Agri-Food and Biosciences Institute

Northern Ireland disease surveillance Quarterly Report

January-March 2008

Vol 4 No. 1

Northern Ireland disease surveillance report, 1st January to 31st March 2008

- **Brucellosis in a suckler and a dairy herd**
- **Bluetongue in imported cattle**
- **Tuberculosis in a sheep**
- ***Fasciola hepatica* resistance to triclabendazole**
- **Tuberculosis in an otter**

These are some of the matters discussed in the Northern Ireland animal disease surveillance quarterly report for 1st January to 31st March 2008

CATTLE:

Respiratory diseases

Pneumonia was the principal pathological finding in 63 carcase submissions between 1st January and 31st March 2008. *Pasteurella multocida* (10 cases), *Mannheimia haemolytica* (8 cases), *Mycoplasma bovis* (6 cases), *Arcanobacterium pyogenes* (5 cases), *Histophilus somni* (2 cases) and bovine viral diarrhoea virus (2 cases) were the most common pathogens detected.

A two-week-old calf had recovered from a diarrhoeic episode, but died suddenly two days later. At postmortem examination, enteritis was present, fibrin was seen in many limb joints and there was fibrinous pleurisy and pneumonia. There was consolidation of the right accessory, apical and cardiac lung lobes with patchy consolidation of the left cardiac lobe. *M. haemolytica* type A1 was recovered from the lung and in septicaemic distribution. The histological changes in the lung were consistent with pasteurellosis. No other respiratory or enteric pathogens were detected.

A four-month-old calf from a beef herd died suddenly. This was the second death in this batch of 15 calves. At postmortem examination, necrotic laryngeal chondritis with stenosis of the laryngotracheal opening (Fig 1) was present and *A. pyogenes* was cultured from the lesion.

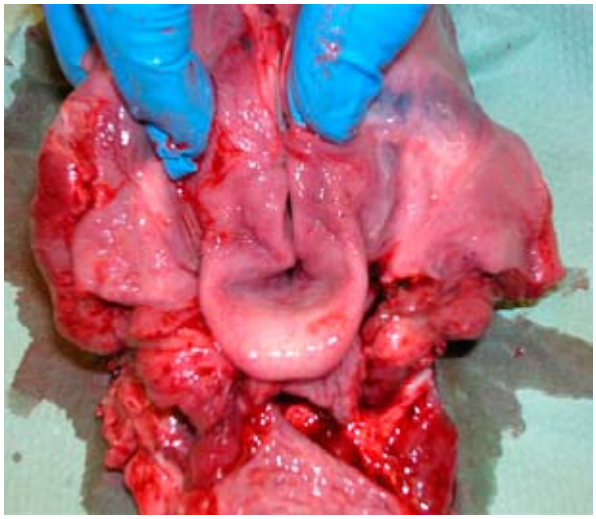

Fig 1. Laryngeal stenosis due to necrotic chondritis

A yearling heifer which had died suddenly was submitted for postmortem examination. The heifer was from a batch of 22 cattle, which had been purchased four days previously and subsequently vaccinated for infectious bovine rhinotracheitis and treated for fluke and worms. Approximately 20 per cent of the cranial lungs were consolidated, and lesions typical of pneumonic pasteurellosis were seen histologically. *M. haemolytica* type A1 and *P. multocida* were isolated from the lung tissue. The likely predisposing cause of this condition was stress of handling and transport (shipping fever).

Alimentary diseases: Bovine Viral Diarrhoea / Mucosal disease

A total of 632 blood samples were tested by virus isolation or antigen capture ELISA for bovine viral diarrhoea virus (BVDV). Of these, a positive result was obtained from 57 samples (9.02 per cent). In addition 283 submitted tissues and nasal mucus samples were tested by immunofluorescence for BVDV, with 18 (6.4 per cent) being found positive.

Six cases of mucosal disease were confirmed at postmortem examination. One case involved a three-month-old dairy heifer which had been losing weight prior to death. Four similar cases had occurred in this batch of calves. Lesions typical of mucosal disease were present, including crusting of the muzzle, erythema and erosions of the buccal epithelium, and ulceration of oesophageal and abomasal mucosa. Immunofluorescence on multiple tissues for BVDV was positive. A previous blood sample submitted from this animal had also tested positive for BVDV antigen.

A blood sample was also examined from a two-month-old Charolais calf in another herd. The calf had a blood-stained diarrhoea and had been treated for suspected coccidiosis. The diarrhoea had resolved, but the calf had lost weight and was weak and recumbent. The blood sample was positive for both BVDV antibody and antigen. It was likely that the BVDV antibody was maternally derived and that the calf was persistently infected with BVDV. These submissions reflect the continuing importance of BVDV infection in herds in Northern Ireland.

Neonatal enteritis

The pathogens identified in neonatal bovine faecal samples during the quarter are shown in Table 1.

TABLE 1: Pathogens identified in neonatal bovine faecal samples in Northern Ireland, 01 January to 31 March 2008.

	Number	
Pathogen	**Number tested**	**Positive (per cent)**
Cryptosporidia	630	189 (30.0%)
Rotavirus	424	124 (29.2%)
Coronavirus	487	20 (4.1%)
Escherichia coli K99	312	15 (4.8%)

Concurrent infections with more than one pathogen were identified frequently. One case involved a one-week-old Friesian calf from a unit where several others had neonatal diarrhoea.

Nine calves had died within the previous two weeks. At postmortem examination the calf had enteritis. A profuse growth of K99-positive *Escherichia coli* was recovered from the intestinal contents. In addition there were moderate numbers of cryptosporidial oocysts and both Rotavirus and Coronavirus were detected.

Another case involved a faeces sample submitted in January from a one-week-old calf with diarrhoea. *Salmonella* Dublin, Rotavirus and *E. coli* K99 were all detected.

Five cases of traumatic reticulitis were seen at postmortem examination during this quarter. One case involved an 18-month-old bull that had died suddenly. Haemopericardium that had probably resulted in cardiac tamponade was seen on postmortem examination (Fig 2).

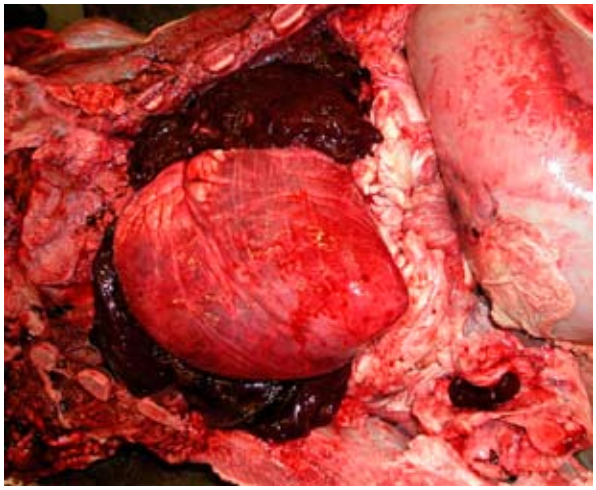

Fig 2. Haemopericardium in a bull

A 10-12cm piece of sharp wire had perforated the reticulum and was protruding through the diaphragm. The haemorrhage had resulted from puncture

Other enteric conditions

Parasitic ova found in ruminant faeces samples submitted during the period are shown in Table 2.

		No of parasitic ova					
	Total	**Negative**	**+**	**++**	**+++**	**++++**	**% positive**
Liver fluke							
Bovine	499	328	102	48	15	6	34.2%
Ovine	103	46	16	25	5	11	55.3%
Coccidia							
Bovine	628	529	78	12	4	5	15.8%
Ovine	130	67	45	3	7	8	48.5%
Strongyle worm egg count		**<500 epg**	**≥500 epg**				
Bovine	540	528	12				2.2%
Ovine	119	92	27				22.6%

≥500 eggs per gram of faeces (epg) was considered of likely clinical significance

- \+ Low, ++ Moderate, +++ High, ++++ Very high

Table 2. Endoparasitic infections in ruminants in Northern Ireland, 01/01 to 31/03 2008.

of a branch of the coronary artery. Diphtheria was seen in a two-month-old dairy calf that was found dead. A large ulcerative area, containing necrotic debris, was present on the caudal aspect of the tongue (Fig 3).

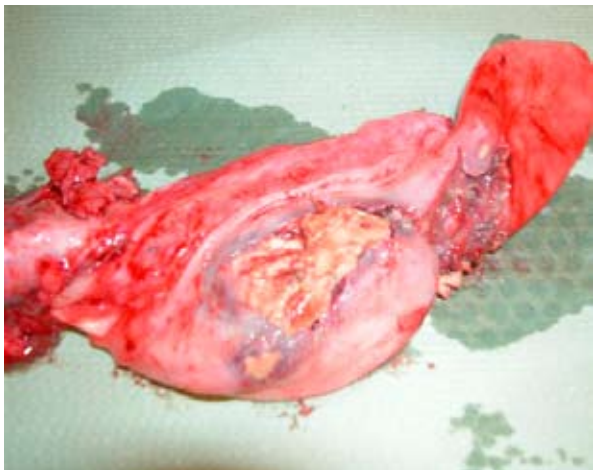

Fig 3. Calf diphtheria lesion on tongue

No clinical signs had been observed prior to death, suggesting that on this farm inadequate time may have been be devoted to observation of calf health and behaviour.

At postmortem examination of a nine-year-old cow that had died suddenly, the abomasum and proximal jejunum were distended with watery greenish-coloured fluid and the distal jejunum was flaccid and empty. The jejunum was obstructed by a haemorrhagic mass, 8 cm in diameter, that was attached to the intestinal wall. Associated with this mass was a large blood clot occupying the lumen of the proximal jejunum. Histologically, the mass comprised short swathes and interlacing bundles of spindle cells, with scant stroma. In areas, the interlacing bundles formed a herringbone pattern. The mitotic index was low. The mass was histologically most consistent with a schwannoma, although differential diagnoses could include leiomyoma and gastrointestinal stromal tumours. Multicentric schwannomas are not uncommon in older cattle and tend to be associated with the autonomic nervous system, particularly the epicardial plexus, thoracic and cervical sympathetic ganglia, tongue, intercostal nerves and brachial plexus. Schwannomas, or peripheral nerve sheath tumours, associated with the intestine are rare but have been recorded in cattle at the hepatic plexus. This case is unusual as the mass was associated with the intestine and was solitary, as in cattle multiple masses of this type are usually reported.

Atresia of the small intestine was present in two calves from separate farms, which were examined *post mortem* during the same week in March. One case involved a four-day-old Charolais calf that had abdominal distension prior to death, while the other affected animal was a three-day-old Blonde d'Aquitaine calf. The causes of intestinal atresia are not completely understood but are thought to result from ischaemia of a segment of gut during fetal development.

Johne's disease

Examination for *Mycobacterium avium* subspecies *paratuberculosis* (MAP) was carried out by microscopic examination

(Ziehl-Neelsen staining) on 305 bovine faecal samples. 11 samples (3.6 per cent) contained acid-fast organisms typical of MAP.
A total of 1953 bovine blood samples were tested for antibodies to MAP; 223 samples (11.4 per cent) were positive.

Reproductive and mammary diseases: Abortion

Specimens from 178 bovine abortions were examined between 1st January and 31st March 2008. Pathogens associated with bovine abortion were detected in 108 cases (60.7 per cent).
Of these *Leptospira Hardjo* was the most commonly identified pathogen, being detected in 54 cases (30.3 per cent of total submissions). *Bacillus licheniformis* was cultured from 14 cases (7.9 per cent), *A. pyogenes* was cultured from 13 cases (7.3 per cent), *Neospora caninum* infection was detected in 12 cases (6.7 per cent), BVDV was detected in 7 cases (3.9 per cent) and *S.* Dublin was cultured in 4 cases (2.2%). *Brucella abortus* was isolated from bovine foetuses in two separate herds during this quarter. One abortion outbreak in a suckler herd was investigated after four cows aborted or calved weak non-viable calves. *Brucella abortus* was isolated from all four fetuses submitted for examination. Six further cows calved over the following week; three of which gave birth to weak calves. The farmer also reported that several other cows had returned to service. Another brucellosis case occurred in a dairy herd.
A seven-month-old fetus was submitted for examination and *B. abortus* was isolated from the foetal stomach contents. This herd was contiguous to a previously confirmed brucellosis reactor herd. Both these brucellosis cases were reported to the Veterinary Service of the Department of Agriculture and Rural Development for Northern Ireland.

Mastitis

A total of 837 bacterial isolates were cultured from milk samples submitted from acute and chronic mastitis cases. Sixty-seven samples (8 per cent) yielded cultures of more than two organisms and were considered to be potentially contaminated. No bacteria were cultured in a further 164 samples.

E. coli was the most frequently isolated organism and was present in 23.3 per cent of samples where microorganisms were identified. *Streptococcus uberis* was cultured in 17.8 per cent of samples, *Staphylococcus aureus* was isolated in 7.6 per cent of samples, *Streptococcus dysgalactiae* was isolated in 3.8 per cent of samples, *A. pyogenes* was isolated in 1.4 per cent of samples and *P. multocida* was isolated in 0.8 per cent of samples.

Both *Staphylococcus* (excluding *S. aureus*), and *Enterococcus species* were isolated in a large number of

samples (7.1 per cent, and 6.1 per cent respectively). An unusually high number of *Bacillus species* were isolated in 6.6 per cent of samples. *S.* Dublin was also isolated from one case; this is an uncommon isolate from mastitis cases.

Neurological diseases

Clostridium botulinum type D toxin was identified in five cases in the first quarter of 2008. Three of these cases were closely associated with access to broiler litter.

In March two cows died suddenly after showing vague abdominal clinical signs, anorexia and blindness. At postmortem examination one cow was found to have aspiration pneumonia and both cows had abomasitis. Kidney lead levels of 73 and 94µg per g (normal range 0-25µg per g) confirmed a diagnosis of lead poisoning. No source of lead was found in the environment where the cows were being housed.

One further case with clinical signs of anorexia and blindness responded to treatment for lead poisoning. No further cases occurred after different silage was fed to the herd.

Two two-day-old Limousin calves of the same sire, but from separate dams were euthanised after showing neurological signs from birth. On postmortem examination both calves had a domed head and hydrocephalus, and excess cerebrospinal fluid was present in the third ventricle and in the subarachnoid space. The frontal cerebral hemispheres of both calves were compressed by excess cerebrospinal fluid. Cerebellar hypoplasia was present in one calf; histologically a disorganised cerebellar cortex with decreased Purkinje and granular cellular layers was seen. Both calves tested negative for BVDV.
A cause of the hydrocephalus was not identified.

Other diseases

In January 2008, the results of a routine post import test on a batch of 21 in-calf heifers, which were imported into Northern Ireland from the Netherlands, demonstrated that eight of the animals had antibody to bluetongue virus serotype 8, indicating that they had been infected before importation. Although the cattle had been imported following compliance with all official health controls, DARD decided that they should be held for a period in isolation and retested. At 30 days after importation, one seronegative animal tested positive by realtime reverse transcriptase-PCR, indicating that it had become infected. Three calves born to seropositive dams also gave positive results to the PCR test. Northern Ireland is a bluetongue-free region and no vector activity was demonstrated throughout the incident. Investigation failed to reveal any alternative source of infection, and it was concluded that transplacental

transmission was the most likely route of infection.

There was also evidence of lateral transmission without vector activity. In addition to the imported seronegative heifer that became PCR positive, another animal in an adjoining pen had positive PCR results, but remained seronegative, which would be consistent with recent infection. Both these animals had calved in a pen that had previously held two seropositive heifers that had given birth to PCR positive calves. It is postulated that infection was transmitted through contact with the infected calves, or the placental tissues and fluids which were not removed between calvings. No further bluetongue infection was found following extensive sero-surveillance of neighbouring farms and Northern Ireland remains a bluetongue-free region.

Thrombosis of the caudal vena caval and embolic suppurative pneumonia were diagnosed in two 27-month-old first-calving dairy heifers. The heifers had lost weight since calving four to five months earlier and had been euthanised before postmortem examination. These and other heifers in this batch of 33 had been coughing excessively. Lungworm larvae had been detected in four of six faecal samples taken from animals in this batch earlier in the winter. At postmortem examination of the heifers hepatic abscessation and closely associated thrombosis of the posterior vena cava were present (Fig 4).

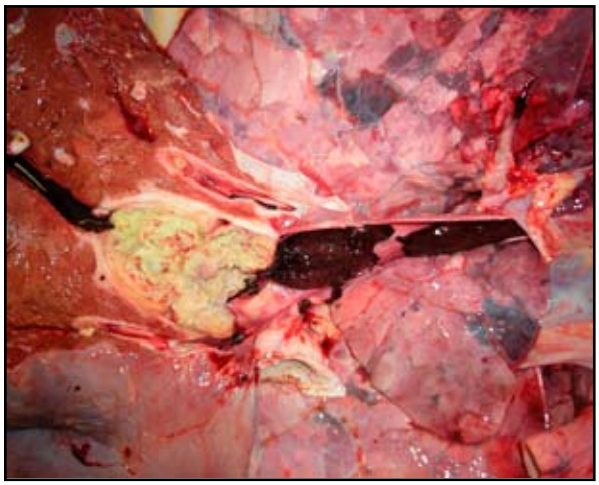

Fig 4. Posterior vena caval thrombosis

Embolic suppurative pneumonia was detected in both heifers, with intrapulmonary and intrabronchial haemorrhage associated with pneumonia in one of the heifers. This animal had a recent history of epistaxis and haemoptysis. Large blood clots were also present in the rumen of this heifer.

SHEEP:

Respiratory diseases

Pneumonia was identified as the principal pathological finding in 16 ovine carcase submissions during the 1st quarter of 2008. Jaagsiekte (7 cases), pasteurellosis due to *M. haemolytica* (3 cases) and laryngeal chondritis (1 case) were the most common causes.

One case of ovine pulmonary adenocarcinoma (jaagsiekte) occurred in a 10-month-old Oxford Down hogget from a small pedigree flock, which was found dead. Focal consolidation was seen in the anteroventral lung lobes. Histologically, early stage pulmonary

adenomatosis with secondary bacterial infection was seen. *Salmonella* Diarizonae was isolated from the small intestinal contents and was considered to be an incidental finding. Tuberculosis was diagnosed in ovine lung that was submitted for histology from an abattoir. Granulomatous lesions with encapsulation and central caseous necrosis were seen histologically. Numerous multinucleated giant cells were also present. A Ziehl-Neelsen stained preparation showed acid-fast organisms present within giant cells. Positive immunostaining for *Mycobacterium bovis* was also detected using a commercially available polyclonal antibody against *M. bovis*. Tuberculosis occurs infrequently in sheep, most cases being associated with close contact with tuberculous cattle.

Alimentary diseases

A high level of *Salmonella* Derby was isolated from the small intestine of one-year-old ewe presented for postmortem examination in January. *S.* Derby is the second most common serovar isolated from pigs, but infections in sheep tend to be occasional and sporadic. In this particular case there was no history of direct contact with pigs.

Fascioliasis was a common postmortem finding in sheep during this quarter. Evidence suggestive of triclabendazole resistance was recorded on two occasions.

One case involved a two-year-old ewe which had been euthanised. Seven sudden deaths had occurred in this flock within the previous two weeks. At gross postmortem examination the carcase was pale, with excess fluid in the body cavities and watery blood. The liver was pale and firm with haemorrhagic tracts and dilated bile ducts. On cut section, the bile ducts contained numerous flukes and more than 100 adult and juvenile flukes were collected, when the liver was subsequently examined in detail. There was a history of worming with triclabendazole during the autumn, and triclabendazole was administered at a dose level of 1.5 times the recommended level three weeks prior to the death of this animal. This finding typifies a significant number of cases reported recently, and raises concerns that triclabendazole resistance may be increasing locally in the fluke populations. On the other hand, the possibility that chronically damaged livers are unable to metabolise the anthelmintic to the active form must be borne in mind.

A one month old lamb was found dead. Two other lambs had recently died in this flock. At postmortem examination the lamb had pale, watery blood and was found to have haemorrhaged through an ulcer in a spiral fold (plica) of the abomasum. Mild emphysema was seen in the abomasal wall. Fluorescence for *Clostridium sordellii* was positive on the ulcer tissue.

Two 10-day old lambs, which were delivered by caesarean section, died after a short illness during which antibiotics had been administered. At postmortem examination one lamb was jaundiced and severe focal to confluent hepatoparenchymal necrosis was seen histologically. *S.* Dublin was isolated in small numbers but in a septicaemic pattern from this lamb.
Foci of hepatoparenchymal necrosis were seen histologically in the second lamb. No significant bacteria were isolated, but antibiotic treatment is likely to have interfered with bacterial recovery.

Johne's disease

A total of ten ovine faecal samples were examined microscopically (Ziehl-Neelsen staining) for *Mycobacterium avium* subspecies *paratuberculosis* (MAP). No samples tested positive. A total of seven ovine blood samples were tested for antibodies to MAP. Of these, one sample tested positive.

Reproductive diseases

Samples from 189 ovine abortions were examined. Recognised pathogens were detected in 122 cases, with two or more abortifacient agents identified in a number of cases with two or more abortifacient agents identified in a number of cases.

Toxoplasma species were detected in 56 cases (29.6 per cent of total submissions) *Leptospira* was detected in 36 cases (19 per cent), *Chlamydophila abortus* was detected in 31 cases (16.4 per cent), *Campylobacter* species was detected in six cases (3.2 per cent), *Listeria monocytogenes* was detected in five cases (2.6 per cent) and *A. pyogenes* was detected in 3 cases (1.6 per cent). *Listeria ivanovii* was isolated from one aborted foetus. Two other abortions had occurred in this 200 ewe flock.
Approximately 50 abortions occurred in a 500 ewe flock in February.
Leptospiral immunofluorescence was detected in kidney, lung and adrenal of one aborted foetus submitted for postmortem examination. No other pathogens were detected. High *Leptospira* Hardjo titres were detected in blood samples from ewes in this flock (including titres of 1/1000 and 1/300). *Toxoplasma* titres ranging from Nil to 1:256 were also detected. Vaccination for abortificient agents was not undertaken in this flock.

Nutritional and metabolic diseases

At postmortem examination ruminal acidosis was diagnosed in a six-month old lamb, which was found dead.
Six further deaths had occurred in this batch of housed lambs, which were being fed silage and concentrates. The lamb had a congested carcase with scattered subcutaneous haemorrhages. Ruminal contents were frothy and contained a large amount of concentrate. Rumen pH was extremely acid at 4.11, indicating

carbohydrate overload and ruminal acidosis. In addition the lamb had been diarrhoeic, mesenteric lymph nodes were enlarged and pale and the abomasal mucosa was thickened in appearance. There was evidence of concurrent parasitic gastroenteritis. Strongyle species eggs were present (5200 per gram of faeces). A worm count revealed 14,000 *Trichostrongylus vitrinus* and 7000 *Cooperia* in the small intestines, with lower numbers of *Teladorsagia circumcincta* and *Trichostrongylus axei* in the abomasum.

Skin diseases

Four cases of sheep scab were confirmed during the first quarter of 2008.

Other diseases

Plant poisoning due to *Pieris* species. was identified in sheep from three flocks during this quarter. Heavy losses were recorded in one flock. Two of 25 ewes, which died from a batch of 62, were submitted for postmortem examination in January. *Pieris* species leaves were found in the rumen of both ewes. The sheep had strayed from their field and down a neighbour's laneway. Eight sheep which became recumbent and dull made a subsequent recovery following supportive therapy. The flockowner also submitted some specimens of a plant that he had found in the vicinity and that he had believed to be responsible. This plant submitted was identified as common periwinkle (*Vinca minor*), which is not poisonous. *Pieris* species, which belongs to the same family of plants as rhododendron, are one of the more commonly detected plant poisonings at the Veterinary Sciences Division.

PIGS

Alimentary diseases

Salmonella Typhimurium was isolated from pigs and faeces samples submitted from a unit with a history of ill-thrift, respiratory signs and deaths. Serology revealed seroconversion to porcine reproductive and respiratory syndrome (PRRS) on this unit. The pigs were high health status progeny which had been moved to a commercial unit for fattening. The buildings had not been cleaned and disinfected before the transfer of these pigs. Deaths ceased in this unit following treatment with antibiotics and feed acidification.

A 23-week-old pig which died suddenly was examined *post mortem*. The pig was from a batch of 100 which had diarrhoea and were coughing. The pigs were not currently on medication, but the feed had been acidified a few days previously. One other death had occurred a few days earlier. Gastric ulceration was present at postmortem examination. There was an area of acute inflammation and ulceration close to the pylorus. The ulcer was approximately 8 mm in diameter, with a hyperaemic border, and

fibrin was adherent. There was no gross evidence of enteritis and a very mild pneumonia was seen. A profuse growth of *S.* Typhimurium was recovered from the intestines and from the ulcer.

Other diseases

Post-weaning multisystemic wasting syndrome (PMWS) was diagnosed in two eight-week-old pigs from a batch of 18. The pigs were emaciated and one was jaundiced. Two pigs from this batch had died each week for the previous month. At postmortem examination both pigs had enlarged lymph nodes and cranioventral pneumonia. The diagnosis of PMWS was made on the basis of gross findings and clinical history, typical histological findings and the demonstration of porcine circovirus type 2 antigen in sections of lymph node.

HORSES:

Two hundred and sixty-two swabs were examined for the presence of *Tayorella equigenitalis*. All were negative. Eighteen equine pathology cases were examined this quarter. Eight aborted foetuses from different premises were received for postmortem examination. *Aeromonas hydrophila* was isolated from the liver and stomach contents of one foetus and leptospiral antigens were detected by immunofluorescence in the lung and kidney of a second. Both leptospiral and equine herpesvirus (EHV) antigens were detected by immunofluorescence from equine placental material. No significant pathogens were recovered from the other five foetuses.

Hepatic lipidosis was seen in a fixed liver submission from a 10-year-old donkey that had died after a period of inappetance. The liver was reported as being fatty and friable at a field postmortem examination.

A mass from a two-year-old mare was received for histological examination. The mass consisted predominantly of immature fibrovascular tissue and was suggestive of an equine sarcoid.

A four-year-old donkey, which had died suddenly, was found to have numerous cyathostome larvae encysted in fibrous capsules within the wall of the caecum.

A two-day-old foal with a history of diarrhoea was examined *post mortem*. Marked haemorrhagic enteritis with congestion of the large intestine and fibrin coating the mucosal surface was present. *Clostridium difficile* and *Clostridium perfringens* alpha toxins were identified in the caecal contents.

A four-year-old horse, which had been haemorrhaging from its sheath, was found dead. At postmortem examination the urethral outlet was found to be partially blocked with inpissated caseous material and the bladder was distended with haemorrhagic contents.

A seven-year -old horse was examined *post mortem*. The horse became dull and had an episode of epistaxis two

days after racing. On gross examination there was extensive lung consolidation affecting both right and left cranioventral lobes. An extensive fibrinous pleurisy was also present. Histologically, there was a suppurative bronchopneumonia with lung abscessation. *Streptococcus zooepidemicus* was isolated from the lungs.

An 11-year-old mare died after an acute episode of colic. A gastric rupture was seen at postmortem examination, with a 35 cm tear present along the greater curvature of the stomach. Extensive fibrinous peritonitis and a large quantity of forage digesta and clotted blood were seen free within the peritoneal cavity.

A two-year-old male pony, with a history of sudden death, was submitted for postmortem examination. The carcase was emaciated with all body fat reserves exhausted. Malnutrition was suspected.

BIRDS

A one-year-old Silkie chicken from a zoological collection was found dead. At postmortem examination the right kidney was found to be very enlarged. Histologically, there was focal interstitial nephritis with cystic changes and granulomatous inflammation. No significant pathogens were isolated from the kidneys.

A male Carolina duck (*Aix sponsa*) from a zoological collection was found dead. At postmortem examination several large fungal plaques were adherent to abdominal air sacs and lungs. Subsequent lung histology demonstrated areas of granulomatous inflammation surrounding a central core of fungal hyphae. High levels of *Aspergillus fumigatus* were cultured from the air sacs.

MISCELLANEOUS MAMMALS

An adult male otter, weighing 6kg, was found dead. The otter was in good body condition. The tail had been predated and blood was seen around the mouth and nose. At postmortem examination the thorax was filled with serosanguinous fluid and there were numerous miliary white foci in the lung lobes. The spleen was enlarged and congested. The stomach and small intestine were almost empty. Numerous acid fast bacilli present on Ziehl-Neelsen preparations from lungs, liver and spleen and numerous granulomatous lesions were seen on histology of the lungs. *Mycobacterium bovis* was cultured from the lungs and spleen. Both isolates were spoligotype 140, VNTR genotype 1.140. This is the local cattle strain for the area in which the otter was found.

This summary has been compiled by the Veterinary Sciences Division of the Agri-Food and Biosciences Institute (AFBI*) of Northern Ireland and is based on diagnostic submissions to AFBI's veterinary laboratories at Stormont, Belfast, and Omagh, Co Tyrone.

http://www.afbini.gov.uk/index/services/diagnostic/adds.htm

*AFBI was created on 1st April 2006 as the amalgamation of DARD Science Service and the Agricultural Research Institute of Northern Ireland. AFBI operates a farm animal disease diagnostic service on behalf of the Department of Agriculture and Rural Development for Northern Ireland.