GB miscellaneous & exotic farmed species quarterly report
Disease surveillance and emerging threats
Volume 20: Q4 – October-December 2018

Highlights

<table>
<thead>
<tr>
<th>Condition</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yersinia pseudotuberculosis in an Agouti</td>
<td>5</td>
</tr>
<tr>
<td>Review of camelid submissions in 2018</td>
<td>6</td>
</tr>
<tr>
<td>First case of nasal bots in an alpaca</td>
<td>8</td>
</tr>
</tbody>
</table>

Contents

Introduction and overview ................................................................. 1
New and re-emerging diseases and threats ................................. 4
Unusual diagnoses ............................................................................. 5
Review of camelid submissions 2018 .............................................. 6
Changes in disease patterns and risk factors ................................. 7
Horizon scanning ............................................................................. 7
Publications ....................................................................................... 10
Introduction and overview

This quarterly report reviews disease trends and disease threats for the fourth quarter of 2018 October – December. 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 Annex available on GOV.UK. https://www.gov.uk/government/publications/information-on-data-analysis.

Diagnostic submission trend

Diagnostic submissions in Quarter 4 (October to December) for alpacas, llamas and farmed deer – the APHA figures include submissions to partner post mortem providers (PPP) as detailed above. Other miscellaneous and exotic species may also be received in small numbers.

<table>
<thead>
<tr>
<th>Oct-Dec</th>
<th>APHA</th>
<th>SAC</th>
<th>Total</th>
<th>APHA</th>
<th>SAC</th>
<th>Total</th>
<th>GrTotal</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>74</td>
<td>8</td>
<td>82</td>
<td>32</td>
<td>2</td>
<td>34</td>
<td>116</td>
</tr>
<tr>
<td>2015</td>
<td>51</td>
<td>19</td>
<td>70</td>
<td>18</td>
<td>5</td>
<td>23</td>
<td>93</td>
</tr>
<tr>
<td>2016</td>
<td>63</td>
<td>15</td>
<td>78</td>
<td>37</td>
<td>4</td>
<td>41</td>
<td>119</td>
</tr>
<tr>
<td>2017</td>
<td>24</td>
<td>21</td>
<td>45</td>
<td>26</td>
<td>8</td>
<td>34</td>
<td>79</td>
</tr>
<tr>
<td>2018</td>
<td>15</td>
<td>8</td>
<td>23</td>
<td>26</td>
<td>8</td>
<td>34</td>
<td>57</td>
</tr>
</tbody>
</table>

The reduction in non-carcase submissions in quarter 4 2018 follows the trend detailed in previous quarterly reports and shows a marked decrease in numbers since 2016. Changes were implemented in quarter 4 2017 which altered the way postal samples were handled by APHA and this is likely to have been a contributing factor to this decline. SAC have also seen a marked decrease in postal samples compared to quarter 4 2017. Quarter 4 2018 carcase submissions for both APHA and SAC remain static in comparison to Q4 2017.
Total diagnostic submissions for Quarter 4 for all years (2014-2018) for each main species covered by this report and also for each main geographical area.

Western followed by Eastern England have seen the largest number of total submissions received during quarter 4 over the past five years. Alpacas constitute the majority of submissions from these areas, reflecting their geographical distribution throughout the UK. The highest number of deer submissions was received from Eastern England followed by Scotland. Alpaca still remain the most frequently represented miscellaneous species for sample submission overall, as reflected in previous quarterly reports.

2014 – 2018 inclusive submission totals for all quarters for alpaca, deer and llamas for various regions of England, Wales and Scotland
The geographical distribution of submissions during quarter 1 to quarter 4 over the last five years reflects the quarterly findings, with Western and Eastern England submitting the highest amount of miscellaneous submissions overall. Western England have seen the highest number of alpaca submissions with Scotland followed by Eastern England submitting the most deer samples.

2014 – 2018 inclusive submission totals for alpaca, deer and llamas for various regions of England, Wales and Scotland

As demonstrated by the dark green bar, the non-carcase miscellaneous species submissions received by APHA over all quarters is reducing yearly with 2018 seeing a total of 69 submissions, down 51% from 2017 and down 71% from the 2016 total of 239 non-carcase submissions. SAC non-carcase submissions remain more constant however 2018 has seen a reduction in numbers, with 47 submissions received, down from the 2017 total of 81. APHA miscellaneous species carcase numbers are at the highest level since 2014, with 108 submitted in 2018. 2018 also saw the highest level of carcase submissions received by SAC over the last five years, with 34 recorded.
Summary of highlights discussed in previous quarterly Miscellaneous and Exotic Farmed Species emerging threats reports during 2018

<table>
<thead>
<tr>
<th>List of Highlights</th>
<th>APHA web link</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aberrant fluke in an alpaca lung</td>
<td>Emerging threats: miscellaneous and exotic farmed species disease report January to March 2018</td>
</tr>
<tr>
<td>Chondrosarcoma in a llama</td>
<td></td>
</tr>
<tr>
<td>First case of Chronic Wasting Disease in European Union</td>
<td></td>
</tr>
<tr>
<td>Emerging 'Camel Prion Disease' in Algeria.</td>
<td></td>
</tr>
<tr>
<td>Abortion in Alpacas</td>
<td>Emerging threats: miscellaneous and exotic farmed species disease report April to June 2018</td>
</tr>
<tr>
<td>Otitis media in Alpacas</td>
<td></td>
</tr>
<tr>
<td>Haemonchus alert</td>
<td></td>
</tr>
<tr>
<td>Babesia odcoilei in captive cervids in Canada</td>
<td></td>
</tr>
<tr>
<td>Rabies in Svalbard Reindeer</td>
<td></td>
</tr>
<tr>
<td>Update on MERS-CoV</td>
<td></td>
</tr>
<tr>
<td>Fibromatous lesions of antler velvet in a reindeer</td>
<td>Emerging threats: miscellaneous and exotic farmed species disease report July to September 2018</td>
</tr>
<tr>
<td>Copper toxicity in an alpaca</td>
<td></td>
</tr>
<tr>
<td>Congenital heart defects in camelids</td>
<td></td>
</tr>
<tr>
<td>Bovine tuberculosis in white-tailed deer in Michigan, USA</td>
<td></td>
</tr>
<tr>
<td>First case of Anthrax in Bison in British Columbia, Canada</td>
<td></td>
</tr>
</tbody>
</table>

New and re-emerging diseases and threats

No new re-emerging disease threats were identified this month other than the unusual cases described below.
Unusual diagnoses

Yersinia pseudotuberculosis in an Agouti

A variety of tissues were submitted from a female adult Agouti (Dasyprocta) from a wildlife park after being found dead. A postmortem had been carried out by the private vet and upon the discovery of multiple white granulomas throughout the viscera and lymph nodes, the suspicion of Mycobacterium bovis infection was raised. Tissues were submitted to APHA Starcross to investigate this further. Histopathology was carried out and a severe, subacute, multifocal necrotising nephritis, hepatitis, splenitis, pneumonia and lymphadenitis with leukocytoclastic debris and gram negative coccobacilli was identified. No evidence was found to support a diagnosis of TB. Routine culture of liver, kidney and spleen was subsequently performed and Yersinia pseudotuberculosis was isolated in pure growth from multiple sites.

Figure 1: Multifocal to coalescing granulomas in a section of liver, after fixing in 10% formalin.

Agoutis are large rodents originally from Central and South America. Multiple species including deer, lagomorphs, pigs, sheep, wild birds and rodents can be carriers of Yersinia pseudotuberculosis. The organism can be found as an intestinal commensal in healthy animals as well as those showing clinical signs, however stressors such as weather, poor diet, overcrowding and transport can be predisposing factors for production of disease. Carrier animals shedding the organism via faeces into the environment also contribute to pathogenesis as the bacteria can survive long periods in cold, damp conditions. In deer Yersinia pseudotuberculosis poses a threat to farmed deer populations where disease is most often seen in young males in their first winter. Yersiniosis can present as sudden death although foetid diarrhoea and dehydration have been noted in less acute cases. A zoonotic risk of severe gastrointestinal disease also exists, usually facilitated by food-borne transmission.

Gross pathology of Yersinia pseudotuberculosis usually includes severe haemorrhagic necrotising enteritis with lymphadenitis of the mesenteric lymph nodes. Sometimes in septic infections multiple caseo-necrotic foci throughout organs and lymph nodes can be seen and can easily be mistaken for Mycobacterium bovis infection when carrying out a field post-mortem. Any suspicion of TB should be reported immediately to APHA field services who are able to advise on the appropriate next steps. A useful review article describing how to identify TB in miscellaneous species has been referenced below.
Frothy bloat in Reindeer

APHA VIC Bury St. Edmunds saw two cases of frothy bloat causing the death of reindeer in October and November. The first case consisted of a three-year-old male reindeer in good body condition which was found dead overnight. A diet of grass supplemented with straw, hay, moss and commercial pelleted feed had been provided to the group of six. Frothy bloat was diagnosed at post-mortem examination, with large quantities of stable froth occupying the rumen and the entirety of the oesophagus. A concurrent ruminal acidosis was also detected with a low rumen pH of 5.3 and copious visible grain particles. A mesenteric twist affecting the distal small intestine was thought to be secondary to ruminal distension due to bloat and subsequent intestinal displacement.

In the second case a three-year-old male reindeer was the fourth to die suddenly out of a group of seven used for commercial entertainment purposes. Again, animals had access to grazing with supplementary straw and concentrate feed. In this case a severe frothy bloat had led to rupture of the diaphragm with displacement of the cranial abdominal viscera and forestomachs into the thoracic cavity leading to respiratory arrest.

Captive reindeer in the UK have increased in numbers in recent years. Many of the health problems seen in this species are related to husbandry and welfare concerns exist regarding their suitability as a captive species. Reindeer are naturally browsers rather than grazers and in the wild will be seen to lose condition over winter where food supplies are low. The physiological adaptations of this species render it extremely liable to dietary upset following sudden diet change. Access to lush pasture should be avoided to prevent frothy bloat, along with avoiding feeds formulated for other species and high carbohydrate rations which can result in ruminal acidosis.


Review of camelid submissions 2018

In 2018 APHA, SRUC and third party post-mortem providers received 185 diagnostic submissions from alpacas and llamas. In 94 of these (51%) a diagnosis was reached. The most common condition diagnosed by VIDA code data was parasitic gastroenteritis with 18 cases, representing 19% of the total diagnosed conditions. In addition to these, haemonchosis was responsible for 8 cases (9%) with one case of nematodirus also reported. Fascioliasis was common with 12 animals affected (13%) and in three of these cases, concurrent endocarditis was also seen. Coccidiosis (7%) and neoplasia (5%) were also diagnosed frequently.
Out of 94 cases where a diagnosis was made, 71 (76%) of these involved submission of a carcase. In 91 cases a diagnosis was not reached. An overwhelming majority (71%) of these involved submission of non-carcase samples which meant that a full investigation and relevant testing was not possible. Adults made up 70% of diagnostic submissions (130/185), post weaned animals accounted for 6% (11 cases), preweaned for 4% (8 cases) and neonates for 1% (2 cases). The age of animal in the remaining submissions was not known.

Changes in disease patterns and risk factors

Please refer to the annexe for more information on the data and analysis.

Horizon scanning

First case of nasal bots in an alpaca

Few case reports exist of nasal bots in South American Camelids. To date, four cases have been described in llamas in North America presenting with respiratory symptoms including sneezing and
nasal discharge. In this case, an adult male castrated Huacaya alpaca was submitted to University of Veterinary Medicine Hannover following a three week history of sneezing, with bouts lasting up to two hours. Clinical examination revealed bilateral serous nasal discharge, distension of the nostrils and a mild increase in respiratory noise. Endoscopic examination of the nasal passages was carried out, facilitated by both local and general anaesthesia. A tissue mass was visualised protruding from the right nasal mucosa, occupying approximately 30% of the nasal lumen with four live larvae visible. A diagnosis of nasal bots was made.

Treatment was given with a single dose of subcutaneous doramectin. The endoscopic examination was repeated six days after treatment, with cessation of sneezing, no larvae seen and reduction in mucosal inflammation. The species of bot was not determined in this case, however in llamas, both Oestrus ovis, the sheep and goat bot fly and Cephenemyia spp., the deer bot fly have been implicated. In this case no contact with deer was reported, but suspicion of involvement of Cephenemyia spp remained. This bot species causes intense mucosal inflammation in deer, which was seen in this case. As well as being the first reported case of nasal bots in an alpaca, this is the first report of treatment for the condition in a camelid with a single dose of subcutaneous doramectin, as opposed to ivermectin which has been used with varying success in llamas.

In the UK, cases of nasal bots (Oestrus ovis) in sheep are most commonly seen in late spring, with most cases reported in the warmer South and West of England. First stage larvae are deposited in the nasal passages by adult flies in May and June, where, they develop to third stage larvae over a period of 40 days. In this time, clinical signs can be seen in the host animals. Bots are then sneezed out to pupate in the environment. The optimum temperature for pupal development is 27ºC with temperatures under 16ºC proving lethal to the pupae. These subsequent adult flies continue the cycle, with larvae deposited in autumn overwintering in the nasal turbinates.

Cephenemyia spp. flies are also present in the UK. C. stimulator larval bots have been reported in wild roe deer and C. auribarbis bots have been seen in wild red deer with cases reported as north as the Scottish Highlands.

Given the presence of both the sheep and deer nasal bot fly in the UK, this condition should be considered in South American Camelids presenting with respiratory signs including sneezing.

A captive population of Brazilian dwarf brocket deer (*Mazama nana*) exists in the Bela Vista Biological Sanctuary, a protected area on the border of Brazil and Paraguay, for breeding and conservation purposes. In 2015 and 2016, seven deer died showing signs suggestive of haemorrhagic disease. Cases of undiagnosed haemorrhagic disease in dwarf brocket deer in the area had been reported since 1990 and given the implications on the conservation effort, the aetiology surrounding these deaths was investigated further by clinicians at the University of Santa Catarina.

Post-mortem findings in the seven deer examined included multiple haemorrhages throughout the body cavities with congestion noted in the major organs and the gastrointestinal tract and haemorrhagic intestinal contents. Free blood was present in the abdominal and thoracic cavities.

Differentials for haemorrhagic disease in deer include bluetongue virus (BTV), epizootic haemorrhagic disease (EHD) and adenovirus haemorrhagic disease (AHD), although no reports of AHD in deer exist as yet in South America. Diagnostic testing to investigate the possibility of these disease was carried out on blood and tissue samples from the deer carcases. All seven deer were positive for BTV by RT-qPCR, with no evidence of either EDHV or ADV. Further sequencing identified BTV serotypes 3, 14, 18, 19 and 22. Although BTV is present in Brazil, these five serotypes have not previously been reported in the country. Before this outbreak of haemorrhagic disease, blood from 32 healthy deer was tested for BTV antibodies with only one deer recording a positive result to the AGIDT test, suggesting a low level of seropositive animals. Molecular testing on these animals was negative in all 32, showing no evidence of the virus currently circulating at the time of sampling. Three of the negative animals sampled at this time went on to die and test positive in 2015, suggesting these deer are highly susceptible to infection and are unlikely to survive long enough to produce an antibody reaction. Small cattle herds were situated as close as 1000 metres to one end of the enclosure however no clinical observations suggestive of BTV infection had been reported in these.
Given the circulation of BTV serotype 3 in Europe over the last few years, and the increasing risk of vector born disease in temperate climates, BTV should be carefully considered in cases of haemorrhagic disease in deer in the UK.


Publications


This paper follows on from the report in June 2016 of chronic wasting disease being detected in moose (Alces alces) in Norway. The three affected moose were detected through a government surveillance program, with testing confirming abnormal prion protein (PrPsc) in brain tissue only. Further testing including immunohistochemistry and Western blot revealed the type of prion disease in these cases was the same, although was distinct from previous CWD cases in both North America and Europe and other ruminant prion diseases, suggesting an emerging disease condition. This case was discussed in the quarter 2 2016 miscellaneous species threats report and can be accessed here.


This case report is the first published detailing the case of Streptococcus agalactiae infection in llama (Lama glama). The ten-year-old female originated from a herd of around 200 South American Camelids used for a trekking and therapy business. Horses, chickens, rabbits, cats and dogs were also present on the holding. Presenting signs included a relatively low body condition score (2/5) and a non responsive, chronic, suppurative fistulating lesion in the intermanibular region. The animal was found dead by the breeder. Following postmortem examination, findings included submandibular oedema, enlargement of the retropharyngeal lymph nodes, fibrinous abdominal and thoracic effusions, necrosis of the liver, emphysema and oedema of the lungs and an interstitial pneumonia. Streptococcus agalactiae was isolated from the abscess material and the lung tissue. This organism has previously been identified in skin infections in camels and is also known to act as an opportunistic organism in humans, causing pathogenesis in elderly and immunocompromised individuals. This is the first case of disease caused by the bacteria reported in a llama. Given the enterprise the animal originated from, there was a zoonotic risk of transmission given the close human to animal contact.

The host range for *Mycoplasma ovipneumoniae* was presumed to be limited to ruminants, and more specifically the subfamily Caprinae, given these were the hosts the organism is most frequently isolated from. This group contains domestic sheep, goats and bighorn sheep, where the organism is known to be present in both healthy animals and those displaying respiratory symptoms. A few reports do exist that suggest non-Caprinae species including Beira antelope and cattle can also carry *M. ovipneumoniae* however the supporting evidence in these is limited.

This paper describes the first identification of the organism in members of the subfamily Capreolinae in both healthy, and clinically unwell animals. Between July 2017 and January 2018 *M. ovipneumoniae* was isolated in six moose from both wild and captive environments, five wild caribou and two mule deer, one of which was showing respiratory signs. Nasal swabs were submitted from 230 moose, 243 caribou and 5 mule deer to the US Department of Agriculture Agricultural Research Service and DNA extraction, PCR and 16S rRNA typing methods were employed. This study raises awareness of the organism in new species however recognised further work on full genome sequencing is needed to investigate this further.


The limitations of the human influenza virus vaccination are well documented and currently multiple administrations of vaccination, along with modifying vaccines to accommodate regularly mutating influenza strains is needed to offer reasonable levels of protection. This paper describes isolating antibodies from llamas which had been immunized with both the influenza vaccine and the H2 H7 recombinant, and combining the surface proteins of four of the antibodies generated to produce a synthetic antibody which was inserted into a harmless virus shell. The small size of antibodies produced by llamas mean that this recombinant synthetic antibody has the ability to target parts of flu surface proteins which do not mutate, unlike the currently offered vaccine which can only attach to haemagglutinin tips which readily mutate. This artificial antibody was then administered intranasally to mice which were shown to then begin to generate antibodies against influenza. Once challenged the mice, including old and immunocompromised individuals were introduced to 59 different influenza strains, and were fully protected against all but one, which isn’t known to produce disease in humans. This study suggests administration of an annual intranasal recombinant gene would offer rapid onset and wide coverage protection against a wide range of human seasonal flu strains along with potential emerging diseases such as avian influenza.
Statement regarding use of this material

The material in this report has been compiled by the Animal and Plant Health Agency (APHA) Surveillance Intelligence Unit in collaboration with the APHA Surveillance and Laboratory Services Department. Images are governed by Crown Copyright except where specifically acknowledged to have been provided by others external to APHA. Use of material directly from the report is acceptable so long as APHA (or others where specifically indicated) is acknowledged as the owner of the material. This does not include use of the APHA logo which should excluded, or used only after permission has been obtained from APHA Corporate Communications (apha.corporatecommunications@apha.gsi.gov.uk).

You may re-use this information (excluding logos) free of charge in any format or medium, under the terms of the Open Government Licence v.3. To view this licence visit www.nationalarchives.gov.uk/doc/open-government-licence/version/3/ or email PSI@nationalarchives.gsi.gov.uk

This publication is available at https://www.gov.uk/government/collections/animal-disease-surveillance-reports

Any enquiries regarding this publication should be sent to us at SIU@apha.gsi.gov.uk

http://apha.defra.gov.uk/vet-gateway/surveillance/index.htm

The Animal and Plant Health Agency (APHA) is an executive agency of the Department for Environment, Food & Rural Affairs, and also works on behalf of the Scottish Government and Welsh Government.