

**Northern Ireland  
Animal Disease Surveillance Quarterly Report**

**Vol. 1 No. 2 April-June 2005**

**Agri-Food and Biosciences Institute  
Veterinary Sciences Division  
Stoney Road  
Stormont Belfast BT4 3SD**

**Highlights:**

- Bovine herpesvirus type-4 in cows
- Botulism in cattle
- Nematodirosis in lambs and calves
- *Salmonella* *Diarizonae* in sheep
- Equine herpesvirus infection

**CATTLE**

**Respiratory diseases**

Pneumonia was identified as the cause of death in 70 post-mortem submissions during this period. The most frequently identified respiratory pathogen was *Mycoplasma bovis* which was found in 11 cases, using an antigen-capture enrichment sandwich ELISA on lung tissue. *Pasteurella multocida*, *Mannheimia haemolytica* and *Histophilus somni* were isolated from 10, nine and six cases, respectively. Immunofluorescence to bovine respiratory syncytial virus (BRSV) was detected in 3 cases and to bovine viral diarrhoea virus (BVDV) in 2 cases. The multifactorial aetiology of bovine respiratory disease was illustrated by a 2-month-old calf from which *Mannheimia haemolytica* and *Salmonella* Dublin were cultured in septicaemic pattern. Positive immunofluorescence to BRSV and infectious bovine rhinotracheitis virus was also detected in lung tissue from this animal.

**Alimentary diseases**

**BVD/MUCOSAL DISEASE**

Two cases of mucosal disease were confirmed by post-mortem examination (PME). Extensive ulceration of the alimentary tract was observed and BVD viral antigen was detected in multiple tissues of each animal.

**NEONATAL ENTERITIS**

Enteritis was identified as the cause of death in 31 post-mortem submissions of neonatal calves. In addition, a large number of faeces samples were submitted from

neonatal calves with enteritis. The main pathogens identified in these submissions are listed in Table 1.

**Table 1: Pathogens identified in bovine faeces samples (April-June 2005)\***

<b>Pathogen</b>	<b>No tested</b>	<b>No positive (%)</b>
Cryptosporidia	368	161 (44)
Rotavirus	347	82 (24)
Coronavirus	347	16 (5)
<i>E. coli</i> K99	192	7 (4)

\*mainly submitted from neonatal calves although age not always given

*Salmonella* Typhimurium was isolated from a faeces sample submitted from a 4-day-old calf with a history of septicaemia, meningitis and collapse. *S. Dublin* was cultured from multiple organs of a calf that had fibrinous peritonitis and arthritis. Multiple foci of necrosis, consistent with salmonellosis, were seen on microscopic examination of the liver of this animal.

Severe abomasal ulceration was seen on PME of two 7-day-old calves that were submitted with a history of diarrhoea, respiratory signs and difficulty in swallowing milk. One also had severe fungal rumenitis and bronchopneumonia. *Candida* species spores were seen on microscopic examination of the rumen and this organism was isolated from the small intestine of both animals. The zinc sulphate turbidity test indicated that insufficient colostrum had been absorbed. The candidiasis was likely to have been secondary to hypogammaglobulinaemia and antibiotic treatment.

#### POST-NATAL ENTERITIS

A breakdown of the parasites found in ruminant faeces samples submitted during the quarter is shown in Table 2. Fluke eggs were detected in approximately 10% of sheep and cattle faeces samples reflecting the relatively high rainfall of recent years. Coccidial infections were widespread in sheep and cattle.

**Table 2. Endoparasitic infections in ruminants (April-June 2005)**

	Total	No. Negative	No. with >800 epg*	No. of parasites				Percentage positive
				+	++	+++	++++	
<b>Liver Fluke</b>	335	302		29	4	0	0	9.9
Bovine								
Ovine	78	70		4	0	1	3	10.3
				11				
<b>Coccidia</b>	457	310		3	21	6	7	32.2
Bovine								

Ovine	136	46	41	19	22	8	66.2
<b>Strongyle worm egg count</b>							
Bovine	356		4				1.1
Ovine	85		8				9.4

+ = low numbers; ++ = moderate numbers; +++ = high numbers

\*>800 eggs per gram (epg) faeces considered of likely clinical significance

Coccidiosis was identified as the cause of death of 4 post-mortem submissions, ranging in age from 3 weeks to 6 months. Faeces samples submitted from calves (10 weeks to 4 months of age) from 2 different farms contained significant levels of *Nematodirus battus* eggs. These animals had been at pasture for a few weeks after which diarrhoea and deaths were reported. The source of this infection is usually lambs (sometimes calves) that have grazed the pasture in the previous year. In one of these incidents, the calves had experienced a previous bout of pneumonia which may have resulted in increased susceptibility to other diseases.

A faecal sample submitted in April from a 5-year-old cow, that had calved one week earlier, contained a strongyle worm egg count of 2,800 eggs per gram of faeces (epg), suggesting type 2 ostertagiosis.

A 14-month-old bullock, submitted for PME, had been recumbent with congested mucous membranes and elevated heart rate. Severe localised bile peritonitis associated with perforation, inflammation and distension of the gall bladder was seen at necropsy. A 10 cm diameter abscess at the neck of the gall bladder, was identified as the primary cause of the gall bladder obstruction. *Escherichia coli* was cultured from the abscess but it is not known if this isolate was clinically significant.

A 14-month-old heifer was submitted for PME with a history of diarrhoea. Necropsy revealed a thickened abomasal mucosa ("Moroccan leather" appearance) and haemorrhage. Over 10,000 adult nematodes were detected in the lumen of the abomasum and numerous microscopic larvae were seen in the mucosa. Although this animal had been treated with an avermectin product in late 2004, the findings were suggestive of combined type 1 and type 2 ostertagiosis.

Fluke eggs were detected in 2 of 3 faeces samples submitted from 3 dairy cows in a herd that had experienced a drop in milk production and diarrhoea.

A recently imported Holstein heifer died after having gained access to a field of lupins and kale. Post-mortem examination revealed a pale dehydrated carcass, white foamy tracheal exudate, and pulmonary oedema and emphysema. Ulceration of the oesophageal and abomasal mucosa was also seen and histological examination revealed mycotic rumenitis and abomasitis with evidence of embolic spread of fungi to the lungs. *Candida* species were cultured from the abomasum and small intestine. These fungi have the potential to invade tissues from the gastrointestinal tract and rarely spread systemically. The sudden change of diet

following access to the lupins and kale, with associated fluctuations in rumen pH, could have provided the local conditions for overgrowth and invasion to occur.

### JOHNE'S DISEASE

A total of 458 bovine blood samples, from cattle in 108 herds, were submitted for serological testing for *Mycobacterium avium* subspecies *paratuberculosis* (MAP) during this quarter. Sixty seven samples (14.6%) were positive, while 8 (1.74%) gave inconclusive results by ELISA.

Microscopic examination for the presence of acid-fast bacteria was carried out on 147 bovine faecal samples. Acid-fast organisms morphologically consistent with MAP were detected in six samples (4.1%).

No cases of Johne's disease were identified in carcasses submitted for PME during this quarter.

### Nutritional and metabolic diseases

Biochemical testing indicated a significant prevalence of hypocalcaemia and hypomagnesaemia in submitted samples (Table 3). Blood non-esterified fatty acid (NEFA) concentrations are a measure of fat mobilisation and elevated concentrations indicate nutritional stress or negative energy balance. Beta-hydroxybutyrate (BHB) concentrations above the reference range indicate ketosis. Low erythrocyte glutathione peroxidase activity, indicating long-term selenium deficiency, was a common finding. Hypocupraemia was detected in a small number of bovine blood samples. Although animal details or clinical history were not always available, most of the samples tested for calcium, magnesium, NEFA and BHB are believed to have been submitted from adult dairy cows. The samples tested for copper and GPX were submitted from a wide range of animal types.

**Table 3. Selected tests of mineral status and energy balance in cattle (April-June 2005)**

Analyte	No. of tests	Reference range	No. (%) above or below reference range
Calcium	235	2.0 -2.8 mM	42 (17.9%)*
Magnesium	344	0.73-1.31 mM	41 (11.9%)*
Non-esterified fatty acids	107	0-0.5 meq/L	30 (28.0%)**
Beta-hydroxybutyrate	305	0-1.5 mM	31 (10.2%)**
Glutathione peroxidase	406	>160 units/g Hb	44 (10.8%)*
Copper	398	8-16 µM	14 (3.5%)*

\*Below reference range; \*\*Above reference range; Hb Haemoglobin

A 3-year-old Holstein cow was submitted for PME with a history of jaundice. Chocolate-coloured blood, suggestive of methaemoglobinaemia, and severe localised hemorrhagic gastroenteritis were seen at necropsy. Histological liver lesions were suggestive of acute hypoxia or toxicity. Proteinuria and haematuria

were also present. Although the exact cause of these lesions is unknown, nitrite poisoning was suspected. This can result from ingestion of excessive nitrates which can be converted to nitrite by ruminal microbes. Sources of nitrate include artificial fertilisers, heavily fertilised forage, cereals and root-crops, and silage and silage effluent made from such herbage.

## **Reproductive and mammary diseases**

### **ABORTION**

Specimens from 93 cattle abortion cases were examined during the second quarter of 2005. Recognised pathogens were detected in 40 (43%) cases. Of these, *Leptospira* Hardjo was the most commonly identified pathogen (47%).

Bovine herpesvirus type 4 (BHV-4) was isolated from post-partum discharge from dairy cows. This is only the second isolation of BHV-4 made at VSD, the first isolate having been made approximately 2 years ago from another dairy herd that also had a uterine discharge problem. In follow-up work on the first herd, seroconversion to this virus was demonstrated in naive heifers entering the main dairy herd during the periparturient period. This seroconversion was not associated with clinical disease and the significance of BHV-4 as a cause of uterine discharge remains unclear. To investigate the prevalence of BHV-4 in Northern Ireland, we carried out a serological survey of dairy and beef herds. There was evidence of widespread infection with positive animals found in 67% of beef herds and 65% of dairy herds tested. No evidence of seroconversion was found in a survey of 64 fetuses submitted to VSD, suggesting that BHV-4 is not a significant cause of abortion.

*Mannheimia haemolytica* was isolated at high levels from a sample of uterine discharge that was submitted from a cow with metritis. This organism is a commensal of the upper respiratory tract and has been associated with pneumonia, septicaemia and occasionally mastitis. However, it is an unusual isolate from metritis cases.

### **MASTITIS**

Several herds with high bulk milk somatic cell counts (BMSCC) were investigated. In one case, *Bacillus cereus*, *E. coli* and *Streptococcus uberis* were isolated from all 26 individual cow milk samples, submitted by the herd owner. Cross-contamination during the sampling procedure was suspected. Only *S. uberis* was isolated consistently from samples collected aseptically from the same cows during a subsequent farm visit. During this visit, severe "teat end" hyperkeratosis was observed in all cows in this herd. Observations of the milking routine and subsequent testing of the milking machine by a parlour technician identified over-milking as the cause of the teat lesions. Appropriate preventative advice was given. This incident illustrates the importance of using aseptic technique when collecting milk samples for bacteriological examination, and of correct milking routine in the prevention of mastitis.

*S. uberis* was also isolated from milk samples of approximately 25% cows in another herd. Hyperkeratosis of the teat end was also observed in this herd. In this case, the problem was traced to excessive vacuum levels in the milking plant.

Individual quarter milk samples submitted from five cows in a herd with high BMSCC yielded a primary culture of *Salmonella* Dublin from three quarters of one cow. Although *Salmonella* Dublin is an unusual isolate from milk samples, if the cow is septicaemic, these bacteria can cross into the udder and be excreted in the milk.

*Pasteurella multocida* was isolated from two individual quarter samples from a cow with mastitis. *Pasteurella* species occasionally cause outbreaks of mastitis in individual herds, with upper respiratory tract infection or septicaemia being the most likely cause of infection. Once established in the mammary gland, it can be difficult to treat (despite favourable in vitro antibiotic sensitivity test results), spread from cow to cow during milking and cause both severe acute and chronic mastitis. Therefore, culling is often recommended.

### **Nervous diseases**

A 12-month-old steer, with a history of blindness, was euthanased after fracturing a limb and submitted for PME. Although the kidney lead concentration was below the 25 ug/g toxicity threshold, an elevated blood level indicated exposure to lead. This was considered to be a likely case of sub-lethal lead poisoning. Lead poisoning was also identified in a 3-month-old suckler calf with nervous signs on the basis of a blood lead concentration of 5uM (upper limit 1.4uM).

A 27-month-old beef heifer was submitted for PME after having shown signs of pyrexia and nervous signs for the previous 2 weeks. Although there had been an initial response to antibiotics and anti-inflammatory agents, the heifer collapsed, developed opisthotonus, limb paddling and blindness, and was euthanased. Necropsy revealed suppurative meningitis and *Arcanobacterium pyogenes* was isolated from the brain. This organism is an unusual cause of meningitis in this age of animal.

### **BOTULISM**

Samples from 28 suspect cases of botulism from 25 different herds were submitted for toxin testing during this period. Type D botulinum toxin was detected in gastrointestinal contents of four cases, but no toxin was identified in samples from any of the other animals.

Upwards of 30 deaths were reported in a bull-beef unit where six-month-old calves developed flaccid paralysis typical of botulism. A deep litter poultry unit was present on the farm although no direct contact between affected cattle and poultry litter was reported.

In another incident, seven animals died in a group of 45 15- to 18-month-old heifers after having shown typical signs of botulism. Type D botulinum toxin was detected in intestinal contents of two submitted animals. However, no specific risk factors were reported in this incident.

### **Skin Diseases**

Severe mite and lice (*Linognathus* spp.) infections were identified in a 3-week-old calf from a group in which there had been signs of illthrift, anaemia and 5 recent deaths.

### **Other diseases**

A 5-month-old Friesian bull calf was submitted for PME after having shown apparent respiratory signs for 8 days. Necropsy revealed marked anasarca, hydrothorax and hydroperitoneum. The heart was enlarged and rounded with a thickened right ventricular free wall and dilated right ventricle. The cranial cusp of the right ventricular valve was incomplete medially, with fibrosis in the adjacent atrial endocardium. Tricuspid valve dysplasia with fulminant congestive cardiac failure was diagnosed.

Necropsy of an 18-month-old bull revealed a congested carcass, enlarged lymph nodes, epithelial erosions in the oropharynx and oesophagus and haemorrhagic enteropathy. Histological examination revealed marked lymphocytic meningitis and vasculitis in brain, and interstitial lymphocytic nephritis and vasculitis in kidney. These lesions are consistent with malignant catarrhal fever (MCF) and this diagnosis was supported by a positive serological result for MCF virus.

Five cases of blackleg and one of black disease were identified by PME.

Necropsy of a 6-month-old-calf revealed cloudy joint fluid and fibrin in multiple limb joints from which *Streptococcus dysgalactiae* was cultured. This organism is more commonly associated with arthritis in lambs.

## **SHEEP**

### **Reproductive diseases**

#### **ABORTION**

As the peak of the lambing season had already passed, specimens from only 14 ovine abortions were submitted during this quarter. Recognised pathogens were detected in six cases. Of these, chlamydial abortion agent (EAE) was identified in three cases, *Toxoplasma gondii* in two, and *Leptospira* Hardjo in one.

### **Nutritional and metabolic diseases**

A clotted blood sample was submitted from an adult ewe from a group of eight ewes in which four had died a few days after lambing. This animal had been jaundiced and blood analysis revealed a copper concentration of 134.5 uM (reference range 8-20 uM). This group of recently purchased ewes had been fed cattle feed which is normally supplemented with copper. Copper poisoning was also diagnosed in a submission from another flock.

Elevated transketolase activity in a blood sample from an eight-week-old lamb with nervous signs indicated cerebro-cortical necrosis.

### **Alimentary diseases**

Two diarrhoeic lambs, aged six to seven weeks, were submitted for PME in mid-April from a group of 150 in which there had been one other death and 2 other sick lambs. Clinically significant burdens of *Nematodirus* nematodes were detected (105,550 and 24,100, respectively) in the small intestine. In addition, 10,000 *Teladorsagia circumcincta* and 1000 *Ostertagia trifurcata* were present in the abomasum of one lamb while the other contained 14,7020 *T. circumcincta* and 8,280 *O. trifurcata*. This

outbreak of nematodiriosis occurred during the predicted 2005 high-risk period. However, the finding of significant levels of *Teladorsagia* and *Ostertagia* infections in these lambs was unusual in that it was very early for larvae of this species to be present on pasture.

A ewe was submitted for PME from a flock in which three others had died suddenly at pasture. There was evidence of enteritis and *Salmonella* Diarizonae was isolated from multiple organs. This organism is an uncommon isolate from sheep in Northern Ireland.

A young lamb was submitted in late April from a flock in which several lambs were diarrheic. Although coccidiosis was suspected, no coccidia were detected at PME. However, the kidneys were enlarged and pale and histological lesions consistent with ovine nephropathy were identified.

Abomasal ulceration and haemorrhage were seen on PME of a 4-week-old ewe that had been the fourth to die in a group of 65 over the previous 3 weeks. In the absence of systemic infection or disease, such ulceration is unusual in adult sheep. Although bovine abomasal ulceration has been associated with coarse roughage, stress and gastric venous infarction, no cause was apparent in this sheep.

### **Respiratory diseases**

Pneumonia was identified as the cause of death in 19 ovine post-mortem submissions, with *Mannheimia haemolytica* being a common isolate. Pulmonary adenomatosis (“jaagsiekte”) was identified in three ewes from two flocks.

### **Nervous diseases**

Streptococcal septicaemia, associated with polyarthritis and vegetative endocarditis was seen on PME of a Texel ewe submitted with a history of illthrift. There were histological lesions of suppurative meningitis and microabscessation in the brainstem. Although these lesions are typical of listeriosis, *Listeria* organisms were not isolated.

### **Other diseases**

A one-and-a-half year old ewe was submitted for PME after having been found dead. The carcass was pale and the pericardial sac was distended by approximately one litre of clotted blood that had emanated from a tear of the ascending aorta. The findings were consistent with cardiac tamponade due to aortic rupture.

## **PIGS**

### **Respiratory diseases**

A 2-year-old sow that had died suddenly on a 150-sow unit was submitted for PME. Three other sows had died during the preceding week and other animals were dull. Necropsy revealed a severe fibrinopurulent pleuropneumonia involving 75% of the lung volume. *Pasturella multocida* was isolated from the lungs.



### **Alimentary diseases**

*Serpulina hyodysenteriae* was isolated at a high level from a faecal sample that had been submitted from a sow with a history of diarrhoea.

*Salmonella* Typhimurium phage type DT104B was isolated from a single porcine faecal sample.

### **Other diseases**

Lesions of post-weaning multisystemic wasting syndrome, associated with porcine circovirus type 2, were identified in a 6-week-old pig. *Salmonella* Derby was also isolated from this animal.

*Actinobacillus equuli* was isolated from swabs submitted from a batch of pigs with swollen eyes.

## **BIRDS**

### **Poultry**

A batch of 57-week-old laying hens was submitted for PME from an 8000-bird unit on which over 500 birds had died in the previous week. A heavy infestation with red mites was identified. This case highlights the difficulties in controlling this ectoparasite, including the shortage of effective licensed products.

Two-day-old ducks were submitted for PME with a history of respiratory disease and high mortality. *Riemerella anatipestifer*, *Salmonella* Orion and *S. Brandenburg* were isolated.

In a follow up investigation, several groups of ducks, aged 17 to 38 days, were submitted for examination. Lesions suggestive of bacteraemia or septicaemia, including fibrinous pericarditis, were seen in many birds. Some birds also showed evidence of septic arthritis and acute fibrinous meningitis. *S. Orion* was isolated in low numbers from many of these ducks.

Four pigeons were submitted from a racing loft with a history of weight loss, lethargy and reluctance to fly. *S. Typhimurium* was cultured. Histologically there was evidence of severe acute meningitis, nephritis and tracheitis with marked bacterial colonisation.

### **Cage and aviary birds**

An adult female kakariki was submitted with a history of weight loss and ill-thrift associated with vomiting. Histological examination of the proventriculus revealed aggregates of lymphocytes and macrophages in the lamina propria and numerous large rod-like bacilli on the surface of the mucosa. These organisms were morphologically consistent with *Macrorhabdus orinithogaster* which is a comycetous yeast and cause of megabacteriosis. This disease results in abnormal digestion and is especially important in budgerigars, cockatiels and finches. It may be diagnosed by microscopic examination of wet mounts of faeces, vomit or proventricular scrapings.

## **Wild birds**

A 10-year-old male Pochard duck (*Aythya ferina*) was submitted for PME from a nature reserve. Necropsy revealed that the syrinx was inflamed and filled with cheesy necrotic debris. Histologically there was evidence of severe necrotising tracheitis, associated with well-developed fungal mycelia. *Aspergillus* species were isolated, confirming fungal tracheitis.

Necropsy of a 6-year-old emperor goose (*Anser canagicus*), submitted from a nature reserve, revealed a severe fibrinous airsacculitis associated with numerous acid-fast organisms, consistent with avian tuberculosis.

Severe necrotising fungal airsacculitis was identified at PME of a 10-month-old female zoo gentoo penguin (*Pygoscelis papua*). *Aspergillus fumigatus* was cultured.

Six coloured doves (*Streptopelia decaocto*) were submitted for poisons analysis under the Wildlife Incident Investigation Scheme. *Trichomonas gallinae*, a common protozoan parasite of doves and pigeons, was identified. Hand-feeding these species in restricted areas, such as domestic gardens, allows these trichomonads to spread easily among susceptible avian species.

## **HORSES**

A total of 358 swabs were submitted for contagious equine metritis (CEM) culture during the second quarter of 2005. *Taylorella equigenitalis* was not isolated from any submission.

*Streptococcus equi* subspecies *equi* was isolated at high levels from a nasal swab from a sporting horse confirming a diagnosis of strangles.

Post-mortem examination of a 6-week-old foal with a history of diarrhoea confirmed a diagnosis of parasitic gastroenteritis with 27,000 *Strongyloides* species epg detected in faeces.

An equine foetus was found to have gross and histological changes consistent with equine herpes-virus type 1 (EHV1) infection. The dam was the 4<sup>th</sup> mare to have aborted in 3 weeks on the premises on which there were 31 at-risk mares. EHV1 antigen was detected in the foetal liver, lung and kidney. *KleibSELLA pneumoniae* was cultured from foetal stomach contents and organ pool. Further typing of this organism at the Animal Health Trust, Newmarket confirmed the presence of capsule type K5. *K. pneumoniae* capsule types 1, 2 and 5 may be spread venereally and it was recommended that the mare should not be used for breeding until negative swab (endometrial and clitoral) results were obtained and that any in-contact stallions or teaser stallions should also be tested.

A one-week-old colt foal was submitted with an initial history of slight scour associated with the mare's "foal heat". However it deteriorated rapidly and was found recumbent with tachypnoea, a temperature of 105.5F and a blood-stained nasal discharge. At PME, pulmonary oedema and necrosis, associated with bacteria (clumps) were seen. *Streptococcus zooepidemicus* was isolated from multiple tissues and *Actinobacillus equuli* from the lungs. The pulmonary necrosis is

consistent with *A. equuli* infection, which can be associated with a short course of illness and lethargy in foals. The effects of the *Actinobacillus* infection may have been potentiated by the concurrent streptococcal infection.

Antibodies to equine herpesvirus (EHV) were detected in a blood sample submitted from a mare that had given birth to a premature foal. The mare subsequently developed posterior paralysis and abnormal gait.

A blood sample submitted from a mare, which had aborted 6 weeks prematurely, was found to have a titre of 1/100 to *Leptospira Canicola*.

### **MISCELLANEOUS MAMMALS**

A yearling farmed red deer (*Cervus elephas*) was submitted in poor body condition with a history of diarrhoea. The lymph nodes of the entire mesenteric chain were markedly enlarged with evidence of caseous necrosis and the ileum was thickened. Granulomatous lesions associated with large numbers of acid-fast bacilli were observed histologically in intestine and lymph nodes confirming Johne's disease.