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Annual Report 2022

Project FZ2100

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APHA is an Executive Agency of the Department for Environment, Food and Rural Affairs and also works on behalf of the Scottish Government, Welsh Government and Food Standards Agency to safeguard animal and plant health for the benefit of people, the environment and the economy.

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Monitoring the occurrence of certain animal diseases can highlight the potential for zoonotic transmission and provide an indication of human, environmental and foodborne health risks. These FZ2100 project reports, which primarily relate to farmed animal species, summarise the surveillance activities of the Animal and Plant Health Agency (APHA) and the SRUC Veterinary Services in Scotland, for zoonoses and infections shared between man and animals in Great Britain, using data gathered by the network of Veterinary Investigation Centres. Quantitative diagnostic data for all of GB is provided by the Veterinary Investigation Diagnostic Analysis (VIDA) surveillance system. Summaries of joint veterinary/medical investigations into incidents and outbreaks of zoonotic disease and associated activities are also included. This report covers the relevant VIDA data for Quarter 4 (October to December 2022) incorporated into the previous Quarters results for the past year to give the total data for the 12-month period between January and December 2022.

The Zoonoses and Veterinary Public Health project (FZ2100) is funded by Defra, the Scottish Government and the Welsh Government through the APHA's Bacterial Diseases and Food Safety portfolio and also uses returns from scanning surveillance projects. Non-statutory zoonoses are defined as any zoonoses for which no specific animal-health derived legislation exists, and so excludes *Salmonella* and those diseases which are compulsorily notifiable in certain animal species, e.g. TB. Information concerning notifiable or reportable zoonoses is recorded elsewhere, some under specific projects such as FZ2000 (*Salmonella*). *Coxiella burnetii* (Q fever), avian chlamydiosis (in psittacines) and brucellosis in dogs were made reportable under the Zoonoses Order in 2021 and are included in this report. In March 2022 the APHA testing protocol for *Mycobacterium bovis* in non-bovine animals changed (details on page 7), and non-bovine *M. bovis* cases have been included in this annual report.

1. General scanning surveillance

1.1 Zoonoses VIDA data for Great Britain: January to December 2022

Table 1 (collated 3 February 2023) summarises clinical diagnoses of zoonoses and infections shared between animals and humans from specimens submitted to APHA and SRUC Veterinary Investigation Centres for the 12-month period between January and December 2022 and compares the findings with the data for 2020 and 2021. It includes rare zoonotic infections and those for which zoonotic potential is confined predominantly to immunocompromised 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 and most reportable diseases (notably salmonellosis, which is recorded elsewhere). The table is intended only as a general guide for veterinary and public health

professionals to the diagnosed occurrence of animal-associated infections in predominantly farmed animal species in GB.

Table 1. General scanning surveillance: Zoonoses VIDA data for Great Britain January to December 2022 – all species

Table notes:

- blank cells indicate that a diagnosis is not available for that species
- birds: data for birds includes domestic and wild birds
- wildlife: data for wildlife includes mammals only

VIDA codes	Diagnosis	2020	2021	2022	Cattle	Sheep	Goats	Pigs	Birds	Misc.	Wildlife
311	Babesiasis	7	45	23	23	-	-	-	-	-	-
258 & 659	*Brachyspira pilosicoli* /intestinal spirochaetosis	42	67	48	-	-	-	48	0	-	-
013	*Campylobacter* fetopathy	67	73	114	7	107	0	-	-	0	0
282	Chlamydiosis (*C. psittaci*)	0	1	2	-	-	-	-	2	-	-
014	*Chlamydia abortus* fetopathy	206	214	145	0	143	2	-	-	0	0
732	*Corynebacterium pseudotuberculosis (CLA)*	24	27	29	-	22	7	-	-	-	-
318	Cryptosporidiosis	303	357	245	223	15	1	2	2	1	1
362	Cysticercosis	0	4	1	-	1	-	-	-	-	-
193	Dermatophilus infection	3	4	3	2	1	0	-	0	0	-
022, 133 & 615	Erysipelas	29	22	24	-	6	0	11	7	0	-
371, 372 & 373	Fasciolosis	189	230	154	90	54	2	-	-	4	4
363	Hydatidosis	0	0	0	-	0	-	-	-	-	-
015, 136 & 139	Leptospirosis (all categories)	6	4	5	2	0	0	2	-	0	1

VIDA codes	Diagnosis	2020	2021	2022	Cattle	Sheep	Goats	Pigs	Birds	Misc.	Wildlife
016, 140, 150, 189 & 711	Listeriosis (all categories)	111	177	124	34	81	9	0	0	0	0
217	Louping ill	13	23	36	2	27	-	-	7	-	-
225	Orf (parapox virus)	30	31	24	-	21	2	-	-	1	-
152,153, 157, 158	*Pasteurella multocida* pneumonia /pasteurellosis	195	219	207	113	45	1	45	2	0	1
223	Pseudocowpox (parapox virus)	0	0	0	0	-	-	-	-	-	-
027 & 262	Q Fever/*Coxiella burnetii*	2	3	3	1	1	1	-	-	0	0
374	Red Mite *(Dermanyssus gallinae)*	5	12	4	-	-	-	-	4	-	-
195	Ringworm	4	5	3	2	0	1	0	0	0	0
379, & 392	*Sarcoptes scabei infection*	2	3	2	0	-	0	1	-	1	-
024, 171, 172 & 644	Streptococcal infection (excluding bovine mastitis)	139	151	98	-	15	0	80	1	1	1
745	Swine influenza	32	50	27	-	-	-	27	-	-	-
026 & 315	Toxoplasmosis (incl. fetopathy)	106	162	132	-	131	1	-	-	0	0
142	Tuberculosis (excl. bovine *M. bovis*)	27	28	21	-	-	0	1	4	9	7
034 & 154	Yersiniasis (incl. fetopathy)	20	20	13	-	8	2	3	0	0	0

Common minor diseases of zoonotic importance, such as orf and ringworm, are grossly underestimated by the VIDA recording and reporting system, as it is unusual for practising veterinary surgeons to submit material for diagnosis.

Please note the increase in Babesiosis VIDA-coded cases in 2021 was due to the development of a Test Development Project funded by the ED1000 cattle surveillance project which allowed for the free testing of submitted EDTA samples from suspect clinical cases. This project continued until the end of 2022.

The increase in the number of *Campylobacter* sp. fetopathy VIDA coded cases in sheep in 2022 may be associated with the cyclical nature of the disease. Peaks are anecdotally recognised to occur every 5 to 8 years.

More detailed specific information on scanning surveillance diagnoses and trends for endemic diseases is available from: http://apha.defra.gov.uk/vet-gateway/surveillance/index.htm

1.2 Highlights from APHA and SRUC disease surveillance centres

This section provides information on a few noteworthy cases, of zoonotic interest from material submitted to the APHA (England and Wales), SRUC Veterinary Services (Scotland), and partner post-mortem providers between January and December 2022.

Further information is provided in the quarterly reports by the APHA species groups and the monthly surveillance reports in the Vet Record derived from scanning surveillance, which can be found at: http://apha.defra.gov.uk/vet-gateway/surveillance/reports.htm

The species expert group quarterly reports provide comprehensive details on scanning surveillance activities throughout 2022, covering avian, cattle, small ruminant, pigs, miscellaneous and exotic farmed species, and wildlife. A few interesting cases are mentioned below:

Toxoplasmosis in a nine-month-old pet chicken

A nine-month-old chicken had shown signs of splayed legs and paresis. Post-mortem examination showed no significant gross lesions. Histopathological examination revealed a severe systemic protozoal infection with major involvement of the central nervous system, heart, and eye. The severity of the changes associated with the protozoal infection would have accounted for the neurological signs reported clinically. Immunohistochemistry for *Toxoplasma gondii* revealed specific positive labelling of numerous protozoal tachyzoites within foci of necrosis and inflammation in the brain and specific labelling of bradyzoite cysts associated with extraocular muscle fibres and associated nerves in the eye, confirming a diagnosis of toxoplasmosis in the bird. Although chickens are known to be susceptible to *T. gondii* infection, which can be acquired following ingestion of oocysts from cats as the definitive host for the parasite, clinical signs resulting from infection

appear to be unusual. The findings from this bird indicate that toxoplasmosis should be considered in the differential diagnosis of neurological signs in chickens, particularly backyard and smallholding birds that may have access to cats. The consumption of raw or undercooked meat from contaminated birds represents a potential risk of zoonotic infection. This case was described in the APHA Q1 2022 Great Britain avian quarterly report: disease surveillance and emerging threats and was published in the Vet Record APHA monthly surveillance report in March 2022.

Colisepticaemia in (non-neonatal) older dairy calves

The Cattle Expert Group reported cases of *Escherichia coli* septicaemia in older calves in both Q2 and Q3 2022 GB cattle quarterly reports. These cases are in contrast with the customary presentation of septicaemic *E. coli* infection in neonatal calves, most having received insufficient colostrum. Poor environmental hygiene and other managemental factors can also be contributory. In comparison, all calves in the recent investigations, with one exception of an unweaned three-month-old calf, had been weaned. Similar cases in non-neonatal calves have been identified in several herds, in England, Wales and Scotland. There has been no consistent evidence of other diseases. Further investigations into the *E. coli* types are ongoing and further updates including information regarding zoonotic potential will be provided in later editions of the FZ2100 Zoonoses and Veterinary Public Health Reports.

2. Specific scanning and targeted surveillance and other studies

2.1 Campylobacter

Human campylobacteriosis is usually caused by the thermophilic *Campylobacter* species *C. jejuni* and *C. coli*, which can be found in a wide range of livestock, poultry and wildlife species. Poultry and poultry meat products are the main sources for human infection, and campylobacteriosis is the most commonly reported bacterial cause of food poisoning in the UK, with over 65,000 cases reported in 2018. This report does not cover foodborne illness related to *Campylobacter* infection.

However, non-thermophilic *Campylobacter* strains (such as *C. fetus*) can also (rarely) cause severe systemic illness in people.

Please note that only *Campylobacter* fetopathy numbers are detailed in Table 1 above.

England & Wales

In 2022 there were a total of 101 *Campylobacter* isolates (6 in Quarter 4) identified by the APHA Starcross laboratory, which were mainly from ruminant abortions and comprised:

- Bovine – a total of 11 isolates: 3 *C. fetus venerealis intermedius*, 1 *C. fetus venerealis*, 4 *C. fetus fetus*, 2 *C. jejuni*, 1 *C. lari*. In Quarter 4 there was 1 *C. fetus venerealis intermedius* and 1 *C. fetus fetus.*
- Ovine – a total of 90 isolates: 8 *C. coli*, 78 *C. fetus fetus*, 4 *C. jejuni*. In Quarter 4 there were 4 *C. fetus fetus*.

Scotland

SRUC Veterinary Services had a total of 336 *Campylobacter* isolates during 2022 (86 in Quarter 4), which were:

- Bovine – a total of 8 isolates: 2 *C. fetus venerealis intermedius*, 2 *C. fetus venerealis,* and 4 *C. jejuni*. In Quarter 4 there was 1 *C. fetus venerealis intermedius*.
- Ovine – a total of 14 isolates: 8 *C. fetus* not-typed and 6 *C. jejuni*. In Quarter 4 there was 1 *C. jejuni.*
- Canine – a total of 294 isolates: 233 *C. upsaliensis,* 54 *C. jejuni,* 3 *C. lari*, and 4 non-typed *Campylobacter* sp. In Quarter 4 there were 73 *Campylobacter* isolates which comprised 49 *C. upsaliensis,* 22 *C. jejuni,* 1 *C. lari*, and 1 non-typed *Campylobacter* sp.
- Feline – a total of 13 isolates: 12 *C. upsaliensis* and 1 *C. jejuni.* In Quarter 4 there were 8 *Campylobacter* isolates which comprised 7 *C. upsaliensis* and 1 *C. jejuni.*
- Zoo animals – a total of 7 isolates: all *C jejuni* (from 1 capybara, 6 tamarins). In Quarter 4 there were 3 *C. jejuni* isolates (from 3 tamarins).

2.2 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. Between January and December 2022, a total of 225 kidney specimens (kidneys from 57 cattle, 156 pigs, 3 sheep, 1 deer, 1 alpaca, 1 wild boar, 5 foxes, and 1 other mammal, species not stated) were examined by real-time PCR for pathogenic leptospires. There were 5 positive kidney test results: 1 cattle, 1 pig, and 3 foxes. 39 of the submitted samples were unsuitable for testing (most of these were too autolysed).

2. In 2022, a total of 2,102 serum samples from a range of species were tested for *Leptospira* antibodies, which included 607 serum samples from a range of species tested in Q4 (October to December 2022). A summary of the serology findings for dogs, cattle and pigs for Q4 is as follows:
   - **Dogs** (export tests) – for export purposes 153 canine sera were tested for *L.* Canicola and 11 were tested for *L.* Icterohaemorrhagiae, 10.9% and 0% were positive respectively, compared to 3.9% and 0% for the same quarter last year
   - **Dogs** (diagnostic tests) – 50 canine sera were tested for diagnostic purposes - 24% were positive for *L.* Canicola (7.7% in Q4 2021), 25.5% for *L.* Copenhagenii (25.3% in Q4 2021), 8.7% for *L.* Icterohaemorrhagiae (9.7% in Q4 2021), 2.4% for *L.* Bratislava (13.8% in Q4 2021), 0% for *L.* Pomona (3.3% Q4 2021), 28.6% for *L.* Grippotyphosa (5.0% Q4 2021), 94.1% for *L.* Australis (39.4% Q4 2021), 0% for *L.* Autumnalis (2.0% Q4 2021) and 25% for *L.* Sejroe (5.2% Q4 2021)
   - **Cattle** – 140 bovine samples were tested for *L.* Hardjo bovis, of these 8.76% were positive (5.6% in Q4 2021)
   - **Pigs** – 155 porcine samples were tested, of these 25.2% were positive for *L.* Bratislava (0% in Q4 2021)

Note: more than one serotype may be detected in a serum sample.

3. Between January and December 2022 there were 47 bulk *L.* Hardjo antibody milk tests (for monitoring purposes) which gave the following results: 17 (36.2%) were negative, 7 (14.8%) were low positive, 6 (12.8%) were mid positive and 17 (36.2%) were high positive.

   For comparison, between January and December 2021, 26 (31.5%) of 83 bulk milk *L.* Hardjo antibody tests were negative, 13 (15.6%) were low positive, 7 (8.4%) were mid positive and 37 (44.5%) were high positive.

   The significance of these observations is heavily influenced by vaccination status and selection, although it is thought unlikely that fully vaccinated herds contributed many samples. Low submission numbers also make comparisons across the two years difficult.

2.3 Mycobacteria (excluding bovine cases of *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 Official Veterinarians at abattoirs.

Our testing protocol has changed and since 30 March 2022, all new submissions from non-bovine animals have been tested by PCR which detects the *M. tuberculosis* complex and *M. bovis*. If positive for the *M. tuberculosis* complex and *M. bovis*, the sample is sent for culture to harvest growth to establish the WGS clade of *M. bovis*.

If positive for the *M. tuberculosis* complex and negative for *M. bovis*, an unvalidated PCR for *M. microti* is carried out. If the PCR is positive for *M. microti*, there is no further testing.

If the PCR for *M. microti* is negative, culture is carried out to establish the Mycobacterium present (possibilities include other members of the *M. tuberculosis* complex such as *M. tuberculosis* or *M. caprae*).

This means that we will not be receiving results for a wide range of *Mycobacterium* sp. as previously.

Summary of non-bovine *Mycobacterium* sp. during the period January to December 2022

Although our testing protocol changed in March the figures below include all cases tested during 2022 including those tested by culture and the new testing protocol.

Mycobacterium microti was detected on 18 occasions from: 6 cats, 9 pigs, 1 deer and 2 alpaca. One was by culture and 17 by PCR.

In addition *Mycobacterium tuberculosis* complex was detected in 1 pig, the culture result was not available at the time of publication of this report.

Mycobacterium bovis in non-bovine animals was detected on 82 occasions from a range of species: 10 alpaca, 4 cats, 51 deer, 9 pigs, 6 sheep, 1 wild boar and 1 zoo mammal (species unknown).

Tuberculosis in an alpaca and deer

Two *Mycobacterium bovis* TB submissions were described in the Q1 2022 Great Britain miscellaneous and exotic farmed species quarterly report. The alpaca carcase was received in emaciated body condition with no body fat visible. Multiple extensive calcified lesions were present in the majority of the lung lobes with minimal normal lung tissue remaining. The deer had been culled from a deer park and samples were submitted to investigate suspicion of tuberculosis. Multiple abscesses were visible in the mesenteric lymph nodes, and these contained soft white purulent material which is often the presenting sign of tuberculosis in deer. Culture confirmed the presence of *M. bovis* in both cases.

2.4 Q fever

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. Confirmation of Q fever as a cause of fetopathy requires histopathology and immunohistochemistry of placental tissue, in addition to a positive PCR result. In each case when *C. burnetii* is detected by PCR, public health colleagues are informed of the incident and the zoonotic potential of this organism is highlighted to the farmer and private veterinary surgeon, with the provision of an advisory sheet:

Q fever: Information for farmers

During the period January to December 2022 a total of 47 samples (from 41 submissions) were tested for the presence of *Coxiella burnetii* by PCR at the APHA Q fever National Reference Laboratory, Penrith Veterinary Investigation Centre. The samples comprised 22 placental samples, 20 foetal fluid samples, 1 foetal stomach contents sample, 2 spleen samples, 1 foetal tissue unspecified sample and 1 bulk milk sample. The *C. burnetii* PCR has been validated for placental and foetal fluid samples, although other samples are also tested.

These samples were from 25 cattle, 16 sheep, 5 goat, and 1 alpaca submissions. 7 samples tested positive for *C. burnetii* (4 cattle, 1 sheep and 2 goats). In addition, the detection of *C. burnetii* in a bovine bulk milk sample (from an English dairy farm) by PCR at an overseas laboratory was reported to APHA.

Further information about the positive submissions is provided in section 3.4.

2.5 *Streptococcus suis*

Streptococcus suis isolates from diagnostic material submitted to APHA and SRUC Veterinary Investigation Centres are typed further for disease surveillance purposes. The submission numbers and serotypes from porcine diagnostic material submitted during the period January to December 2022 are shown below, with annual data for the previous two years (2021 and 2020) for comparison. UT = untypeable.

Table 2. *Streptococcus suis* serotypes from porcine diagnostic material, 2020 to 2022

	1	2	3	4	5	7	8	9	10, 11	13	14	15, 16	20, 21, 24	25, 28, 29	31, 33, 34	UT	Total
2020	12	47	6	4	3	29	5	8	1 (11)	2	11	4 (15)	2 (20) 3 (21)	1 (25) 3 (28) 3 (29)	1 (31)	7	**152**
2021	15	32	6	3	2	22	5	5	1 (10) 1 (11)	2	8	1 (16)	1 (21) 1 (24)	-	1 (33) 1 (34)	7	**114**
2022	15	36	5	2	1	11	1	3	-	-	4	-	-	-	-	13	**91**

Note: for columns that refer to more than one serotype – for example 10, 11 – the number in brackets indicates the serotype.

Serotype 2 was the most common serotype in all three years (2020, 2021 and 2022) although there was less spread across serotypes in 2022. Serotype 7 was the second most common serotype in 2021 and 2020, whereas it was less common in 2022. Interestingly there was a higher proportion of untypeable samples in 2022.

2.6 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 VICs. 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 2022, 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. Toxoplasmosis as a cause of fetopathy in sheep and goats may also be diagnosed through antigen (PCR) testing of placental tissue, and in sheep through IFAT testing of foetal blood or body fluid.

During the period January to December 2022: 199 ovine samples and 18 caprine samples were submitted for Toxoplasma serology. There were positive titres in 84 of the ovine samples and 4 of the caprine samples. Toxoplasma fetopathy figures for sheep and goats are provided in Table 1.

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)

There is similar guidance on the investigation and management of zoonotic disease in Scotland:

http://www.hps.scot.nhs.uk/resourcedocument.aspx?id=1190

Advice for members of the public planning a trip to animal-associated visitor attractions and other information can be found on the Public Health England Zoonoses webpages.

3.1 Cryptosporidiosis

Investigations to assist in human outbreaks of Cryptosporidiosis linked to direct contact with animals are undertaken at the request of Consultants in Communicable Disease Control (CsCDC) of UKHSA/PHW (CsPHM in Scotland) and in collaboration with the National Cryptosporidium Reference Unit, Swansea, and follow jointly agreed guidelines.

APHA assisted with three outbreak investigations of cases of human cryptosporidiosis in 2022. All investigations commenced during Q2 (April to June) 2022. One was in England

and the investigation continued into the third quarter. The other two outbreaks were in Wales. All were associated with open/petting farm attractions. Further details are provided in the Q2 and Q3 Zoonoses and Veterinary Public Health reports, and summarised here:

Quarter 2 is traditionally the busiest time for such investigations and is related to the frequency of open farm visits undertaken by families or school groups around the Easter holiday and Bank Holidays. Contact with young lambs either through bottle-feeding or handling is the major risk factor for the zoonotic spread of *Cryptosporidium parvum* in these settings. The availability of appropriate hand-washing facilities including soap, rather than antimicrobial gel (which is not effective for this pathogen) is extremely important.

With the English outbreak two individuals had a concurrent STEC O26 infection. A visit to the farm by Environmental Health Officers identified a number of issues which increased the risk of exposure to Cryptosporidium such as poor hand washing facilities, direct contact while feeding pet lambs and goats, and poor understanding/compliance with the Industry Code of Practice for such farms. As part of a new initiative to maximise our ability to detect cryptosporidia in potential contact animals and hence match the results to the human cases, pre-emptive faeces samples were collected by an Environmental Health Officer from 15 different animal group areas on the farm and these were submitted to APHA for Cryptosporidium FAT testing. Despite our pre-emptive sampling all 15 samples were negative for Cryptosporidium by FAT testing making a definitive epidemiological link to the human cases and the farm visits difficult. A multidisciplinary team visited, monitored, and advised on actions that would improve hygiene for visitors and which would reduce potential exposure to these zoonotic pathogens. The recommended actions were successfully implemented.

With the Welsh cases areas for improvement were identified, and actions were taken by the operators under the guidance of the Local Authority.

3.2 STEC

Shiga toxin-producing *E. coli* (STEC, formerly known as VTEC) outbreak investigations are undertaken, according to agreed guidelines, at the request of CsCDC of UKHSA/PHW (CsPHM in Scotland) where an animal-associated source is suspected. These investigations often also involve collaboration with other organisations, including the Environmental Health Departments of Local Authorities and the Health and Safety Executive. Determination of phage type (PT), shiga toxin (ST) type, and comparison of human and animal isolates by whole genome sequencing (WGS) analysis are performed by the Gastrointestinal Bacteria Reference Unit (GBRU), UKHSA Colindale. If isolates from animals circumstantially implicated in outbreaks have an indistinguishable WGS profile to those from human cases, this is taken as confirmatory evidence of a causal association. Other STEC (VTEC) PTs or WGS types may be detected incidentally during the investigation of animal premises.

During 2022 APHA assisted with five STEC outbreaks, including the joint Cryptosporidiosis - STEC O26 outbreak above. There were two other STEC outbreaks linked to dairy farms

in England in Q3; STEC O103 and STEC O145. APHA attended several Outbreak Control Team meetings and assisted with the collection of cattle faeces samples for both of these cases. Further information about these cases is available within the Q3 Zoonoses and Veterinary Public Health report.

In Q4 2022 APHA assisted PHW with an investigation in Wales where there were two human cases of STEC O145 which were linked to a private collection of animals on a smallholding. There was no public access to the animals or their housing. Multiple species were on site and included cattle, goats, deer and pigs. Some of the food consumed by people on site is grown in the garden and cattle manure (rotted for 12 months) was used. An APHA Veterinary Investigation Officer (VIO) collected thirty environmental faecal samples and submitted these to the UKHSA Colindale laboratory for culture and typing (as APHA do not currently perform non-O157 testing). Despite extensive testing a precise match to the outbreak strain was not found, which is sometimes the case as excretion of the organism is intermittent. Advice on the prevention of zoonotic disease was provided.

In Q4 2022 an APHA VIO visited an Open farm at the request of the Incident Management Team following a diagnosis of STEC O157 in people. The outbreak strain was detected in one environmental sample from a pig enclosure. It was advised the risk to the public from zoonotic infections could be lowered further by making some improvements to supervision of animal contact, improving handwashing facilities, and making improvements to some animal exhibits. This case is ongoing and an update will be provided in the next Zoonoses and Veterinary Public Health report.

3.3 *Corynebacterium ulcerans*

Corynebacterium ulcerans was first isolated from cases of throat infection in humans in 1926, with zoonotic outbreaks initially associated with direct contact with farm animals or consumption of unpasteurised milk. The organism can produce diphtheria toxin which is capable of producing human disease with the same clinical signs as cutaneous or respiratory diphtheria caused by *C. diphtheriae*. More recently, *C. ulcerans* has been isolated from the oral cavity of domestic pets such as dogs and cats, and current zoonotic outbreaks are investigated by APHA and SRUC Veterinary Services in Scotland by throat swabbing of in-contact companion animals.

During 2022 APHA were involved with assisting the UKHSA Incident Management Teams with four toxigenic *Corynebacterium ulcerans* incidents in Quarter 1, two incidents in Quarter 2, and six incidents in Quarter 3. In Q4 there were six ongoing incidents from Q3, one ongoing incident from Q2 and seven new incidents. These investigations are multidisciplinary and APHA works closely with public health colleagues to investigate, manage, and provide advice regarding the animals involved. Typically APHA will also liaise closely with the private veterinary surgeon to facilitate surveillance swabs, treatment and post treatment clearance swabs as appropriate. Further information about these cases is available within the relevant Zoonoses and Veterinary Public Health reports for each quarter, and in this annual report.

In Q4 the six ongoing incidents from Q3 involved five animal index cases and one human index case. With one index cat (which had a facial abscess) there was another pet (a dog) within the same household which tested positive.

The Q4 incidents comprised five animal index cases and two human index cases.

There were two index case cats from different households that required ongoing antimicrobial therapy and isolation. The first of these cases was a cat which had presented in Q2 with chronic rhinitis. Toxigenic *C. ulcerans* was isolated from a nasal swab taken in May, and despite antibiotic treatment and post treatment swabbing the infection was not cleared, so the cat had prolonged management with further antibiotic treatment including hospitalisation for two weeks to ensure effective treatment and clearance of the infection. The second case (Q4) involved a young cat which had a discharging nail-bed infection affecting its right hind paw. Toxigenic *C. ulcerans* was detected in a swab of this lesion. Although the cat was isolated and treated with a course of antibiotics the lesion was slow to heal. Three weeks of further antimicrobial treatments were given and the foot lesion was reported to have completely healed, and clearance swabs were negative for *C. ulcerans*.

One index case of toxigenic *C. ulcerans* in Q4 was a dog which presented with lethargy and lameness in a front paw. The dog was the only animal within the household. A foreign body was initially suspected, but not confirmed. Unfortunately, despite attempted treatment the dog developed a severe systemic infection and was euthanased.

A full summary of toxigenic *C. ulcerans* data will be provided in the next Zoonoses and Veterinary Public Health Report (Q1 2023) which will compare data for 2020, 2021 and 2022.

3.4 Q fever *(Coxiella burnetii)*

Comparisons of Q-fever data in previous years should be made with caution because from April 2021 Q fever has been a Reportable disease. This means that there is likely to have been increased surveillance for Q fever following April 2021.

There was a total of seven Q fever PCR positive submissions from ruminant abortions in 2022 which comprised five in Q1 2022, one in Q2 2022, and one in Q3 2022. There were no positive submissions in Q4 2022. The *C. burnetii* positives were from four bovine submissions, two caprine submissions and one ovine submission. There were no concerns regarding human illness with any of these submissions. There was a VIDA code diagnosis of fetopathy due to infection with *C. burnetii* in three of these cases, all in Q1 (one cattle, one sheep, one goat). Further information about these cases was previously provided in the previously published quarterly reports.

In Q3 there was also a report of a British bulk milk sample which had tested positive for *Coxiella burnetii* by PCR in an overseas laboratory. Follow up of this case revealed no zoonoses concerns.

APHA provided comprehensive advice to the private vets including information on bovine abortion investigations and laboratory testing. Zoonoses advice about *C. burnetii* was provided including the Q fever advisory farmer information leaflet.

3.5 Avian chlamydiosis (psittacosis)

In 2022 there were two reports of Avian Chlamydiosis in Psittaciformes. The first case which involved an Amazon parrot was described in the Q2 Zoonoses and Veterinary Public Health report. The second case occurred in Q4 2022 and involved an Amazon parrot housed as part of a parrot collection in a hospitality facility. The bird died after displaying intermittent malaise, although eating and drinking patterns were unaffected. Post-mortem examination of the dead parrot was performed by a private veterinary pathologist and a cloacal swab was collected and sent to a private diagnostic laboratory for *Chlamydia* PCR testing. This result was positive and was reported to APHA. PCR testing of pooled faeces collected from the group pen also returned a positive result for *Chlamydia* sp. Further investigations found that the private vet treating the parrots had employed standard quarantine procedures to the group. These included preventing contact between the birds and the public, and limiting exposure to staff except to clean, feed and medicate the group. *Chlamydia psittaci*, the causative agent of avian chlamydiosis can cause serious human illness. APHA provided further advice on ongoing management of the birds including current cleansing and disinfecting recommendations, to prevent zoonotic disease spread. Public Health colleagues were informed of this case for awareness.

4. *Brucella canis*

Since July 2020, there has been a large increase in the number of incidents of canine brucellosis due to infection with *Brucella canis* and APHA, in liaison with health protection agencies across Great Britain, has been involved in investigating these. The UK Chief Veterinary Officer advised on this potential zoonotic disease in a letter published in the Vet Record in February 2021. Changes to the Zoonoses Order in 2021 included an amendment which added dogs to the list of animals in which the detection of *Brucella* sp. is reportable. The UK's first reported case of dog-to-human transmission of *B. canis* occurred in 2022. This case involved transmission of *B. canis* from an imported pregnant German Shepherd cross-breed that aborted in March whilst in the home of its foster carer, a 61-year-old woman, who became unwell. She was hospitalised for more than two weeks during which time she was diagnosed as having brucellosis due to *B. canis* infection following identification by APHA of a bacterial isolate derived from blood culture. Her four dogs, three of which had also contracted *B. canis* were euthanised. This included the German Shepherd-cross and the other three dogs in the household.

Once a dog is infected with *B. canis* the only way to eliminate the risk of disease transmission is euthanasia, whether or not the dog is showing clinical signs. Treatment is not recommended as it is very difficult to cure an infected dog. If owners choose to pursue

treatment it is important to note that this can be expensive as it involves several weeks of therapy with antibiotics. Antibiotics in combination (often referred to as dual antibiotic therapy) provide the best option but even this is often unsuccessful at eliminating the infection. There is also no way of determining that treatment has been successful. Recurrence of disease is common, even after continual use of antibiotics as the bacteria can hide in parts of the body that are hard for antibiotics to reach. Therefore the dog may remain infected, be susceptible to recurrence of illness and be an ongoing source of infection for other dogs and humans even if outwardly healthy.

Between 2020 and 2022 there have been 100 epidemiologically distinct *B. canis* incidents reported to the APHA *Brucella* Reference Laboratory in total (9 in 2020, 36 in 2021, 55 in 2022). There were 262 dogs tested as part of these investigations and 143 of these dogs tested positive. Please note that many of these cases have been determined on the basis of serology and epidemiology rather than definitively confirmed as infected by bacterial culture.

Table 3 provides data on the number of dogs per *B. canis* incident for 2022. Unfortunately it is sometimes difficult to get additional details about each case as the samples are submitted through testing centres and the information received is sometimes limited. The 143 positive dogs included intact and neutered dogs, however information for some of the dogs was unknown.

Table 3: Number of dogs (1, 2, 3 or more) for *B. canis* incidents in 2022

Number of dogs per incident (2022)	Number of incidents (2022)	Percentage of incidents
1 dog	47	85.5%
2 dogs	2	3.6%
3 or more dogs	6	10.9%

The majority of these dogs are imported by rescue organisations or are direct contacts of such dogs. Many of the reported cases originate from Romania, however this is likely a reflection of the number of dogs imported from Romania.