Regional Veterinary Laboratories - Surveillance Report 2008

Department of
Agriculture,
Fisheries and Food
An Roinn
Talmhaíochta,
Iascaigh agus Bia

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Contents

Introduction

This is the fourth Annual Report on the animal disease surveillance activities of the Department of Agriculture, Fisheries and Food (DAFF) Regional Veterinary Laboratory Service. The report provides an overview of the identified causes of diseases in farm animals – both through the examination of carcases and clinical pathology material submitted to the laboratory, as well as the results of on-farm investigations by laboratory staff.

The Regional Veterinary Laboratory (RVL) network was established in 1967, assuming an integral role in the national animal disease surveillance programme through the delivery of a diagnostic pathology service to the farming community. The six RVLs, strategically located in Sligo, Athlone, Dublin, Kilkenny, Limerick and Cork, provide a diagnostic pathology, investigative and advisory service to farmers through their private veterinary practitioners. Clinical samples from live animals, or carcases of dead animals, are received in the RVLs on a daily basis. The investigations conducted in the RVLs by veterinary pathologists and laboratory analysts assist in the diagnosis, treatment and prevention of animal diseases, thereby optimising herd health and animal welfare.

In addition to monitoring the occurrence of endemic diseases, the DAFF Regional Veterinary Laboratory surveillance network contributes to maintaining the health of the national herd by ensuring rapid recognition of new or exotic diseases. Livestock production contributes in excess of €4 billion to the Irish economy annually. Through the assurance provided to consumers, both in Ireland and abroad, of the favourable health status of the national livestock population, the surveillance activities of the RVL network also facilitate the access of Irish livestock to international export markets. Complacency however is an ever-present threat to our freedom from various Office International des Epizooties (OIE) listed diseases. Outbreaks of exotic diseases such as Foot and Mouth and Bluetongue in other jurisdictions provide a continual reminder of the importance of the surveillance role of the laboratory network - not alone to the agricultural industry but to the economy as a whole.

All parts of the DAFF Veterinary Laboratory Service, including the Regional Laboratories, are linked by an integrated Laboratory Information Management System (LIMS) which has been in operation since 2002. It facilitates the recording of all submission information from sample receipt, through testing, to authorisation and final reporting. It also acts as a central database on which details relevant to individual animal disease investigations can be recorded. The LIMS generates readily accessible data for the occurrence of diseases in Irish livestock, facilitating the detection of changing patterns of disease throughout the country.

The Regional Veterinary Laboratories are staffed and operated by veterinarians, laboratory analysts, administrative, and support grades. This RVL Disease Surveillance report, which is a summary of their work during 2008, provides a unique source of information on the occurrence of disease in farm animals in Ireland. It should be of interest to herdowners, private veterinary practitioners, industry, researchers and farm advisors.

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Diseases of Cattle

Neonatal Calves (birth to one month of age)

Enteric infections, at 29 *per cent* of submissions, were the most frequently diagnosed conditions in neonatal calves (birth to one month of age) submitted for *post mortem* examination during 2008 (Figure 1). These were followed by septicaemias and bacteraemias at 19 *per cent*, and respiratory infections at 14 *per cent*. This is consistent with the patterns for 2006 and 2007 (Figure 2). Rotavirus (32.3 *per cent*) and *Cryptosporidia spp.* (19.8 *per cent*) were the agents most frequently associated with enteric infections.

Cryptosporidia spp. are a common cause of diarrhoea in humans. *C. hominis* is almost exclusively a human pathogen while *C. parvum* has a wider host range and can infect both animals and humans. Routine examination of calf faeces in the diagnostic laboratories does not identify the species of *Cryptosporidium* but this can be undertaken when an outbreak in humans is being investigated.

A more detailed analysis of faecal examinations from calves less than one month of age is presented in the Bovine Neonatal Enteritis section on page 6.

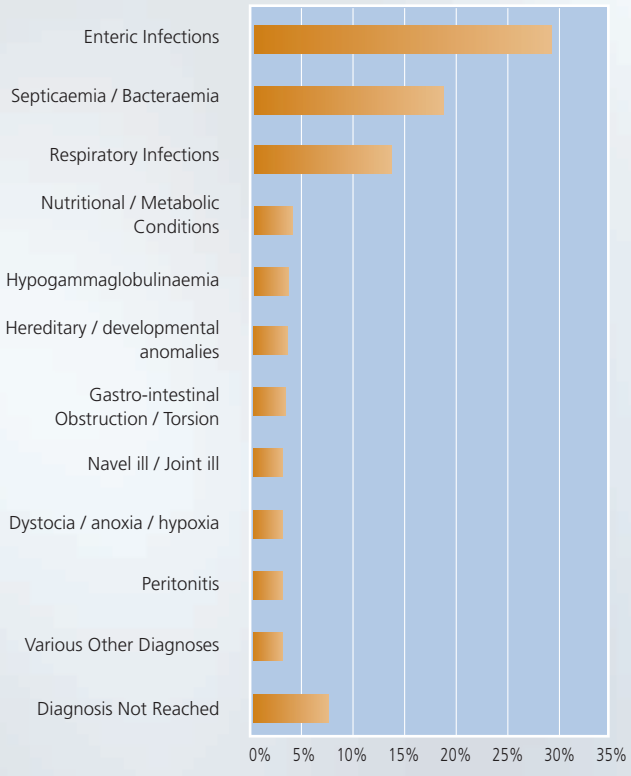

Figure 1: The most commonly diagnosed causes of mortality in calves from birth to one month of age (n=848).

Escherichia coli (40.4 *per cent*) was the pathogen most frequently associated with septicaemia or bacteraemia diagnoses followed by *Salmonella* Dublin (19.9 *per cent*). *Pasteurella multocida* (11.2 *per cent*) and *Mannheimia haemolytica* (10.4 *per cent*) were the pathogens most frequently isolated from the carcases of calves diagnosed with respiratory infections.

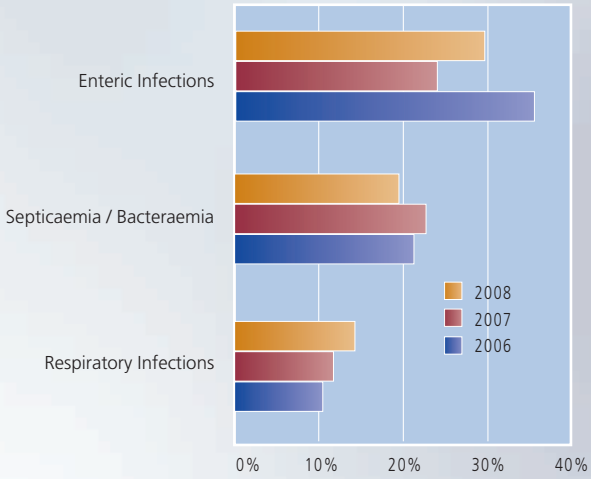

Figure 2: A comparison of the most frequently diagnosed conditions in calves from birth to one month of age for the years 2006 to 2008.

Calves (one to three months of age)

Respiratory infections at 32 *per cent* were the most frequent diagnoses in calves between one and three months of age. These were followed by enteric infections (15 *per cent*) and septicaemias and bacteraemias (10 *per cent*) (Figure 4). This is a similar pattern to previous years (Figure 5). *Pasteurella multocida* (23.6 *per cent*), *Mannheimia haemolytica* (13 *per cent*) (Figure 3) and *Arcanobacterium pyogenes* (7.5 *per cent*) were the three most frequently isolated respiratory pathogens.

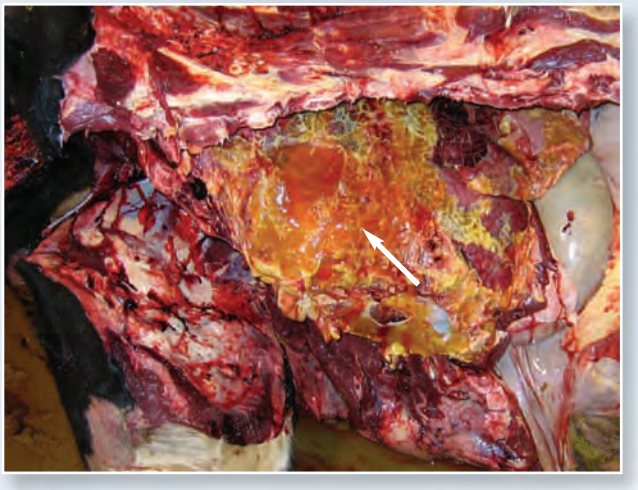

Figure 3: Severe fibrinous pleuropneumonia (arrow) in a 3 month old calf due to *Mannheimia haemolytica* (Photo: John Fagan).

The most frequently identified enteric pathogens were *Coccidia spp.* at 15.1 *per cent*. Coccidiosis is more frequently diagnosed in calves older than one month of age because the pre-patent period of *Coccidia* species can be up to 20 days. For this reason the faeces of calves under 3 weeks of age are not routinely examined for coccidial oocysts.

Peak *coccidia* oocyst-shedding often does not correlate with the onset of diarrhoea in calves. Detection of *Coccidia spp.* in faecal samples is facilitated by sampling pre-clinical comrade animals as well as those showing clinical signs.

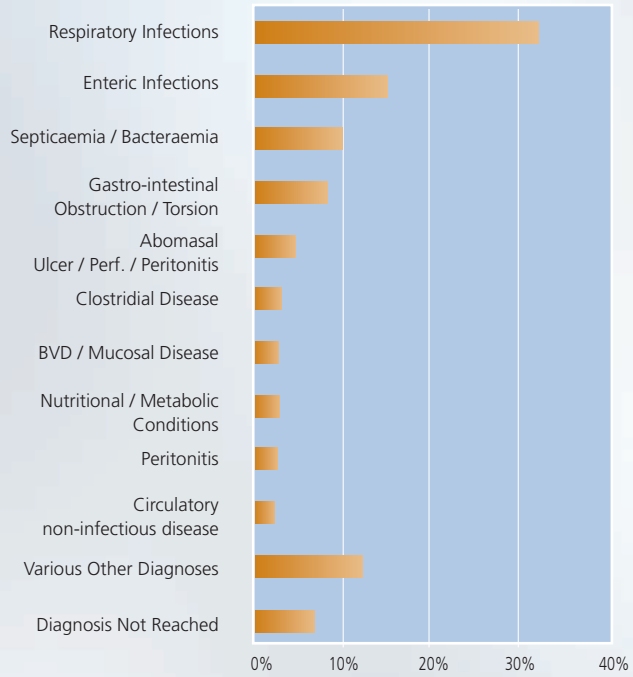

Figure 4: The most commonly diagnosed causes of mortality in calves between one and three months of age (n=499).

Salmonella Dublin (26 *per cent*) was the pathogen most frequently isolated from calves diagnosed with septicaemia or bacteraemia in this age group.

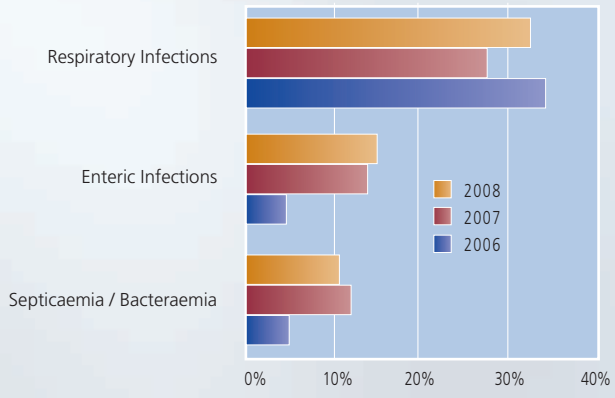

Figure 5: A comparison of the three most frequently diagnosed conditions in calves between one and three months of age for the years 2006 to 2008.

Weanlings (three months to one year of age)

Respiratory infections, enteric infections and BVD/Mucosal disease were diagnosed as the causes of death for 29 *per cent*, 13 *per cent* and 7 *per cent*, respectively, of all bovine weanling carcase submissions to the laboratories in 2008 (Figure 6).

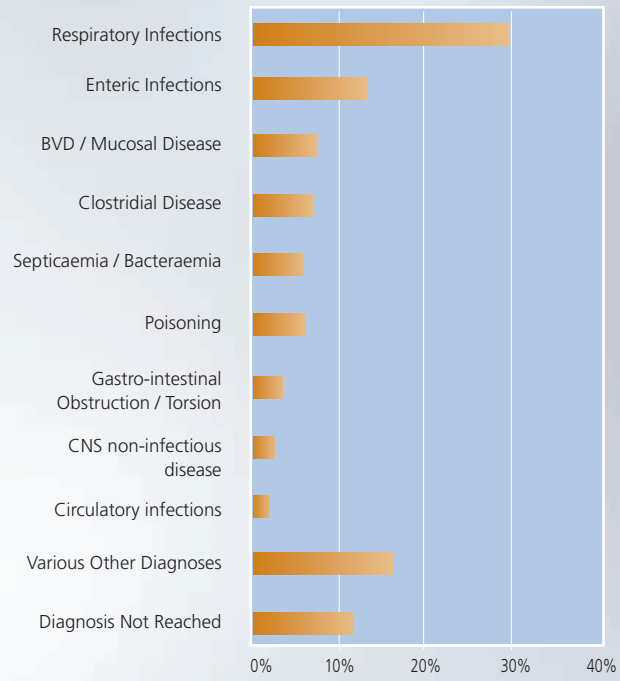

Figure 6: The most commonly diagnosed causes of mortality in weanlings (n=388).

The diagnosis of clostridial disease in 2008 – at 6 *per cent* of carcase submissions – was down from 12 *per cent* in 2007. This is possibly a reflection of increased rates of vaccination by herdowners in 2008 (Figure 7).

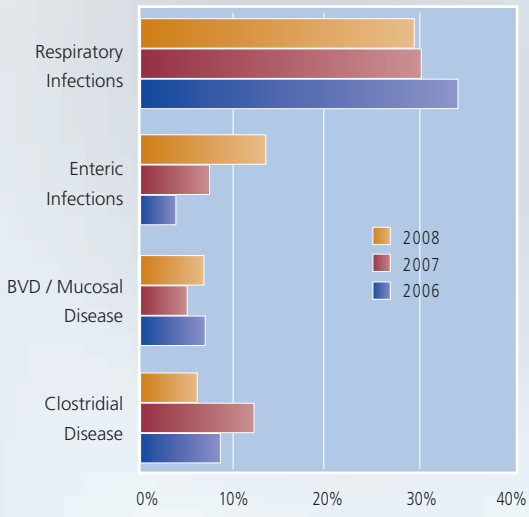

Figure 7: A comparison of the most frequently diagnosed conditions in the years 2006 to 2008 in weanlings from three months to one year of age.

The most commonly identified pathogens in carcases in this age group in which respiratory infections were diagnosed were the strongyle parasite *Dictyocaulus spp*. (19.3 *per cent*) and the bacteria *Pasteurella multocida* (14.0 *per cent*) and *Mannheimia haemolytica* (11.4 *per cent*). The increase in diagnoses of *Dictyocaulus spp.* in weanlings from a level of 8.9 *per cent* in 2007 can be attributed to the very wet summer of 2008. Parasitic gastro-enteritis accounted for 29 *per cent* of enteric infections diagnosed in carcases of weanlings examined in 2008. Further analysis of bovine parasitic disease is presented in the Parasitic Disease section on page 16.

Appropriately applied and effective anthelmintic therapy is a necessary step in reducing losses due to parasitism. Herdowners should be aware that parasitism is a potential problem in an animal's second grazing season as some of the avermectin treatment programmes are so efficient in controlling the parasite that animals fail to develop adequate immunity to the parasite during their first grazing season.

Adult Cattle

As in 2007, respiratory infections, at 14 *per cent*, were the most frequently diagnosed condition in adult cattle submitted for *post mortem* examination during 2008 (Figure 8). Nutritional and metabolic conditions were the second most-frequently diagnosed at 8 *per cent*. This compares to 4 *per cent* in 2007 (Figure 9). This group of diagnoses includes hypomagnesaemia, fatty liver disease (*see* Figure 10), ruminal acidosis, copper, and cobalt and selenium deficiencies. Further analysis of the results of copper and selenium tests in cattle is available on Page 21.

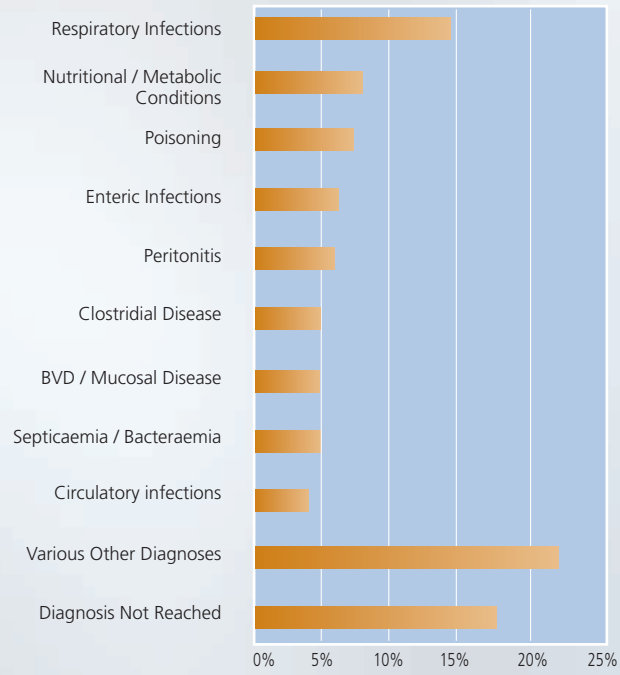

Figure 8: The most commonly diagnosed causes of mortality in adult bovines (n=267).

The variety of diagnoses in adult cattle is greater than in the younger age-groups – hence the relatively high percentage in the category *"Various other diagnoses"* in Figure 8. A diagnosis was not reached in 18 *per cent* of adult cattle carcase submissions. Included in this number are submissions received from private veterinary practitioners comprising parts of carcases from adult animals examined *post mortem* in the field. In many of these cases, the necessarily limited nature of sample selection can hinder the achievement of a conclusive diagnosis. Equally, the presentation of carcases of adult animals in advanced autolysis limits the tests which can be performed to achieve a diagnosis.

When it is necessary to carry out *post mortem* examinations in the field, it is important that veterinary practitioners take the most appropriate samples for laboratory examination - and also preserve and package them properly. Pathologists at the RVLs are available to give advice in this regard.

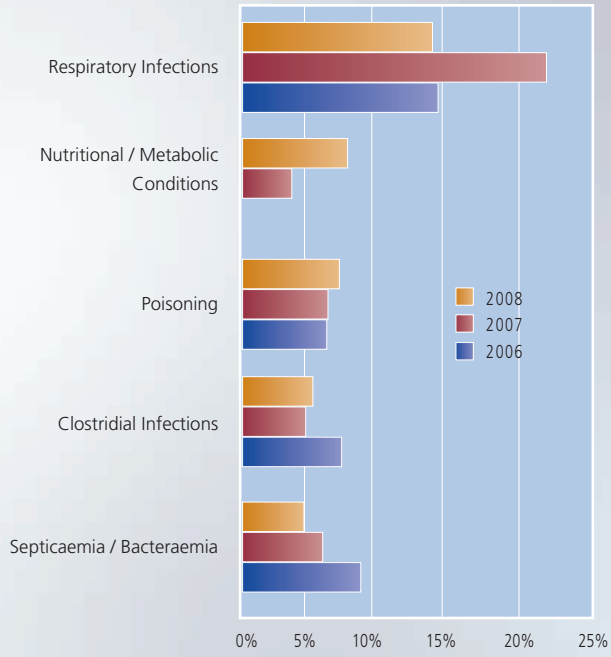

Figure 9: A comparison of the most frequently diagnosed conditions in adult bovines in the years 2006 to 2008.

Figure 10: An enlarged liver with a yellow greasy appearance from a cow with severe fatty liver disease (Photo: Ger Murray).

Poisonings in Cattle

Ingestion by cattle of poisonous plants or other materials continues to be the cause of death of a significant number of adult cattle each year. In 2008 there was an increase in the diagnoses of ragwort poisoning compared to previous years. Analysis of the data shows that many of these diagnoses were made in late spring and early summer - probably reflecting the intake of contaminated silage during the previous winter/spring.

Figure 11: There was an increase in the numbers of deaths in cattle due to Ragwort ingestion in 2008 (Photo: Ger Murray).

Ragwort (*see* Figure 11) is a noxious weed and herdowners should concentrate on preventing the ragwort plant from being inadvertently included in winter forage.

Clostridial Diseases in Cattle

The number of cases of clostridial disease diagnosed in bovine carcase submissions decreased from 74 in 2007 to 57 in 2008. This was primarily due to a decrease in the number of Blackleg diagnoses - from 39 to 25. Neither Black Disease nor Bacillary Haemoglobinuria were diagnosed in cattle submitted to the Regional Veterinary Laboratories in 2008. *Clostridium chauvoei* (14), *Clostridium sordellii* (10) and *Clostridium septicum* (8) were the most frequently isolated *Clostridia* species. *Clostridium chauvoei* and *C. sordellii* were isolated primarily from bovines ranging in age from 2 months to just under 2 years of age.

Vaccination for clostridial diseases remains an important part of on-farm disease control programmes.

Bovine Neonatal Enteritis

Enteritis is the most common cause of mortality in calves less than one month of age (*see* Figure 1) - resulting in considerable financial losses to calf producers. Many of these losses are avoidable through the implementation of good husbandry practices such as the proper feeding of colostrum, good hygiene and the use of appropriate vaccination protocols. The association between a high incidence of enteritis and colostrum deprivation is well established. Calves are born with low levels of circulating antibodies. The ingestion by the calf of adequate quantities of maternal antibody-rich colostrum in the first few hours of life is a vital step in reducing the incidence of neonatal calf disease and death.

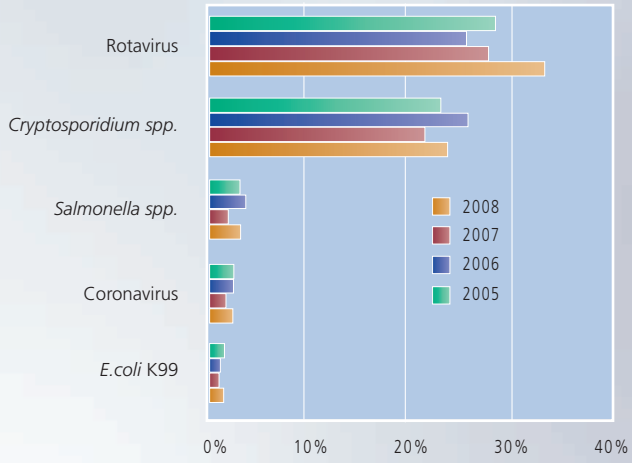

Figure 12: Trends in the incidence of pathogenic agents detected in faecal samples submitted to the RVLs for calf enteritis tests in the years 2005 to 2008.

The *'calf enteritis package'* comprises a series of tests performed by the Regional Veterinary Laboratories on faecal samples from calves under one month of age. In order to facilitate identification of the specific pathogen involved in cases of calf diarrhoea, it is important that samples be submitted from recently infected animals – preferably prior to treatment.

The relative frequencies of pathogens identified in faecal or intestinal content samples submitted to the RVLs in the years 2005 to 2008 are shown in Figure 12. Rotavirus was the most frequently identified pathogen in each of the four years – ranging from about 26 to 34 *per cent* of submissions. *Cryptosporidium* species were the second most frequently detected pathogen – accounting for between 21 and 26 *per cent* of identifications. *Salmonella spp.*, coronavirus and K99 *E.coli* were much less frequently identified at 2.9, 2.3 and 1.3 *per cent* respectively. K99 *E.coli* is a significant pathogen in calves less than one week of age. As the K99 *E.coli*–positive cases are expressed here as a proportion of calves up to one month of age, the proportion of enteritis cases in calves of less than 1 week of age that are attributable to K99 *E. coli* is undoubtedly greater than 1.3 *per cent.*

The Zinc Sulphate Turbidity Test (ZST) is used as a crude measure of antibody levels in calves up to about 10 days of age.

A low value, i.e. under about 16 units, indicates the calf did not receive adequate colostrum in the critical 12 to 24 hours after birth. It is a useful laboratory tool in determining if this vital stage in the management of newborn animals is adequate.

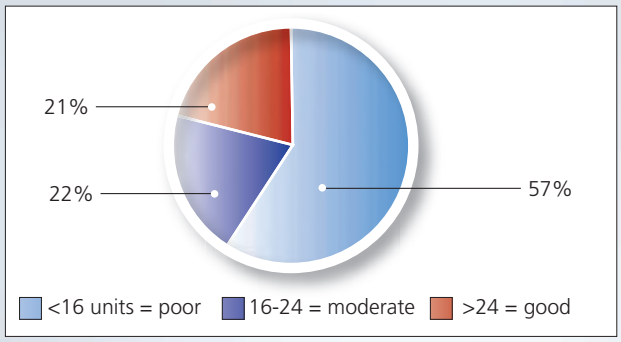

Figure 13: The immunoglobulin status of young calves resulting from colostral antibody transfer as indicated by the ZST test (n=986).

A total of 986 samples from calves were tested, to determine their immunoglobulin status, in 2008. This represents a 30 *per cent* increase in the number of requests for this test in comparison to 2007. Nevertheless, the results for 2008 (*see* Figure 13) show an almost identical pattern to 2007, with over half of all samples tested (57 *per cent*) having a value of less than 16 units.

A further 22 *per cent* recorded values of 16 to 24 units - reflecting only moderate colostrum intake. Only 21 *per cent* of blood samples tested had ZST values which are internationally recognised as being consistent with adequate intakes of colostrum (i.e. greater than 24 units).

While low ZST values can generally be taken to indicate that the calf received insufficient volume of colostrum in the vital 12 to 24 hours after birth, in certain circumstances, factors such as mineral or Vitamin E supplementation of the dam in the weeks immediately preceding calving/lambing can compromise the efficiency of neonatal immunoglobulin G absorption. Postnatal respiratory acidosis in calves has also been observed to adversely affect colostral immunoglobulin absorption, despite adequate colostrum intake early in the absorptive period.

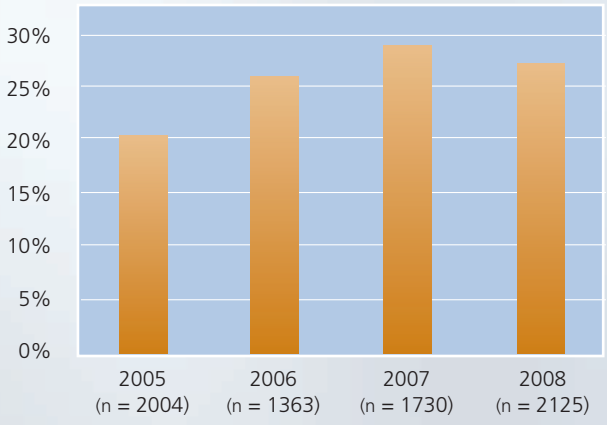

Figure 14: Trends in the detection of *Coccidia spp.* oocysts in calf faecal samples as a percentage of all faecal samples submitted to the RVLs for *Coccidia spp.* detection in the years 2005 to 2008.

The proportion of bovine faecal samples submitted for coccidial oocyst counts in which coccidial oocysts were detected in 2008 was broadly similar to the results recorded for the three previous years (Figure 14). However, coccidiosis is still a significant cause of poor performance and calf enteritis, particularly in calves older than three months of age. Prevention of coccidiosis focuses on practices which improve hygiene and reduce moisture in the calf's environment.

Bovine Abortion

2008 marked the third successive year that *Brucella spp.* have not been isolated from any of the foetal specimens cultured in the RVLs. The EU approved Ireland's application for "Officially Brucellosis Free" status in July 2009.

Abortions represent a significant economic loss on Irish farms – whether as isolated cases or as outbreaks. Aborted bovine foetuses are examined daily in the RVLs for evidence of Brucellosis, and to investigate other possible aetiologies, many of which also pose a potential threat to human health *(e.g. Listeria monocytogenes, Salmonella spp.)*

When foetuses are examined *post mortem* in the laboratory, specific gross lesions are often absent. A sample of foetal stomach contents is collected from all foetuses for routine culture. In addition, heart blood or pleural fluid is collected to carry out serological testing. Depending on the degree of autolysis, tissues can also be taken for microbiological and histopathological examination.

Specimens from 2,014 abortions were cultured in 2008, reflecting an increase of 22 *per cent* compared to 2007. The majority of submissions comprise entire foetuses. However, stomach contents and placentas may also be submitted by veterinary practitioners following *post mortem* examinations conducted in the field. The results of all cultures on bovine foetal submissions for the three years 2006 to 2008 are presented in Table 1.

Agent	2006	2007	2008
Arcanobacterium pyogenes	6.9%	5.8%	5.6%
Salmonella Dublin	6.1%	7.0%	4.6%
Bacillus licheniformis	4.1%	4.5%	2.7%
Listeria monocytogenes	1.3%	1.6%	1.8%
Aspergillus spp.	0.5%	0.9%	1.2%
Brucella spp.	0%	0%	0%
Totals	1,977	1,647	2,014

Table 1: A comparison of bovine foetal culture results for the years 2006 to 2008.

Arcanobacterium pyogenes is the most commonly isolated pathogen associated with sporadic abortions in cattle. This ubiquitous organism is also frequently isolated from abscesses, as well as from cases of mastitis and pneumonia. Following haematogenous spread to the placenta, placentitis may develop leading to foetal hypoxia, death, and abortion. On gross examination, widespread autolysis is commonly noted in the foetus.

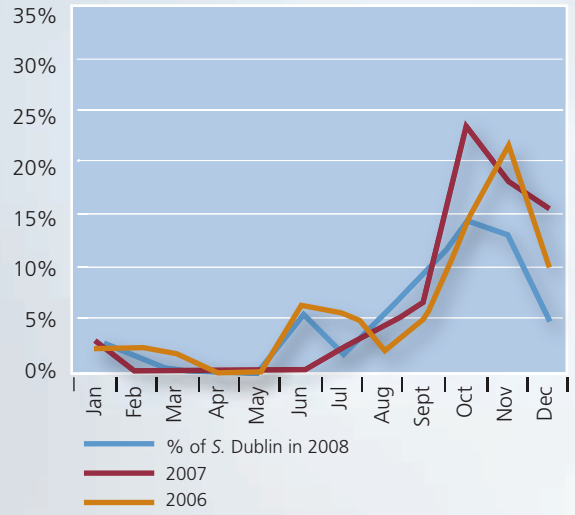

Figure 15: The seasonal trend of *Salmonella* Dublin abortions as a percentage of all foetal submissions in the years 2006 to 2008.

The proportion of abortion cases associated with *Salmonella* Dublin infection showed a decrease in 2008 compared to the previous two years (Figure 15). The now familiar seasonal distribution of *S.* Dublin abortions, with a notable increase in the latter months of the year, was also in evidence in 2008 (Figure 16). No other *Salmonella spp.* serotypes were identified as the cause of bovine abortions during 2008.

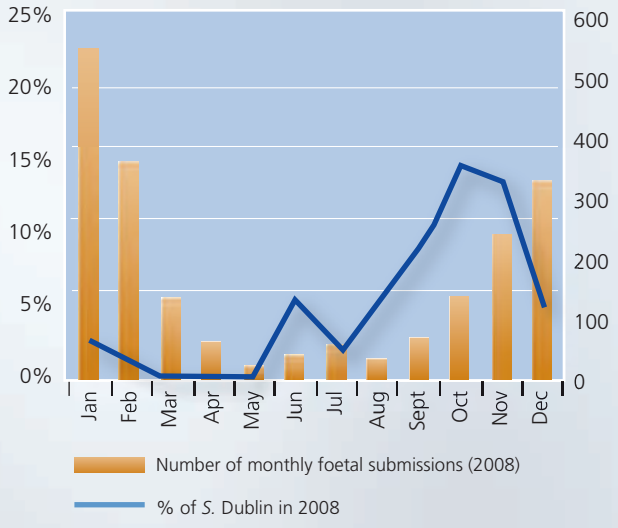

Figure 16: The percentage of *Salmonella* Dublin abortions as a percentage of all bovine foetal submissions during 2008 (n= 2,014).

B. licheniformis causes sporadic abortions in cattle. Typically, the gross *post mortem* finding of placentitis with thickening of the allantochorion, is observed in non autolysed foetuses. The frequency of isolation of *B.licheniformis* from foetal cultures in 2008 at 2.7 *per cent* has decreased relative to 2007 (4.5 *per cent*) and 2006 (4.1 *per cent*).

The frequency of isolation of *Listeria monocytogenes* from cultured foetal specimens, at 1.8 *per cent*, is similar to previous years. The organism can multiply in poorly preserved silage and discharges from aborting cows provide further sources of infection. When conditions are suitable for the contamination of water and feed, multiple abortions can result.

Other microorganisms isolated from foetal culture were *Escherichia coli* (139 isolates), *Streptococcus spp.* (56), *Proteus spp.* (22), other *Listeria spp.* (20), *Staphylococcus spp.* (14), *Bacillus spp.*(11), *Aeromonas hydrophila* (3), *Campylobacter spp.* (3), *Pasteurella spp.* (2), *Candida spp.* (2), *Pseudomonas spp.* (2), *Mannheimia haemolytica* (1), *Mucor spp.* (1), *Mycoplasma spp.* (1), *Pseudomonas spp.* (1), *Yeast spp.* (1), *Yersinia spp.* (1). While involvement of these microorganisms in abortions cannot be ignored, in many cases their isolation may be attributed to their ubiquitous presence in the environment.

Leptospira interrogans serovar *hardjo* is associated with abortion and milk drop syndrome in cattle and is of significant zoonotic potential, capable of causing human infection *via* infected foetal material or urine. It is diagnosed by the detection of *Leptospira interrogans* serovar *hardjo* specific antibodies using a solid phase immunoassay method. Typically, titres equal to, or higher than 1 /100, are considered to be positive. In addition to the serological test results shown in Table 2, tests on tissues were undertaken in a further 38 foetuses, producing only one positive result.

Agent		2007	2008
L. hardjo (serology)	Number Tested	431	544
	Number Positive (>1/100)	14	22
	Percentage	3.2%	4.0%
Neospora caninum	Number Tested	771	65
	Number Positive	38	1080
	Percentage	4.9%	6%
BVD virus [1]	Number Tested	683	812
	Number Positive	38	46
	Percentage	5.6%	5.7%

Table 2: The frequency of detection of *Leptospira hardjo, Neospora caninum* and BVD virus in foetal carcases in 2007 and 2008.

[1] BVDV abortions are diagnosed by detecting BVD viral antigen in foetal tissue. The detection of BVDV antibodies in an immune competent foetus suggests exposure to the virus in the last two thirds of gestation. The figures for foetuses with a positive titre to BVDV antibodies were not included in this table.

Neospora caninum is a protozoan parasite with a two-host life cycle that causes abortion in many mammals including cattle. The reproductive stage occurs in the dog (the definitive host) and oocysts are released in the dog's faeces. Following ingestion by the intermediate host (*e.g.* cattle), tissue cysts are formed. Transplacental infection of the foetus may occur during pregnancy leading to either abortion or the birth of congenitally infected calves. Neosporosis is diagnosed by the detection of *Neospora* specific antibodies in foetal pleural/thoracic fluid. *Neospora* abortion may also be diagnosed by the Indirect Fluorescent Antibody Test (IFAT) or by histopathological examination of the brain or myocardium. In addition to the *Neospora caninum* serological results in Table 2, 352 other foetuses were examined by IFAT. 31 (8.8 *per cent*) of these were positive. Overall in 2008 there was a slight increase in the proportion of submissions positive for *Neospora caninum*.

Bovine Mastitis

During 2008 a total of 3,474 bovine milk samples was submitted to the six RVLs for bacterial culture and antibiotic sensitivity testing. As in previous years, there was a marked peak in sample throughput in October and November which coincides with the 'drying-off' of cows (Figure 17).

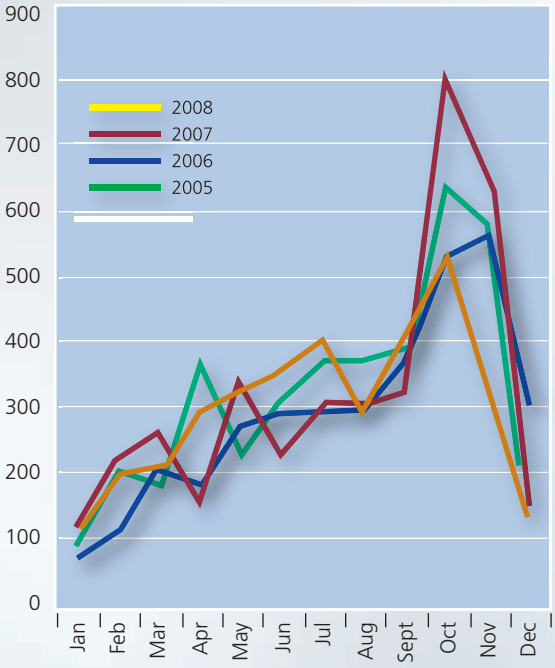

Figure 17: Milk sample submission numbers by month for the years 2005 to 2008.

The relative frequency of isolation of various mastitis pathogens in 2008 followed a similar pattern to that of recent years and is illustrated in Figure 18.

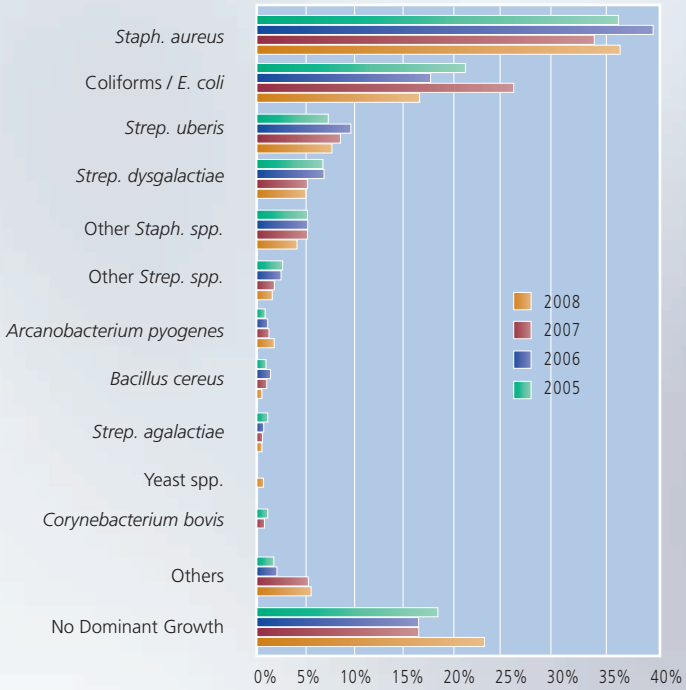

Figure 18: The relative frequency of isolation of mastitis pathogens in the years 2005 to 2008.

Staphylococcus aureus was the pathogen most frequently isolated from milk samples submitted in 2008 (36.1 *per cent*).

Staphylococcus aureus mastitis causes both clinical and subclinical mastitis and is a cause of substantial financial loss to Irish farmers annually. Control of this organism is best achieved through adherence to hygienic milking procedures, proper milking machine maintenance, appropriate therapy and culling of chronic cases.

Similar to the trends identified in previous years, the isolation rate of *Staphylococcus aureus* varied throughout the year with the highest incidence in the summer and autumn months (Figure 19).

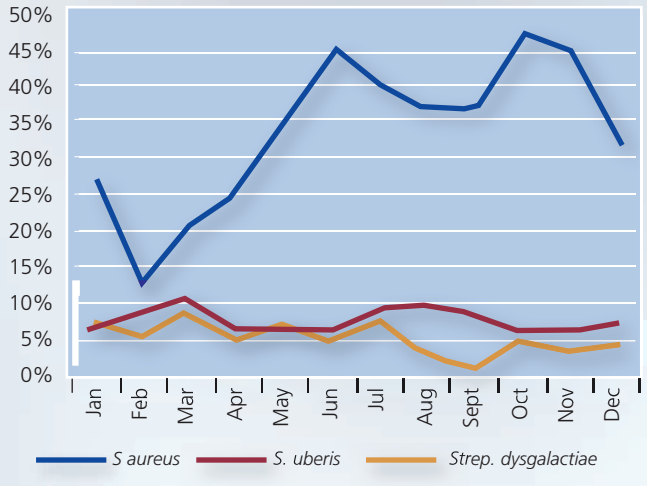

Figure 19: The isolation rates, by month, of *Staphylococcus aureus, Streptococcus uberis* and *Streptococcus dysgalactiae* as a percentage of all milk sample submissions in 2008 (n=3,474).

Streptococcus uberis is an environmental pathogen which typically infects cows during the dry period or in early lactation. Subclinical mastitis with elevated somatic cell counts is a common sequel to infection. Managing the environment during the dry period – i.e. provision of clean calving areas and maintaining clean dry teats - is critical to the control of the pathogen. *Streptococcus uberis* was isolated from 8.2 *per cent* of milk samples cultured in 2008.

Streptococcus agalactiae, a pathogen sometimes associated with severe herd outbreaks of mastitis, continues to be a rare finding, being isolated from only 10 of the samples submitted (0.3 *per cent*).

Contaminated milk samples typically yielded growths of coliform bacteria, which are reflected in its high isolation rate (*see* Figure 18). To avoid contamination, it is important that milk samples are collected aseptically into sterile containers, refrigerated immediately and delivered to the laboratory as soon as possible.

Bovine Respiratory Disease

Respiratory disease represents a major cause of morbidity and mortality in Irish cattle. The RVLs receive specimens for respiratory disease diagnosis from affected live cattle as well as from the carcases of animals that have died. Four hundred and twenty nine of 2,002 bovine carcases submitted to the RVLs during 2008 were recorded as having a primary diagnosis of respiratory disease (21.5 *per cent*). In the vast majority of these cattle, the lesions comprised chronic pneumonia of cranio-ventral distribution. These were presumed to represent the end-stage of respiratory infection. Consequently, sampling and testing for known primary respiratory pathogens of cattle (such as viruses or *Mycoplasma bovis* that may have elicited this pathogenic process) was not always attempted - and where attempted, the frequency of detection of these pathogens was relatively low (Table 3).

Pathogen	Number Positive	Number Tested	% Positive
BHV1 (IBR virus)	15	275	5.4%
BRSV	23	282	8.2%
PI3 virus	5	271	1.8%
BVD virus	16	342	4.7%
Mycoplasma bovis	2	49	4.1%

Table 3: The relative frequency of detection of primary respiratory pathogens in necropsy cases of respiratory disease in 2008.

BVD virus infection is frequently cited as a contributory factor in the pathogenesis of respiratory disease. Some studies have shown a relatively high incidence of BVD virus-positive animals among those identified with respiratory lesions on *post mortem* examination. Given that only 1-2 *per cent* of Irish cattle that are blood sampled and tested for BVD virus are shown to be viraemic (i.e. either transiently or persistently infected with the virus), the rate of detection of viraemic animals within the cohort described here was not exceptionally high.

Routine bacteriological culture of lung tissue is performed on samples from all carcases identified with lung pathology on *post mortem* examination (Table 4). The bacterial pathogens which are isolated are probably often secondary to primary viral agents.

Agent	Number of Isolates	Percentage of total
Pasteurella multocida	77	19.3%
Mannheimia haemolytica	40	10.0%
Arcanobacterium pyogenes	26	6.5%
Histophilus somni	8	2.0%
Sterile/no specific growth	122	30.6%

Table 4: The relative frequency of detection of bacterial pathogens in necropsy cases of respiratory disease (n=399).[2]

Testing of nasal swabs provides a sensitive means of detection of respiratory viruses (Figure 20). The successful detection of respiratory viruses is dependent on a number of factors, namely, the selection of viraemic animals for sampling, the avoidance of cross-contamination and the rapid dispatch of the sample to the laboratory.

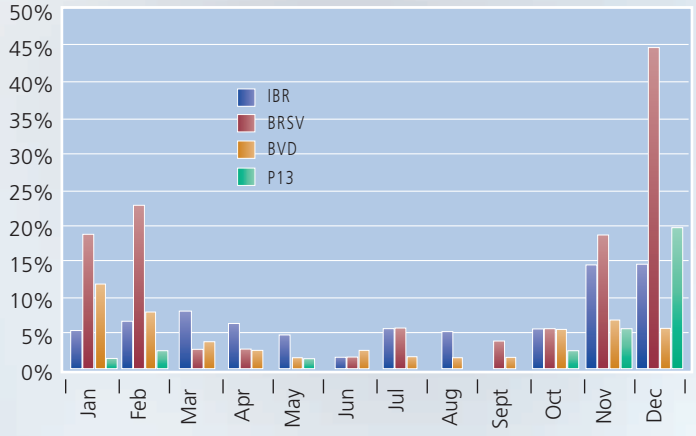

Figure 20: The relative frequency of detection of viruses implicated in bovine respiratory disease during 2008 as a percentage of all nasal swabs tested at the Central Veterinary Research Laboratory (CVRL), Backweston.

[2] *E. coli* was the only isolate from 80 bacteriological cultures of lung tissue. Other coliform species and miscellaneous bacterial species were isolated from the remainder of the 399 sampled but none with a frequency of greater than 2.

Nasal swabs from acutely or recently ill animals are the samples of choice for the diagnosis of respiratory disease. These are tested by PCR for specific respiratory viruses in the laboratory. Alternatively, paired serum samples can be collected from individual animals during the acute and convalescent phases of the disease for antibody testing. It is important that the vaccination status of the animals is outlined on the laboratory submission form.

Acutely ill animals will have little or no antibody against the particular disease-causing organism. Therefore the submission of nasal swabs to the laboratory is preferable to the submission of serum samples in such animals to achieve a diagnosis. If unsure regarding appropriate selection of animals for sampling, contact laboratory pathologists for advice.

The relatively low frequency of detection of respiratory viruses underscores the value of careful histopathological examination of affected lung tissue to try and identify hallmarks of viral pneumonia (e.g. interstitial or broncho-interstitial pathology).

Figure 21: Pulmonary thrombosis secondary to caudal venae cava thrombosis in a cow (Photo: Dónal Sammin).

Bulk milk samples are a very cost effective method of viral screening of many animals at once. Virology Section, CVRL, Backweston finds them most useful for IBR Enzyme Linked ImmunoSorbent Assay (ELISA) for antibody and BVD Polymerase Chain Reaction (PCR) for virus. Both tests can give a useful indication of herd immunity and/or disease. It is important to remember that only cows which are currently milking are assessed by a bulk milk tank test. 45-50ml of fresh milk is the minimum volume required for the test protocols in place at CVRL. Ideally two 50 ml milk samples in universal containers (Sarstedt type) should be sent together and an additional sample should be frozen and stored as a back-up. As fresh milk is not sterile, preservative tablets such as Lactab Mark III tablets or equivalent should be added to the milk, and the sample should be stored at 4°C. To ensure optimal condition of the sample on arrival at the laboratory, the milk sample should not be posted over the weekend.

The Pooling Method for BVD Virus Detection

The options to identify animals persistently infected with BVD virus (PI animals) have been improved and made more practical and economical with the introduction of the Polymerase Chain Reaction (PCR) for BVD on pooled serum samples from herds. The procedure allows for the pooling of samples in groups of 10, with each pool being tested for BVD virus (e.g. 100 cattle form 10 pools). If a pool is positive, then the samples from that pool are tested individually for the virus. Testing of pooled samples in this way can significantly reduce the costs to the herdowner of identifying PI animals in their herd. Practitioners who wish to undertake BVD pooled PCR testing for a herd should contact the Regional Veterinary Laboratory (RVL) prior to sampling to arrange emailing of the animal tag numbers to the RVL. Emailing the electronic file in advance facilitates automatic logging in when samples are received in the laboratory.

It must be borne in mind that even if a full herd is tested, and PI animals are eliminated, that calves present *in utero* while PI animals are present on farm, and born subsequently, could possibly be persistently infected. These animals should also be checked after they are 6 months old to ensure complete eradication of the virus from the herd.

When the virus has been successfully eradicated from a herd it is important to maintain appropriate biosecurity (*e.g.* the isolation and BVD testing of bought-in animals before they join the herd, appropriate disinfection etc.) to prevent its reintroduction. Following eradication, herd immunity is totally dependent on vaccination.

Johne's Disease 2008

Johne's Disease is a Class B notifiable disease caused by infection with the bacterium *Mycobacterium avium* subspecies *paratuberculosis* (MAP). The bacterium has a wide host range but the disease is primarily of concern in domesticated ruminants. In 2008, 416 samples from bovine animals were submitted for MAP culture. The increased numbers of faecal submissions were due, in part, to the follow-up faecal testing of seropositive animals. This can help to identify possible false positive serology results due to infection with non-pathogenic environmental *Mycobacteria spp.*. The percentage of positive animals identified on MAP faecal culture in 2008 (22.1 *per cent*) is consistent with the average value for the last three years (Table 5).

Year	Tests	Positive (%)	Herds positive
2005	206	17.0	31
2006	170	25.3	27
2007	304	19.4	32
2008	416	22.1	62

Table 5: *Mycobacterium avium* subsp. *paratuberculosis* (MAP) faecal culture results from cattle for the years 2005 to 2008.

Analysis of data on infected animals identified in 2008 reveals that 92 *per cent* were born in Ireland and this is consistent with the data for 2007.

As the development of the disease in animals is slow, clinical signs are most frequently observed in cattle between 2 and 6 years of age. Eighty two *per cent* of infected cattle were female, with dairy and beef breeds being equally represented. The majority of the bulls infected were of the Limousin breed. An analysis of the age of culture positive animals in 2008 showed that almost 50 *per cent* of infected animals were between 2 and 4 years of age, while nearly 40 *per cent* were between 5 and 6 years of age.

A survival analysis of culture-positive animals revealed that 78 *per cent* were dead within 6 months of the receipt of material for culture at the RVL.

The number of sera tested for MAP specific antibodies continues to increase annually with an average of approximately 7 *per cent* testing positive each year (Table 6).

Year	Tests	Positives	Positives (%)
2005	2001	152	7.6
2006	2185	183	8.4
2007	2755	173	6.3
2008	3372	229	6.8

Table 6: The percentage of sera which tested positive for *Mycobacterium avium* subsp. *paratuberculosis* specific antibodies in the years 2005 to 2008.

The maintenance of herd biosecurity (i.e. maintaining a closed herd, the provision of clean water, proper calving hygiene etc.) and avoiding the pooling of colostrum are all vital steps in the protection of herds from Johne's Disease.

Diseases of Sheep

Mortality in lambs (birth to six months of age)

The number of submissions of carcases of lambs less than six months of age increased by 18 *per cent* in 2008 (n=285) when compared to 2007 (n=242). The most common diagnosis was parasitic gastroenteritis (8.8 *per cent*), which showed a significant increase on the previous year (Figure 22). Further analysis of parasitic disease in sheep is available on page 16. Enteritis was the next most common diagnosis, mainly in young lambs. The infectious agent most frequently associated with enteritis in young lambs in 2008 was *Cryptosporidium* species. Pneumonia (7.4 *per cent*), mainly due to *Mannheimia haemolytica*, remains a common diagnosis in lambs. Starvation (6.7 *per cent*), mainly due to mismothering of young lambs, was also a significant cause of lamb mortality in 2008.

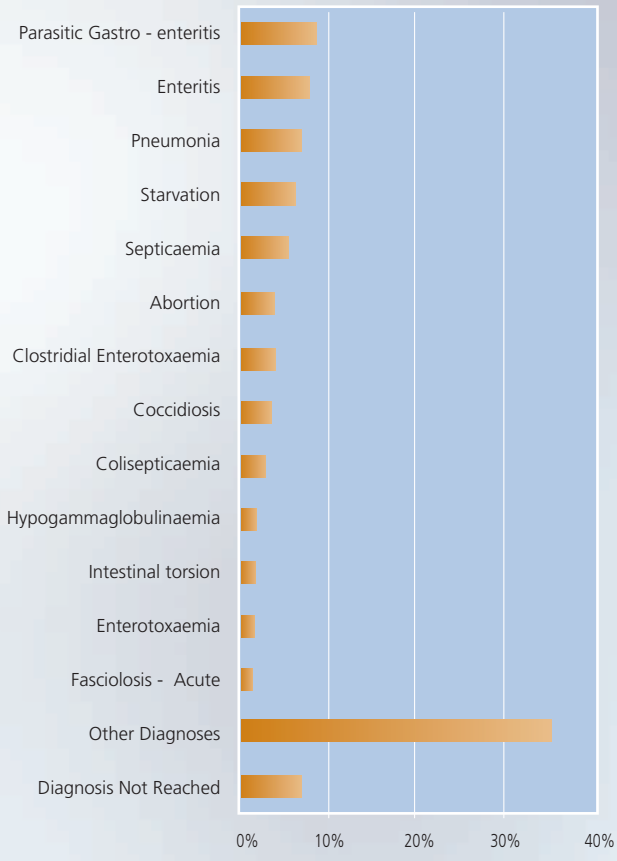

Figure 22: The relative frequency of the diagnosed causes of deaths of lambs under six months of age (n=285).[3]

Diagnoses associated with the death of less than 1.5 *per cent* of lambs examined have been grouped under the heading of *'Other Diagnoses'*. This includes arthritis, encephalitis, hypothermia and nephrosis.

[3] In both age groups, the category "Diagnosis Not Reached" includes sheep which were unsuitable for examination due to autolysis.

Mortality in adults (older than six months of age)

Figure 23 outlines the relative frequencies of the diagnosed causes of deaths of 263 adult sheep presented for *post mortem* examination to the Regional Veterinary Laboratories (RVLs) in 2008.

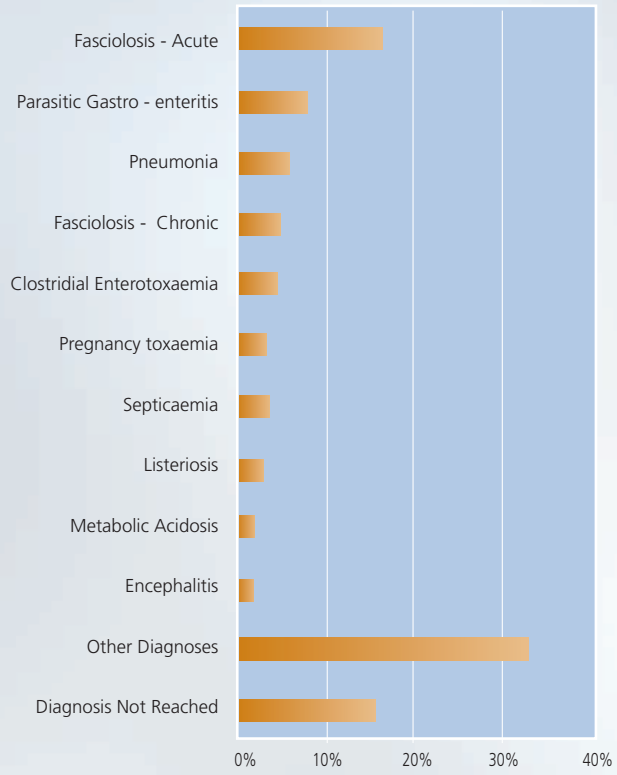

Figure 23: The relative frequency of diagnosed causes of deaths of adult sheep carcases examined in 2008 (n=263).

Acute fasciolosis was the most frequent diagnosis in adult sheep at 15.6 *per cent*. Acute and chronic fasciolosis cases combined accounted for 20.5 *per cent* of diagnosed causes of death in adult sheep. Deaths due to acute fasciolosis were also seen in lambs.

Parasitic gastroenteritis (7.6 *per cent)*, pneumonia (6.1 *per cent*), due mainly to *Mannheimia haemolytica* and clostridial enterotoxaemia (4.6 *per cent*), were the other significant causes of mortality in this age group. Diagnoses associated with the death of less than 1.5 *per cent* of adult sheep examined have been grouped under the heading of *'Other Diagnoses'*. This grouping includes mastitis, peritonitis, poisoning (three deaths due to copper poisoning in a Cork flock), and Black Disease. Pulmonary Adenomatosis (Jaagsiekte) was diagnosed in two sheep submitted from a Co. Galway flock (Figure 24).

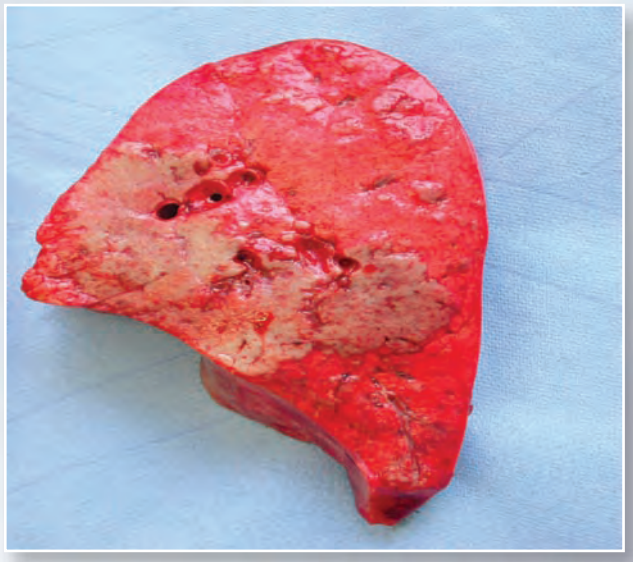

Figure 24: Pulmonary lesions associated with Ovine Pulmonary Adenomatosis (Jaagsiekte) in an adult ewe (Photo: Mícheál Casey).

Ovine Abortion

Specimens from cases of ovine abortion are submitted to the RVLs to determine the cause, and in particular to rule out specific infectious causes of abortion. Determination of the cause of abortion is an important step in preventing further perinatal losses in a flock as these could be mitigated by taking preventive action such as vaccination. A submission to the laboratory usually consists of more than one aborted foetus - and may include foetal membranes. The relative frequencies of diagnoses for ovine submissions to the RVLs in 2008 are shown in Figure 25.

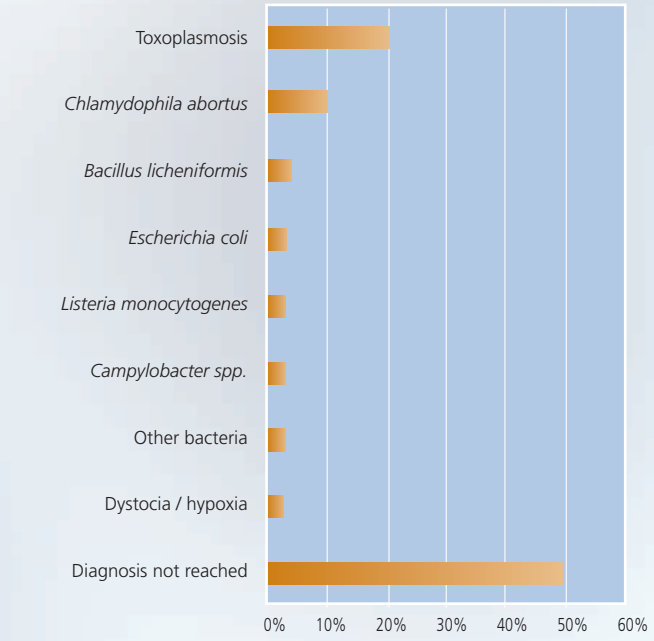

Figure 25: The relative frequency of causes of ovine abortion diagnosed in 2008 (n = 97).

Of 97 separate submissions, toxoplasmosis (20.6 *per cent*) was the most commonly diagnosed cause of ovine abortion in 2008. This was followed by enzootic abortion at 10.3 *per cent*. A definitive diagnosis was not reached in a relatively high proportion of cases (49.5 *per cent*). In many instances this was due to the unsuitability of specimens for diagnosis (advanced autolysis of tissues), or poor sample selection (i.e. the submission of only a single foetus, or failure to submit the foetal membranes from aborting ewes). Non-infectious sporadic causes of abortion, such as physical trauma or environmental or nutritional stresses, are also much less likely to be identified in the laboratory than infectious causes.

Figure 26: Ovine foetal membranes and cotyledons with necrotic foci typical of *Toxoplasma gondii* infection (Photo: John Fagan).

Submission of the foetal membranes from aborting ewes is critical for the optimal laboratory diagnosis of enzootic abortion. *Chlamydophila abortus*, the causative agent of enzootic abortion in ewes (EAE), is most readily detectable in placental tissue, whilst the specific (diagnostic) gross pathological change associated with this infection is severe suppuration of the foetal membranes. In cases where foetal tissues may not be available for submission, but where a significant proportion of a flock have aborted, blood should be collected from a number of aborted ewes and submitted for antibody testing. The blood samples can also be tested for other possible causes of abortion such as *Toxoplasma gondii* (Figure 26). High antibody titres to these agents are taken as evidence that the ewes have been exposed to them. In some cases, a comparison with antibody titres of a number of ewes from the same flock that have lambed normally may assist in interpretation.

The category *"Other Bacteria"* in Figure 25 includes abortions caused by bacteria such as miscellaneous *Listeria spp*,. or *Arcanobacterium pyogenes,* which occur with much less frequency.

An Outbreak of Tuberculosis in Dairy Goats in 2008

Bovine tuberculosis (TB) is an infectious and communicable granulomatous disease caused by *Mycobacterium bovis (M. bovis).* It is a widespread zoonosis which affects nearly all species of vertebrates. Goats are susceptible but only a small number of cases have been recorded previously in Ireland. Infected goats present clinically with ill-thrift, chronic cough and/or poor mik yield. In many cases the goats show no clinical signs until the disease is at an advanced stage.

Figure 27: An abscess in the lung of a goat from which *Mycobacterium bovis* was isolated (Photo: Alan Johnson).

During 2008, outbreaks of tuberculosis were confirmed in three large dairy goat herds in Ireland. This problem was first detected when goats from one of the herds, which died after showing signs of ill-thrift, were submitted to Limerick RVL for *post mortem* examination. Suspect tuberculous lesions were seen and later confirmed on cultures carried out in the CVRL, Backweston. A follow up investigation carried out by the local District Veterinary Office (DVO) revealed a large number of positive reactors to the tuberculin skin test. Subsequent *post mortem* examination confirmed the presence of tuberculosis in many of these reactors. All of the goats had been purchased within the previous year from a single holding. Tracing of in-contact animals by DVO staff revealed that goats from this holding had also been sold to establish another large dairy herd. Skin tuberculin testing of this herd disclosed a high number of reactors, many of which also had tuberculous lesions at *post mortem* examination (Figure 27). Typing of the *Mycobacterium bovis* isolates showed that both herds were infected with the same strain of *M. bovis.*

Following from these two large disease outbreaks a communication was issued to all dairy goat herd owners informing them that they were required to submit a comprehensive TB control plan to Milk Policy Division before being allowed to sell milk for human consumption. Part of this TB control plan involves testing all or part of the herd for TB, the frequency of which depends on whether the goats are kept indoors or outdoors. It was also recommended that milking/adult animals showing signs of ill-thrift should be culled and sent for *post mortem* examination to the nearest RVL.

As a direct result of this communication, a third large outbreak of TB was identified in another dairy goat herd. Fifteen adult goats showing poor thrive were culled and submitted to Athlone RVL and seven were found to have tuberculous lesions. A number of other goats in the herd were positive on a follow-up skin tuberculin test. Typing of a TB isolate from this herd showed that the strain of *M. bovis* was different to that of the two previous outbreaks.

The Regional Veterinary Laboratories continue to play a significant role in the surveillance for Tuberculosis in goats.

Diseases of Pigs 2006-2008

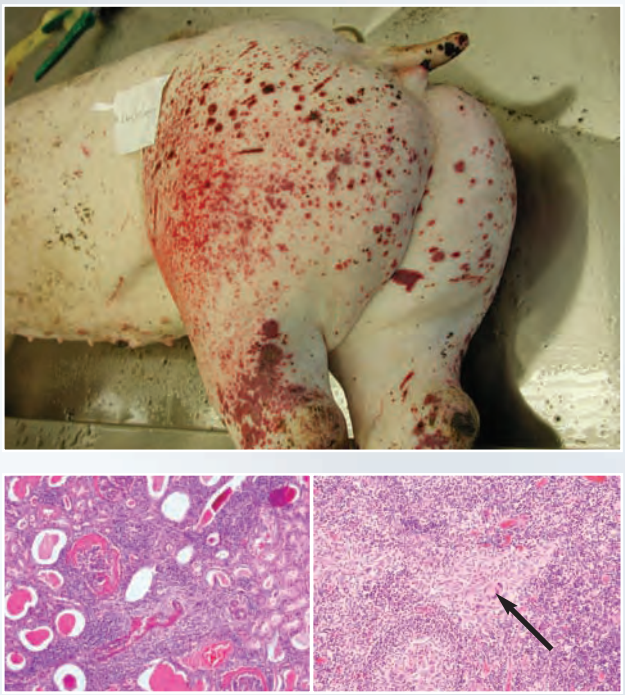

Figure 28: A fattener pig that had dermatitis, glomerulonephritis and histiocytic infiltration with multi-nucleate giant cells in lymph nodes (arrow) indicating a diagnosis of Porcine dermatitis and nephropathy syndrome (Photos: William Byrne).

An analysis of the causes of porcine mortality diagnosed by the Regional Veterinary Laboratories during the three-year period 2006 to 2008 revealed that pneumonia, septicaemia and enteritis were the most frequently diagnosed causes of death (Table 7).

Diagnosis	Percentage of all Diagnoses
Pneumonia	21.4%
Septicaemia	11.8%
Enteritis	10.3%
PMWS	5.7%
Salmonellosis	5.4%
Meningitis	3.9%
Enterotoxaemia	3.4%
Intestinal torsion	2.2%
Peritonitis	1.7%
PDNS	1.7%
PRRS[4]	1.5%
Oedema Disease	1.5%
Pericarditis	1.2%
Anoxia/hypoxia	1.0%
Pleuropneumonia	1.0%
Arthritis	0.7%
Dermatitis	0.7%
Encephalitis	0.7%
Endocarditis	0.7%
Gastro-enteritis	0.7%
Haemorrhage	0.7%
Intestinal obstruction	0.7%
Nephritis	0.7%
Swine dysentery	0.7%
Mulberry Heart Disease	0.7%
Various other diagnoses	4.9%
Diagnosis not reached	13.3%

Table 7: The causes of mortality diagnosed in pigs submitted to the Regional Veterinary Laboratories in the years 2006 to 2008 (n=406).

Pathogens detected in cases of pneumonia (as well as pleuropneumonia and pericarditis) included *Actinobacillus pleuropneumoniae, Mycoplasma hyopneumoniae, Arcanobacterium pyogenes, Pasteurella multocida, Haemophilus parasuis*, Porcine Circovirus 2 (PCV2), Porcine Reproductive and Respiratory Syndrome virus (PRRS), and *Streptococcus suis. Streptococcus suis* was also the most commonly detected pathogen in growing pigs diagnosed with septicaemia and meningitis. Other diseases that were diagnosed less frequently included Glasser's disease (polyserositis), swine dysentery, coccidiosis, endocarditis, nephritis, salt poisoning, and torsion or obstruction of various parts of the gastrointestinal tract. In the case of piglets, enteritis and septicaemia were relatively more common than pneumonia as diagnosed causes of death.

[4] PRRS was identified in 6 carcases from 2 herds. There are only about 20 positive PRRS herds in the country which are currently restricted.

Parasitic Diseases

Ireland experienced weather conditions that were considered to be wetter and warmer than average in 2008. Summer rainfall totals of more than twice the yearly average were recorded in the east and southeast of the country. As expected, these weather conditions favoured the survival of parasite populations in the environment, and lead to a higher prevalence of clinical parasitic disease in cattle and sheep than in previous years. The number of faecal samples submitted to the RVLs for parasitological examination was also higher in 2008 than in the previous two years. The majority of these came from herds or flocks where animals were showing clinical signs of diarrhoea and/or weight loss.

Bovine Parasites

The near saturation of the soil experienced for much of the summer of 2008 was conducive to the survival of the mud snail *Lymnaea truncatula* - the intermediate host for liver fluke *(Fasciola hepatica)*. During 2008, 2,456 bovine faecal samples (from 1,282 farms) were examined for the presence of liver fluke eggs. Of the faecal samples submitted in 2008, 11.9 *per cent* were positive, which was an increase on the 2006 (5.3 *per cent*) and 2007 (10.4 *per cent*) figures. The numbers of faecal samples submitted to the Regional Veterinary Laboratories for fluke egg detection for the three years 2006 to 2008 are shown in Figure 29.

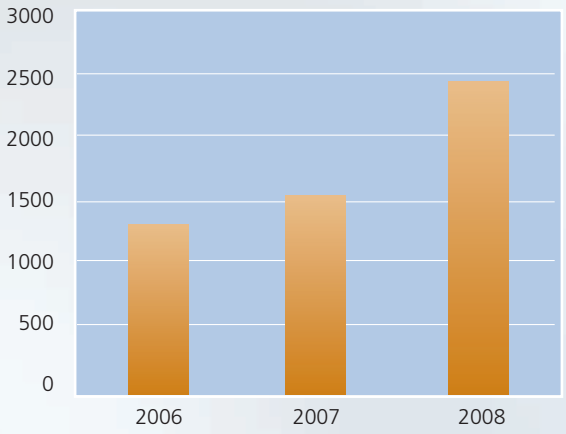

Figure 29: The number of bovine faecal samples submitted for fluke egg detection in the years 2006 to 2008.

Figure 30 illustrates similar seasonal trends in detection of *Fasciola hepatica* eggs in faeces between 2006 and 2008. It is notable that from April to November in both 2007 and 2008, the frequency of detection of liver fluke eggs in bovine faecal samples was consistently higher than in 2006. These results provide useful validation of the Department of Agriculture fluke forecasts issued in the autumn of both 2006 and 2007.

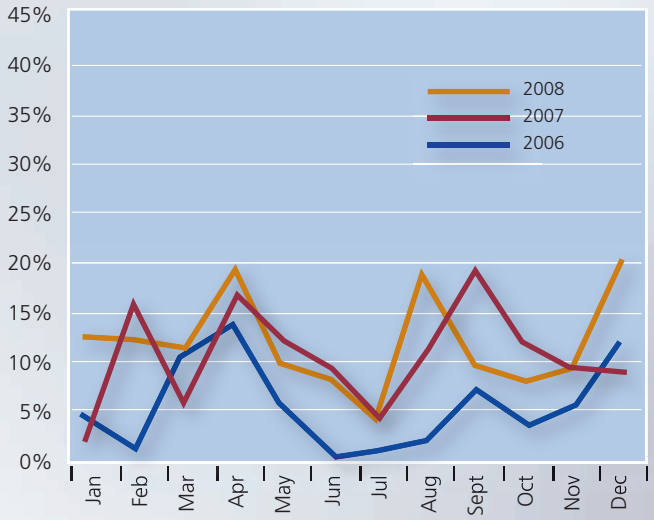

Figure 30: A comparison, by month, of the percentage of bovine faecal samples positive for liver fluke eggs in the years 2006 to 2008

Parasitic pneumonia, associated mostly with *Dictyocaulus viviparus* infection, is a severe disease of cattle, particularly in the first grazing season. Twenty nine (3.6 *per cent*) of 805 faecal samples analysed in the RVLs for lungworm larvae using the Baerman sedimentation method, were positive for *D. viviparus* larvae in 2008.

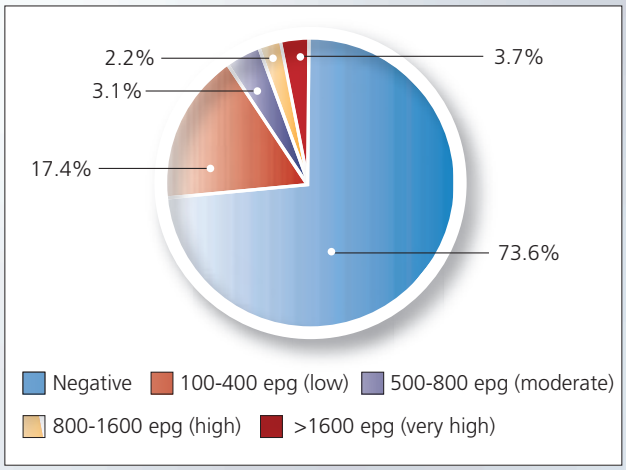

Figure 31: The percentage of bovine faecal samples positive for strongyle eggs in 2008 (n=3,330).(epg = eggs per gram).

Parasitic gastro-enteritis is a significant cause of weight loss and ill-thrift in calves and cattle in Ireland. *Ostertagia ostertagi,* and to a lesser extent *Trichostrongylus axei, Trichostrongylus colubriformis* and *Cooperia spp.*, are considered to be the major strongyle parasites responsible for the disease. The eggs of *Ostertagia ostertagi* are similar to other 'strongyle' eggs and these are grouped together for reporting purposes. Of 3,330 faecal samples examined in 2008, 879 (26.4 *per cent*) were found to have strongyle eggs present.

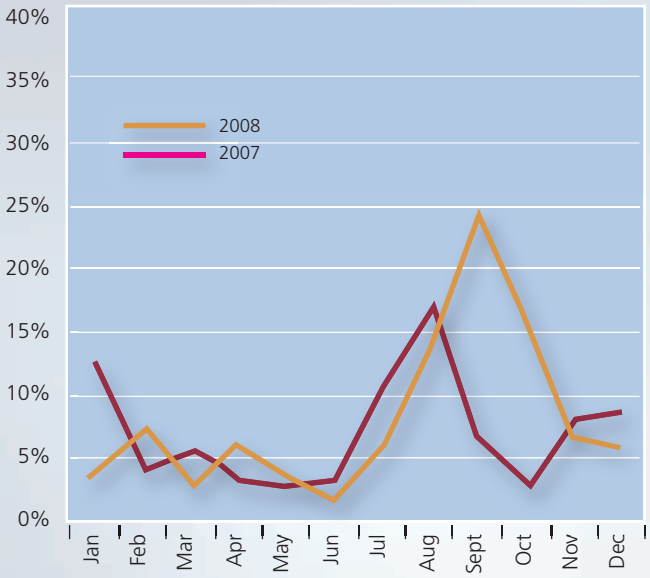

Figure 32: The percentage, by month, of bovine faecal samples with significant strongyle egg counts (>400 eggs per gram) in the years 2007 and 2008.

Figure 32 illustrates the frequency of significant strongyle egg detection (>400 eggs per gram) in bovine faecal samples by month. There was a notable surge in detection of strongyle eggs in bovine faeces during the summer and autumn, peaking at 23.4 *per cent* in September.

Figure 33: Rumen fluke *(Paramphistomum spp.)* (arrow) on the mucosa of the rumen of a yearling heifer (Photo: Cosmé Sanchez).

In the course of *post mortem* examinations of ruminants, rumen fluke *(Paramphistomum daubneyi)* have been encountered with increasing frequency in recent years (Figure 33). While adult paramphistomes were previously regarded to be relatively harmless in cattle, recent reports have demonstrated that paramphistome species can cause significant gastrointestinal disease and loss of thrive. Diagnosis relies on a combination of *post mortem* findings, clinical signs observed in the animal, and response to drenching. The presence of eggs in faeces only indicates the presence of adult fluke and has no diagnostic value for an outbreak of the acute disease. Oxyclozanide is one of the few anthelmintic treatments effective against paramphistomes.

Ovine Parasites

615 ovine faecal samples (from 290 farms) were examined for the presence of liver fluke eggs during 2008. Eighty (13.0 *per cent*) of these were positive, which represents a substantial increase compared to 2007 (4.5 *per cent*)

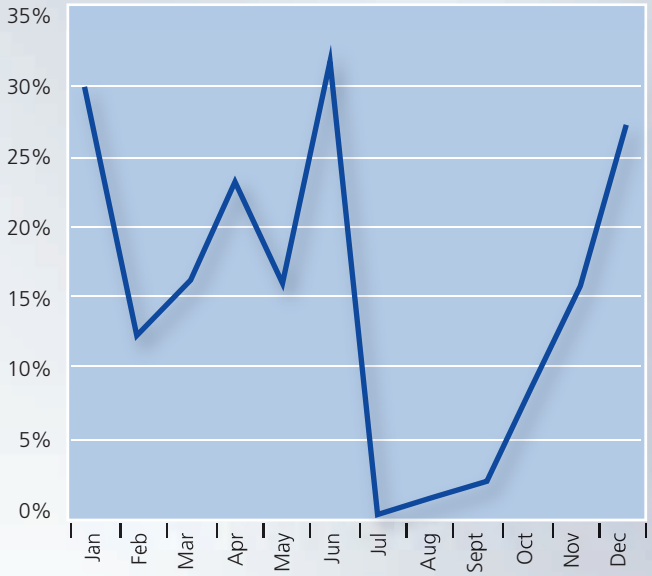

Figure 34: The percentage of ovine faecal samples positive for liver fluke eggs by month in 2008 (n=615).

Figure 34 illustrates the breakdown by month of ovine faecal samples in which fluke eggs were detected. The low relative frequency of fluke eggs detected in ovine faeces in July and August may reflect the increased use of anthelminthics by flockowners conscious of the potential fluke threat posed by the inclement weather in early summer 2008. The farm incidence rate for liver fluke egg detection in 2008 was 16.6 *per cent*.

Figure 35: Severe liver damage (arrow) due to chronic fasciolosis in a ewe submitted for *post mortem* examination during 2008 (Photo: Alan Johnson).

Many sheep carcases submitted for *post mortem* examination during 2008 were found to have lesions of acute or chronic liver damage that were associated with liver fluke infestation (Figure 35).

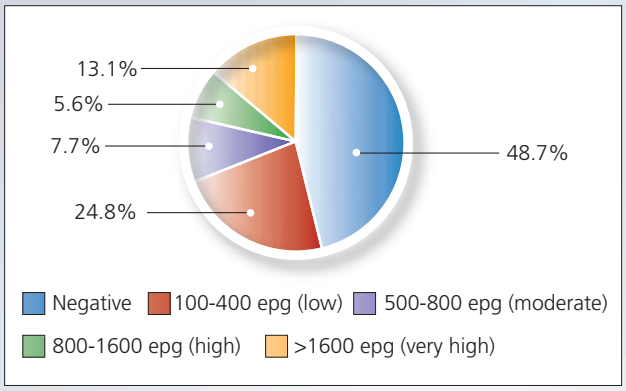

Figure 36: The percentage of ovine faecal samples positive for strongyle eggs in 2008 (n=817).

A total of 817 ovine faecal samples was examined for the presence of strongyle eggs in 2008. Eggs were detected in 51.3 *per cent* of the samples - compared to 45.2 *per cent* in 2007. Figure 36 summarises the findings and categorises the infection according to the number of eggs recorded on faecal examination.

Nematodirosis is a significant cause of diarrhoea in young lambs. Outbreaks can occur when the presence of high numbers of larvae on pasture coincides with the presence of young susceptible lambs. Large numbers of *Nematodirus battus* larvae tend to appear on the pasture in April and early May following mass hatching of over-wintered eggs. After ingestion of the L3 stage larvae by lambs, development to the adult stage takes place in the intestinal mucosa - where severe intestinal damage can occur. The clinical signs of disease typically occur during the pre-patent period, when the parasites have not yet reached the egg-producing adult stage, so faecal samples collected at this time may have low or zero egg counts.

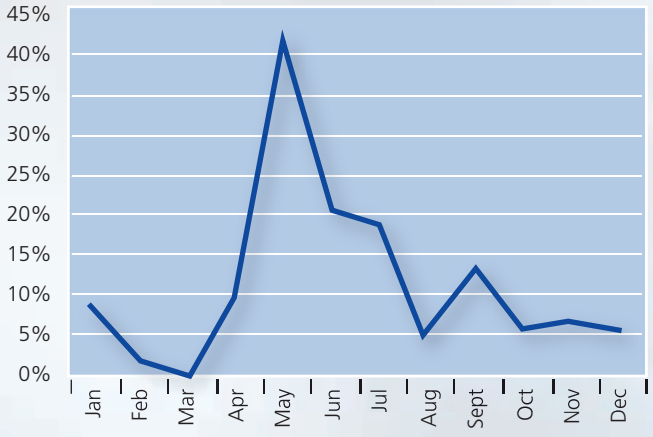

Figure 37: The percentage of ovine faecal samples positive for *Nematodirus spp.* eggs by month in 2008 (n=817).

Nematodirus eggs were detected in 67 (8.2 *per cent*) of the 817 ovine faecal samples examined in 2008. This represents a decrease when compared to 2007 results (10.8 *per cent*). The results for *Nematodirus sp.* positive samples by month in 2008 are shown in Figure 37. There was a sharp rise in the frequency of *Nematodirus sp.* egg detection during the early summer.

The *Trichinella spp.* Survey 2008

Trichinella species (almost exclusively *Trichinella spiralis*) are nematode parasites which pose a significant zoonotic threat. The adult worm may be found in the intestinal mucosa of carnivorous animals such as rodents, foxes and pigs, among others. The second larval stage of the worm passes *via* the circulatory system to striated muscles where it encysts. Most human infections can be traced back to the consumption of undercooked meat from wild animals. Commission Regulation (EC) No 2075 / 2005 lays down specific rules on official controls for *Trichinella spp.* in meat intended for human consumption. It states that a risk-based wildlife monitoring programme should be put in place in regions where the risk of *Trichinella spp.* infection in domestic pigs is officially recognised as negligible. In 2008 the Department of Agriculture, Fisheries and Food (DAFF) carried out a fox survey to fulfil the requirements of the wildlife monitoring programme.

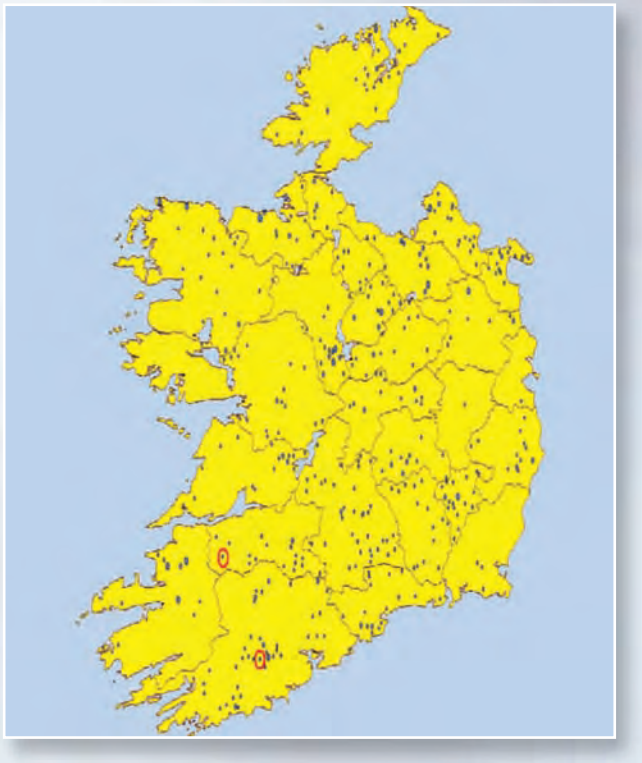

Figure 38: The locations where foxes were collected for the *Trichinella spp.* survey in 2008. Larger dots represent locations where more than one fox was collected. The two sites where the positive foxes were located are circled in red (n=510).

In the spring and autumn of 2008, 510 foxes were collected from multiple locations throughout the country (Figure 38) and delivered to each of the six RVLs. Muscle from the forelimb, tongue, cheek and diaphragm was harvested from each animal and digested using a pepsin/hydrochloric acid solution. Following sedimentation, the digestion fluid was examined under a microscope for the presence of *Trichinella spp.* larvae. Of the 510 foxes examined, *Trichinella* larvae were found in two.

Antimicrobial Susceptibility Profiles 2008

Milk Pathogens

Streptococcus dysgalactiae

The results of *in-vitro* antimicrobial susceptibility and resistance testing for *Streptococcus dysgalactiae* isolates from milk samples are shown in Figure 39.

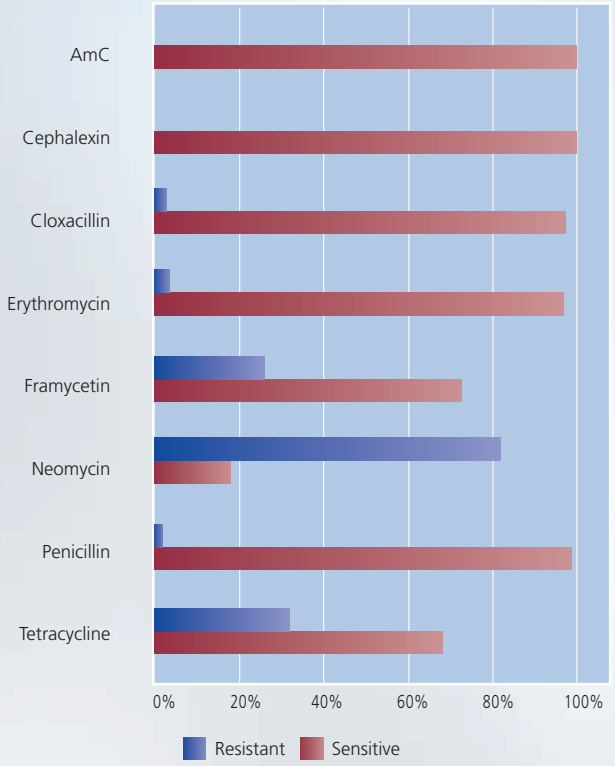

Figure 39: Antimicrobial susceptibility in *Strep. dysgalactiae* isolates from bovine milk submissions (n = 169). (AmC = amoxycillin-clavulanate).

No resistance was recorded to amoxycillin-clavulanate or cephalexin - with only a few isolates showing resistance to penicillin, cloxacillin, and erythromycin. These results are similar to those reported in the Disease Surveillance Reports for 2006 and 2007. Figure 40 illustrates the very similar resistance patterns recorded over each of the three years.

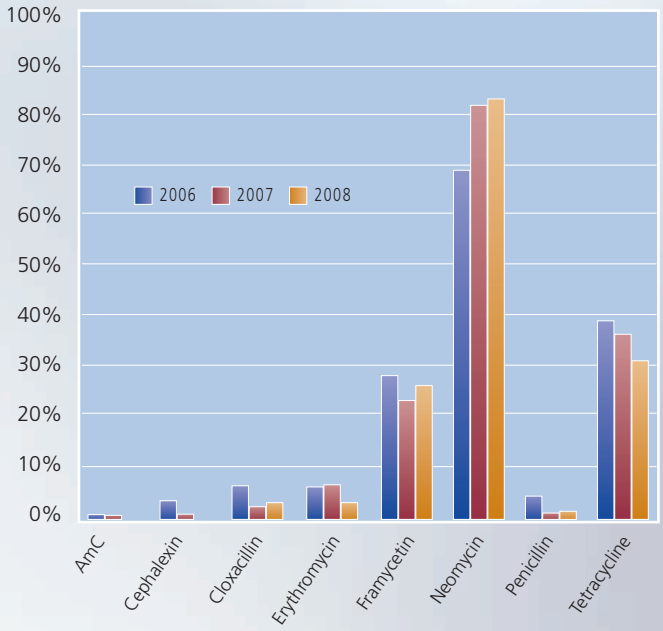

Figure 40: Antimicrobial resistance *in-vitro* in *Strep. dysgalactiae* isolates from bovine milk submissions for the years 2006 to 2008 (n = 490). (AmC = amoxycillin-clavulanate).

Escherichia coli

Antibiotic susceptibility and resistance patterns for *E. coli* isolates from milk samples are shown in Figure 41.

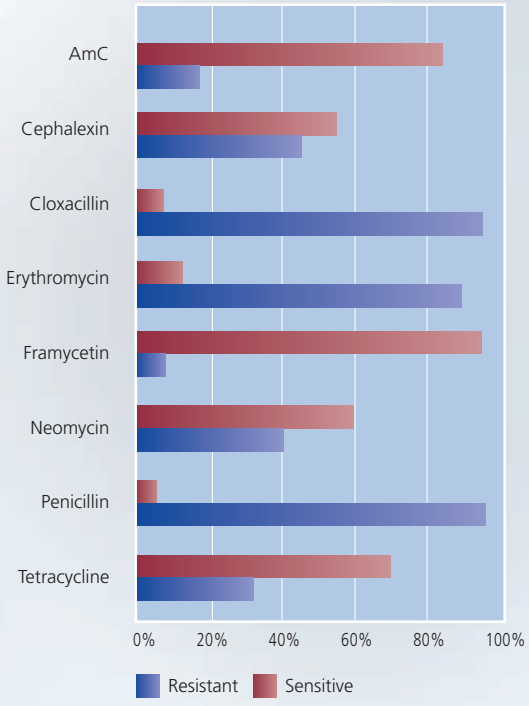

Figure 41: Antimicrobial susceptibility in *E. coli* isolates from bovine milk samples (n = 464). (AmC = amoxycillin-clavulanate).

The results are very similar to those published in the two previous RVL surveillance reports for 2006 and 2007. This is highlighted in Figure 42 which compares resistance patterns over the three years.

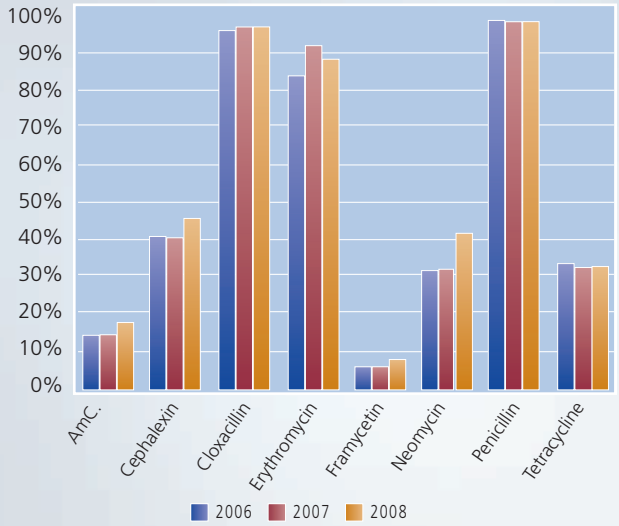

Figure 42: Antimicrobial resistance *in-vitro* in *E. coli* isolates from bovine milk samples for the years 2006 to 2008 (n = 1,385). (AmC = amoxycillin-clavulanate).

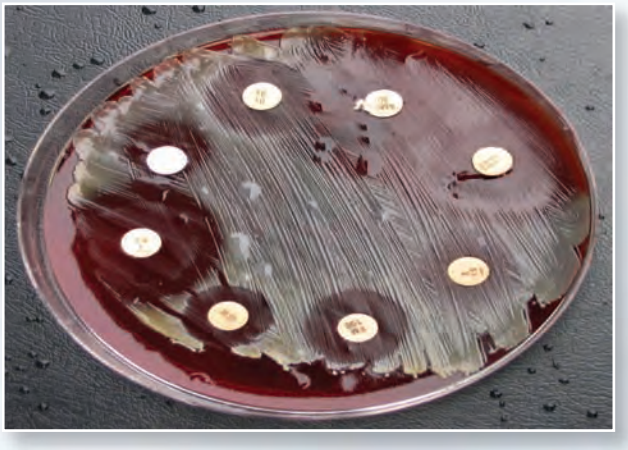

Figure 43: An *E.coli* isolate showing zones of clearance, indicating sensitivity, around multiple antibiotic sensitivity disks (Photo: Gerry Duignan).

The antimicrobial agents with the lowest frequency of resistance in each of the three years were framycetin and amoxycillin-clavulanate. On the other hand, over 80 *per cent* of *E. coli* isolates were resistant to cloxacillin, erythromycin, and penicillin in each of the three years. It must be emphasised however that isolation of *E. coli* from milk samples should be interpreted with caution - owing to the ease with which environmental contamination of the sample may occur if full asepsis is not observed at collection.

Enteric Pathogens

Salmonella Dublin

Resistance levels for *Salmonella* Dublin isolates from bovine submissions for each of the years 2006, 2007 and 2008 are shown in Figure 44. The results show that a fairly wide choice of antibiotics is available for the treatment of *Salmonella* Dublin, based on *in-vitro* testing.

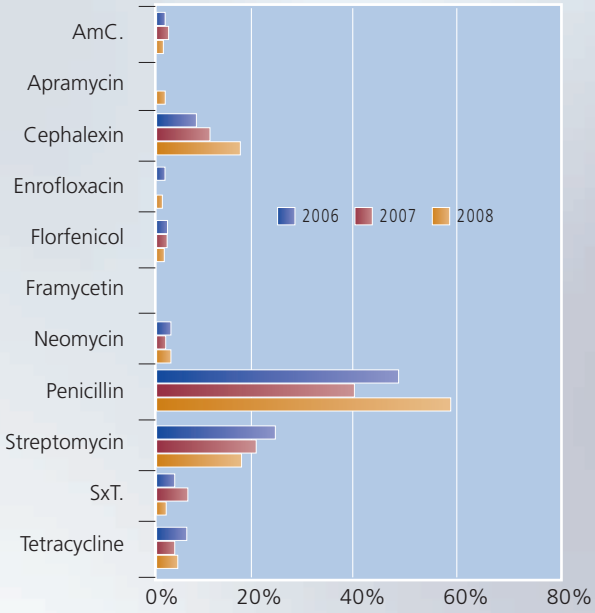

Figure 44: Antimicrobial resistance in *Salmonella* Dublin isolates from bovine submissions for the years 2006 to 2008 (n = 591). (AmC = amoxycillin-clavulanate,SxT = sulphamethoxazole-trimethoprim).

Salmonella Typhimurium

Antimicrobial susceptibility profiles for *Salmonella* Typhimurium isolates in the Regional Laboratories in 2008 are shown in Figure 45 (multiple species). *Salmonella* Typhimurium was detected more frequently in 2008 (n= 41) than in 2007 (n=23). However, the number of cases from which the *S.* Typhimurium phagetype DT104 was isolated did not increase significantly. There were 14 isolates in 2008 (12 bovine, 1 ovine, 1 porcine) compared to 12 in 2007.

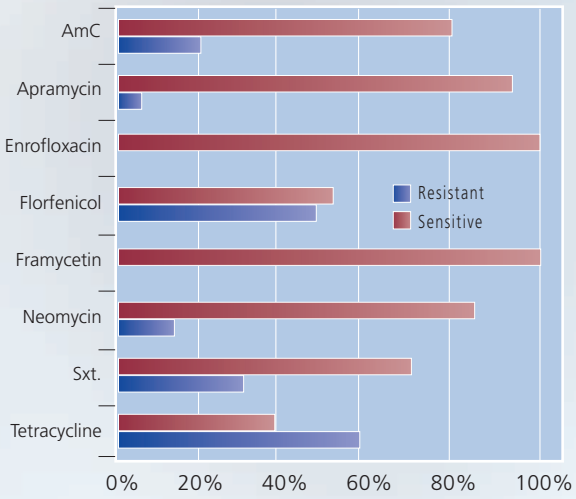

Figure 45: Antimicrobial susceptibility in *Salmonella* Typhimurium isolates from bovine, ovine, porcine, and equine submissions (n = 41). (Sxt = sulphamethoxazole-trimethoprim, AmC = amoxycillin-clavulanate).

The levels and patterns of antimicrobial resistance in all isolates were comparable to those in previous years.

Clinical Pathology

Copper and Selenium Analyses in the Regional Veterinary Laboratories 2008

Copper deficiency causes diseases of economic importance in cattle of all ages. Deficiency may be primary (inadequate dietary intake) or secondary (interference with the utilisation of copper by environmental conditioning agents such as molybdenum or inorganic sulphate). Copper deficiency occurs most commonly in spring and summer when herbage copper levels are at their lowest. Deficient cattle may show clinical signs of ill-thrift, diarrhoea and anaemia. The Regional Veterinary Laboratories carried out copper analysis on a total of 9,907 bovine blood samples submitted in 2008. A value of 9.4 micro moles per litre or less indicates low or deficient serum copper levels. The results show that 2,150 bovine samples (21.7 *per cent*) recorded a deficient copper level. Figure 46 shows the number of deficient samples recorded in each of the RVLs.

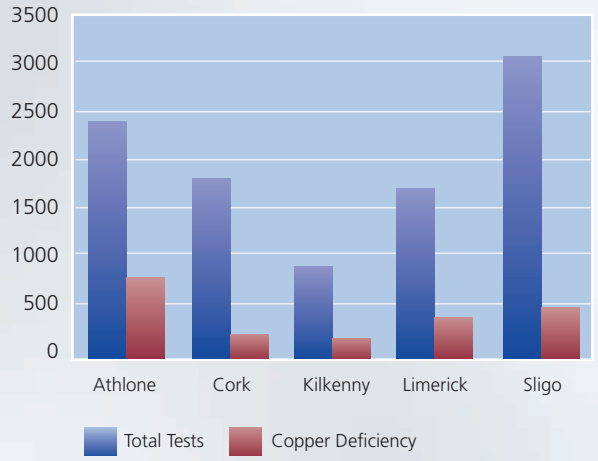

Figure 46: The total number of bovine blood copper analyses and the number of deficient samples detected in each of the RVLs[5] in 2008 (n=9,907).

Selenium is an essential nutrient for animals. It is a biochemical component of a number of proteins, enzymes and hormones. Selenium deficiency can contribute to ill-thrift in calves, retained foetal membranes in cows and reduced resistance to infectious disease. Serum selenium concentrations are determined by measuring either blood selenium levels or determination of the selenium-containing Glutathione Peroxidase (GSH-Px) enzyme activity in red blood cells. Glutathione Peroxidase is an enzyme which has been shown to have a good correlation between its activity in whole blood and the blood selenium level. The levels of both selenium and GSH-Px give an indication of the long term status of selenium and rise or fall slowly with changing tissue selenium levels. A total of 4,168 samples was submitted for selenium/GSH-Px analysis (1,305 blood selenium and 2,863 GSH-Px analyses). A blood selenium value of less than or equal to 0.75 micromoles per litre or a GSH-Px level of less than 40 units/ml Packed Cell Volume indicates low or deficient selenium status. Figure 47 shows the number of bovine samples tested, as well as the number classified as deficient for each laboratory. In the Sligo RVL catchment area, 34.5 *per cent* of samples analysed were identified as being selenium deficient. This may reflect the effect of soil pH, soil sulphur content, or the effect of heavy rainfall on pasture selenium levels in the North West during 2008.

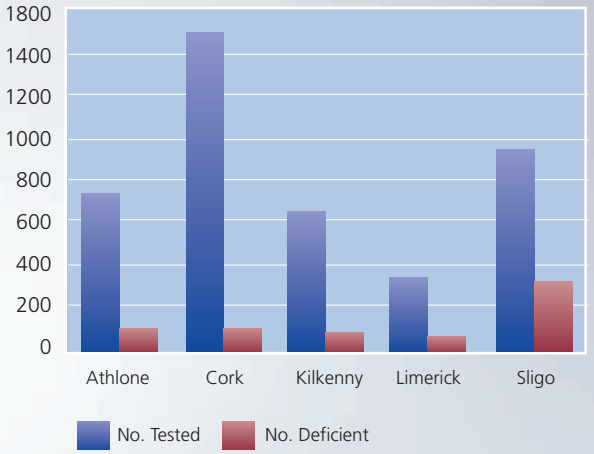

Figure 47: The number of bovine samples analysed for determination of selenium status (either by Blood Selenium analysis or measurement of GSH-Px activity) and the numbers of those samples identified as deficient in each of the RVLs[5] in 2008 (n=4,168).

Haematology Testing in the Regional Veterinary Laboratories

Haematology testing is available in all the Regional Veterinary Laboratories. In 2008 1,180 samples were submitted for haematology analysis. 49 *per cent* of these samples were from cattle, 21 *per cent* from horses and 3 *per cent* from sheep.

Haematology assists the clinician in forming a view on the adequacy of haematopoiesis and/or the presence or absence of a systemic inflammatory response in the sampled animal. Examination of the blood film (EDTA blood sample is required) can confirm the diagnosis of haemoparasitic diseases such as babesiosis (Figure 48) and anaplasmosis (Figure 49). Haematology is also valuable in the investigation of anaemia or haemostatic disorders and can provide a definitive diagnosis in suspect cases of leukaemia. All of the RVLs are equipped with automated haematology analysers which can determine the full range of haematology parameters, including white cell differential counts.

[5] Samples submitted to Dublin RVL are analysed in the Veterinary Clinical Pathology Section, Central Veterinary Research Laboratory (CVRL), Backweston and are not included in these figures.

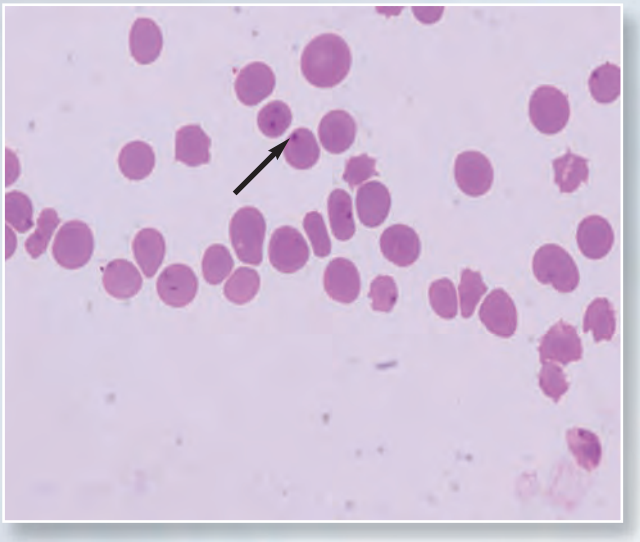

Figure 48: Erythrocytes containing *Babesia spp.* (arrow) identified on a blood film from a cow (Photo: Cosmé Sanchez).

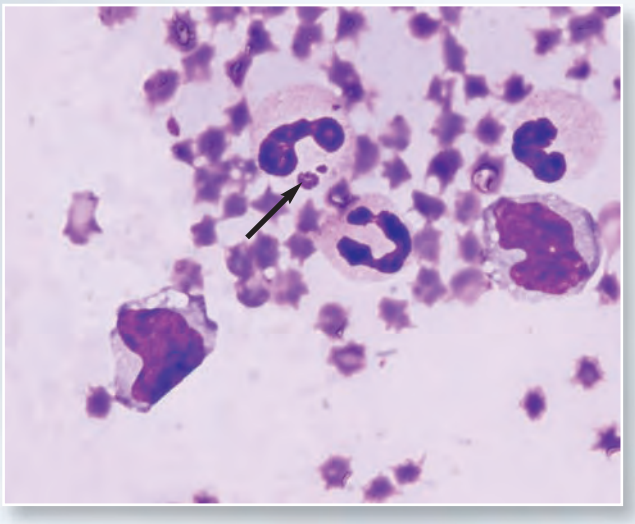

Figure 49: *Anaplasma phagocytophila* inclusions (arrow) within a bovine neutrophil. Anaplasmosis (Tick Borne Fever) is readily diagnosed by demonstrating intracytoplasmic inclusions in peripheral blood granulocytes or monocytes of febrile animals (Photo: Cosmé Sanchez).

Proficiency Testing in the Regional Veterinary Laboratory Service

The six Regional Veterinary Laboratories and Clinical Pathology Section, Backweston (for Dublin RVL), subscribe to four Proficiency Testing (PT) Schemes. Three schemes are operated by Veterinary Laboratory Agency, UK (haematology, microbiology and tissue lead and copper). The Randox International Quality Assessment Scheme (RIQAS) offers proficiency testing of proteins, metabolites, liver enzymes, major and trace element tests.

Proficiency testing for bacteriology involves a freeze-dried material containing a known pathogen being sent to all participating laboratories with a limited case history. Each laboratory is asked to identify the pathogen and is then scored on the basis of its results.

Proficiency testing for the haematology and biochemistry components of RVL work involves each laboratory testing sample materials for certain specified constituents (e.g. copper, calcium). The returned results for all of the laboratories in the scheme are assessed by the external proficiency supplier (i.e. VLA or RIQAS) and, after obvious 'outlier' values have been discarded, a consensus mean is arrived at. Each laboratory then receives its own individual results - together with a statistical analysis showing how its performance compares to the mean for the peer group. This process allows any laboratory with a result of two or more standard deviations from the consensus mean for any one component to investigate its analytical procedures. Participation by RVLs in PT schemes is beneficial in excluding the possibility that laboratory results could be biased in a particular direction - and is one of the requisites for accreditation by the Irish National Accreditation Board (INAB). All of the Regional Laboratories also follow an internal quality control programme using standard solutions and controls.

Procedures for the submission of samples for laboratory investigation

Compliance with correct procedures for the packaging of samples being submitted to the Laboratory Service is key to protecting the health and safety of postal workers and laboratory staff. The responsibilities of the consignor are laid down in the European Agreement for Transportation of Dangerous Goods Regulations 2007 which can be viewed at:

http://www.unecwe.org/trans/danger/publi/adr/adr2007/07ContentsE.html.

Samples should be packaged in three layers. The primary container, which holds the specimen, should be wrapped in absorbent material and placed in a leak proof plastic container, which is then placed in the outer padded envelope or box. The words "Diagnostic Specimen" must be labelled on the outside of the package.

Contact details for suppliers of appropriate packaging materials may be obtained from the Institute of Packaging Ireland (also known as the Irish Packaging Society) at www.iom3.org/packaging.

Class A Disease Surveillance 2008

The Regional Veterinary Laboratories form a key component of the State's surveillance of statutorily-controlled and exotic diseases. Such exotic viral diseases are highly contagious and following viral incursion have a propensity to spread rapidly in susceptible animal populations. Hence they are listed by the OIE and subject to stringent control measures prescribed in national and EU legislation. A vigilant laboratory surveillance network contributes to maintaining the health of the national herd by providing early identification of new or exotic diseases.

Foot and Mouth Disease

There have been no cases of Foot and Mouth (FMD) disease in Ireland since 2001. FMD is a highly contagious viral disease of cloven-hooved animals. The virus has an incubation period of between 2 and 12 days and is characterised by high fever and the formation of blisters inside the mouth and on the feet that may burst leaving ulcers (Figure 50). Drooling and lameness are common signs. Surveillance by the Department of Agriculture, Fisheries and Food to prevent the introduction of Foot and Mouth Disease into Ireland is ongoing.

Figure 50: Sloughing of the buccal mucosa in a yearling with Foot and Mouth Disease. (Photo: Mícheál Casey)

Bluetongue

Bluetongue is an OIE listed viral disease of ruminants that has 24 known serotypes. Many serotypes have circulated for decades in the warmer climes of Africa and the Middle East. However, in the last decade the virus has spread steadily northwards and westwards in tandem with the expansion of the range of the primary vector, the midge *Culicoides imicola*, as well as the adaptation of the virus to other endemic midge species. In addition to vector-mediated spread of the virus, Bluetongue may also be spread transplacentally in infected animals, by infected semen, or iatrogenically by infected blood or other body fluids. Bluetongue Serotype 8 was associated with outbreaks in many European countries, including the UK. Incubation of the virus takes between 4 and 20 days, after which a clinical disease of variable severity and mortality may occur. The clinical signs of Bluetongue include pyrexia, anorexia, inflammation and hyperaemia of the mucosal surfaces, oedema of the tongue, lips and face and ulceration and necrosis of the palate, tongue and nares. The full range of clinical signs is listed on the Department of Agriculture website, available at: **www.agriculture.gov.ie/bluetongue.**

Eleven investigations of Bluetongue suspects were undertaken by the Department of Agriculture in 2008. Bluetongue testing was carried out on a further 5,500 samples in the Virology Division, Central Veterinary Research Laboratory (CVRL) Backweston during 2008. Ireland continues to be Bluetongue free.

Avian Influenza

Avian influenza is a highly contagious viral disease affecting the respiratory, digestive or nervous systems of birds. The disease can have serious consequences for avian health and poses a potential threat to human health. Carcase submissions from avian influenza suspects are initially examined in the RVLs by laboratory staff. Samples are selected for analysis by Virology Division, CVRL Backweston. During 2008, 1,029 samples from birds were tested in CVRL for avian influenza. Two of these samples were M gene positive; one was identified as a non-pathogenic H6 strain while the other was not identified. One hundred and ninety three of these samples were further submitted for avian influenza virus isolation. One sample was positive for pigeon paramyxovirus 1. No samples were positive for pathogenic avian influenza. Surveillance to prevent the introduction of avian influenza into Ireland is ongoing.

BSE

Ninety two clinical BSE suspects were examined during 2008. Brains were removed in the RVLs and submitted to the CVRL for examination. A summary of the histopathological diagnoses made in these brains is given in Table 8.

Histopathological Diagnosis	Number
No Specific Lesion	55
Listerial Encephalitis	25
Autolysed (BSE negative)	4
BSE	2
Non-Suppurative Encephalitis	2
Neoplasia	2
Hepatic Encephalopathy	1
Cerebellar Hypoplasia	1
Total	**92**

Table 8: The histopathological features of 92 adult bovine brains from clinical BSE suspects examined in 2008.

Two cases of BSE were diagnosed. In the majority of the other submissions no significant histological lesions were seen. This is not unexpected as several diseases of cattle with neurological signs show no significant light microscopic lesions (e.g. hypomagnesaemia, ketosis, acute lead poisoning).

Where a diagnosis was made, the most common condition diagnosed was Listerial encephalitis. These cases showed an expected seasonal distribution with the majority detected from January to June (Figure 51). Under the active surveillance programme for BSE, an additional 21 cases of BSE were diagnosed in Ireland in 2008 and confirmed in CVRL, Backweston.

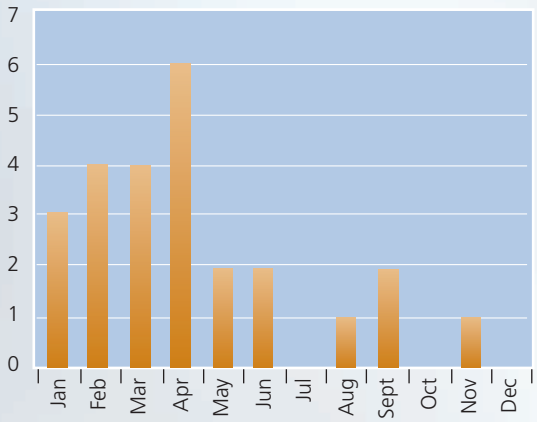

Figure 51: Listerial encephalitis cases in clinical BSE suspects by month in 2008.

A Selection of RVL On-Farm Investigations 2008

Laboratory pathologists are regularly consulted for advice regarding animal disease and production problems. They may also carry out on-farm investigations, especially when there is a suspicion that zoonotic, exotic or novel diseases may be involved. Investigations may also be undertaken where production or infectious endemic diseases have given rise to significant on-farm losses. Presented below are summaries of selected farm investigations conducted by RVL veterinary staff during 2008.

Coronavirus Pneumonia in Calves

Sligo RVL investigated an outbreak of respiratory disease of high morbidity and low mortality in a suckler beef herd where vaccination against respiratory diseases was being undertaken. Six to eight week old calves and older weanlings were primarily affected with some coughing, varying severity of dyspnoea and general loss of thrive being noted. Polymerase chain reaction (PCR) testing of the calves identified bovine coronavirus infection, while RSV, PI3 and *Pasteurella multocida* (on routine bacteriological culture of nasal swabs) were detected in the weanlings. Inadequate ventilation outlet capacity in the older animal houses, where the weanlings tended to be housed, was identified as a contributory factor. Since the instigation of corrective actions, the farmer has lost only one calf to respiratory disease. While occasional respiratory infections are still identified, thrive is not affected as long as affected calves are treated early.

Joint Laxity and Limb Deformities in Calves

In the summer of 2008, Athlone RVL investigated a 40-cow suckler herd with a high incidence of joint laxity and limb deformities. This was the second year that this problem occurred on the farm. Three calves were born with the condition in 2007, and nine in 2008. Dams were fed almost exclusively on pit silage while housed. The severity of the condition varied considerably among those affected. Most had pronounced sickle hocks with variable thickening of the hock joints (Figure 52). Outward rotation of the fetlocks was also evident in a number of calves.

Figure 52: Congenital joint laxity and limb deformity in a newborn calf (Photo: Ger Murray).

Most reports of investigations of limb deformities and joint laxity to date have had inconclusive findings - with mineral deficiencies (particularly manganese), or silage mycotoxins, being suggested as possible causes. Manganese levels in the blood and hair samples of cows tested on the present farm were found to be below the reference range. However, some factors have been found to be common to many of these outbreaks, in particular the exclusive feeding of pit silage without access to hay or concentrates. Mee *(Irish Veterinary Journal* 48:93-105, 1995) described how the introduction of hay or rolled barley with the silage, when housed, resulted in a significant decline in the incidence of joint laxity and limb deformities in problem herds. Following the introduction of meal with the pit silage for the winter of 2008 on this farm, there were reports of a substantially decreased incidence in the spring of 2009.

Dermatitis in Fattening Bulls

A problem of dermatitis in fattening bulls was referred to Sligo RVL for investigation. This had developed over the previous four years, when the management system had moved entirely to bull beef. The problem surfaced in late July and early August each year. Approximately 20 animals were severely affected in 2008 out of a herd of 400. The condition was confined to white or grey bulls. The affected bulls tended to lose a lot of weight, prolonging the time to slaughter. Blood samples taken by RVL staff on-farm showed liver enzymes and urea to be elevated in affected cattle, while selenium levels were lower than that of non-affected cattle. This condition had the characteristics of photosensitisation - and the presence of hepatotoxic fungi in the grass was considered the most likely cause of the problem. The growth of such fungi on pasture is enhanced by wet humid weather, particularly in June/July. The farmer intends to alter his management of the white-coloured bulls in future, by housing them in July and finishing them first.

An Outbreak of Coccidiosis in a Layer Flock

In the autumn of 2008, Dublin RVL undertook an investigation of increased mortality and loss of production in a layer flock. The flock comprised 8,000 laying hens in a newly constructed purpose built house. Examination of flock records showed that approximately 6 – 10 birds were being lost daily for one week prior to the farm investigation visit. Records also showed a moderate drop in egg production, though feed and water intake remained stable. A walk-through of the house was conducted to assess general flock health, before blood sampling of a representative subset of birds in the house. A small number of birds was clinically affected, the primary clinical sign being severe lethargy. These birds were euthanised before transportation to Dublin RVL for full *post mortem* examination. Flock serum samples and tissue samples from the birds were submitted to the Poultry Virology Section, CVRL Backweston and proved negative for Class A pathogen involvement. Gross *post mortem* and histopathological examination of tissues from the birds revealed severe necrotising parasitic enteritis caused by coccidial infection. Septicaemic change was also evident in some of the birds; this was likely to have resulted from invasion by enteric bacteria of the disrupted intestinal mucosa caused by coccidiosis.

Cobalt Sulphate Poisoning of Calves

In the spring of 2008, Athlone RVL undertook an investigation of deaths of calves less than one week of age on a seventy-cow dairy farm. Eleven calves had been lost in an eight-week period - with seven of these deaths attributed to non-specific illnesses which followed very short clinical courses. It was noted that calves that progressed past the first week of life generally survived. A farm visit was undertaken and the cows were noted to be in good condition. Older calves outside however were lethargic and had dry coats. A six-day-old calf, which had died the previous day, was necropsied and tissues were taken for analysis. Liver cobalt was recorded in excess of 30ppm (wet matter), which is one hundred times the normal reference range of 0.04-0.29ppm. Further investigation revealed cobalt supplementation of calves from two days of age had occurred in an effort to improve their performance - as some of the calves had seemed slow to progress after birth. The recommended dose was not adhered to and some calves were given a further dose some days later. Young ruminants are unable to utilise cobalt until they have developed a functional ruminal microbial population (about 6 weeks of age). It appears that many deaths attributed to acute toxicity are due to the substantial fluid loss in the gastrointestinal tract occasioned by the acidic nature of cobalt sulphate.

Mycoplasma gallisepticum Infection of a Mixed Poultry Flock

In October 2008, Limerick RVL carried out a farm investigation of a small backyard mixed-poultry flock following direct contact from a local private veterinary practitioner (PVP). The PVP had visited the farm and was worried about the clinical signs being exhibited by a group of turkeys. No other birds appeared to have been affected. The PVP was concerned about the possible aetiology and wished in particular to rule out avian influenza (AI) as a possible cause of death.

Figure 53: A turkey exhibiting periorbital swelling caused by *Mycoplasma gallisepticum* infection (Photo: Alan Johnson).

The flock consisted of 23 hens, 6 geese, 5 ducks and 17 turkeys. All were free ranging. The land around the farmhouse had been leased out and was stocked with cattle. The owner stated that there were no other poultry farms in the near vicinity.

The clinical signs were seen initially about two weeks prior to the farm investigation visit. They had been worsening over the intervening period but had only affected the turkeys. Approximately six of the group of seventeen were showing obvious periorbital (sinus) swelling and breathing difficulty (Figure 53). According to the owner the appetites of the affected birds were reduced but no deaths had occurred. The turkeys had been purchased in early August at a local mart and were being fattened for Christmas.

Based on the presenting clinical signs a tentative diagnosis of *Mycoplasma gallisepticum* infection was made. *Mycoplasma gallisepticum* infection causes a slow onset chronic respiratory disease of turkeys, normally of low morbidity and mortality, often characterised by severe sinusitis. Blood samples from six birds, and pharyngeal swabs from a further five birds, were taken. The bloods were submitted individually for *Mycoplasma gallisepticum*, Avian Influenza and Paramyxovirus type 1 (PMV1) serology. The swabs were pooled, immersed in transport medium and submitted for avian influenza analysis. Avian influenza and PMV1 tests were negative but all the serum samples were positive for *Mycoplasma gallisepticum* infection. As recovered birds remain infected for life and subsequent stress may cause recurrence of disease, the owner decided to euthanize the birds and bury them under licence on the farm.

Calf Mortality in a Suckler Herd

During 2008, Athlone RVL conducted a farm investigation in a suckler herd experiencing high calf mortality. Calves were born strong and hardy but developed navel infections and scours at approximately 2 weeks of age. Almost all home bred calves (from both cows and heifers) were affected. Interestingly, some young calves that had been bought-in showed no ill effects. The herdowner ensured that calves received adequate colostrum in the first hours of life. Navel dipping and navel clips were also used. Vaccination for *L hardjo*, BVD and calf diarrhoea (Rotavirus and Coronavirus) was undertaken and cows had regular fluke and worm treatments. Pre-calving minerals were spread on silage at the recommended rate for a minimum of 60 days and booster minerals were also given to calves at birth for 3 days.

The cows' diet, since January, had included silage with 0.5 kg of soya and 2 kgs of straw fed in a feeder wagon. The heifers were fed silage *ad lib*. There were 10 calving pens which were power hosed, cleaned and disinfected regularly. Blood and faecal samples were taken from a representative number of cows from the herd. When sampling a batch of pregnant animals the sweet smell of ketones was detected from some of the animals. The laboratory findings showed raised Beta-Hydroxybutarate (BHB) values in 5 out of the 6 cows tested in late pregnancy – some were very high. This suggested inadequate energy in the pre-calving diet. There were also some marginally low copper and magnesium values. There was only one calf under 2 weeks of age on the farm at the time of the investigation visit and this calf showed evidence of poor colostral immunity on the ZST test. All other parameters measured were within their normal ranges. There was no evidence of Salmonellosis, BVD or Neosporosis. There were no significant fluke or worm burdens in the cows. It was concluded that colostral quality was poor due to the pre-calving diet. It was recommended that in future the herdowner ensure that the pre-calving diet had sufficient energy to maintain pregnancy, that the cows be supplemented with copper and to ensure that magnesium was supplemented during the high risk tetany periods. It was notable that calves born subsequently and fed on colostrum sourced from a different herd did not develop any similar problems.

A Selection of Abstracts from Published Papers 2008

The Relationship Between Clinical Signs, Pathological Changes and Tissue Dissemination of *Mycobacterium avium* subspecies *paratuberculosis* in 21 cattle from Johne's Disease Affected Herds.

The Veterinary Record (2008) Vol.162: 147-152. (Reproduced with their kind permission)

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Twenty-one cows from eight herds affected by Johne's disease were assigned to four groups; seven were not thriving and had persistent diarrhoea, six were not thriving and had intermittent diarrhoea, four were not thriving but did not have diarrhoea and four were clinically normal. *Post mortem* macroscopic lesions consistent with Johne's disease were identified in 17 of the cows and *Mycobacterium avium* subspecies *paratuberculosis (Map)* was isolated from all of them. However, except for the fact that diarrhoea was correlated with the presence of lesions in the large intestine there was little correlation between the presence or absence of clinical signs and the lesions associated with Johne's disease. The tissue distribution of Map was also poorly correlated with either the clinical signs or the lesions. The organism was widely distributed in 17 of the 21 cows, including three of the clinically normal animals, and was present in mammary tissues of seven cows including two of the clinically normal animals. Three distinct histopathological patterns were observed in the affected intestines; infiltration of the lamina propria with giant cells, tuberculoid lesions, and lepromatous lesions; the lepromatous lesions were associated with extensive pathological changes.

Major outbreak of suspected botulism in a dairy herd in the Republic of Ireland

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This is the first report of a major outbreak of a paralytic disease in cattle on a farm in the Republic of Ireland. In the early stages of the disease, the animals were listless, reluctant to move and stiff. Within 24 hours severely affected cows became depressed, dehydrated and progressively paralysed. Other clinical signs included photophobia, sluggish rumen movements, reduced anal tone and tail paralysis. The outbreak lasted eighteen days with the loss of thirty-six of the sixty five cows in the herd. A presumptive diagnosis of botulism was made on the basis of the clinical signs, the duration of the outbreak and the *post mortem* findings, and by ruling out other differential diagnoses.

Control of *Mycobacterium bovis* infection in two sika deer herds in Ireland

Irish Veterinary Journal 61: (1), 27 – 32 (Reproduced with their kind permission)

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In a number of countries, tuberculosis (due to infection with *Mycobacterium bovis*) is a significant health problem of captive deer. This paper describes outbreaks of bovine tuberculosis in sika deer *(Cervus nippon)* on two farms in Ireland and the methods used to control the disease. On Farm A, infection was first detected during 1993. The infection was eradicated using a programme of test and removal, in association with segregation of young animals. A second outbreak (also due to infection with *M. bovis*, but a different RFLP profile) was detected in 2002. In the latter outbreak, infection was particularly prevalent in two groups of young deer. *M. bovis* with the same RFLP profile was also isolated in a badger found dead on the farm. Control was achieved by test and removal in association with herd management changes. In Herd B, infection was first detected in 1995, and subsequently eradicated using test and removal alone. In Herd A, re-infection remains an ongoing risk. Control rather than eradication of infection may be more realistic in the short- to medium-term.

Tuberculosis in alpaca *(Lama pacos)* on a farm in Ireland. 1. A clinical report

Irish Veterinary Journal 61: (8), 527 – 531 (Reproduced with their kind permission)

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This case report describes tuberculosis (TB) due to infection with *Mycobacterium bovis (M. bovis)* in alpaca *(Lama pacos)* on a farm in Ireland. Two severely debilitated alpaca were presented to the University Veterinary Hospital, University College Dublin in November 2004.

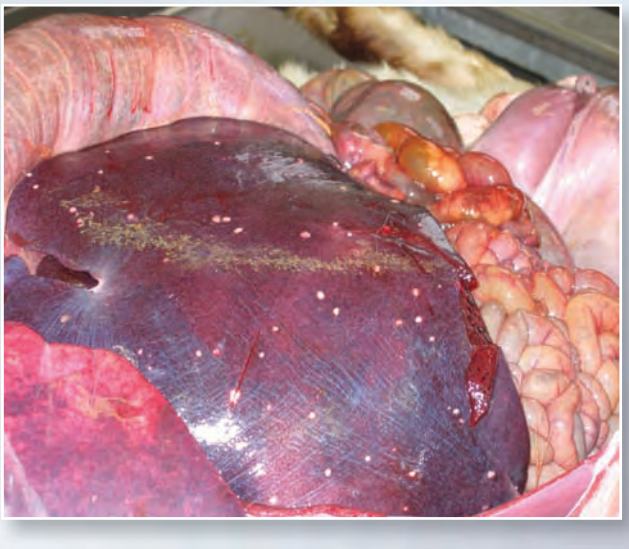

Figure 54: Miliary tuberculous lesions in the liver of an alpaca (Photo: John Fagan).

Bloods were taken, and haematology and biochemistry results were indicative of chronic infection. Radiological examination showed evidence of diffuse granulomatous pneumonia suggestive of tuberculosis. On necropsy there were granulomatous lesions present throughout many body organs including lung, liver (Figure 54), kidney, intestine as well as on peritoneum and mesentery. Culture of acid-fast bacilli from lesions led to a diagnosis of tuberculosis due to *M. bovis*. The use of intradermal skin testing proved inefficient and unreliable for *ante mortem* diagnosis of tuberculosis in alpaca. Infection due to *M. bovis* should be considered among the differential diagnoses of debilitating diseases in alpaca, particularly those farmed in areas known to be traditional black spots for tuberculosis in cattle.

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