Animal & Plant Health Agency

SRUC

GB miscellaneous & exotic farmed species quarterly report

Disease surveillance and emerging threats

Volume 24: Q1 – January-March 2020

Highlights

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Introduction and overview

This quarterly report reviews disease trends and disease threats for the first quarter,January to March 2020. It contains analyses carried out on disease data gathered from APHA, SRUC Veterinary Services division of Scotland's Rural College (SRUC) and partner post mortem providers and intelligence gathered through the Small Ruminant Species Expert networks. In addition, links to other sources of information including reports from other parts of the APHA and Defra agencies are included. A full explanation of how data is analysed is provided in the annexe available on GOV.UK https://www.gov.uk/government/publications/information-on-data-analysis

Diagnostic submissions in Quarter 1 (January-March) 2020, for alpacas, llamas and farmed deer (Figure 1) – the APHA figures include submissions to partner post mortem providers (PPP) . Other miscellaneous and exotic species may also be received in small numbers.

	Non Carcase Submissions			Carcase Submissions			
Jan-Mar	APHA	SAC	Total	APHA	SAC	Total	GrTotal
2016	66	8	74	26	2	28	102
2017	61	19	80	25	7	32	112
2018	28	15	43	36	16	52	95
2019	15	20	35	25	9	34	69
2020	25	7	32	25	5	30	62

Figure 1: Diagnostic submissions in Quarter 1 (January-March) 2020, for alpacas, llamas and farmed deer

There is a continuing downward trend in both total carcase and non-carcase submissions in this Quarter (Figure 2) but with carcase submissions to APHA Regional Laboratories the same as Q1, 2019.

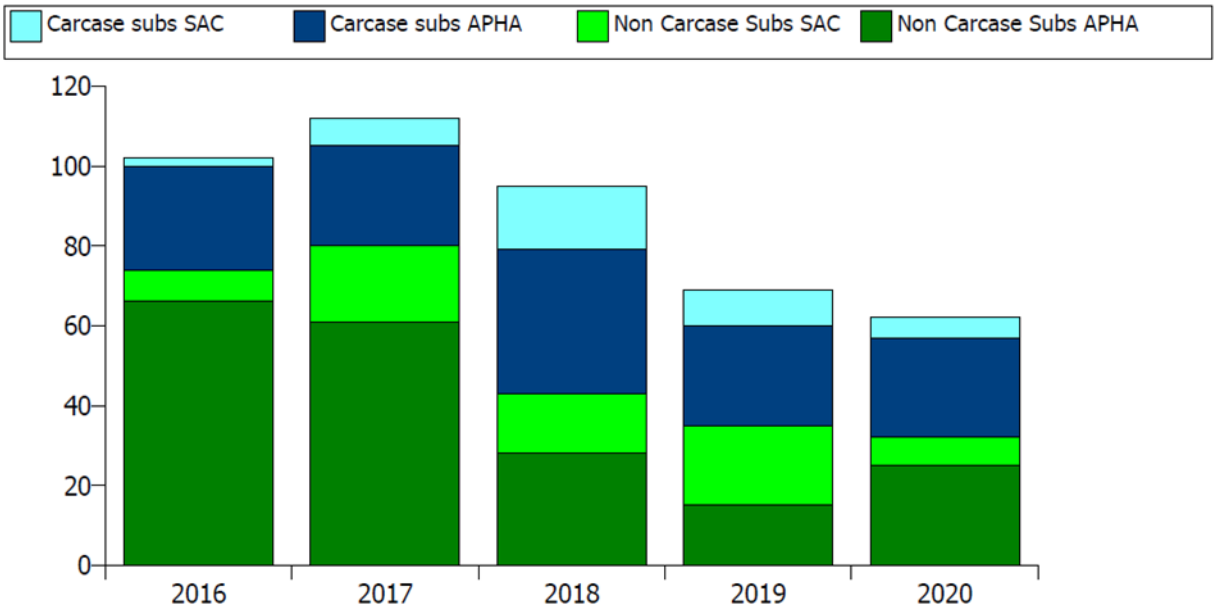

Figure 2: Carcase and non-carcase submissions

Total diagnostic submissions for Quarter 1 for all years (2016-2020) for each main species covered by this report and also for each main geographical area (Figure 3)

All Years	ALPACA	DEER	LLAMA	Sum:
Eastern England	77	34	9	120
Northern England	46	12	2	60
Scotland	37	37	7	81
Wales	25	2	3	30
Western England	67	18	6	91
Unknown	41	9	8	58
Sum:	293	112	35	440

Figure 3: Total diagnostic submissions for Quarter 1 for all years (2016-2020)

Total diagnostic submissions were lower in this Quarter (440) compared to Q1,2019 (476) largely due to fewer alpaca (-12) and deer-related (-21) submissions.

New and re-emerging diseases and threats

Promed Report:

ref: Ahasan MS, Subramaniam K, Campos Krauer JM, et al. Three new Orbivirus species isolated from farmed white-tailed deer (Odocoileus virginianus) in the United States. Viruses. 2019; 12(1). pii: E13. doi: 10.3390/v12010013.

Abstract

We report the detection and gene coding sequences of 3 novel Orbivirus species found in 6 dead farmed white-tailed deer in the United States. Phylogenetic analyses indicate that the new orbiviruses are genetically closely related to the Guangxi, Mobuck, Peruvian horse sickness, and Yunnan orbiviruses, which are thought to be solely borne by mosquitos. However, 4 of the 6 viruses analyzed in this work were found as co-infecting agents along with a known cervid pathogen, epizootic hemorrhagic disease virus-2 (EHDV-2), raising questions as to whether the new viruses are primary pathogens or secondary pathogens that exacerbate EHDV-2 infections. Moreover, EHDV-2 is known to be a Culicoides-borne virus, raising additional questions as to whether Culicoides species can also serve as vectors for the novel orbiviruses, if mosquitoes can vector EHDV-2, or whether the deer were infected through separate bites by the insects. Our findings expand knowledge of the possible viral pathogens of deer in the United States. Moreover, due to the close genetic relatedness of the 3 new orbiviruses to viruses that are primary pathogens of cattle and horses, our findings also underscore a crucial need for additional research on the potential role of the 3 new orbiviruses as pathogens of other animals.

Two groups of Orbivirus cause hemorrhagic disease (HD) in deer from North America: the epizootic hemorrhagic disease virus (EHDV) group and the bluetongue virus (BTV) group (Reoviridae: Orbivirus). HD is the most important viral disease affecting white-tailed deer (Odocoileus virginianus) and mule deer (O. hemionus) in the United States.

EHDV and BTV are transmitted between their ruminant hosts by species of Culicoides biting midges. Available data suggest that the species of Culicoides that transmit EHDV are likely to be similar though not necessarily the same as for BTV.

The 3 new orbivirus species along with 3 variants in dead farmed white-tailed deer warrant continued surveillance efforts and further studies to determine the potential threat these viruses may pose to farmed and wild white-tailed deer populations and possibly to other animals.

Diagnoses from the Regional Laboratories/ Partner post mortem Providers including unusual diagnoses

In addition to the submissions described in more detail below there were three Reindeer submissions in the Quarter, one of which was a three year old female in which Malignant Catarrhal Fever was confirmed and the other two were faeces samples only. Parasitic enteritis and parasitic pneumonia were diagnosed in both Red and Fallow deer (further details below), with parasitic gastroenteritis also featuring in camelid submissions.

Johnes Disease in alpacas

A 5-year-old alpaca lost weight over three to four months and was euthanased. Six other animals in the group were unaffected. The lower small intestine had diffuse mural thickening, and several raised plaque-like lesions presumed to be located at the site of Peyer's patches. The mesenteric lymph nodes were markedly enlarged. Histopathological lesions were consistent with severe granulomatous enteritis and lymphadenitis caused by infection with *Mycobacterium avium paratuberculosis*(Johnes disease).

In a separate submission, a 20 month-old male alpaca was submitted from a herd of 20, having experienced weight loss despite a good appetite before death. *Eimeria macusaniensis*, a common cause of diarrhoea and weight loss in camelids had been detected recently on faceal counts and a coccidiostat had been administered, along with a multivitamin injection. Gross pathological findings included easily bendable ribs, a peritoneal effusion, scant carcase fat, a 'cobblestone' appearance to the small intestinal mucosa and marked enlarged mesenteric lymph nodes which had a rubbery texture and were cream in colour. *Salmonella Oslo* was isolated from caecal contents. The cause or significance of infection was uncertain however advice was given to the owner on the zoonotic potential of this organism, especially as animals on this premises were used for 'alpaca walking tours'. Histopathology was affected by severe carcase autolysis however special stains confirmed mycobacteriosis. Unaccredited PCR testing of lymph tissue was negative for *Mycobacterium bovis*, the causative agent for bovine TB, however was positive for *Mycobacterium avium* subspecies *paratuberculosis*, confirming a diagnosis of Johnes disease.

Haemangiosarcoma in an alpaca

A ten year old male alpaca was submitted with a history of recumbency prior to euthanasia despite treatment with intravenous Calcium and a non-steroidal antinflammatory. Clinical examination showed a low rectal temperature, abdominal bloating and intestinal stasis. On post-mortem examination free blood was present in the abdomen together with fine blood clots on the viscera. A large amorphous mass (20x10cm) comprising of mainly a large arterial blood clot was present caudal to the liver, and in the area of the pancreas and right kidney (Figure 4). The liver appeared grossly normal, however on histopathology hepatic necrosis was evident. The changes were multifocal with variably sized areas of lytic necrosis with haemorrhage and basophilic granular material. Special stains (Gram, PAS and Grocott) were utilised to identify the cause of the necrosis, however unfortunately no bacteria or fungi were detected. Also on histopathology, the haemorrhagic mass was found to be composed almost entirely of red blood cells and fibrin, with low numbers of neutrophils. There was some vasculitis of submucosal blood vessels so leakage from damaged blood vessels may have been the source of the haemorrhage. There was no stromal component, consistent with an haemangiosarcoma. It is unclear how the hepatic necrosis and haemorrhagic mass were linked, if at all, with the underlying cause of both unable to be identified.

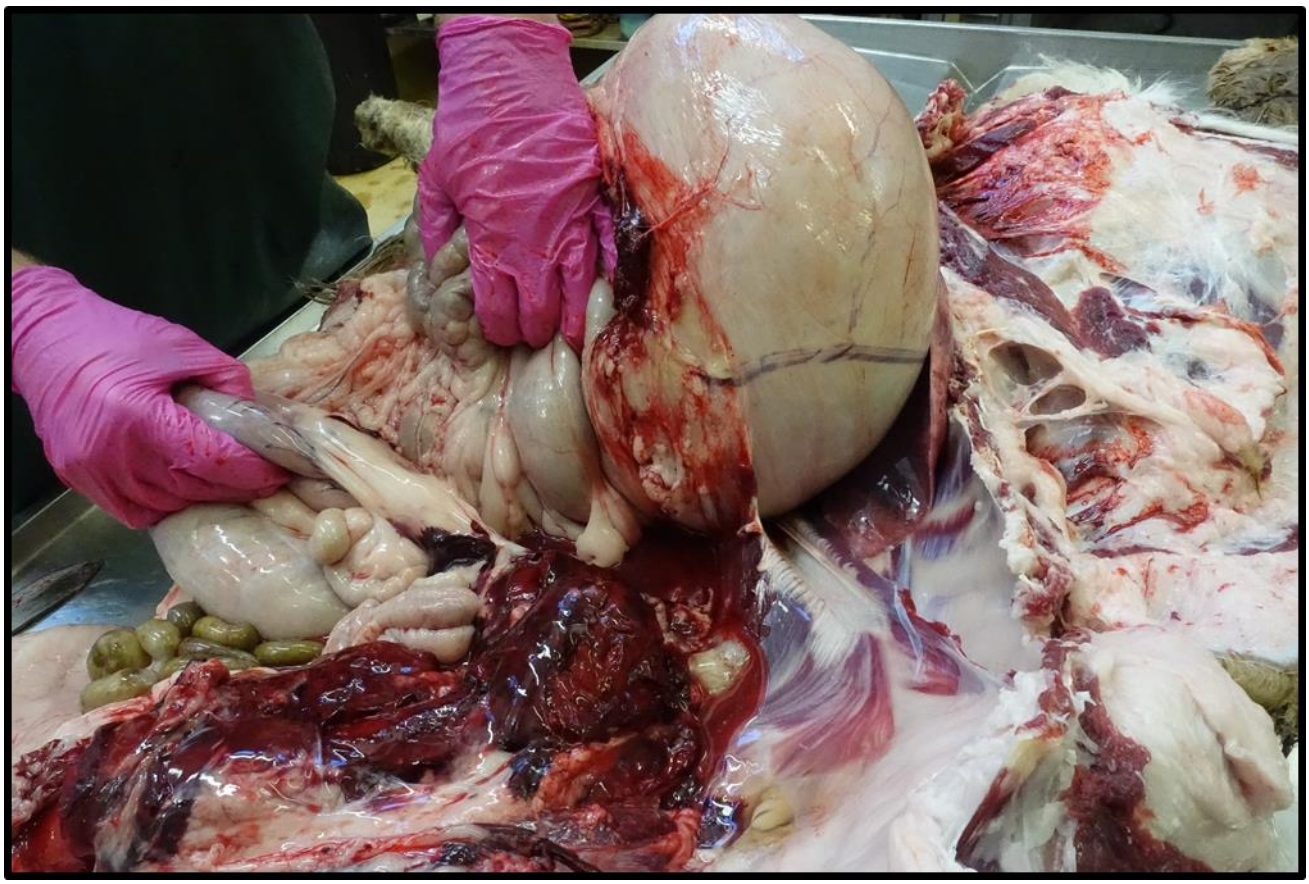

Figure 4: Haemangiosarcoma in an alpaca

Parasitic enteritis and bronchitis together with clostridial enterotoxaemia in a fallow deer

A five-month-old fallow deer was submitted to investigate the cause of scour and death. Lungworm were visible in the trachea and bronchial tree. The ileum had multiple cream plaques visible on the serosal surface which extended through the wall of the ileum to the mucosa and caecal contents were dark brown and watery. The faecal egg count was 1900 for Trichostrongyle-type eggs and the estimated total worm count was 23,000 small intestinal *Trichostrongylus* spp. In addition to parasitic gastroenteritis,*Clostridium perfringens* Epsilon toxin was detected in the small intestinal contents. Histopathology revealed a severe fibrinosuppurative enteritis and a parasitic bronchopneumonia due to with *Dictyocaulus eckerti*. Subsequent gram staining of the enteric lesions was suggestive of the involvement of *Fusobacterium necrophorum* in the necrosis of the ileum wall.

Yersiniosis in alpacas

Two six-month-old alpacas died following a period of weight loss. One was submitted for post mortem examination and was in emaciated condition. The large intestine had multifocal fine ulceration and several large coalescing ulcerative plaques on the mucosa (Figure 5). This was confirmed histologically to be a severe and chronic enteritis associated with intralesional bacteria. *Yersinia pseudotuberculosis* was isolated in culture

confirming a diagnosis of yersiniosis. Yersinia are environmental organisms and it is thought that infections are most likely to occur in animals which are stressed or debilitated.

Figure 5: Ulcerative lesions in the mucosa of the large intestine

In a separate case a group of ten alpacas, including seven weanlings, had been on a premises for three weeks. Within a few days of arrival three died and a fourth was reported ill and scouring. It was euthanased and examined. It was in poor to emaciated condition with faecal soiling around the perineum, haemorrhages in the stomach mucosa (compartment 3), and multifocal and coalescing diphtheritic necrotic lesions in the caecum and proximal colon (Figure 6). *Eimeria macusaniensis* oocysts and *Yersinia pseudotuberculosis* were detected in intestinal contents. Histopathology supported the diagnosis as there was fibrinosuppurative gastritis with large bacterial colonies in compartment 3 and enteritis associated with coccidial stages in the intestinal tract (Figure 7).

Figure 6: Marked thickening and ridged folding of the intestinal mucosa with necrotic/diphtheritic exudate.

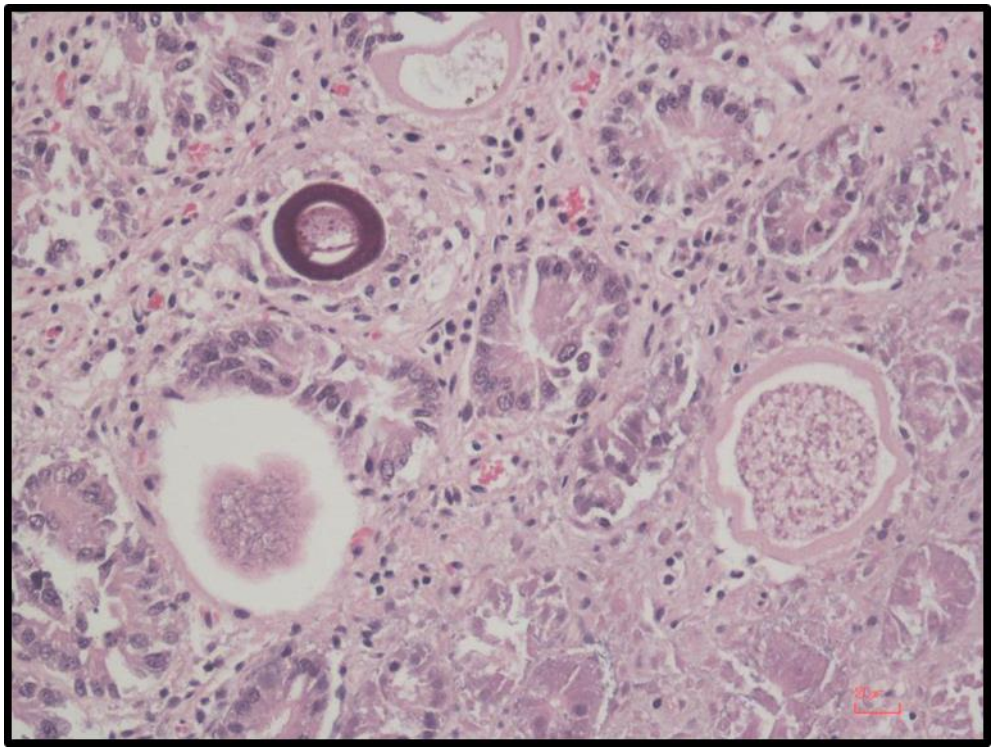

Figure 7: Histopathology image of the intestine showing inflammatory infiltration; there are large developing coccidia with morphology typical of E. macusaniensis).

Liver fluke and endocarditis in an Alpaca.

A four and a half year old female alpaca presented with acute onset respiratory distress and coughing and died within a few hours. This was one in a group of 10 with six recently weaned crias and another three unrelated adults at pasture with supplementary feeding. A combined anthelmintic and flukicide (triclabendazole and ivermectin based) treatment whad been administered in mid-December. At post mortem examination there were scattered ecchymotic haemorrhages throughout the subcutaneous tissues of caudo-ventral neck. The lungs were generally oedematous, reddened and had scattered ecchymoses throughout. There were poorly demarcated areas of dark red, firm parenchyma bilaterally affecting the middle lobes and cranial part of caudal lung lobes. There was a small volume of free, pale yellow fluid in the thoracic cavity. A thick fibrino-serous clot was found lining the left ventricle with roughening of the endocardial surface underneath. Six adult fluke were expelled from the bile ducts near the hiatus and the bile ducts were generally thickened. Bacteriology was unrewarding but further gross examination of the heart by a histopathologist and subsequent microscopic examination revealed that two of the tricuspid valves were encased in the endocardial deposit which was a fibrovascular tissue together with evidence of inflammation and necrosis throughout the heart musculature. Liver histopathology revealed severe necrosuppurative inflammation with vasculitis and abscess formation which was consistent with chronic liver fluke infection; A diagnosis of valvular endocarditis with death due to a likely bacteraemia and disseminated intravascular coagulation (DIC) was made.

Some literature research around this case found previously reported causes of endocarditis in camelids including *E. coli, Actinobacillus suis, Clostridium perfringens, Streptococcus equi subspecies zooepidemicus, Listeria monocytogenes, Mycoplasma* spp.,and *Actinomyces* spp., and the gross and histopathology findings in this case were most consistent with the latter three bacteria. Additionally, unlike in many other species, endocarditis in camelids frequently involves the adjacent myocardium and sometimes the valves are only minimally involved or not at all - this was seen in this case with fibrovascular material replacing the endocardium and one of the tricuspid valves.

Diaphragmatic paralysis (associated with Wallerian degeneration of the phrenic nerve) in an alpaca

A 6-month-old alpaca cria was euthanased following a two week illness. It had suddenly developed breathing difficulty, showing abdominal effort and flaring of the nostrils and sometimes mouth breathing. It was otherwise eating and drinking normally. Marked haemorrhage/congestion of the lungs was present, and histological examination of the phrenic nerve, diaphragm and lung was undertaken. Wallerian degeneration was present in the diaphragmatic nerve; multifocally myelin sheaths were irregularly dilated and contained variably sized aggregates of globular bright pink material and rare Gitter cells (digestion chambers). The severity of the degeneration suggested a marked phrenic nerve dysfunction which would account for the clinical presentation in the alpaca. Diaphragmatic paralysis is uncommon, however, and the aetiology is unknown. Injury causing nerve

compression, potential toxic degeneration and central lesions may be involved in the pathogenesis of the Wallerian degeneration.

SRUC Report: Fungal pneumonia in an alpaca

A four-year-old male alpaca was noticed to be unsteady on its feet, became recumbent after 24 hours and died soon after. Postmortem examination detected three, 3 cm diameter soft masses within the lungs, and excess cerebrospinal fluid was also noted around the brain. Histopathology revealed large areas of expansile necrotising, histiolymphocytic and fibrosing pneumonia containing very numerous fungal hyphae. Neuropathology confirmed a concurrent severe histiocytic angiocentric encephalitis, with intralesional fungal hyphae giving a final diagnosis of mycotic pneumonia and meningoencephalitis. *Aspergillus fumigatus* was isolated from lung tissue, confirming the aetiology.

Mycotic pneumonia has been described in alpacas following ulceration of the third compartment of the stomach. Multiple irregular raised nodules were described in the third compartment of this case; however, histopathology was not carried out. It is possible that previous mucosal damage had provided a route of entry for the *A fumigatus*.

Horizon scanning

Although not impacting significantly on this Quarter 1, 2020 Report, the current Covid-19 crisis is likely to have an impact on the number of carcase and non-essential ,non-carcase submissions to APHA Regional Laboratories during the forthcoming Quarter and beyond for an unknown period. This will potentially have a major effect on our ability to monitor endemic disease trends as well as new and re-emerging diseases through our surveillance network.

Publications

Faulkner, J., Williams, D.L. & Mueller, K. (2020). Ophthalmology of clinically normal alpacas (*Vicugna pacos*) in the United Kingdom: a cross-sectional study. *Veterinary Record*, Published Online First: 17 April 2020. doi: 10.1136/vr.105758

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