Vitamin D toxicity in sows
APHA Disease Surveillance Report
July 2014

- *Salmonella* Dublin spinal osteomyelitis in calves
- *Klebsiella pneumoniae* septicaemia in weaned pigs: cases seen outside East Anglia

**CATTLE**

*Musculoskeletal disease*

**Spinal osteomyelitis due to Salmonella Dublin** infection was diagnosed at Starcross in suckler calves. Three calves aged approximately three weeks were similarly affected in a group of 27 animals. Initially they exhibited hindlimb lameness which progressed to paralysis. A calf was submitted which was alert but unable to stand and adopted a ‘dog-sitting’ posture with both hindlimbs extended (fig 1). Postmortem examination revealed protrusion of creamy pus-like material into the spinal canal at the level of the third lumbar vertebra (fig 2). The vertebral body consisted of collapsed, crumbly, haemorrhagic bone (fig 3). A pure, profuse growth of *Salmonella* Dublin was isolated. Three other calves in the group had also been previously developed swollen stifles and had responded well to antibiotic and anti-inflammatory treatment. Spinal osteomyelitis is a very unusual presentation of infection by *S.* Dublin, though it can sometimes affect several animals in a herd. In a report of 14 Irish cases (Healy and others 1997) lesions were only found in the lower cervical or proximal thoracic (C6 to T1) vertebrae, whereas in APHA submissions lumbar vertebral lesions have also been identified.

*Respiratory disease*

**Husk:** Outbreaks of husk were diagnosed in Shrewsbury and Carmarthen. In the first case disease occurred in a group of five Holstein-Friesian heifers which had been purchased from another farm. Two of the animals died, with the others suffering weight loss and milk drop, and becoming recumbent. Respiratory disease was not a primary sign; however lungworm larvae were detected by Baermann’s technique, confirming patent husk. In the second outbreak 10 animals in a dairy herd of 80 first calved heifers were affected. The animals exhibited more typical signs with coughing and open-mouth
breathing difficulty with protrusion of the tongues. *Dictyocaulus viviparus* larvae were identified in faeces samples. Both outbreaks are timely reminders of this seasonal parasite which can cause severe disease, even in adult cattle, when there has been little or no exposure to lungworm during the rearing period.

*Circulatory disease*

**Sudden death in dairy cows:** Fatal internal haemorrhage was diagnosed as the cause of sudden death of a five year old dairy cow that had been dried off two weeks earlier. Four similar deaths in the same herd were reported in cows at different stages of lactation in recent months. The affected animal had been seen alive and apparently normal at 5 o’clock in the morning but was found dead two and a half hours later. Extensive abdominal and retroperitoneal haemorrhage was present which was identified to have originated from a ruptured segment of the left external iliac artery. Histological examination of the affected vessel confirmed a vasculopathy similar to previously identified cases of arterial aneurysm and rupture syndrome in dairy cattle (Crawshaw and others 2011). The condition has been identified in Holstein-Friesians in the UK, Holland and the USA, affecting cows at all stages of lactation. The aetiology is not established.

Fig 1: *Salmonella* Dublin-infected calf with hind limb paresis adopting a ‘dog-sitting’ position
Mastitis

*Pseudomonas aeruginosa mastitis:* Two adult dairy cows were submitted from a herd where there had been eight sudden deaths in newly dried off cows in recent weeks. This prompted the farm vet to attend the drying off of the next group of seven cows and monitor hygiene and technique. Four of
these cows died after treatment. Postmortem examination findings were widespread petechial haemorrhages throughout subcutaneous and other tissues in both cows. Both cows had deep purple / red glandular tissue of the udder and evidence of bright white teat sealant within the glandular tissue in more than one quarter. Teat sealant should not be massaged up the teat and should remain in the teat canal. Pseudomonas aeruginosa was isolated, mostly in pure growth, from milk samples expressed from all four quarters of both cows; also from mammary gland tissue from all four quarters and in pure growths from lung tissue of both cows, confirming P. aeruginosa septicaemia in both cases. Further submissions were requested and culture of milk from a clinically affected surviving cow, pre-dip wash sample, header tank water sample and hot water after parlour wash water sample all yielded growths including P. aeruginosa. Samples of post-dip and borehole water did not yield this organism. P. aeruginosa is an important pathogen in human nosocomial infections and research has shown it is able to form biofilms on surfaces including for example those in water systems / pipes. Although the unattached organism can be inactivated by water at temperatures over 60°C for 30 minutes, when present in biofilms adherent to surfaces water temperatures of 85°C have been shown to fail to completely destroy and remove the organism within biofilms. Chemical or mechanical sanitation together with hot water cleaning is necessary to remove contamination within water systems / milking machine plant components. This illustrates the importance of regular monitoring of routine plant washing procedures including temperatures.

Alimentary disease

Idiopathic necrotising enteritis: Further cases of idiopathic necrotising enteritis of suckler calves (INESC), reported by APHA in its June report, were diagnosed by Penrith in two additional herds.

SMALL RUMINANTS

Systemic disease

Unusual case of Campylobacter infection in a lamb: Two three-week-old lambs were submitted with a history of being off colour for a few days. The group of 200 ewes and 300 lambs had lambed inside and were turned-out to grass when lambs were two-days-old. Postmortem examination of one lamb found liver change suggestive of hepatic necrobacillosis, arising from an infected navel. Trueperella pyogenes was isolated in pure culture from the lesions and there was no evidence of Fusobacterium spp. on anaerobic culture. Findings in the second lamb were quite distinct. Multiple foci of hepatic necrosis were present and were reminiscent of those seen in some cases of Campylobacter sp. abortion in lambs. Each lesion consisted of a central pale zone of necrosis surrounded by a ring of inflammation. Campylobacter coli was isolated from the liver in pure culture and histopathology revealed a multifocal, coalescing, acute- subacute, necrotising, purulent and thrombosing hepatitis consistent with bacterial hepatitis. Special stains revealed the presence of intralesional/perilesional clusters of small
bacilli. This is a very unusual, rarely reported manifestation of *Campylobacter* infection in lambs.

**Enteric disease**

**Coccidiosis:** Coccidial oocyst speciation was carried out several times this month on samples from diarrhoeic lambs to determine the significance of high oocyst counts by assessing the proportion of pathogenic species present. This is particularly relevant in older lambs as previous exposure when younger should result in immunity to reinfection and the correct diagnosis is required for appropriate treatment advice. Some of the individual results are presented in the table below:

<table>
<thead>
<tr>
<th>Age</th>
<th><em>Eimeria crandallis</em></th>
<th><em>E. ovinoidalis</em></th>
<th>% non-pathogenic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preweaned</td>
<td>1%</td>
<td>8%</td>
<td>91%</td>
</tr>
<tr>
<td>Preweaned</td>
<td>0%</td>
<td>5%</td>
<td>95%</td>
</tr>
<tr>
<td>3 months</td>
<td>3%</td>
<td>24%</td>
<td>73%</td>
</tr>
<tr>
<td>3 months</td>
<td>14%</td>
<td>7%</td>
<td>79%</td>
</tr>
</tbody>
</table>

In one incident three lambs from a group of 120 had died over a 24 hour period. Diarrhoea had been noticed in the group, although they had been treated with a benzimidazole drench six weeks previously. There were no other obvious premonitory signs. A lamb was submitted for postmortem examination; there was minimal evidence of enteritis despite a trichostrongyle-type egg count of 3500 eggs per gramme and coccidial oocyst count of over two million per gram. Speciation was performed and identified 76% *Eimeria faurei*, 14% *E. bakuensis*, 9% *E. ovinoidalis* and 1% *E. parva*. Of these only *E. ovinoidalis* is pathogenic and although it was not the predominant species present, as part of such a high count it was considered significant in the presence of gastroenteritis in this case.

**Clostridium perfringens** type-D enterotoxaemia in goats: An eight-month-old billy goat died following acute onset abdominal bloat and seizures. Orphaned as a neonate, the animal had been hand-reared and kept with horses. Marked glucosuria suggested the involvement of *Clostridium perfringens* type-D enterotoxaemia, which typically manifests as an acute terminal enterocolitis in goats. This diagnosis was confirmed by detection of clostridial epsilon toxin in intestinal contents by ELISA. Other postmortem findings included pericardial effusion, diarrhoea and intestinal lesions. This goat had not received any vaccinations but even vaccinated animals can be at risk as goats are known to respond unreliably to vaccination. It is recommended that the vaccine manufacturer is consulted for advice about use in goats, and for specific regimes that would be appropriate.

**Haemonchosis:** An adult ewe from a small flock was found dead without any premonitory signs. This was the second to die over the last five days. Postmortem examination revealed the animal to be severely anaemic and hypoproteinaemic with white mucous membranes and fluid effusions into the serosal cavities. Opening of the oesophagus revealed a few *Haemonchus* spp nematodes in its lumen and high numbers in the abomasum (Fig. 4). A
diagnosis of haemonchosis was made and review of the anthelmintic strategy was encouraged.

![Haemonchus spp nematodes in the lumen of the oesophagus of an adult ewe (the majority were in the abomasum)](image)

**Fig 4:** *Haemonchus* spp nematodes in the lumen of the oesophagus of an adult ewe (the majority were in the abomasum)

**Respiratory disease**

*Staphylococcus aureus* bronchopneumonia: Twelve to fourteen two-month-old Rough Fell lambs died in a group of 200 over a two-week period and were reported to Penrith. Affected lambs appeared ill for only a few hours before death. Two lambs (twins) were submitted for postmortem examination. One lamb showed multifocal areas of consolidation throughout all lung lobes and histopathology revealed a moderate suppurative and eosinophilic bronchopneumonia. The second lamb showed an area of mild pneumonia in the left cranial lung lobe and a more severe, focal area of pneumonia with associated pleurisy in the left caudal lung lobe. Histopathology confirmed a severe necrotising and suppurative bronchopneumonia. *Staphylococcus aureus* was isolated from both lambs. No ticks were found on either carcase although ticks are present on the farm and the possibility of tick pyaemia cannot be discounted.

**PIGS**

**Alimentary Disease**

Clostridial enterotoxaemia causing neonatal diarrhoea and deaths on outdoor units: Two incidents of neonatal diarrhoea due to clostridial enterotoxaemia were diagnosed at Bury St Edmunds on unrelated outdoor breeding units. Both involving gilt litters. In the first, one-day-old live piglets...
were submitted to investigate diarrhoea affecting neonatal piglets in gilt litters since just after Christmas.

In the first case, ten of 35 gilt litters were affected with neonatal mortality increasing in these litters from around 12% to 20%. Neonatal mortality in the rest of the herd was just 7-8%. Gilts were homebred with the gilt paddocks sited approximately one mile from the dry sow area. Congenital tremor-type A2 was diagnosed in March 2014 in gilt litters and a few cases were still being seen. In two piglets submitted there was a very scant quantity of yellow, slightly frothy fluid in the small intestines. The mucosa of the duodenum and proximal jejunum was white in colour and moderately thickened with a fluffy appearance. The caecum and colon contained a scant yellow fluid and the colonic mesentery was oedematous. Testing for neonatal enteropathogens detected alpha clostridial toxin in small intestinal contents of one piglet and gammaglobulin estimation was suggestive of less than optimal colostral antibody transfer in both. Intestinal histopathology supported the detection of alpha toxin and was consistent with clostridial enterotoxaemia.

In the second incident, which had been ongoing for 3-4 months, diarrhoea was occurring from one-day-old followed by wasting in piglets which survived. Ten litters of each batch of 70 gilts farrowing weekly on the single parity unit were affected. Not all piglets in a litter were affected, but a poor response to antimicrobial treatment was reported, with an estimated 50% case mortality. A one-day-old piglet submitted had jejunal thickening and necrosis (Figure 1) suggestive of clostridial enterotoxaemia. Alpha toxin was detected in small intestinal contents from this piglet.

![Fig 5: Small intestinal necrosis in a case of clostridial enterotoxaemia in a neonatal pig](image)

A four-day-old piglet submitted was in very poor body condition, severely dehydrated with urate accumulations in the kidneys and was considered to be a more chronic case. Gammaglobulin testing in the one-day-old piglet revealed hypogammaglobulinaemia and this, together with possibly inadequate immunity of gilts to rotavirus prior to farrowing, is likely to have predisposed to disease. Gilt acclimatisation and exposure to resident pathogens was considered worth reviewing on both units.
**Systemic disease**

**First outbreak of Klebsiella pneumoniae septicaemia outside East Anglia:** Two submissions of 10-12 day old piglets from the same farm to Starcross resulted in the first diagnosis of *Klebsiella pneumoniae* subsp. *pneumoniae* (Kpp) septicaemia outside of the East Anglian region. The post-mortem findings were very similar to those seen in previous cases with piglets in good condition showing evidence of recent feeding but with a septicaemic appearance and marked haemorrhages on the intestinal serosa. The Kpp organism was isolated from a wide range of internal sites. The outbreak was typical of most previous ones, with unexpected deaths of preweaned pigs in good body condition on an outdoor breeding unit. However, mortality was significantly higher at 16% over a period of four weeks. Antimicrobial treatment was instituted at the same time as iron supplementation and, when treated pigs came through, mortality stopped. This treatment will be continued until the autumn as, so far, Kpp outbreaks have been confined to the summer. The herd has been closed for several years and litters from sows of all parities were affected, the reason for the outbreak is not known but the isolate will be typed to determine whether it is the same as the emerging ST25 strain detected in previous Kpp outbreaks. As the presenting sign of sudden death is not specific for Kpp septicaemia, diagnosis depends on post-mortem examination and bacterial culture.

**Polyuria, polydipsia and inappetance in adult sows due to vitamin D toxicity:** All the sows on two breeding units were affected by vitamin D toxicity due to accidental addition of the vitamin to the mineral pre-mix resulting in marked overdose of vitamin D to the pigs consuming the affected ration. Fortunately, the affected feed was only fed to two pig units and was replaced as soon as concerns were raised with voluntary restriction of cull sows on-farm agreed for a specified period to protect the food chain. Clinical signs included marked polydipsia and secondary polyuria followed by inappetence and weight loss (figure 2). Post-mortem examination of culled sows at Thirsk were principally of a nephropathy as shown in figure 3 which was confirmed by histopathology which revealed calcium phosphate mineralisation. Further details of the case are given on this link: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/352185/pub-survrep-p0214.pdf
BIRDS

Commercial Layers

Spotty liver in free range layers: Increasing mortality from four to five birds per day to ten birds per day was occurring in a free range flock of 6,500 layers aged 29 weeks. Antibiotic treatment given in the water had no obvious effect on the mortality and there was a slight decrease in egg production and food consumption. Fewer birds had been using the raised slats/perches. Six out of ten birds in the first batch examined and 11 out of 11 birds in the second batch had diffuse pale speckling throughout the livers, which were slightly swollen (Figure 8). The hepatic lesions were consistent with “spotty liver” which has been considered to be associated with a Campylobacter sp. infection. Histopathology confirmed changes consistent with a diagnosis of infectious hepatitis of bacterial origin, supporting the suggestive diagnosis of spotty liver, but no specific aetiological agent was identified in this case. Spotty liver typically affects free range layers around peak lay (20 to 30 weeks of age) and mortality can be up to 10%.

Backyard flocks

Marek’s disease: A 12-month-old Light Sussex cockerel was submitted as part of an investigation into sporadic mortalities within a group 15 mixed breed chickens. Clinical signs in previous cases had included dullness and diarrhoea prior to death. No vaccination was practiced and the birds were bought in from multiple sources, some of them as eggs subsequently hatched on site. The submitted bird exhibited depression, low neck carriage and fine repetitive neck tremors, as well as loose droppings. The gross postmortem findings included an empty alimentary tract with necrosis of the caecal tonsils, together with enlargement of the spleen and kidneys. Histopathology undertaken on brain, peripheral nerve, spleen and kidney tissues revealed a pleomorphic lymphoma consistent with Marek’s disease in the parenchymatous organs and a lymphocytic neuritis and focal, non-suppurative meningoencephalitis which were also consistent with Marek’s. Despite the presence of nervous signs in the bird, the sporadic nature of the cases ruled out the suspicion of notifiable disease involvement.

Capillariasis: An 11 to 12-week-old backyard chicken was affected by capillariasis. The flock of 12 adult chickens and four 11 to 12-week-old chicks were kept as a single group in the back garden. The adults and three other chicks were reported to be healthy. The affected chick was emaciated and weak. No routine treatments or vaccines were administered apart from a powder to control red mite. Following postmortem examination, microscopic examination of wet preparations of the mucosal surface of the duodenum showed Capillaria sp. worms and eggs. Capillaria spp. can be highly pathogenic when present in large numbers. Some species have a direct lifecycle whilst others have earthworms as an intermediate host. It was suggested the other young birds in the flock were treated with a suitable
anthelmintic and a control plan established to control gastro-intestinal parasitism in this small flock.

Game birds

**Coccidiosis in partridges:** Thirty five-week-old red-legged partridges from a group of 900 in two pens were found dead over a 24-hour period. Other birds in the group had signs of mild diarrhoea and were huddling. Eleven further pens of 300 birds and three pens of 600 birds were unaffected. All birds were purchased from a single source at day old. The gross lesions were of a typhlitis with caseous caecal cores present. Large numbers of coccidia of various stages were detected in the small and large intestine. *Eimeria legionensis* is the coccidial species usually associated with caecal cores in partridges. Clinical coccidiosis in the affected pens had occurred despite the use of preventative in-feed and in-water medication. Mortality depends on the level of challenge and the immunity of the bird; control measures include keeping the level of challenge as low as possible, maintaining good hygiene especially around drinkers and feeders and avoiding re-use or overstocking of pens.

**Spironucleosis (hexamitiasis):** *Spironucleus* (*Hexamita*) infection was diagnosed in pheasant poults up to six weeks of age. In one case, increased mortality in poults aged 11 days was investigated with the submission of live and dead birds. The live birds were standing with closed eyes, mild respiratory distress and eyes closed. Six of the seven birds had empty crops and all had foamy intestinal contents. Motile flagellate protozoa consistent with *Spironucleus* sp. were seen in moderate numbers in wet preparations from intestinal contents of two of the three birds received live. This is at the lower end of the age range for *Spironucleus* infection and it was thought that the current hot weather conditions may have exacerbated disease and dehydration leading to increased deaths.

**Coronavirus nephritis**

One hundred ex-laying pheasants out of a group of 500 purchased three weeks earlier had since died following signs of loss of condition. Gape worms had been detected during on-farm postmortem examinations but losses continued in spite of anthelmintic treatment. The birds reportedly drank a lot. Five dead pheasants were submitted for postmortem examination, one of which was diagnosed with severe gape worm (*Syngamus*) infestation. The other four had markedly enlarged and pale kidneys (Figure 9) and in three of those, the pericardium and liver were covered in a layer of urate deposits indicative of visceral gout. Pheasant coronavirus-associated nephritis was suspected and further supported by detection of a coronavirus by PCR testing on caecal tonsil tissue. The pathogenesis of this disease is not fully understood but unspecified stress factors in adulthood have been reported to result in outbreaks of the disease with high mortality. Potential stress factors in this case included the gape worm infestation and the recent move of the pheasants.
Fig 8: Miliary lesions in the liver of a layer chicken (“spotty liver”)

Fig 9: Pallor and enlargement of the kidneys in an adult pheasant with suspected coronavirus nephritis

References


This summary is produced by the APHA and is drawn from reports provided at the time of reporting by the former AHVLA laboratories at Bury St Edmunds, Carmarthen, Langford, Lasswade, Leahurst, Penrith, Royal Veterinary College, Shrewsbury, Starcross, Sutton Bonington, Thirsk and Weybridge. APHA monthly reports are available online at https://www.gov.uk/government/publications/disease-surveillance-reports-2014