Animal & Plant Health Agency

Non-Statutory Zoonoses
(Project FZ2100)

4/14 **Annual Report** **2014**

Monitoring the field occurrence of appropriate animal diseases can highlight the potential for zoonotic transmission and provide a sentinel for human environmental and foodborne health risks. These reports, which primarily relate to farmed animal species, summarise the surveillance activities of the Animal and Plant Health Agency (APHA)* and the Scottish Agricultural College Consulting, Veterinary Services (SACCVS, operating within Scotland's Rural College – SRUC) for non-statutory zoonoses and infections shared between man and animals in Great Britain, using data gathered by the network of diagnostic laboratories. Quantitative diagnostic data for confirmed clinical disease incidents is provided by the Veterinary Investigation Diagnostic Analysis (VIDA) surveillance system. Summaries of joint veterinary/medical investigations into incidents and outbreaks of non-statutory zoonotic disease and associated activities are also included, together with publications funded by the project. This report covers the 12 month period between January and December 2014.

The Non-Statutory Zoonoses project (FZ2100) is funded by Defra, the Scottish Government and the Welsh Government through the APHA's Food and Environmental Safety programme and also uses returns from the species Emerging Diseases and Welfare surveillance projects. Information concerning compulsorily notifiable or reportable zoonoses is recorded elsewhere under other projects such as FZ2000 (Salmonella).

*The APHA was formed on 1st October 2014 following the merger of the former Animal Health and Veterinary Laboratories Agency (AHVLA) with parts of the Food and Environment Research Agency (FERA) responsible for plant and bee health to create a single agency responsible for animal health in GB, and for plant and bee health in England and Wales.

1. General scanning surveillance

1.1 Non-statutory zoonoses VIDA data for Great Britain 2014

This table (collated 28/01/15) summarises confirmed clinical diagnoses of non-statutory zoonoses and infections shared between animals and man from specimens submitted to APHA and SACCVS veterinary investigation centres during 2014 and compares the findings with those in 2013 and 2012. It includes rare zoonotic infections and those for which zoonotic potential is confined predominantly to immuno-compromised individuals. Diagnoses use strict criteria and are recorded (once only per incident) using the Veterinary Investigation Diagnostic Analysis (VIDA) system. The list is subject to selection, submission and testing bias. It is not definitive and excludes notifiable or reportable diseases (notably salmonellosis, which is recorded elsewhere). It is intended only as a general guide for veterinary and public health professionals to the diagnosed occurrence of non-statutory animal-associated infections in predominantly farmed animal species in GB.

Diagnosis	Annual total (all species)			Diagnoses in 2014						
	2012	2013	2014	**Cattle**	**Sheep**	**Goats**	**Pigs**	**Birds** [1]	**Misc.** [3]	**Wildlife** [2]
Babesiasis	10	10	9	9						
Brachyspira pilosicoli / intestinal spirochaetosis	42	23	33				25	8		
Brucella spp. in marine mammals	7	0	0						0	0
Campylobacter fetopathy	109	226	168	27	141	0			0	0
Chlamydiosis (*C. psittaci*)	2	2	1					1		
Chlamydophila abortus fetopathy	475	280	390	0	389	1			0	0
Coryne. pseudotuberculosis (CLA)	50	50	43		41	2				
Cryptosporidiosis	1164	1207	963	876	73	6	2	6	0	0
Cysticercosis	1	1	4		4					
Dermatophilus infection	9	4	2	0	2	0		0	0	
Erysipelas	46	45	37		6	0	19	12		
Fasciolosis	1432	1710	622	428	184	4			5	1
Hydatidosis	0	1	0		0					
Leptospirosis (all categories)	16	4	3	3	0	0	0		0	0
Listeriosis (all categories)	178	181	148	36	101	8	0	1	2	0
Louping ill	24	35	38	9	29			0		
Orf (parapox virus)	49	53	29		27	2				
Pasteurella multocida pneumonia/pasteurellosis	261	232	193	90	49	1	44	7	2	0
Pseudocowpox (parapox virus)	0	0	0	0						
Q Fever/*Coxiella burnetii*	6	3	4	2	0	2			0	0
Red Mite *(Dermanyssus galinae)*	17	10	5					5		
Ringworm	20	7	6	5	1	0	0	0	0	0
Sarcoptes scabei infection	6	1	3	0		0	2		1	
Streptococcal infection (excluding bovine mastitis)	102	100	81		8	0	71	1	0	1
Swine influenza	38	33	27				27			
Toxoplasmosis (incl. fetopathy)	248	215	207		200	7			0	0
Tuberculosis (excl. bovine TB)	32	32	25			1	0	7	16	1
Yersiniasis (incl. fetopathy)	16	10	23		13	4		2	4	0

NR – Not recorded Shaded boxes indicate a diagnosis is not available for that species

[1] Includes domestic and wild birds [2] Mammals only [3] Misc. = miscellaneous exotic or other farmed species

Comments
The number of diagnostic submissions to APHA and SACCVS veterinary investigation centres declined overall in 2014, compared to 2013. The decline was seen across all species groups, apart from pigs, which saw a small rise in submissions (please see table below). The variation in submission numbers between subsequent years calls for care in the interpretation of any trends.

The number of diagnostic submissions to APHA and SACCVS veterinary investigation centres fluctuates from year to year. Many factors will influence submission rates, including agricultural economic factors, the general health of the GB livestock population overall and surveillance structures. The weather in 2014 was mild throughout, which is generally considered favourable in livestock health terms. 2014 also saw the implementation of the new surveillance structure in England and Wales ("Surveillance 2014"), with the closure of some APHA veterinary investigation centres, coupled with the commencement of a carcase collection service and provision of post-mortem services by alternate providers. Please see following link for more information: http://webarchive.nationalarchives.gov.uk/20140707141417/http:/www.defra.gov.uk/ahvla-en/disease-control/surveillance/new-vet-surv-model/

Diagnostic submissions† (carcase and non-carcase) received at APHA and SACCVS centres

	Cattle	Sheep	Goats	Pigs	Birds∫	Miscellaneous*
2010	41,795	9,684	934	1,582	1,768	838
2011	37,116	8,466	833	1,599	2,176	621
2012	38,530	10,460	852	1,456	2,150	726
2013	34,716	9,555	943	1,227	2,040	626
2014	29,408	8,364	862	1,291	2,036	555

† figures collated 19/01/15 ∫exc. wild birds *Farmed Alpaca, deer and llama

The number of diagnoses of swine influenza remained high in 2014, possibly because testing continued to be offered free of charge in some circumstances. All diagnoses in 2014 were in pigs from farms in England. The predominant strain of swine influenza circulating in the pig population in 2014 was the pandemic strain which emerged in 2009 (termed A(H1N1)pdm09), whilst H1N2 and avian like H1N1 were also frequently reported. Co-circulation of multiple strains raises questions as to the long term dynamics of virus strain dominance or coexistence, particularly the potential for further genetic reassortment.

There was a significant increase in the proportion of calf diarrhoea cases in which cryptosporidiosis was diagnosed in England and Wales. This trend was not replicated in submissions from Scotland, nor in those from sheep in GB. In calves and lambs, the zoonotic *Cryptosporidium parvum* is the most common species of *Cryptosporidium* causing clinical disease, although subclinical carriage is frequent. Management factors such as a high degree of hygiene in calf pens, low stocking density and ensuring good colostral intake are important considerations in control of the disease. The single pig case of cryptosporidiosis involved a three week old piglet on a Scottish farm submitted for investigation of diarrhoea, concurrent coccidiosis was also diagnosed. The six incidents of cryptosporidiosis in birds in 2014 related to diagnoses of bulgy eye in grouse caused by *C. baileyi*.

In 2014, there was a fall in the number of diagnoses of fasciolosis (a very rare zoonosis in the UK) in both cattle and sheep from the peak recorded in 2013. Levels of fasciolosis in GB livestock are very dependent on climatic conditions, with prolonged periods of wet ground providing favourable conditions for the life cycle of the parasite and multiplication of its intermediate snail host.

There was a significant increase in the incidence of enzootic abortion of ewes (EAE: fetopathy due to *Chlamydophila abortus*), which again was the most common cause of ovine abortion identified in 2014. The levels of the three most commonly diagnosed ovine abortifacients (*C. abortus*, *Toxoplasma gondii* and *Campylobacter fetus fetus* infection) fluctuate between years, being influenced by both vaccination and also natural immunity waxing and waning in the national flock. Further details on diagnoses of ovine abortion is presented in section 1.3.

Common minor conditions of zoonotic importance, such as orf and ringworm, are grossly underestimated by the VIDA recording and reporting system.
More detailed specific information on scanning surveillance diagnoses and trends for endemic diseases is available from: http://www.defra.gov.uk/ahvla-en/category/publications/disease-surv/surv-reports/

1.2 Highlights from APHA and SACCVS disease surveillance centres

This section provides a summary of main items of zoonotic interest from material submitted to the APHA (England and Wales) and SACCVS (Scotland) in 2014.
Further information is provided in the quarterly reports by the APHA species groups and the monthly surveillance reports in the Veterinary Record derived from the Emerging Diseases and Welfare programme. Both sets of these reports may be found at: http://www.defra.gov.uk/ahvla-en/category/publications/disease-surv/surv-reports/

Cysticercus bovis

Further to the report of an outbreak of *Cysticercus bovis* mentioned in previous FZ2100 reports (Q3 and Q4 reports, 2013), APHA investigated a further four farms in the same locality as the farm of the original outbreak. *C. bovis* is the intermediate (larval) stage of *Taenia saginata*, the human beef tapeworm. Cattle become infected with bovine cysticercosis by ingesting materials contaminated with tapeworm eggs originating from human faeces. Humans, the definitive host, become infected via consumption of raw or undercooked beef. Bovine cysticercosis is of economic importance to the beef industry due to the costs of control measures (carcases condemnations, downgrading and extended cold storage) for carcases identified as being affected during meat inspection at abattoir.

In February 2014, APHA was made aware of four farms where significant levels of *C. bovis* infection in fattened cattle were reported by a single abattoir. In one case, involving a farm which purchased 21 month old store cattle to sell as finished at 24 months, 14 out of a batch of 20 animals were shown to have heavy infections. This resulted in significant disruption and economic loss to both the slaughterhouse, which is required to freeze the carcases for a minimum of two weeks, and the farmer, whose end carcase price may be only 60% of the anticipated finished price and well below the initial outlay to purchase store cattle. All affected farms purchased store cattle from different sources, and fattened the cattle over a period of approximately four months. Epidemiological investigations considered many potential sources of infection, including feed, bedding, flooding and staff sanitary conditions of the four affected farms. A common link was the feeding of potatoes from a single supplier, this potato merchant also supplied feed potatoes for the farm which experienced the previously reported outbreak in 2013 (See Q4 (2013) FZ2100 report). 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. The issue was also referred to the Food Standards Agency.

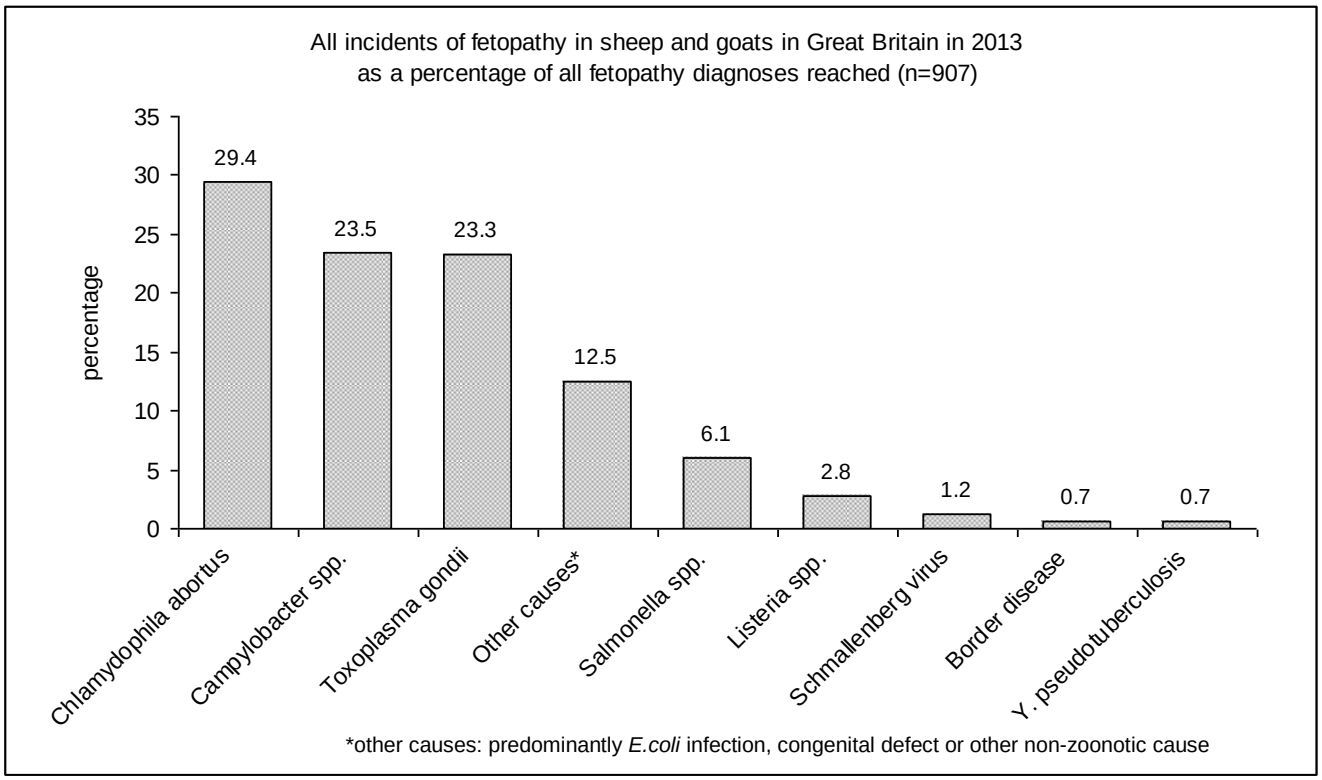
Hantavirus

The carcase of a pet rat which had been euthanased due to age-related health issues was submitted to APHA to test for hantavirus. The pet rat was one of a group of three belonging to a household in which two human cases of clinical hantavirus infection had been identified. Molecular testing at APHA Weybridge identified the presence of Seoul virus RNA in lung and kidney using a specific real time PCR. Epidemiological links between this pet rat and several other pet rat colonies were identified, including the Oxfordshire colony previously reported in which a significant level of infection with hantavirus was demonstrated (See Q1 and Q4 (2013) FZ2100 report). Partial polymerase gene sequences from this recently tested domestic rat are identical to those detected in the previously reported colony. Mixing of rodents is likely to facilitate spread of hantavirus and other infections between colonies, emphasizing that principles of biosecurity are equally applicable to the pet sector.

APHA are aware of continuing isolated reports of hantavirus infection in rat owners in GB. The generally accepted principle is that rats, as with all animals, carry a variety of zoonotic pathogens and sensible hygiene precautions should be adopted as a routine. Specific advice on reducing the risk of human infection from pet rodents has been issued by Public Health England and can be accessed at:
https://www.gov.uk/government/publications/pet-rats-mice-hamsters-reducing-the-risk-of-infection

1.3 Sheep and goat abortions 2014

In view of the large number of potentially zoonotic infections involved in abortions in these species, additional information (mainly from the first quarter of 2014) is shown separately below. General advice to pregnant women during the lambing season is available on the gov.uk website (please click on links): Pregnant women advised to avoid animals that are giving birth and Infection risks during lambing season, from the Welsh Government Pregnant women are advised to avoid animals that are giving birth and also from the Scottish government: Lambing advice to pregnant women



2. Specific scanning and targeted surveillance and other studies

2.1 Campylobacter

Human campylobacteriosis due to thermophilic campylobacters is a major cause of food poisoning, although non-thermophilic strains (such as *C. fetus*) can also (rarely) cause severe systemic zoonotic illness.

A total of 236 campylobacter isolates (mainly from ruminant abortion cases or from fertility screening submissions in England and Wales) were identified by the APHA - Starcross laboratory during 2014: there were 181 isolates from sheep, 52 from cattle, two from birds and one isolate from an antelope.

Of the ovine isolates, 159 (88%) were *C. fetus fetus,* a similar proportion to that seen in 2013, with the remaining 22 (12%) a mixture of enteric strains (*C. jejuni*, *C. coli* and *C. sputorum*).

Of the 52 bovine isolates, 16 (31%) were *C. fetus venerealis intermedius*, one was identified as *C. fetus venerealis* and three isolates were identified as *C. fetus fetus.* The remaining 32 (35%) of bovine isolates were a mixture of enteric (thermophilic) strains, including one isolate derived from a bull sheath washing which was further identified using 16S rRNA gene sequence analysis as a potentially novel *Campylobacter* spp, most closely related to stains described as *C. lanienae*. This isolate was not considered to be clinically significant.

The two avian isolates were identified as *C. coli*. The isolate from the antelope faeces was further identified as *C. jejuni.*

A total of 210 campylobacter isolates were identified by SACCVS during 2014: there were 34 isolates from sheep, 23 from cattle, 142 from dogs, 10 from cats and one isolate from a rabbit. Thirty-three of the ovine isolates were from abortion cases and comprised 19 (57%) *C. fetus fetus,* 10 *C. jejuni* (30%), three *C. sputorum* (9%) and a single isolate of *C. lari* (3%). The other ovine isolate was a *C. jejuni* recovered from a faeces sample. Seventeen of the bovine isolates came from abortions and the other six from fertility investigations. All the bovine isolates belonged to *C. fetus*, 11 of which were sub-speciated and identified as *C. fetus venerealis intermedius*.

Amongst the 142 canine isolates, 89 (63%) were C. upsaliensis, 21 (15%) *C. jejuni*, eight (6%) *C. coli*, seven (5%) *C. lari* and 12 isolates were not identified further. Seven (70%) of the feline isolates were C. upsaliensis and one (10%) *C. lari,* two isolates from cats were not speciated. The sole isolate from a rabbit was identified as *C. jejuni*.

2.2 Hepatitis E (HEV)

The prevalence and variation of Hepatitis E (HEV) virus in UK pigs at slaughter was assessed through alignment of APHA data for prevalence of HEV RNA in caecal-content samples (compiled as part of the 2013 Baseline survey in pigs[1] and Defra-funded project OZ0155) with PHE data for prevalence of HEV RNA and antibody in blood of the same pigs (sampled at time of slaughter; n=629). HEV RNA was detected in at least one sample type in 20.5% of pigs (17% of caecal-contents and 5.7% of blood samples). The prevalence of antibodies to HEV was 92.8% (584/629).
Phylogenetic analysis of partial genome sequences obtained from selected pig samples indicated that all sequences were of genotype 3. However, although HEV is prevalent in pigs in the United Kingdom and viremic pigs are entering the food chain, most (22/23) viral sequences clustered separately from the dominant type seen in humans[2]. Thus, pigs raised in the UK are unlikely to be the main source of human HEV infections in the UK. Further details of this study can be found in the published paper.[3]

The prevalence of hepatitis E virus in slaughter-age pigs in Scotland was assessed as part of a Chief Scientist Office funded project investigating epidemiology and potential transmission routes of autochthonous HEV infection in Scotland, and led by Glasgow Caledonian University. APHA investigated the antibody prevalence in pig serum samples (n=176) that had been collected in 2006, with an overall seroprevalence of 61.4 % recorded. A paper describing this study was published.[4]

[1] The baseline study was co-funded by Defra, Food Standards Agency (FSA), the British Pig Executive (BPEX), the Veterinary Medicines Directorate (VMD) and PHE.

[2] Ijaz S, Said B, Boxall E, Smit E, Morgan D, Tedder RS (2014). Indigenous hepatitis E in England and wales from 2003 to 2012: evidence of an emerging novel phylotype of viruses. *J Infect Dis.* 209 (8):1212-8.

[3] Grierson S, Heaney J, Cheney T, Morgan D, Wyllie S, Powell L, Smith D, Ijaz S, Steinbach F, Choudhury B, Tedder RS. Prevalence of Hepatitis E Virus infection in UK pigs at the time of slaughter. *Emerg Infect Dis*. http://dx.doi.org/10.3201/eid2108.141995

[4] Crossan C, Grierson S, Thomson J, Ward A, Nunez-Garcia J, Banks M, Scobie L. Prevalence of hepatitis E virus in slaughter-age pigs in Scotland (2015) *Epidemiology and Infection* 143 (10) 2237-2240.

2.3 Leptospirosis

Targeted surveillance by APHA for leptospirosis is variously achieved by analysis of results from: (1) RT-PCR for pathogenic leptospires on appropriate diagnostic samples, sequencing and denaturing high pressure liquid chromatography (DHPLC), (2) Microscopic agglutination test (MAT) antibody testing on sera submitted for disease diagnosis, monitoring and export (mainly dogs). Diagnostic MAT titres are considered seropositive at 1/100 or above (1/50 for *L.* Hardjo bovis in cattle) and, (3) Bulk milk tank antibody testing (by ELISA) of samples submitted from dairy herds for monitoring purposes. The latter two methods are influenced by vaccination (dogs and cattle), MAT results are also very dependent on the range of serology (pools or single serovars) undertaken.

1) During 2014, a total of 147 clinical specimens were examined by real-time PCR for the presence of pathogenic leptospires. The specimens were from a range of mammalian species but mainly cattle and pig fetal kidneys. Of the 126 samples suitable for testing, none tested positive for leptospiral DNA, a similar finding to 2013. There is no field evidence to suggest that leptospirosis is a significant clinical animal health problem in England or Wales, although this will be in part because of the level of cattle vaccination currently undertaken.

2) 5521 serum samples from a range of species were examined during 2014. Of 983 canine sera, 13.4% and 6.2% were positive to *L.* Canicola and *L.* Icterohaemorragiae respectively, compared to 16.9% and 8.0% in 2013, of 2772 bovine samples examined for *L.* Hardjo bovis, 22.6% were positive (21.2% in 2013), 32.9% of 504 porcine samples tested for *L.* Bratislava were positive (32.1% in 2013). Other significant serovars noted included 27 dogs positive to *L.* Bratislava, three positive to *L.* Zanoni, 33 positive to *L.* Copenhageni and one horse was seropositive to *L.* Icterohaemorragiae.

3) During 2014, 162 (34%) of 482 tests undertaken for *L*. Hardjo bulk milk monitoring were negative, 60 (12%) were low positive, 37 (8%) were mid positive and 223 (46%) were high positive. In 2013, the comparable figures (561 tests) were 35% negative, 10% low positive, 8% mid positive and 46% high positive. These results indicate serological evidence of potentially active infection (mid and high positives) in between 50-60% of dairy herds from the population submitting samples, a figure which has remained stable for the previous three years. The significance of these observations is heavily influenced by persistence of antibody, vaccination status and selection bias. However, it is unlikely that many fully vaccinated herds submitted samples for testing so these results are expected to be fairly representative of unvaccinated herds in England and Wales.

2.4 Mycobacteria (excluding *M. bovis*)

Since *Mycobacterium bovis* became notifiable in all species in 2006, the number of samples examined by APHA Weybridge has increased, particularly from pets and camelids. Samples from pigs are mainly submitted by meat inspectors. A summary of potentially zoonotic non-statutory mycobacteria identified from animals in Great Britain during 2014 is given below.

M. microti was isolated from five cats. *M. avium* was isolated from three pigs and also from one wallaby which belonged to a zoological collection.

2.5 Toxoplasmosis

The European Food Safety Authority (EFSA Journal 2007, 583, 1-64) highlighted the significance of toxoplasmosis as a foodborne zoonosis and the need to improve surveillance in this field. Serological examinations for *Toxoplasma gondii* using the latex agglutination test (LAT) are undertaken by the APHA on sera submitted to APHA veterinary investigation centres. The findings presented below provide a summary of the serological status of samples submitted for diagnosis, monitoring and screening purposes during the period January to December 2014, but do not constitute a structured survey. Positive samples, as defined here, have LAT titres of 1/64 or greater and indicate a history of exposure to this protozoan parasite.

During 2014, 421 (73.7%) of 571 sheep sera received (from 114 separate submissions) tested positive for *T. gondii*. This compares to 528 (65.3%) positive sera from 808 samples (216 submissions) received in 2013. In goats, 57 (70.4%) of 81 sera (15 separate submissions) tested positive. Two cattle sera from two separate

submissions both tested negative, as did a single pig serum sample. Two tayra (weasel-like mammals) sera (from a zoological collection) both tested negative.

2.6 Q fever

There were four diagnoses of Q fever in 2014, two of these were on cattle farms and two were part of a protracted incident on a single goat farm, and all cases were identified in England. Of the bovine diagnoses, the first involved a four year old Devon suckler cow which had aborted in late gestation. Q fever was also diagnosed as the cause of abortion in an adult dairy cow, which was the second to abort in the space of a week in a herd of 160 cows. The other two diagnoses followed examination of foetal material from a dairy goat farm which had experience a protracted abortion storm mainly in maiden doe goats. In all four cases, *Coxiella burnetii* was the sole abortifacient detected during the investigation.

Diagnosis of Q fever is undertaken using PCR to confirm the presence of *Coxiella burnetii*, typically following the identification of suspicious acid-fast bodies in MZN stained smears of foetal tissues. In each case, the regional Public Health England office was informed of the incident and the zoonotic potential of this organism was highlighted to the farmer and private veterinary surgeon, with the provision of an advisory sheet provided: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/322815/Q_fever_information_for_farmers.pdf

2.7 *Streptococcus suis*

Streptococcus suis isolates from diagnostic material submitted to APHA and SACCVS disease surveillance centres are typed further for disease surveillance purposes. The numbers and serotypes from porcine diagnostic material submitted during the period January to December 2014 are shown below with data for the previous years for comparison. Please note that the 2012 figures are the first to include SACCVS data, data from Scotland is not included in the figures prior to 2012.

Year	1	2	3	4	5	6	7	8	9	10	11	12	14	16	21	29	1/2	UT	1/14*	Total
2011 (E&W)	11	**48**	8	5	1		8	5	1				4	1			17	10		**119**
2012 (GB data)	12	**49**	2	2		1	8	2	1	1			5				3	4		**90**
2013 (GB data)	11	**33**	6	3	2		6	4	1		1		4	1	1		7	7		**87**
2014 (Gb data)	2	**45**		1	2		10	5	3	2		2	4	3		1	2	8	**2**	**92**

*isolates cross react with both 1 and 14 UT =untypable

Streptococcus suis type 2 again predominated.

3. Investigations into zoonotic and potentially zoonotic incidents

Protocols for the investigation of zoonotic disease incidents in England and Wales are set out in the following document: Guidelines for the Investigation of Zoonotic Disease (England and Wales), which is currently being updated.
For Scotland, relevant guidelines are set out here: Guidelines on the roles and responsibilities of agencies involved in the Investigation and Management of Zoonotic Disease in Scotland

APHA collaborations with PHE in the investigation of zoonotic incidents are also included in the PHE Zoonoses Newsletters

An industry Code of Practice (CoP) on preventing or controlling ill health from animal contact at visitor attractions is available. This CoP is aimed at owners, operators and managers of such visitor attractions, and includes a section specifically for those leading school and other group trips to such establishments.
The document can be downloaded from the Farming and Countryside Education (FACE) website

Advice for members of the public planning a trip to animal-associated visitor attractions and other information can be found on the PHE Zoonoses Webpages

3.1 Cryptosporidiosis

Investigations to assist in human outbreaks of cryptosporidiosis linked to direct contact PHE/PHW and in collaboration with the Cryptosporidium Reference Unit, Swansea and follow jointly agreed guidelines.

There was only one farm–related investigation in 2014:

In March, APHA assistance was requested in the investigation of five cases of Cryptosporidium infection in visitors to an open farm in the North West of England. APHA provided advice to the Outbreak Control Team, but no veterinary visit was required on this occasion.

3.2 VTEC O157

Verocytotoxigenic-producing *E.coli* (VTEC) O157 outbreak investigations are undertaken according to agreed guidelines at the request of CsCDC of PHE/PHW or CPHMs as part of an outbreak control team in Scotland where an animal-associated source is suspected. These outbreak investigations variously involve collaboration with other organisations, including the Environmental Health departments of Local Authorities and the Health and Safety Executive. Determination of phage type (PT), verocytotoxin (VT) type and comparison of human and animal isolates by pulsed field gel electrophoresis (PFGE) or variable number of tandem repeat (VNTR) analysis are performed by the Laboratory of Gastrointestinal Pathogens (LGP), Gastrointestinal Infections Reference Unit (GIRU), Microbiology Services, Colindale. If isolates from animals circumstantially implicated in outbreaks have the same PT and indistinguishable PFGE or VNTR profiles from human cases, this is taken as confirmatory evidence of a causal association. In practice, there can be minor profile variation amongst some isolates associated with an outbreak investigation and VNTR profiles of strains within an outbreak can also show variation at a single tandem repeat locus. Other VTEC O157 PTs may be detected incidentally during the investigation of animal premises.

There were four farm related investigations in 2014:

a) In March, APHA assistance was requested in the investigation of three cases (within two families) of VTEC O157 PT 21/28 infection in children who had visited an open farm in the East of England. Environmental Health Officers had recommended several measures to further reduce the risk of zoonotic infection in visitors. An APHA Veterinary Investigation Officer visited the farm and reported good standards of hygiene and husbandry and the farm was considered to be in broad compliance with the industry Code of Practice. VTEC O157 was not isolated from any of the 42 samples taken from animals on the farm and it was suggested that evaluation of other possible exposures may be warranted.

b) In April, APHA assistance was requested in the investigation of a relatively large outbreak of VTEC O157 PT 21/28 in visitors to a lambing event held at a country store in the North West of England. A total of 15 laboratory confirmed cases (including one staff member) and 15 possible cases (defined as people who visited the premises and reported symptoms but who were not microbiologically confirmed) were identified. Several of the cases developed haemolytic uraemic syndrome (HUS). During the lambing event, visitors could observe ewes lambing and hold and bottle feed orphan lambs which were housed in a polytunnel shed adjacent to the country store. Ferrets and ducklings were also on display. VTEC O157 PT 21/28 was isolated from adult ewes, suckling lambs and orphan lambs and molecular testing confirmed the animal isolates were indistinguishable from the human isolates, confirming the lambing event as the source of the outbreak. Many areas of non-compliance with the industry Code of Practice were identified, including a failure to adequately inform visitors of the risk of zoonoses and how to prevent infection and a failure to control contamination of visitors with animal faeces. Due to the ongoing challenges of controlling zoonotic risk on this premises and the scale of the outbreak, the lambing event was closed prematurely.

c) In June, APHA assistance was requested in the investigation of three cases of VTEC O157 PT 21/28 in children visiting an open farm in the Yorkshire and Humber Region. APHA provided advice to the Outbreak Control Team, but no veterinary visit was required on this occasion.

d) In November, APHA assistance was requested in the investigation of nine (at the time of writing) human cases of VTEC O157 PT 21/28 infection, epidemiologically linked to the consumption of unpasteurised cows' milk from a dairy producer-retailer in England. Extensive investigation had already been undertaken by the FSA, and a recall notice had been actioned. However, testing of environmental samples from the dairy and bulk milk tank had not yielded any VTEC O157. APHA visited the farm to conduct a veterinary farm to fork investigation including animal sampling. *E. coli* O157 was isolated by APHA Bury St Edmunds from four out of 30 faecal samples collected from the milking herd, one of these was confirmed as VTEC O157 PT 91, and the other three as VTEC O157 PT21/28 of the same (or single locus variant) VNTR pattern as the human isolates, thereby confirming the farm animals as the source of the human infections. Advice was given on practices to reduce the potential for contamination of raw milk.

3.3 Other human outbreak investigations

VTEC O55

In December, APHA assistance was requested in the investigation of an outbreak of VTEC O55 infection in people in Dorset. Human cases of VTEC O55 infection are very rare, and an outbreak had never been recorded in the UK before. The outbreak was characterised by its geographical restriction to the county and the severity of clinical disease. At least 18 cases have been confirmed since July 2014, with a high proportion of the clinical cases developing haemolytic uraemic syndrome (HUS). Due to the severity of the disease, a very thorough investigation of many possible exposures was undertaken by the outbreak control team. APHA assisted in the investigation of an open farm which had been visited by (only) two cases prior to the onset of illness, VTEC O55 was not identified in any of the animal samples collected during the visit, but advice was offered on the control of zoonoses in general on the premises. As VTEC O55 is closely related to VTEC O157, for which a major reservoir of infection is cattle, APHA also assisted with mapping of cattle imports from areas of Europe where VTEC O55 cases had previously been reported, to investigate any possible route of introduction of VTEC O55 to Dorset. Despite extensive investigation of food, environmental and animal reservoirs, no source for the outbreak has yet been identified, and investigations continue.

Corynebacterium ulcerans

In October, the assistance of APHA was requested in determining a potential companion animal source of infection of toxigenic *C. ulcerans*, which was isolated from a non-healing wound of a human patient following a joint replacement surgery. Toxigenic *C. ulcerans* was isolated from pharyngeal swabs taken from the pet dog in the household, confirming a shared reservoir of infection. APHA offered advice on reducing the risk of zoonotic infections from companion animals, and liaised with the owner's private veterinary surgeon regarding treatment to clear the bacteria. A post antibiotic clearance swab of the dog indicated that treatment had been successful.

This is the second recorded case in the UK where a reservoir of *C. ulcerans* has been demonstrated in a companion animal in association with human illness. Details of the first case were published in the Veterinary Record:

Hogg RA, Wessels J, Hart J, Efstratiou A, De Zoysa A, Mann G, Allen T, Pritchard GC. (2009) Possible zoonotic transmission of toxigenic *Corynebacterium ulcerans* from companion animals in a human case of fatal diphtheria. Veterinary Record 2009 165(23):691-2.

4. Publications

Selected publications below were funded (wholly or in part) from, or have relevance to, FZ2100 during 2014:

Crossan C, Grierson S, Thomson J, Ward A, Nunez-Garcia J, Banks M, Scobie L. Prevalence of hepatitis E virus in slaughter-age pigs in Scotland. Epidemiol Infect. 2014 Nov 20:1-4. [Epub ahead of print] PubMed PMID: 25410494.

Dupinay T, Pounder KC, Ayral F, Laaberki M-H, Marston DA, Lacote S, Rey C, Barbet F, Voller K, Nazaret N, Artois M, Marianneau P, Lachuer J, Fooks AR, Pepin M, Legras-Lachuer C, McElhinney LM (2014) Detection and genetic characterization of Seoul Virus from commensal brown rats in France. *Virology Journal* 11: 32.

Grierson S, Heaney J, Cheney T, Morgan D, Wyllie S, Powell L, Smith D, Ijaz S, Steinbach F, Choudhury B, Tedder RS. Prevalence of Hepatitis E Virus infection in UK pigs at the time of slaughter. Emerg Infect Dis.. http://dx.doi.org/10.3201/eid2108.141995

Jeffries CL, Mansfield KL, Phipps LP, Wakeley PR, Mearns R, Schock A, Bell S, Breed AC, Fooks AR, Johnson N (2014) Louping ill virus: an endemic tick-borne disease of Great Britain. *Journal of General Virology* 95 (5) 1005-1014

Minetti C, Taweenan W, Hogg R, Featherstone C, Randle N, Latham SM, Wastling JM, (2014) Occurrence and diversity of *Giardia duodenalis* assemblages in livestock in the UK. *Transboundary and Emerging Diseases* 61 (6) e60-e67.

Mitchell S, Anscombe J, Wessels J (2014) Disease risks from raccoons and skunks (letter). *Veterinary Record* 174 (20) 510-511.

Phipps LP, Johnson N, Gale P, Shickle L, Roberts H, Fooks AR, Quest R (2014) Potential pathway for Crimean Congo haemorrhagic fever virus to enter the UK (letter). *Veterinary Record* 175 (4) 100-101.

Sheppard SK, Cheng L, Meric G, De Hann CPA, Llarena A-K, Marttinen P, Vidal A, Ridley A, Clifton-Hadley F, Connor TR, Strachan NJC, Forbes K, Colles FM, Jolley KA, Bentley SD, Maiden CJ, Hanninen M-L, Parkhill J, Corander J. (2014) Cryptic ecology among host generalist *Campylobacter jejuni* in domestic animals. *Molecular Ecology* 23 (10) 2442-2451.

Smith RP, Clifton-Hadley FA, Cheney T, Giles M. (2014) Prevalence and molecular typing of *Cryptosporidium* in dairy cattle in England and Wales and examination of potential on-farm transmission routes. *Veterinary Parasitology* 204 (2-4) 111-119.

Vidal AB, Davies RH, Rodgers JD, Ridley A, Clifton-Hadley F. (2014) Epidemiology and control of campylobacter in modern broiler production. *In:* Sheppard SK (ed), Meric G (ed), *Campylobacter ecology and evolution,* Caister Academic Press, Norfolk, 2014, 287-312.