported from a pig herd in Northern Ireland, possibly linked to imported pigs. LA-MRSA was discussed by the MRSA subgroup of Defra Antimicrobial Resistance Coordination which produced guidelines for farmers following a meeting with Industry and farming stakeholders [4].

Outcome

Conscious of the evidence of zoonotic infection and risk, especially in occupationally exposed groups in continental Europe, HAIRS noted these findings with interest. HAIRS will continue to monitor the situation together with the Defra Antimicrobial Resistance Coordination Group.

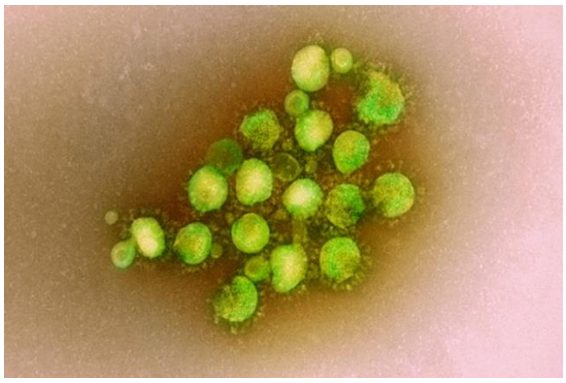
References

1. Hartley H *et al*. Antimicrobial resistance: Confirmation of LA-MRSA in pigs in the UK. *Vet Rec* 2014;175(3):74-75. http://veterinaryrecord.bmj.com/content/175/3/74.extract
2. Hall S & Kearns A. Antimicrobial resistance: Livestock-associated MRSA detected in pigs in Great Britain. *Vet Rec* 2015;176(6):151-152. http://veterinaryrecord.bmj.com/content/176/6/151.3.extract
3. Hadjirin NF*et al*. Detection of livestock-associated methicillin-resistant Staphylococcus aureus CC398 in retail pork, United Kingdom, February 2015. *Euro Surveill*. 2015; 20(24):pii=21156. http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=21156
4. PHE. LA-MRSA: information for people who work with livestock. https://www.gov.uk/government/publications/la-mrsa-information-for-people-who-work-with-livestock

Middle East respiratory syndrome coronavirus and companion animals

Status: New incident	Raised by: Defra	Time period discussed: 2015

Middle East Respiratory Syndrome (MERS) is a respiratory illness caused by the MERS coronavirus (MERS-CoV). This virus was first reported in 2012 in Saudi Arabia and has since been detected in several other countries. MERS-CoV is likely to have originated from bats in the Arabian Peninsula. Although many human cases of MERS have been attributed to human-to-human infections, camels are likely to be a major reservoir host for MERS-CoV and an animal source of MERS infection in humans.



Transmission electron microscopy image of MERS-CoV

Defra asked HAIRS to consider whether there would be a risk to animals if MERS were detected in the UK (in either humans or animals). Camels are not approved for import from affected countries without a specific risk assessment and agreement from European Union (EU) Member States. In addition, any camel milk products being imported into the EU must be pasteurised. APHA has no capability for animal testing, although PHE confirmed that it had capability for MERS testing should it be required.

Outcome

HAIRS determined that the risk from camels in this country either to people or to other animals is so low that it did not need to be considered further at this time.

Mycobacterium lepromatosis in squirrels

Status: New incident	Raised by: Scottish Government	Time period discussed: 2014-15

In 2014, an initial report highlighted a novel presentation of dermatitis in six red squirrels from various locations across Scotland. The disease appears to result in bilateral areas of variable alopecia and cutaneous swelling of the snout area, lips, eyelids, pinnae and distal aspect of all limbs [1]. Sequencing of isolates from three squirrels revealed a novel *Mycobacterium* species with 99% sequence homology with *M. lepromatosis*.

Image of a red squirrel by Airwolfhound CC 2.0

In view of these findings, four cases of epidermal hyperplasia in red squirrels from the south of England were re-examined [2], despite the gross lesions appearing to be very different. Although the numbers of acid-fast bacilli seen in sections were far less (possibly because they represent a chronic stage of red squirrel leprosy), the presence of *M. lepromatosis* was confirmed by PCR.

Mycobacterium lepromatosis, along with *M. leprae*, causes leprosy in humans. It damages the skin, mucous membranes, and nerves, causing discoloration and lumps on the skin and, in severe cases, disfigurement and deformities. There have been no definite indigenously-acquired cases of leprosy reported in England and Wales since 1954, so it is unlikely to be readily diagnosed if a human case presents.

Outcome

Based on a preliminary risk assessment HAIRS determined that there is currently insufficient evidence to indicate whether a zoonotic risk exists from the infected squirrels. The group recommended that the situation continues to be monitored and a full risk assessment be undertaken if further evidence becomes available.

References

1. Meredith A *et al*. Leprosy in red squirrels in Scotland. *Vet Rec* 2014;175(11): 285-286. http://veterinaryrecord.bmj.com/content/175/11/285.extract
2. Simpson V *et al*. Leprosy in red squirrels on the Isle of Wight and Brownsea Island. *Vet Rec* 2015;177(9):206-207. http://veterinaryrecord.bmj.com/content/177/9/238.2

Novel *Brucella* species in White's tree frog		
Status: New incident	Raised by: APHA	Time period discussed: 2014
External experts consulted: Krishna Gopal & John McGiven, APHA		

A White's tree frog (*Litoria caerulea*) that was used as a handling exhibit in a tropical animal collection in Scotland presented with lesions. Although an isolate from the animal would not have been identified as *Brucella* by conventional phenotyping approaches, molecular analysis confirmed it belonged to the rapidly expanding group of 'atypical' *Brucella* [1]. This is the first report outside Germany of the isolation of such strains from amphibians and suggests wide distribution, supported by recent unpublished reports of similar strains found in tropical frog species in the USA. The origin of the frog in this incident was unclear, but it was one of a pair of exhibits thought to have been in the UK for several years (the second animal had no abnormal signs).

Whites tree frog. Image by Flickpicpete CC 2.0

There is no evidence to suggest that *Brucella* isolates associated with amphibians are pathogenic for humans, but many members of the genus are significant zoonotic pathogens. The association of other 'atypical' *Brucella* isolates (*B. inopinata* and *B. inopinata*-like organisms) with serious human infections [1] suggests that appropriate measures should be taken to avoid unnecessary contact with potentially infected amphibians until the zoonotic potential of this emerging group is better understood.

Outcome

The HAIRS group concluded that there was insufficient information available at the time to determine the zoonotic potential of this novel *Brucella* species. The group agreed to monitor the situation.

References

1. Whatmore, AM *et al.* Isolation of *Brucella* from a White's tree frog (*Litoria caerulea*). *JMM Case Reports.* 2015 Feb;2. Doi: 10.1099/jmmcr.0.000017. http://jmmcr.microbiologyresearch.org/content/journal/jmmcr/10.1099/jmmcr.0.000017

Rabbit haemorrhagic disease

Status: New incident	Raised by: PHE	Time period discussed: 2015

Rabbit haemorrhagic disease (RHD) is a viral disease first described in rabbits in China in 1984 and subsequently spread globally, affecting Europe in the late 1980s. RHD causes high mortality in both domestic and wild rabbits. This can have an important economic impact on the rabbit meat and fur industry. In addition, RHD has been shown to have a significant negative ecological impact among wild rabbit populations and indirectly on their dependant predators. In the UK, RHD virus variant 1 (RHDV1) is considered endemic.

Wild rabbit. Image by Dlougs CC 2.0

Since 2012, a new viral variant, RHDV2, has been detected in Europe which has a lower associated mortality than RHDV1. A vaccine against RHDV1 provides incomplete protection for RHDV2. In 2015, an outbreak in England prompted PHE to raise the topic for discussion at HAIRS.

Outcome

There is no evidence to suggest that RHDV (types V1 or V2) is associated with human illness. The HAIRS group does not consider the emergence of RHDV2 in the UK alters the zoonotic risk.

Serum archive for emerging zoonoses – a new zoonoses study		
Status: New topic	Raised by: PHE	Time period discussed: 2014+
External experts consulted: Bengü Said, PHE		

Human exposure to potentially zoonotic infections is likely to occur first in occupational groups with close and frequent exposure to animals, especially sick animals, or animal products. The ability to rapidly undertake serological surveys of such groups is helpful in building up the evidence base for the zoonotic potential of new pathogens. This approach was used in Europe to determine the zoonotic potential of Schmallenberg virus which first appeared in cattle and sheep in 2011. For newly emerging potential zoonoses, and also for many established zoonoses, the evidence available on possible transmission to humans, routes of transmission and susceptibility is often weak or incomplete. The HAIRS group has therefore advocated the establishment of a serum archive in order to inform these risk assessments.

In 2014, PHE established the Serum Archive for Emerging Zoonoses (SAfEZ). The key purpose of SAfEZ is to develop and maintain a collection of anonymised blood samples, together with information on risk factors and exposures, provided by people working with animals in England. The samples are a resource to conduct rapid sero-surveys of a sentinel group of humans at particularly high risk of exposure to potential and established zoonoses in England. In addition, the archive will be used to better understand existing zoonoses, for example by investigating the seroprevalence of hepatitis E in people exposed to different animal groups.

By the end of 2015, SAfEZ contained over 800 serum samples collected from individuals with a range of different types of animal contact. These currently include an occupational cohort of APHA veterinary and field staff, veterinary surgeons, pig workers, poultry and egg workers, sheep farmers and livestock workers, and bat handlers. It is planned to continue recruiting to the archive in the future to include additional groups, as well as re-recruiting to existing groups.

Outcome

The HAIRS group were supportive of the SAfEZ project, and advised on the priorities for the archive.

***Streptococcus halichoeri* – an update**		
Status: Update	Raised by: APHA	Time period discussed: 2014
External experts consulted: Geoff Foster, SAC Consulting: Veterinary Services (part of Scotland's Rural College)		

Streptococcus halichoeri is a rare zoonotic pathogen first reported in seals in the UK in 2004 [1]. In 2013, the first human case of infection was reported in a Chinese patient [2], and an alert was published in the UK informing colleagues of the need to consider this organism in cases of seal bite.

Since 2004, the Scottish Agricultural College reports that *S. halichoeri* continues to be recovered from grey seals in the UK, but not from any other species of marine mammal to date. Internationally, the infection has also been reported from a range of animals including sea lions, an American black bear (whose diet included fish) in a German zoo [3] and in a European badger in Spain [4]. In addition, *S. halichoeri* has been isolated from a handful of human clinical samples.

Outcome

The original HAIRS risk assessment for this organism in 2004 had concluded that, although it was unlikely to pose a significant zoonotic risk for the general population, exposure could occur in seal handlers working in marine rehabilitation and rescue centres, and veterinarians. In 2014 the risk assessment was reviewed, and the group determined that the risk of zoonotic transmission remains very low.

References

1. Lawson PA *et al. Streptococcus halichoeri* sp. nov., isolated from grey seals (*Halichoerus grypus*). *Int J Systematic Evol Microbiology* 2004; 54:1753-56. http://www.ncbi.nlm.nih.gov/pubmed/15388740
2. Rui Min F & Chan D. A fishy tale – a man with *Streptococcus halichoeri* empyema. *J of Clin Micro* 2014 52(2):681-2. http://jcm.asm.org/content/52/2/681.long
3. Grobbel M *et al*. Cerebral haemorrhage caused by severe Streptococcus halichoeri infection in an American black bear (*Ursus americanus*). *European Association of Zoo and Wildlife Veterinarians March 2010.*
4. Moreno, B *et al*. Isolation and phylogenetic characterization of *Streptococcus halichoeri* from a European badger (*Meles meles*) with pyogranulomatous pleuropneumonia. *J Comp Pathol*. 2015; 152(2-3):269-73. http://www.ncbi.nlm.nih.gov/pubmed/25678424

Taenia saginata – an incident of potential public health significance		
Status: Update	Raised by: APHA	Time period discussed: 2013-14

Cattle become infected with the intermediate stage of *Taenia saginata* by ingesting materials contaminated with tapeworm eggs originating from human faeces. Humans become infected with *T. saginata* via consumption of raw or undercooked beef. In humans, infection with this tapeworm can cause abdominal pain, loss of appetite and weight loss, although most people with tapeworm infections have no or only mild symptoms.

Infection of cattle with *T. saginata* is of economic importance to the beef industry due to the costs of meat inspection to detect affected animals, and control measures.

Image of cattle by Mark Higgins CC 2.0

During 2013/2014, APHA was made aware of four farms where significant levels of *T. saginata* infection in fattened cattle were reported by the same abattoir. A common link was the feeding of potatoes from a single supplier, and this potato merchant had previously supplied human faecally-contaminated feed potatoes to a separate farm. Advice was given on reducing the exposure of cattle to potential sources of infection, including measures to reduce any remaining environmental contamination on the affected farms.

Outcome

The HAIRS group determined that, although cases continue to be reported in the cattle population in the UK, there is no increased risk to the human population. The group will continue to monitor from the animal and human perspectives.

Additional information

- UK Zoonosis Report, 2013.Feature article 6: Cysticercus bovis. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/447771/pb13987-zoonoses-report-2013.pdf

Theiler's disease-associated virus – a newly recognised equine pathogen

Status: New topic	Raised by: Defra	Time period discussed: 2013

Theiler's disease (TD) is a form of hepatitis in horses which follows administration of an equine hyperimmune plasma or serum. It has been recognised since 1919 but with no cause identified. In 2013, a flavivirus, tentatively named "Theiler's disease associated virus" (TDAV), was detected in samples from horses investigated during a TD outbreak which followed the use of an equine botulinum antitoxin [1].

TDAV is a *Flavivirus*, most similar to the genus of *Pegivirus*. There are four known pegiviruses, none of which causes natural disease in any animal, and only one (GB-C, formally known as hepatitis G virus) has been found in humans.

HAIRS considered whether humans could be exposed to TDAV by a biologically plausible route. Equine antisera have historically been used for a number of medical indications, but their use has changed over the last 30 years such that most immunoglobulins for human use are now of human origin. Those that remain of equine origin are specialist and very rarely used (botulinum and diphtheria antitoxins). Some snake antivenoms are produced in horses, and a product derived from pregnant mare urine (Premarin®) is used in hormone replacement therapy – although infectious agents are highly unlikely to survive the production process. There does not appear to be any reported association between use of equine serum products and subsequent hepatitis.

Outcome

The HAIRS group agreed that the possibility of transmission to humans could not be excluded, but considered that the risk of TDAV causing infection or disease in humans to be very low. FSA will further consider the possibility of a foodborne risk. The topic has been referred to the Medicines and Healthcare Products Regulatory, and HAIRS continues to monitor.

References

1. Chandriani S *et al.* Identification of a previously undescribed divergent virus from the Flaviviridae family in an outbreak of equine serum hepatitis. *PNAS* 2013; E1407–E1415. http://www.pnas.org/content/110/15/E1407.abstract

***Trichinella pseudospiralis* in England**		
Status: New topic	Raised by: FSA	Time period discussed: 2014+
External experts consulted: Jane Learmount, APHA		

Trichinella pseudospiralis is a very rarely reported zoonotic pathogen in the UK. Last reported in 2009 in Northern Ireland [1], in 2013 a fox tested positive for *T. pseudospiralis* in England during routine surveillance activities [2]. The fox was found as road kill in a village near Bristol, and was the first positive animal out of 6,806 animals tested in Great Britain between 1999 and 2013. Based on this surveillance study, the prevalence rate was estimated as 0.000147 over the 14 year period [2]. This prevalence rate remains below the level determined by the EU for Member States to demonstrate negligible risk for Trichinellosis (a prevalence of <0.01).

Image of a red fox by Peter Trimming CC2.0

Outcome

The HAIRS group discussed the implications for ongoing risk, and what additional sampling would be required to confirm that the prevalence of the organism is low. The group will continue to monitor this issue.

References

1. Defra and PHE. Zoonoses summary report, UK 2014. https://www.gov.uk/government/publications/zoonoses-summary-report-uk-2014
2. Learmount, J. *et al*. First report of *Trichinella pseudospiralis* in a red fox in mainland Britain. *Vet Parasitol* 2015;208(3–4):259-62. http://www.sciencedirect.com/science/article/pii/S0304401715000291

Appendix A: Risk Assessment Processes

The current activities and risk assessment processes used by the group:

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, but they will incorporate monitoring of a wide range of official reports (eg WHO/OIE disease outbreak news), scientific literature (eg Emerging Infectious Diseases) and grey literature (eg ProMED mail, Health Map, media reports). Depending on the perceived urgency of the situation, significant results of horizon scanning 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.

A discussion to determine the requirement for a comprehensive risk assessment is carried out at a time proportionate to the perceived risk of the agent/incident by the HAIRS group. For an initial assessment to be undertaken, an overview of information currently available on the agent/incident is assembled and provided to all members for consideration. Limited information on novel/emerging agents specifies the necessity to draw parallels with related agents and incorporate expert opinion at this early stage to ensure that the most appropriate information is considered.

If, on consideration of currently available information, a formal risk assessment is not deemed necessary by the group, the agent 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/literature on the agent to ensure the accuracy of the currently assigned risk. However, for all incidents/agents discussed, if changes in the agent’s epidemiological properties occur that may affect the public health significance of the agent, the risk assessment of this agent will be re-examined.

2) Risk assessment

If a risk assessment is deemed necessary, a formal assessment 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 external experts. The appropriate risk assessment

procedure is chosen depending on the issue under consideration; Zoonotic potential assessment [1] or Emerging Infection assessment [2].

2.1 Gathering evidence

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 imperative. For many incidents, for which limited information has been published, the literature search will be widened to include non-peer reviewed studies, case reports and other grey literature. For circumstances for which there is still insufficient information, expert opinion would be 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.

2.2 Estimating the risk

Using the relevant completed information tables and the risk assessment algorithms, the probability and impact of the infectious agent under consideration or the zoonotic risk level are estimated. For new and emerging infections, the probability and impact are reported separately to offer greater clarity of the nature of the risk. If a question cannot be conclusively answered (ie yes/no answer), evidence for both answers should be provided in the information tables and following precautionary principles, the algorithm should be continued until a decisive answer is attained. Tentative answers are differentiated from conclusive answers by the use of hatching in the algorithm. 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. All risk assessments carried out within the HAIRS group are made available to members for further dissemination as they deem necessary, unless otherwise specified. A record of distribution is maintained by the secretariat. Risk assessments may be placed in the public domain on the HAIRS pages on the GOV.UK webpages depending on the public health relevance. Risk assessments are also communicated to members of the UK Zoonoses, Animal Diseases and Infections Group (UKZADI). For specific incidents, a narrative risk statement or summary may be appropriate. Outcomes of risk assessments are also published in the HAIRS Annual Reports. The group also 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 monthly on the PHE 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 previous version. 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

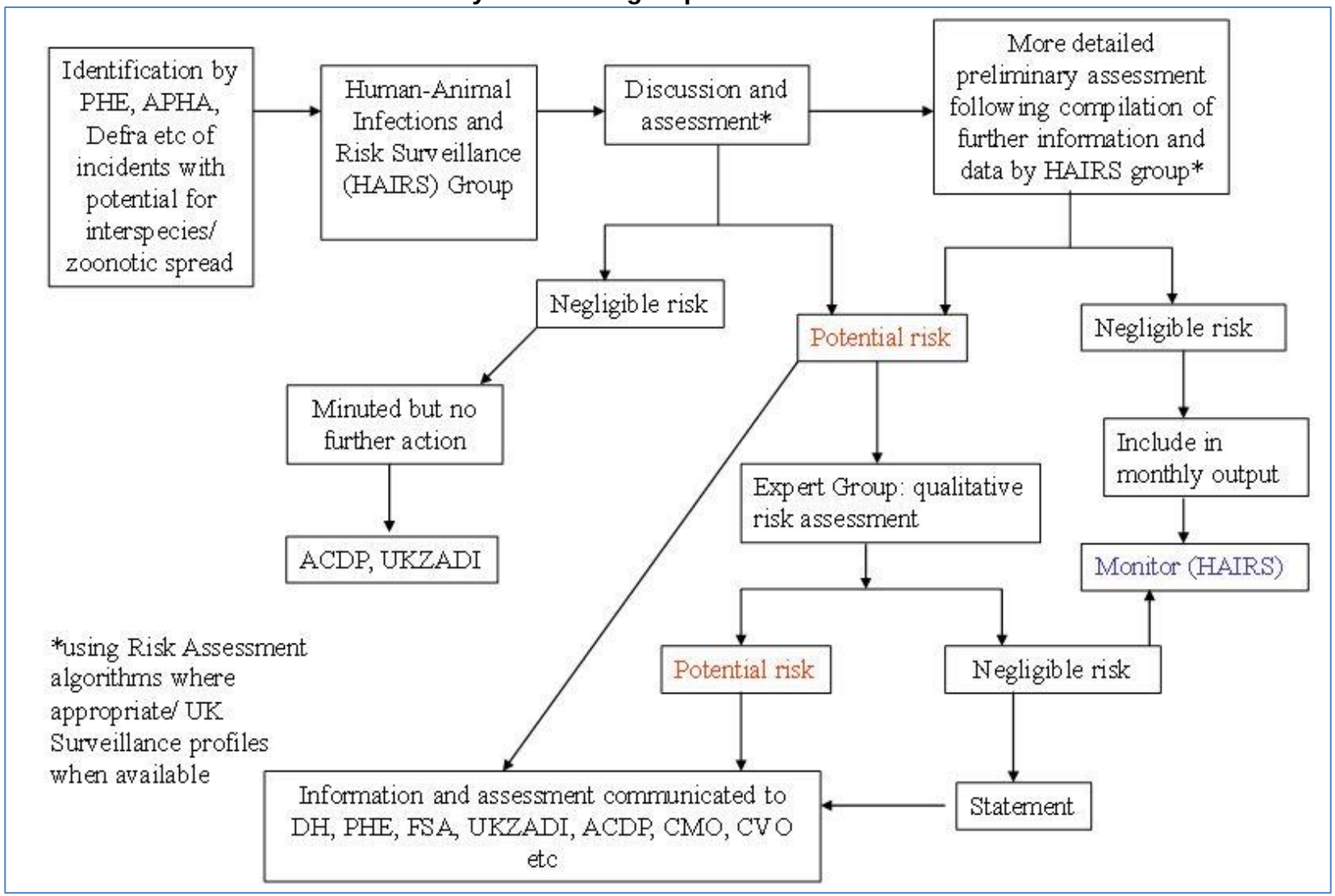
For further information on the risk assessment process and examples, please see: https://www.gov.uk/government/collections/human-animal-infections-and-risk-surveillance-group-hairs

References

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

3. European Centre for Disease Prevention and Control. Operational guidance on rapid risk assessment methodology. Stockholm: ECDC; 2011. http://ecdc.europa.eu/en/publications/_layouts/forms/Publication_DispForm.aspx?ID=463&List=4f55ad51-4aed-4d32-b960-af70113dbb90

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, 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, PHE=Public Health England, UKZADI=United Kingdom Zoonoses, Animal Diseases and Infections group.

Appendix B: Glossary of abbreviations

ACDP	Advisory Committee on Dangerous Pathogens
AHVLA	Animal Health and Veterinary Laboratories Agency (now known as the Animal and Plant Health Agency, APHA)
AKI	Acute kidney infection
AMR	Antimicrobial resistance
APHA	Animal and Plant Health Agency (previously known as the Animal Health and Veterinary Laboratories Agency, AHVLA)
BD	Borna disease
BLV	Bovine leukaemia virus
BoDV	Borna disease virus
CMO	Chief Medical Officer
CVO	Chief Veterinary Officer
DARD	Department of Agriculture and Rural Development, Northern Ireland (now known as the Department of Agriculture, Environment and Rural Affairs, DAERA)
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
ECDC	European Centre for Disease Control
EVD	Ebola virus disease
HAIRS	Human Animal Infections and Risk Surveillance group
HCPS	Hantavirus cardiopulmonary syndrome
HEV	Hepatitis E virus
HFRS	Haemorrhagic fever with renal syndrome
HPS	Health Protection Scotland
iCRGV	Idiopathic cutaneous and renal glomerular vasculopathy
Kpp	*Klebsiella pneumoniae* subsp. pneumoniae
LA-MRSA	Livestock-associated methicillin-resistant *Staphylococcus aureus*
MERS-CoV	Middle East respiratory syndrome coronavirus
MLST	Multilocus sequence typing
NHS	National Health Service
OGL	Open Government Licence
OIE	World Organisation for Animal Health
PCR	Polymerase Chain Reaction
PHE	Public Health England (previously known as the Health Protection Agency)
PH Wales	Public Health Wales

ProMED	Programme for Monitoring Emerging Diseases
RHD	Rabbit haemorrhagic disease
RHDV1/V2	Rabbit haemorrhagic disease variant 1 / variant 2
SAfEZ	Serum archive for emerging zoonoses
SEOV	Seoul virus
TB	Tuberculosis
TD	Theiler's disease
TDAV	Theiler's disease-associated virus
TSS	Tick Surveillance Scheme
UK	United Kingdom
UKZADI	United Kingdom Zoonoses, Animal Diseases and Infections group
VSBV-1	Variegated squirrel 1 bornavirus
WHO	World Health Organization