Animal Disease Surveillance, AFBI

Agri-Food and Biosciences Institute

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Contents

Chapter 1

Introduction

AFBI provides an animal disease surveillance and diagnostic service for the Northern Irish farming industry. Passive (scanning) surveillance is carried out by collecting and analysing data from post mortem and clinical samples submitted to the Omagh and Stormont laboratory sites of the Disease Surveillance and Investigation Branch (DSIB) of AFBI. Analysis of this data assists in establishing baselines for incidence of endemic disease, facilitating the recognition of new and emerging diseases and allowing the rapid identification of changing trends in disease prevalence. This will allow evidence based decision making regarding control by veterinary providers and at a national level.

Chapter 2

Cattle Diseases

2.1 Neonatal Calves (0-1 months)

As in previous years, enteric infections were the most frequently diagnosed cause of death for this age group in 2017 in Northern Ireland (see below breakdown on bovine neonatal enteritis). Failure of passive transfer of maternal immunity was detected in 65% of blood samples tested using the ZST (zinc sulphate turbity test) from calves aged less than 10 days, highlighting the importance of good colostrum management. This year respiratory infections were the second most commonly diagnosed cause of death for this age group.

2.2 Calves (1-5 months)

Respiratory infections accounted for just over half of all deaths in this age group in 2017 Northern Ireland, highlighting the economic and welfare implications of respiratory disease (see the bovine respiratory disease section below).

2.3 Calves (6-12 months)

The most commonly diagnosed cause of death in this age group in 2017 was respiratory infections which increased from 42% of cases in 2016 to 49% of cases in 2017. Clostridial diseases were identified as the second largest cause of mortality in this age group in Northern Ireland in 2017 despite the availability of cheap and efficacious vaccines.

2.4 Adults (> 12 months)

As in previous years, respiratory infections were identified as the most common cause of death in adult cattle. Clostridial disease accounted for 8.4% of adult cattle deaths in 2017, representing a decrease from the 10% of cases in 2016. Cardiac/ circulatory system conditions such as endocarditis, pericarditis and caudal vena cava thrombosis were also a common cause of mortality in adult cows in 2017.

Table 2.1: The conditions most frequently diagnosed on *post-mortem* examinations of neonatal calves (0-1 months) in 2017, (n= 610)

Category	No. of cases	Percentage
Enteric infections	254	41.6
Respiratory infections	89	14.6
Nutritional / metabolic conditions	50	8.2
Septicaemia / toxaemia	47	7.7
Navel ill / Joint ill	43	7.0
Other diagnoses	36	5.9
Salmonellosis	23	3.8
Diagnosis not reached	16	2.6
Cardiovascular system	10	1.6
Stomach / Intestinal torsion /obstruction	10	1.6
Nervous system conditions	6	1.0
Peritonitis	6	1.0
Bovine neonatal pancytopaenia (BNP)	5	0.8
Hereditary and developmental abnormality	5	0.8
Fractures / skeletal abnormalities / calving injuries	4	0.7
Stomach / Intestinal ulcers / perforations	3	0.5
Urinary tract conditions	3	0.5

Table 2.2: The conditions most frequently diagnosed on *post-mortem* examinations of calves (1-5 months) in AFBI during 2017 (n= 369)

Category	No. of cases	Percentage
Respiratory infections	186	50.4
Enteric infections	35	9.5
Diagnosis not reached	19	5.2
Nutritional / metabolic conditions	18	4.9
Stomach / Intestinal torsions /obstruction	17	4.6
Peritonitis	15	4.1
Other diagnoses	14	3.8
Septicaemia / toxaemia	13	3.5
Clostridial disease	11	3.0
Navel ill / Joint ill	11	3.0
Cardiovascular conditions	9	2.4
Nervous system conditions	6	1.6
Urinary tract conditions	6	1.6
Stomach / Intestinal ulcer / perforation	5	1.4
BVD / Mucosal disease	2	0.5
Poisoning	2	0.5

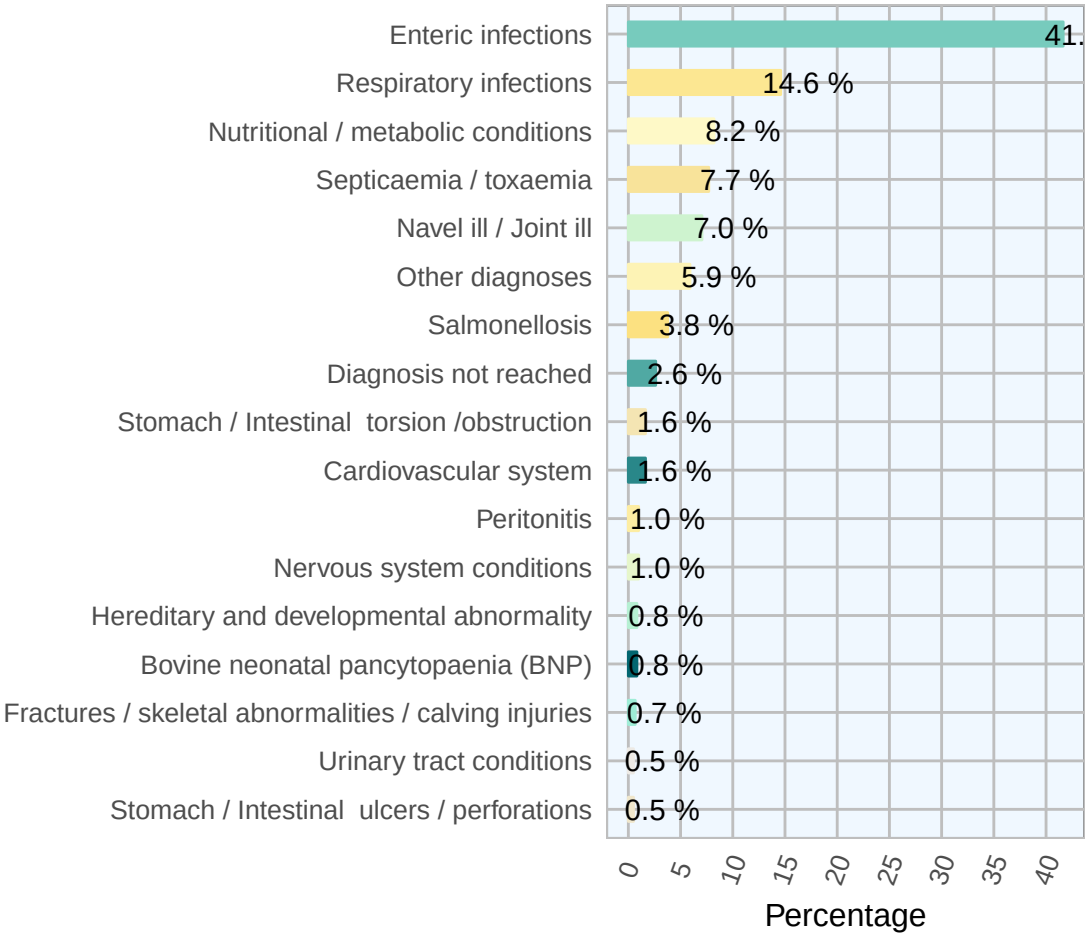


Figure 2.1: The conditions most frequently diagnosed on post-mortem examinations of neonatal calves (0-1 months) by AFBI during 2017 (n= 610)

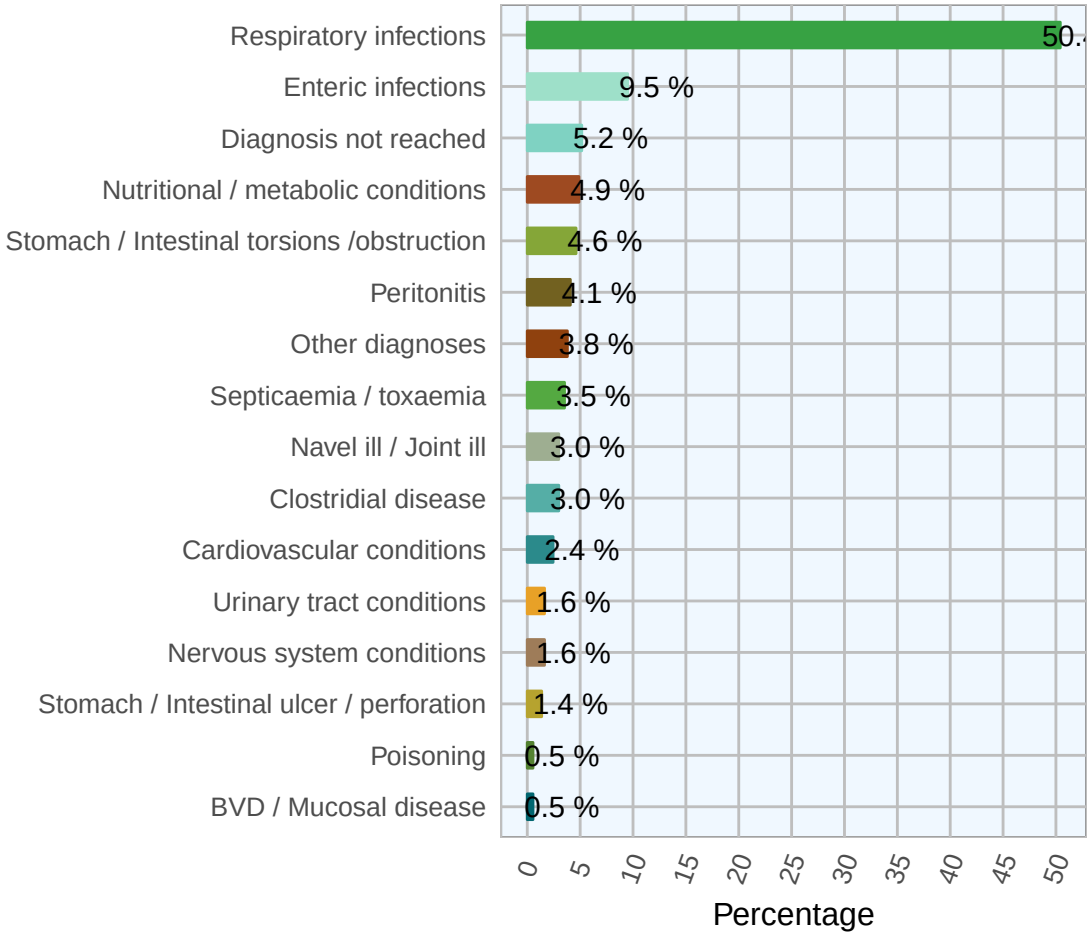


Figure 2.2: The conditions most frequently diagnosed on *post-mortem* examinations of calves (1-5 months) by AFBI during 2017 (n= 369)

Figure 2.3: Intestinal torsion. Photo:AFBI

Table 2.3: The conditions most frequently diagnosed on *post-mortem* examinations of calves (6-12 months) in AFBI during 2017 (n= 163)

Category	No. of cases	Percentage
Respiratory tract infections	80	49.1
Clostridial disease	18	11.0
Diagnosis not reached	17	10.4
Nutritional / metabolic conditions	11	6.8
Enteric infections	8	4.9
Other diagnoses	6	3.7
Liver disease	3	1.8
Poisoning	3	1.8
Stomach / Intestinal ulcer, perforation, for body	3	1.8
Urinary tract conditions	3	1.8
BVD / Mucosal disease	2	1.2
Cardiac conditions	2	1.2
Nervous system conditions	2	1.2
Skeletal conditions	2	1.2
Stomach / Intestinal torsion / obstruction	2	1.2
Peritonitis	1	0.6

Table 2.4: The conditions most frequently diagnosed on *post-mortem* examinations of adults (>12 months) by AFBI during 2017 (n= 464)

Category	No. of cases	Percentage
Respiratory infections	95	20.5
Other diagnoses	56	12.1
Diagnosis not reached	55	11.8
Cardiac / circulatory system	50	10.8
Clostridial disease	39	8.4
Nutritional / metabolic conditions	36	7.8
Liver disease	29	6.2
Stomach / Intestinal ulceration / perforation / foreign body	24	5.2
Enteric infections	19	4.1
Reproductive tract infections / Mastitis	12	2.6
Intestinal or gastric torsion / obstruction	10	2.2
Peritonitis	10	2.2
Poisoning	9	1.9
Urinary tract conditions	9	1.9
Tumour	6	1.3
Nervous system conditions	5	1.1

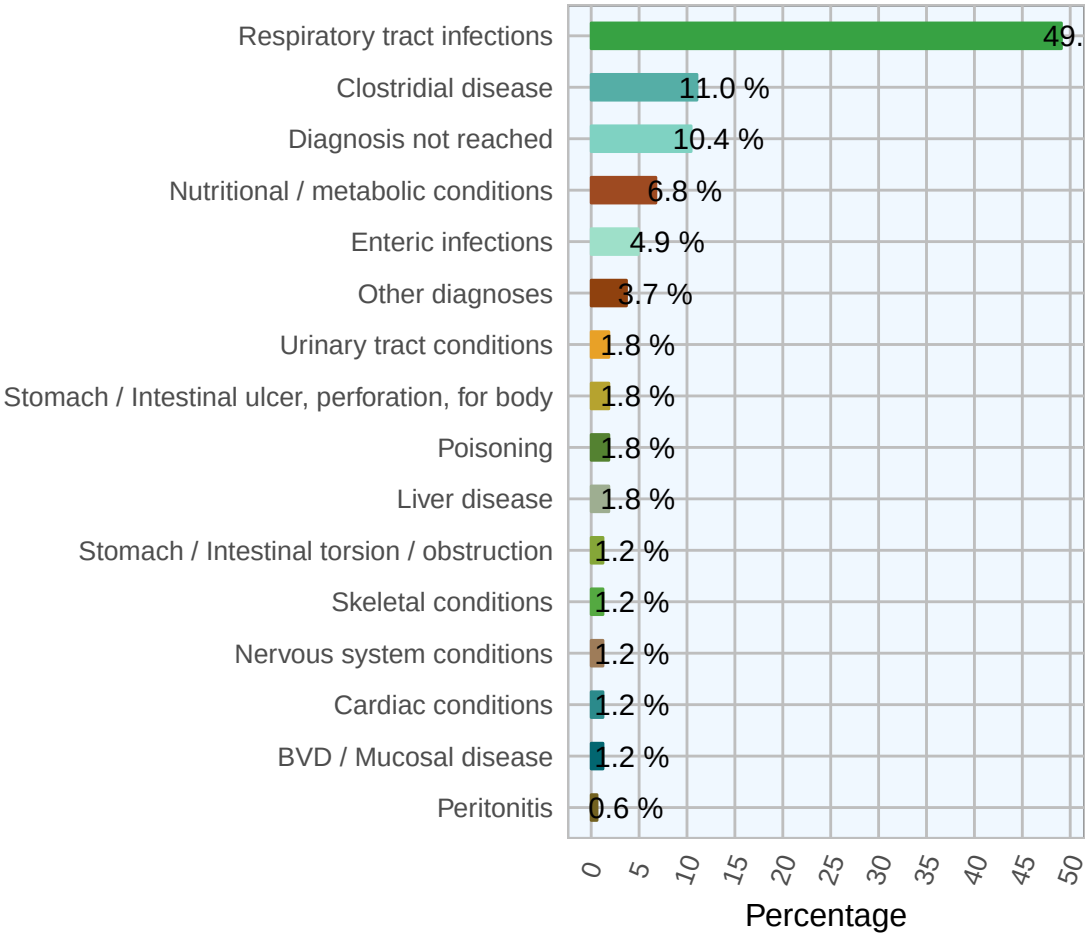


Figure 2.4: The conditions most frequently diagnosed on *post-mortem* examinations of calves (6-12 months) by AFBI during 2017 (n= 163)

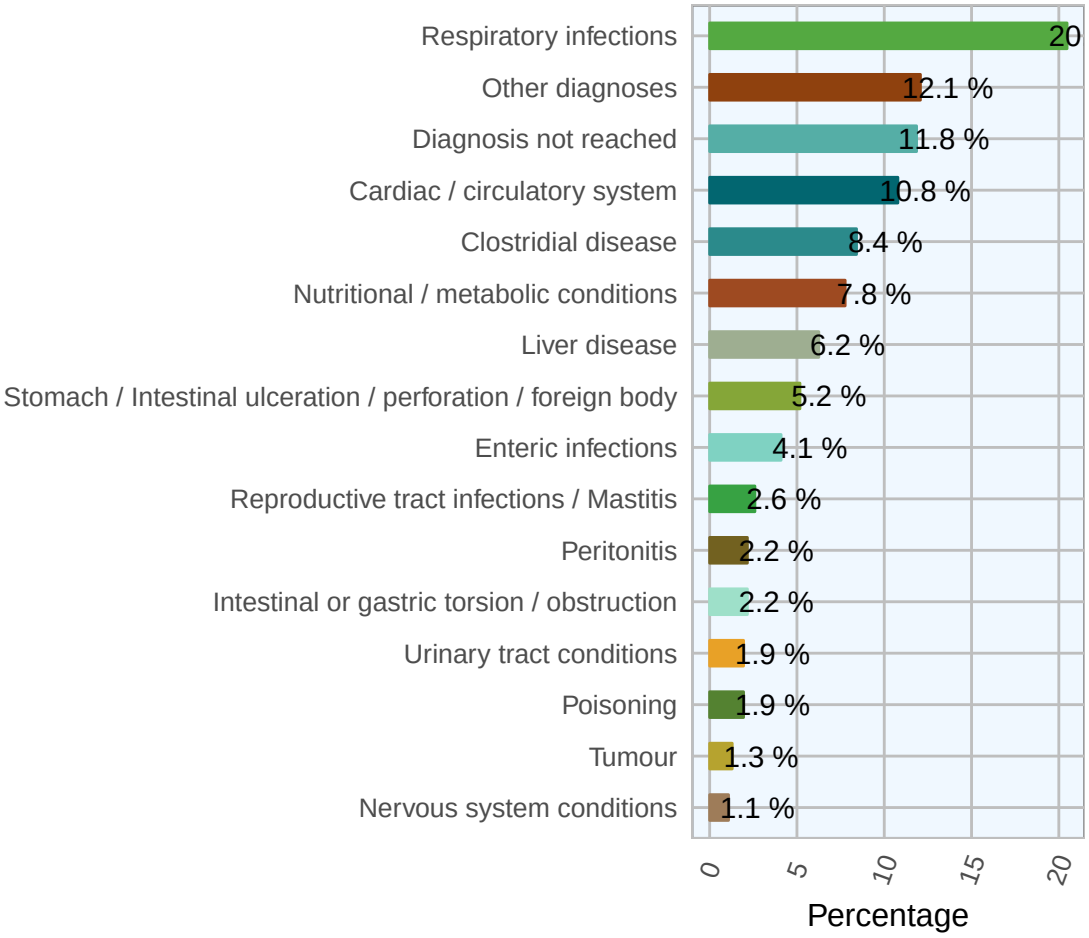


Figure 2.5: The conditions most frequently diagnosed on *post-mortem* examinations of adults (>12 months) by AFBI during 2017, (n= 464)

Chapter 3

Bovine Respiratory Disease (BRD)

Bovine respiratory disease was the most commonly identified cause of death in all age groups of bovines, other than neonatal calves, submitted to AFBI in 2017 and was the second most commonly identified cause of death in neonatal calves. There were multiple aetiologies for respiratory infections identified. As in 2016 *Mycoplasma bovis* was the pathogen identified with the greatest frequency from cattle diagnosed with respiratory disease in 2017. At AFBI *Mycoplasma bovis* is detected by a PCR testing and positive results need to be interpreted in conjunction with gross and histopathological findings. Environmental factors also play a role in the condition. Parasitic bronchitis due to the lungworm *Dictyocaulus viviparus* (Figure 3.3) was seen in 6.9% of bovine respiratory disease diagnoses cases with the expected seasonal peak in August. The economic cost of wastage and reduced productivity due to respiratory infections in the cattle industry is considerable.

3.1 Diagnoses by Group

3.1.1 Bovine Respiratory Disease Diagnoses

3.1.2 Lungworm

Table 3.1: The most common diagnostic groups on *post-mortem* examinations of bovine respiratory disease by AFBI during 2017 (n= 391)

Category	No. of cases	Percentage
Bacterial	220	56.3
Other	135	34.5
Viral	36	9.2

Table 3.2: Relative frequency of diagnoses in bovine respiratory disease recorded by AFBI during 2017, (n= 388)

Category	No. of cases	Percentage
Pneumonia - Mycoplasma bovis	90	23.2
Pneumonia - Other	87	22.4
Pneumonia - P. multocida	45	11.6
Pneumonia - A. pyogenes	35	9.0
Pneumonia - M. haemolytica	33	8.5
Pneumonia - Parasitic - husk	27	7.0
Respiratory - Other	22	5.7
Pneumonia - RSV	15	3.9
Pneumonia - IBR	12	3.1
Pneumonia - H. somnus	10	2.6
Pneumonia - BVD	5	1.3
Pneumonia - aspiration	4	1.0
Pneumonia - PI3	2	0.5
Pulmonary haemorrhage	1	0.3

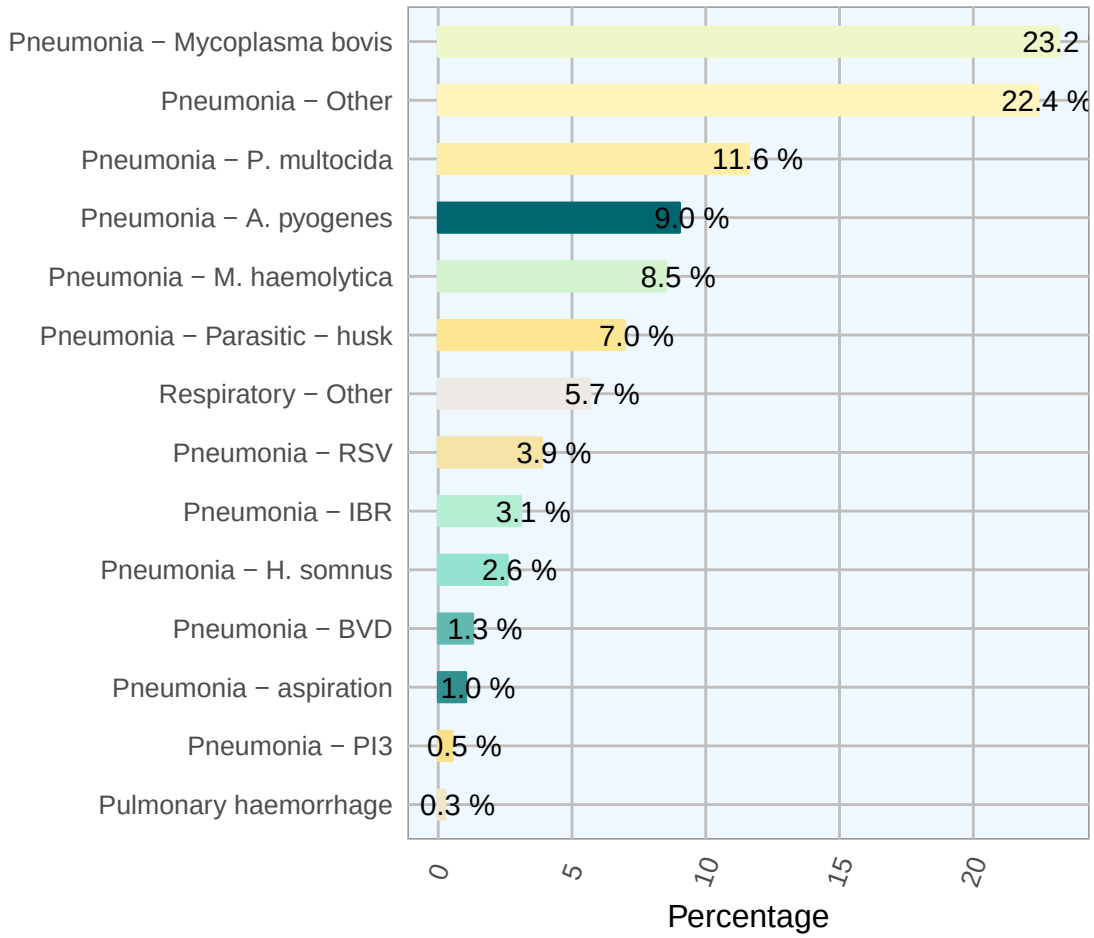


Figure 3.1: Relative frequency of diagnoses in bovine respiratory disease recorded by AFBI during 2017, (n= 0)

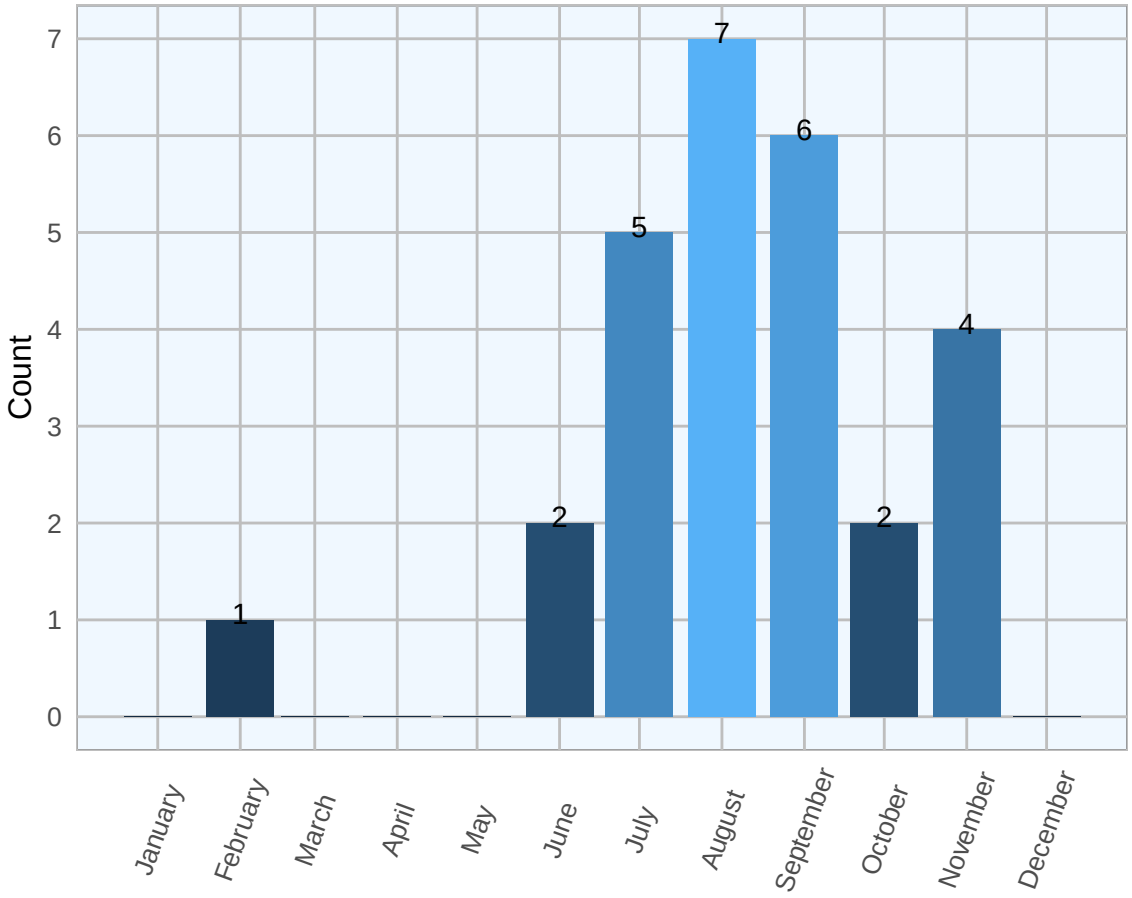


Figure 3.2: Cases of death due to lungworm in cattle recorded by AFBI during 2017, (n= 27)

Figure 3.3: Trachea containing large numbers of lungworm (*Dictyocaulus viviparus*). Photo:AFBI

Chapter 4

Bovine Abortions

Bovine abortion is a significant cause of livestock wastage and results in considerable costs to the cattle industry. As a general guideline once the level of abortions exceeds 3% or if there are several abortions clustered together investigation should be carried out. Specimens from 427 bovine abortions and stillbirths were examined during 2017 (430 were examined in 2016). Significant pathogens were detected in 198 of these (46%). This diagnostic rate is comparable to other years and reflects the multiple aetiologies of bovine abortion and the fact that not all abortions are due to an infectious cause. *Trueperella pyogenes* and *Bacillus licheniformis* were the most commonly diagnosed pathogens as in previous years. *Neospora caninum* was the third most commonly diagnosed pathogen followed by *Salmonella Dublin* BVDV and *E.coli*. *T. pyogenes* is considered a sporadic cause of abortion through haematogenous spread and placentitis. *Bacillus licheniformis* also results in placentitis. *B. licheniformis* is ubiquitous, although silage, run-off water, foodstuffs and bedding that have become contaminated with silage effluent and wet spoiled hay are the most likely sources of infection.

4.1 Salmonella Dublin Abortion

Table 4.1: The most frequently diagnosed causes of cattle abortion diagnosed at AFBI in 2017 (n= 427)

Category	Count	Percentage
Diagnosis not reached	229	53.6
T. pyogenes	37	8.7
B. licheniformis	35	8.2
N. caninum	21	4.9
Other	17	4.0
BVDV	15	3.5
E. coli	15	3.5
S. Dublin	15	3.5
Leptospirosis	12	2.8
Pasteurellosis	9	2.1
Foetal abnormalities	8	1.9
Schmallenberg Virus	5	1.2
Listeria	4	0.9
Campylobacter sp	3	0.7
Aspergillosis	2	0.5

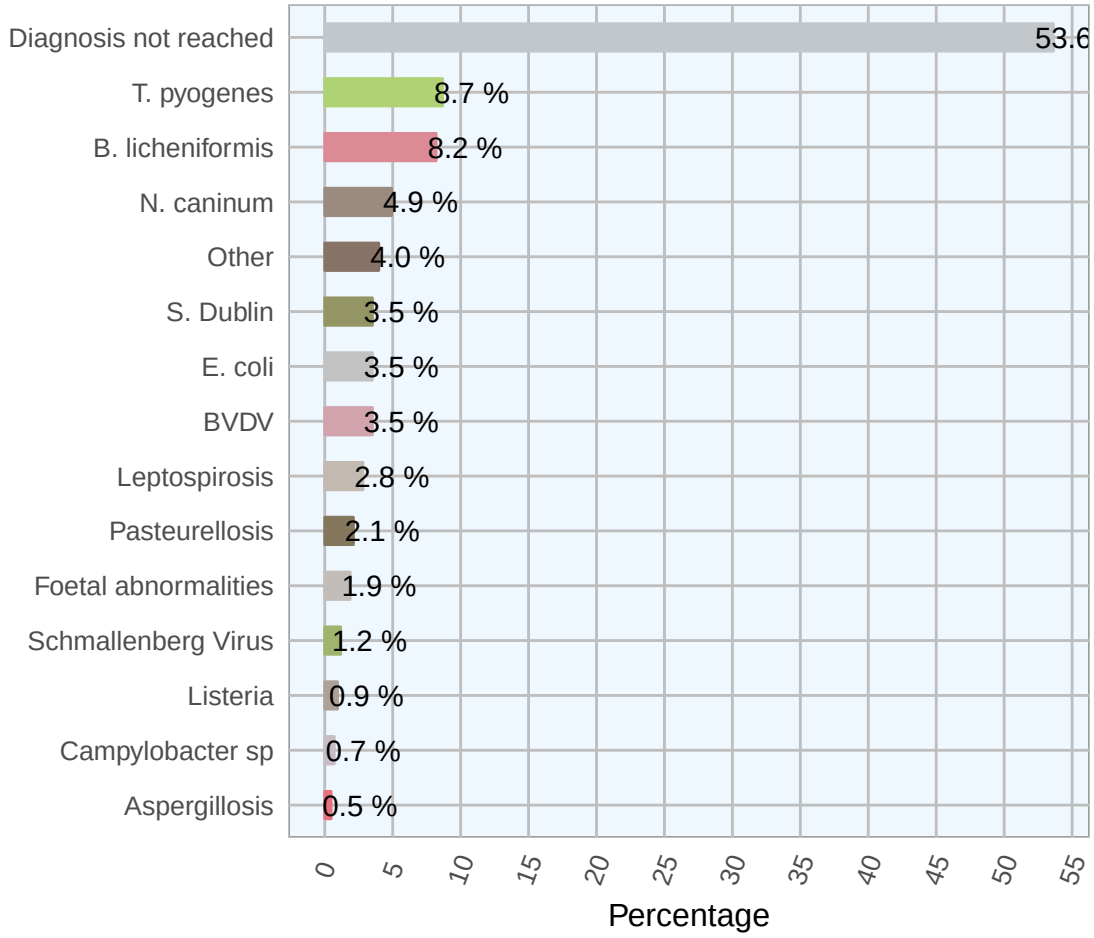


Figure 4.1: The most frequently diagnosed causes of cattle abortion diagnosed at AFBI in 2017 (n= 427)

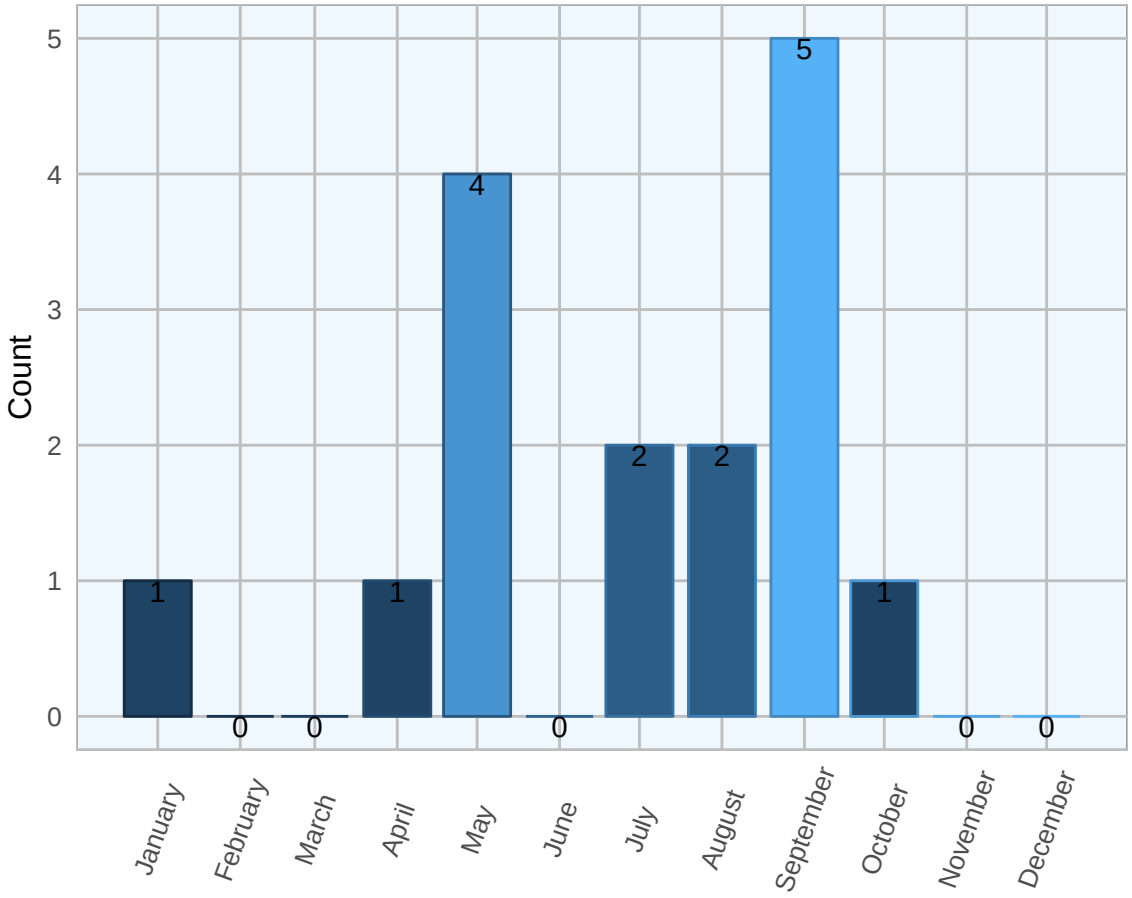


Figure 4.2: Diagnosis of abortion due to *Salmonella Dublin* in 2017

Chapter 5

Clostridial Diseases

Table 5.1: Clostridial Diseases

Clostridial disease	Number of Cases
Blackleg	31
Botulism	12
Black disease	11
Clostridium perfringens	1
Malignant oedema	1

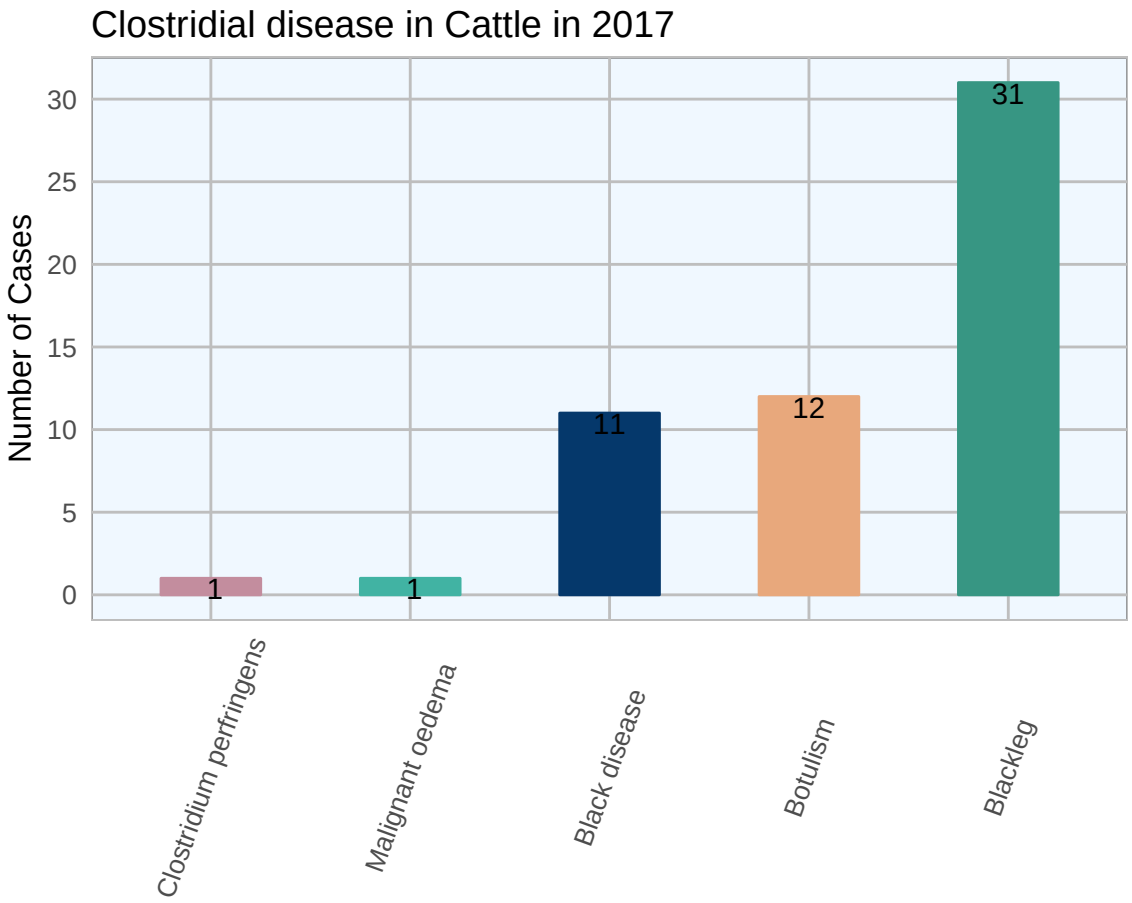
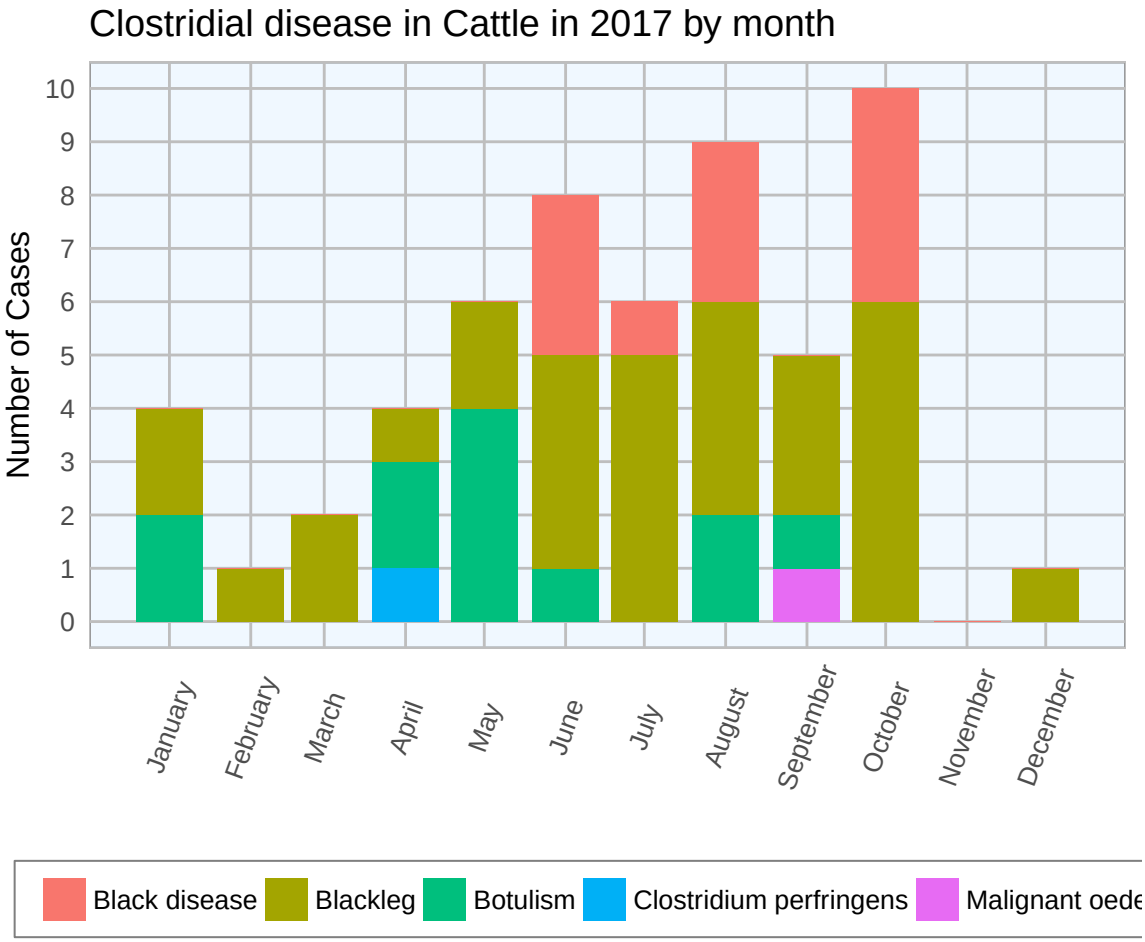


Figure 5.1: Clostridial disease in Cattle in 2017

Figure 5.2: : Pale focus typical of black disease in a bovine liver. Photo:AFBI


Clostridial disease in Cattle in 2017 by month
Number of Cases
0
1
2
3
4
5
6
7
8
9
10
January
February
March
April
May
June
July
August
September
October
November
December
Black disease
Blackleg
Botulism
Clostridium perfringens
Malignant oede

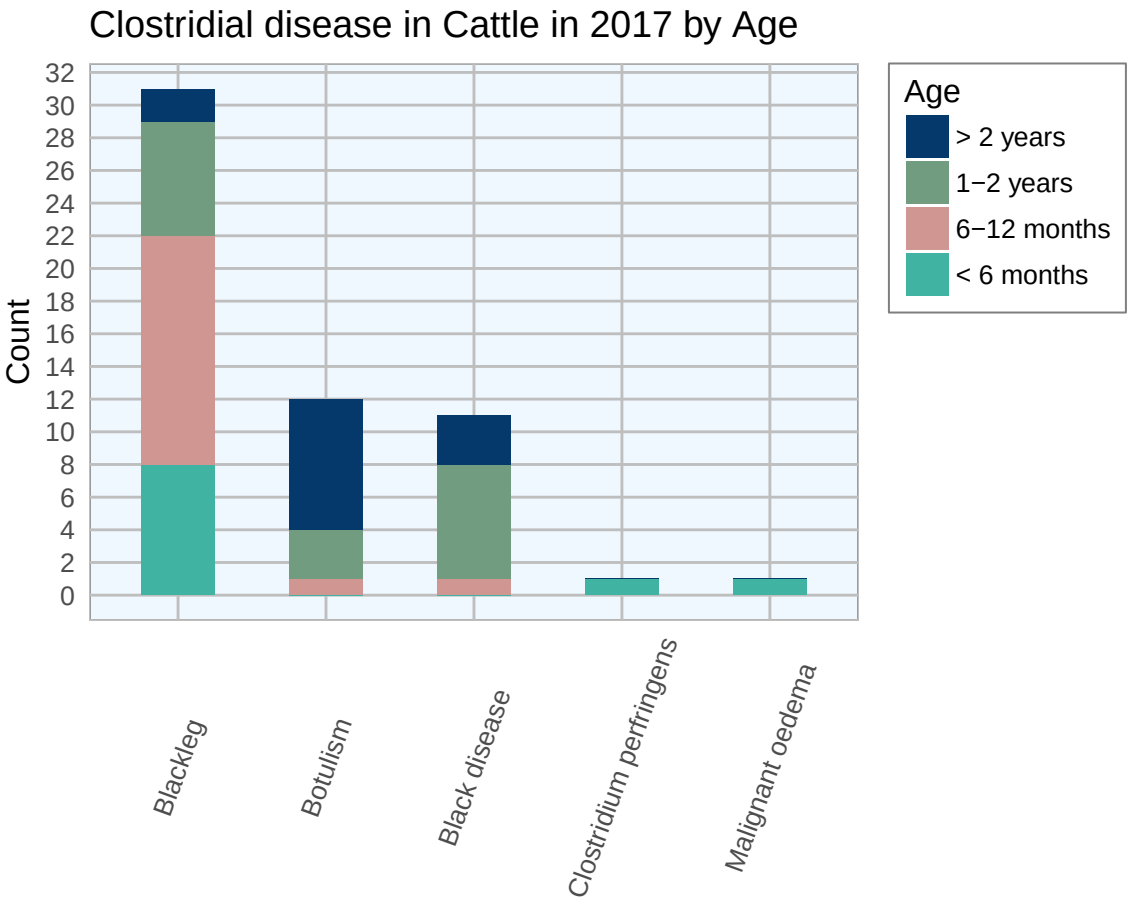


Figure 5.3: Clostridial disease in Cattle in 2017

Chapter 6

Bovine Mastitis

A total of 1147 bacterial isolates were cultured from milk samples submitted from acute and chronic mastitis cases. Significance of the organism depends on the cell count, the level of the organism isolated and whether or not the organism was isolated in pure culture. Isolation of 3 or more species suggests contamination during sampling. Interpretation of the results should therefore be undertaken with care. Submission of contaminated samples has dropped from 10.6% of samples in 2016 to 9.6% in 2017. E.coli was the most frequently isolated organism accounting for 22.8% of isolates cultured (compared with 23.7% in 2016). *E.coli* is the most prevalent environmental cause of mastitis. Risk factors include poor hygiene, suboptimal milking machine function, teat end damage and lactation. Another frequently identified environmental organism, *Streptococcus uberis* was identified in 13.6% of submitted samples,a decline on previous years. *Staphylococcus aureus*, a "contagious" cause of mastitis, typically spread from cow to cow via the milking equipment was identified in 8.5% of samples submitted in 2017, compared to 8.1% in 2016.

Table 6.1: Bacteria isolated on culture of milk samples submitted to AFBI in 2017

Microorganism	No. of cases	Percentage
E.coli	261	22.8
Streptococcus uberis	156	13.6
Staphlococcus aureus	97	8.5
Streptococcus dysgalactiae	28	2.4
Contaminated samples	110	9.6
No bacteria cultured	143	12.5
Other	352	30.7

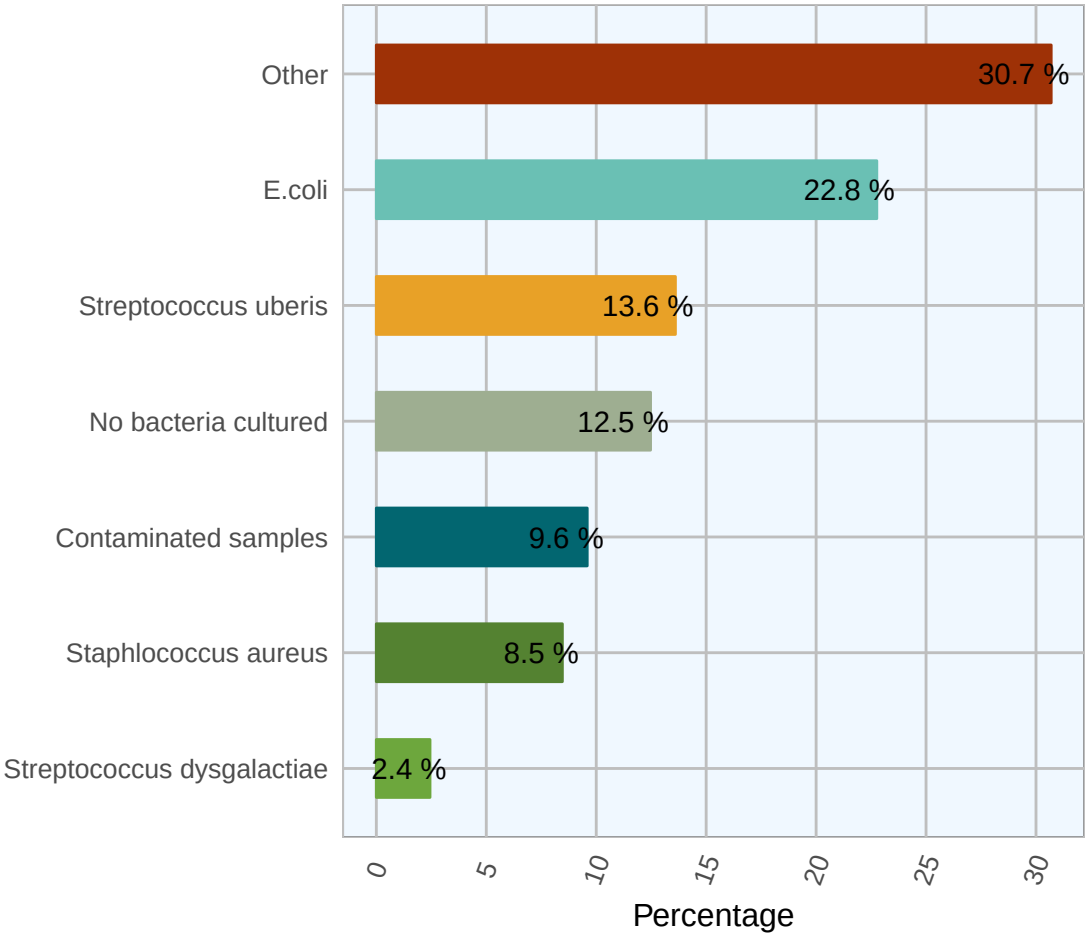


Figure 6.1: Bacteria isolated on culture of milk samples submitted to AFBI in 2017

Chapter 7

Bovine Parasites

7.1 Trichostrongyle eggs

7.2 Liver fluke eggs

7.3 Rumen fluke eggs

7.4 Coccidia

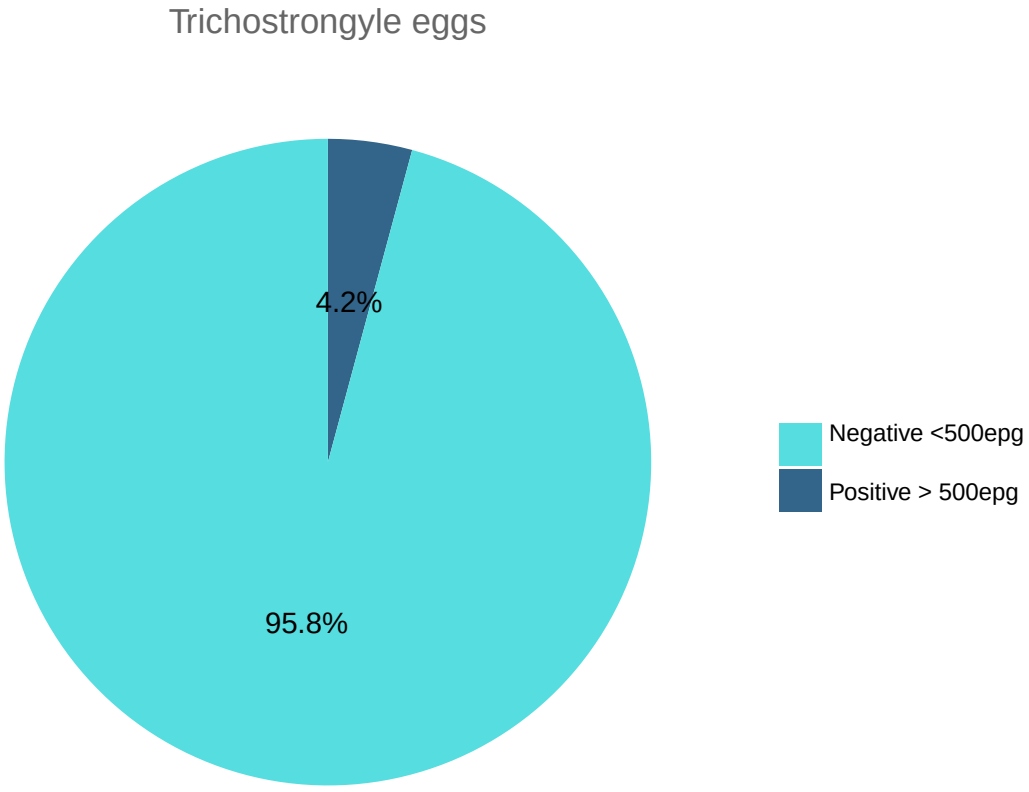


Figure 7.1: Relative frequency of detection of trichostrongyle eggs in bovine faecal samples examined in AFBI in 2017 in relation to a commonly used threshold of significance- 500 eggs per gram (n=3008)

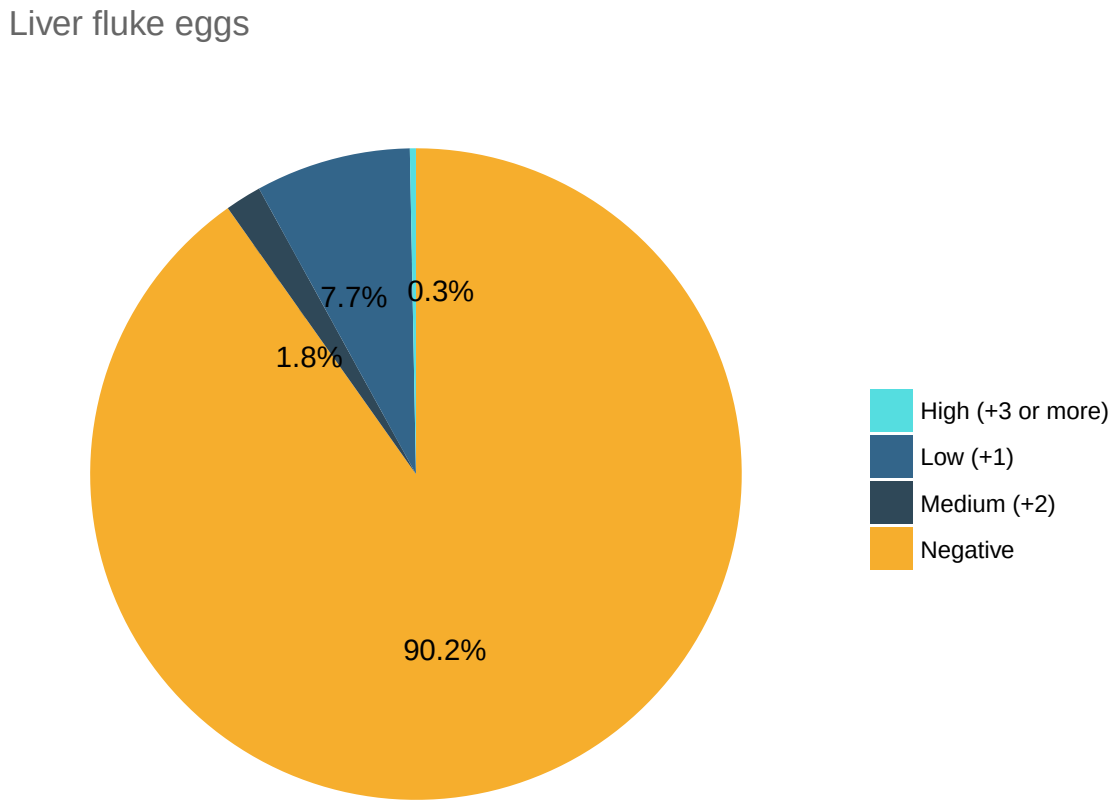


Figure 7.2: AFBI results for bovine faecal samples tested for liver fluke eggs during 2017 (n=2751)

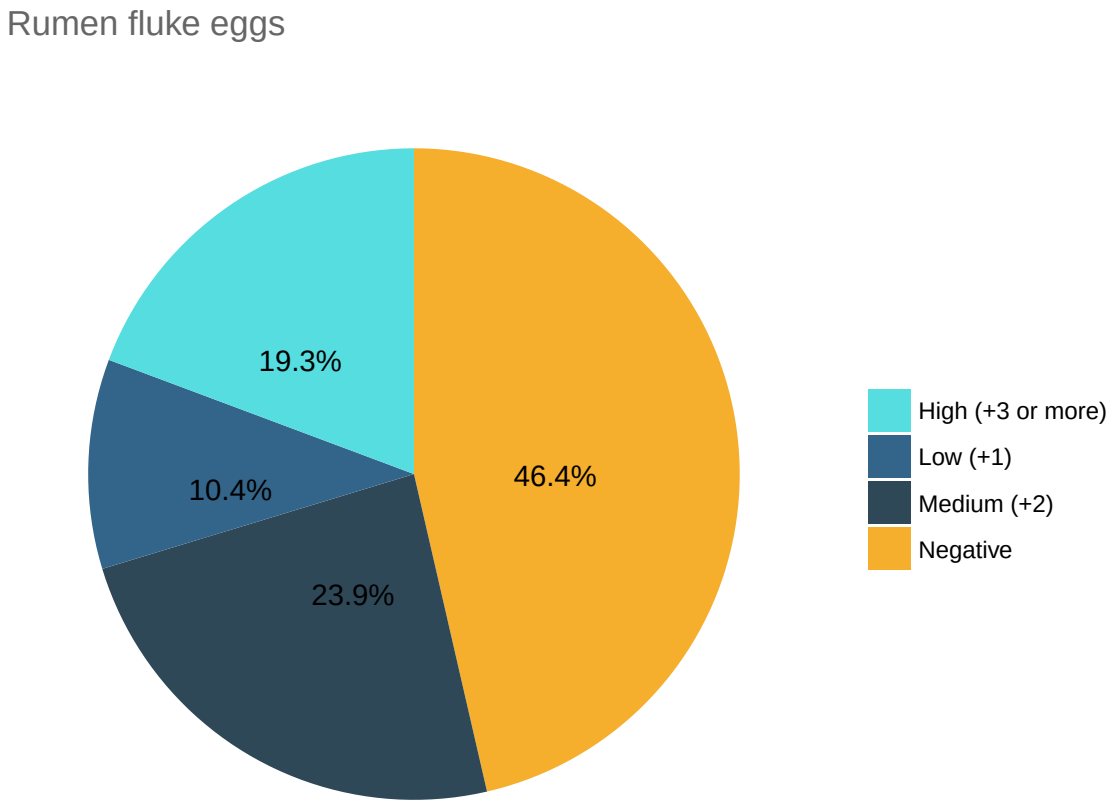


Figure 7.3: AFBI results for bovine faecal samples tested for paramphistome eggs during 2017 (n=2730)

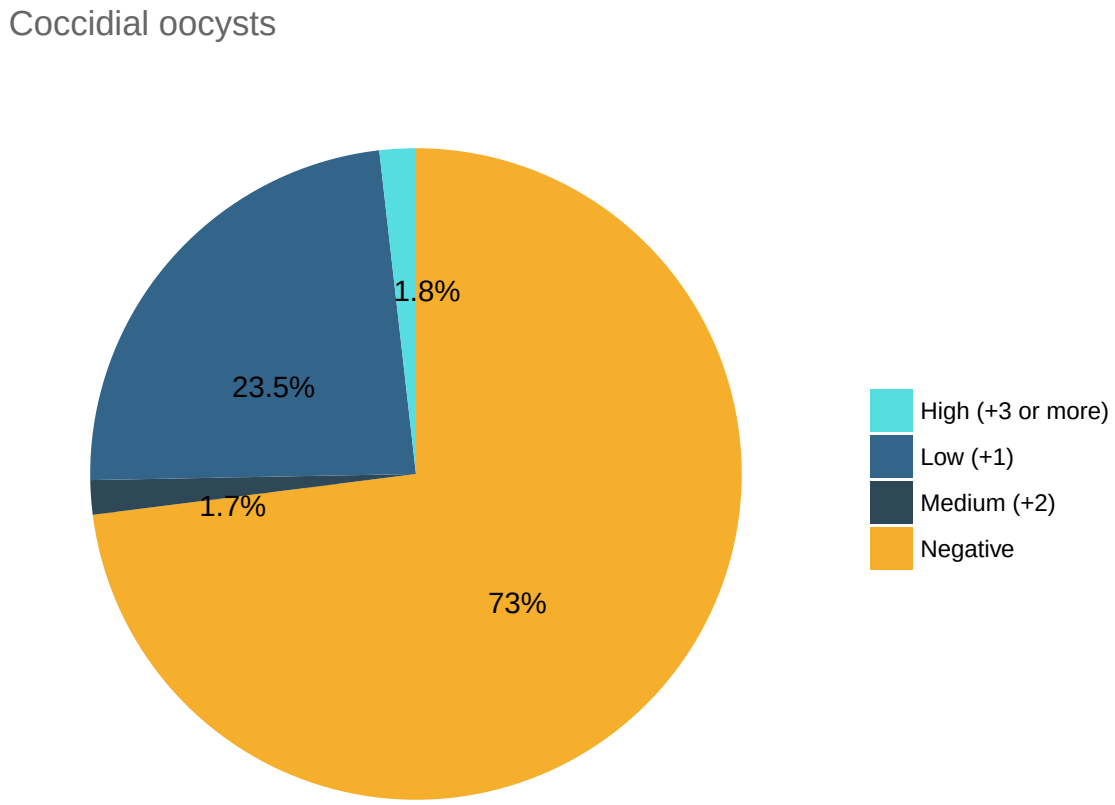


Figure 7.4: AFBI results for bovine faecal samples tested for coccidial oocysts during 2017 (n=3019)

Chapter 8

Bovine Neonatal Enteritis

863 neonatal faecal samples were examined by AFBI in 2017. As in previous years Cryptosporidium was the most regularly identified pathogen, identified in 37% of cases, rotavirus was the second most regularly identified pathogen, identified in 30% of cases and coronavirus was identified in 11% of cases. Faecal samples sent to AFBI from calves less than two weeks of age are also checked for the presence of *E.coli* expressing the K99 fimbrial antigen. *E.coli* K99 has been associated with enterotoxigenic colibacillosis in neonates. In 2017 *E.coli* K99 was identified in 3% of faecal samples from calves less than 2 weeks of age.

Table 8.1: Bovine Neonatal Enteritis

Organism	Tested	Positive	Percentage of samples tested
Cryptosporidium	863	320	37.1
Rotavirus	860	259	30.1
Coronavirus	863	94	10.9
E.coli K99	494	15	3.0
Salmonella	863	31	3.6

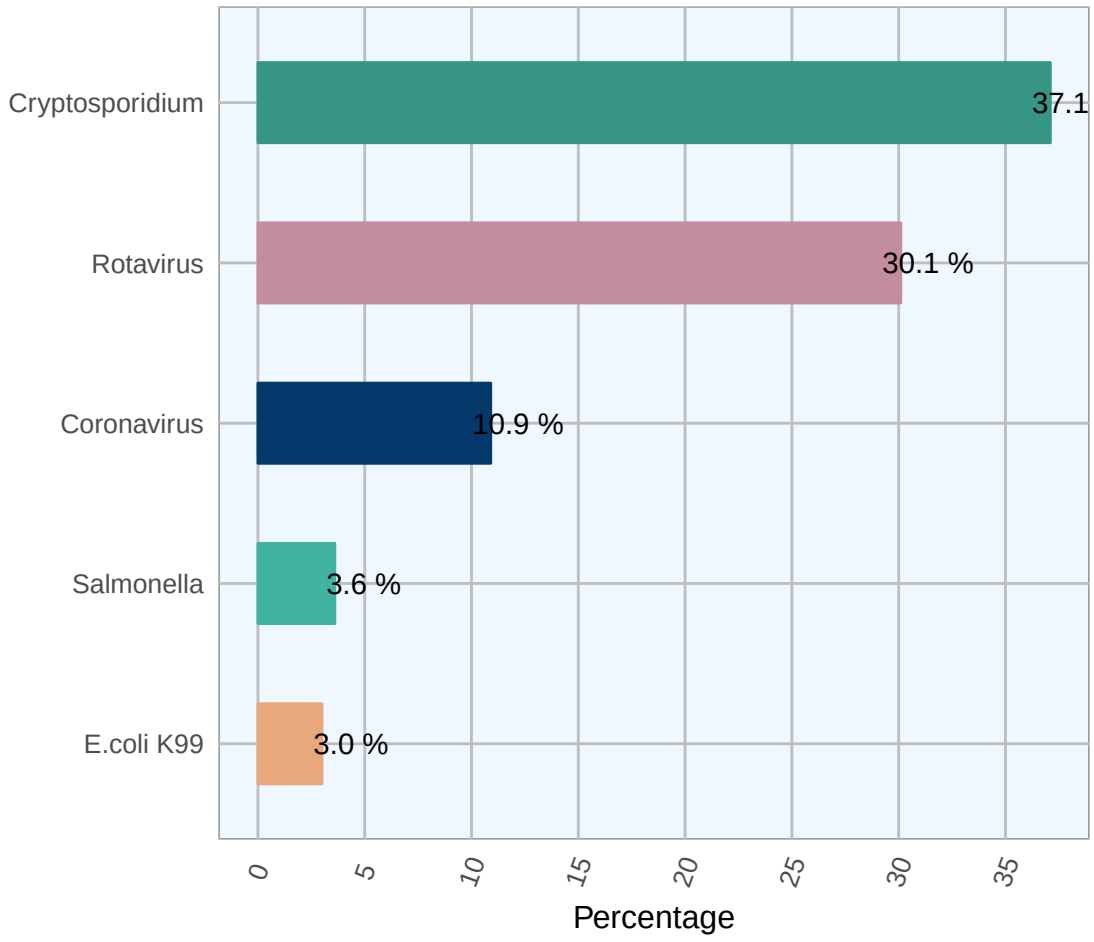


Figure 8.1: Bovine Neonatal Enteritis

Chapter 9

Zinc Sulphate Turbidity (ZST) Test

The Zinc Sulphate Turbidity test is an indirect measurement of the passive transfer of immunoglobulins from the dam to the neonate. During 2017, 864 blood samples (submitted by veterinary practitioners or collected at post-mortem examination of carcases at AFBI) were tested by AFBI and of these 465 (54%) returned a value of less than 20 units i.e. there had been inadequate passive transfer of immunoglobulins in this individual. Further analysis shows that of the 648 blood samples submitted by vets in practice, 324 (50%) were inadequate and of the 216 samples taken during a post mortem 141 (65%) were inadequate, this highlights the link between calf mortality and inadequate passive transfer of immunoglobulins.

Table 9.1: Zinc Sulphate Turbidity Test

Status	Count	Mean	Median	Minimum	Maximum
Adequate	407	30	27	0	111
Low	457	11	11	1	19

Chapter 10

Ovine Diseases

The number of sheep submissions in Northern Ireland decreased slightly in 2017 compared to 2016 perhaps reflecting the economic situation of the sheep sector during the year and also the higher levels of parasitic disease seen in the autumn and early winter of 2016.

As in 2016, parasitic disease and respiratory disease were the most commonly diagnosed causes of death in sheep of all ages in Northern Ireland. The relative importance of clostridial diseases increased slightly in 2017 compared to 2016.

10.1 Causes of sheep mortality in 2017

10.1.1 Septicaemia

Pasteurellosis was the most frequently diagnosed septicaemic cause of mortality in sheep in 2017 despite the availability of protective vaccines against pasteurellosis. Careful vaccination of breeding stock and if necessary finishing lambs is an effective way of reducing pasteurellosis.

Table 10.1: Conditions most frequently diagnosed on *post-mortem* examination of sheep by AFBI in 2017 (n= 559)

Category	No. of cases	Percentage
Parasitic Disease	188	33.6
Enteritis	158	28.3
Respiratory Disease	73	13.1
Septicaemia	36	6.4
Clostridial diseases	32	5.7
Nervous system conditions	27	4.8
Metabolic conditions	23	4.1
Poisoning	22	3.9

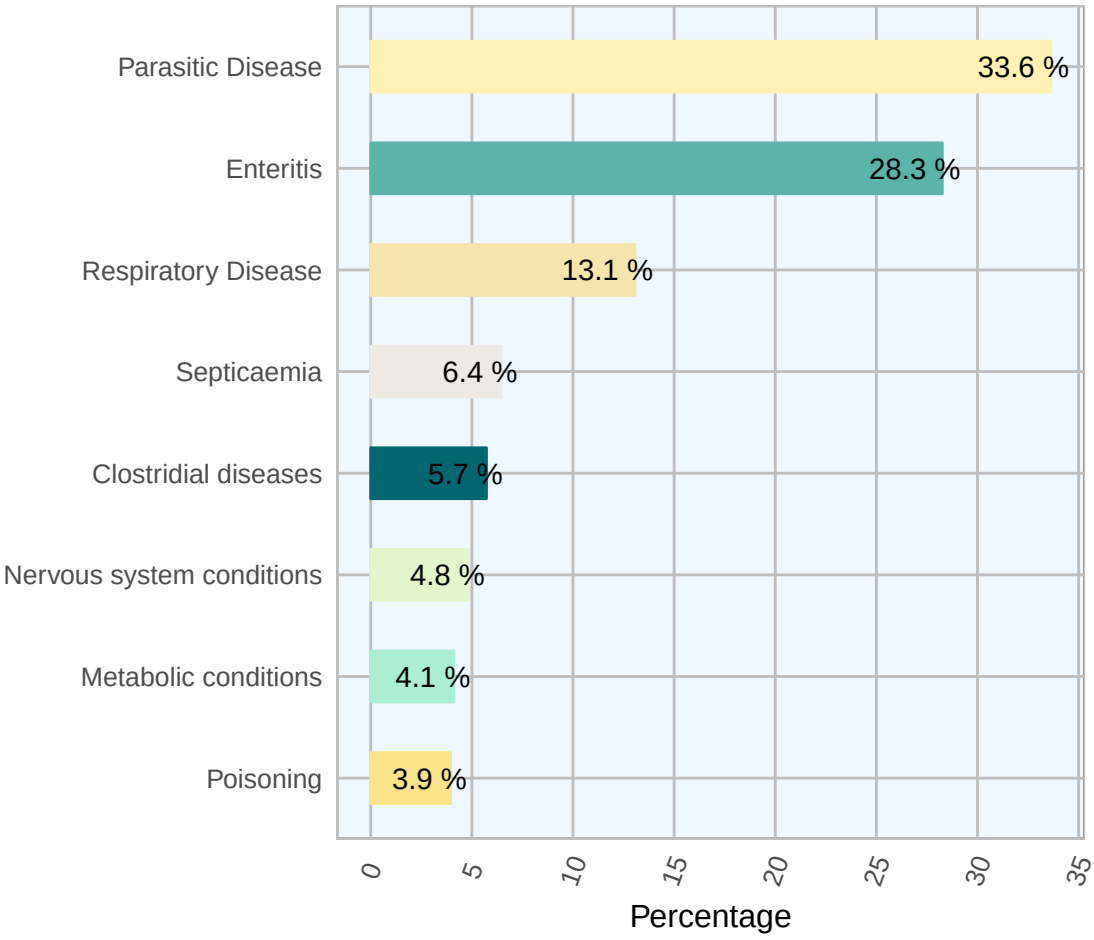


Figure 10.1: The conditions most frequently diagnosed on *post-mortem* examinations of ovine carcases in 2017(n= 559)

Table 10.2: The relative frequency of diagnoses of septicaemic conditions on *post-mortem* examination of sheep in 2017 (n= 36)

Disease	No. of cases	Percentage of total diagnoses
Pasteurella septicaemia	18	3.2
Colisepticaemia	9	1.6
Septicaemia (no organism specified)	5	0.9
Systemic pasteurellosis	3	0.5
Navel-ill / joint-ill	1	0.2

Table 10.3: The relative frequency of common respiratory diseases on *post-mortem* examination of sheep during 2017 (n= 73)

Disease	No. of cases	Percentage of total diagnoses
Pulmonary adenomatosis - Jaagsiekte	29	5.2
P haemolytica	18	3.2
Pneumonia (no organism specified)	10	1.8
Parasitic pneumonia	6	1.1
Bronchopneumonia	3	0.5
Laryngael chondritis	3	0.5
Fibrinous pleurisy	2	0.4
Necrotising laryngitis	1	0.2
Viral pneumonia	1	0.2

Figure 10.2: Lung section demonstrating ovine pulmonary adenomatosis (Jaagsiekte). Photo:AFBI

10.1.2 Respiratory Disease

Jaagsiekte, also known as ovine pulmonary adenomatosis (OPA) is a contagious tumour of the lungs of sheep. It is caused by a virus known as Jaagsiekte Sheep Retrovirus (JSRV) which spreads largely by the aerosol route but may also transmit from ewe to lamb via the colostrum and in utero. The disease is common in most sheep producing countries and GB, Northern Ireland and Ireland are no exception. Flocks affected with Jaagsiekte experience considerable loss through lowered production and increased ewe mortality and culling. Diagnosis in the live animal remains problematic though chest scanning for the detection of tumour tissue (Figure 10.2) becoming an increasingly used method.

10.1.3 Poisoning

Copper and *Pieris spp* (Forest Flame) were the most commonly diagnosed causes of poisoning in sheep in Northern Ireland in 2017.

Table 10.4: The most frequently diagnosed causes of poisoning on *post-mortem* examination of sheep by AFBI during 2017 (n= 22)

Disease	No. of cases	Percentage of total diagnoses
Pieris	14	2.5
Copper	4	0.7
Other plant poisoning	2	0.4
Rhododendron	2	0.4

Table 10.5: The most frequently diagnosed parasitic conditions on *post-mortem* examination of sheep carcasses during 2017 (n= 188)

Disease	No. of cases	Percentage of total diagnoses
Parasitic gastroenteritis	69	12.3
Chronic fasciolosis	50	8.9
Coccidiosis	24	4.3
Nematodirosis	24	4.3
Acute fasciolosis	21	3.8

10.1.4 Parasitic Disease

In 2017 levels of rainfall during the months of June through to September were considerably higher than the Northern Ireland average. July and September saw a 60 % increase in the level of rainfall above normal, with June and August seeing 12% and 33% increase respectively. With these conditions, the ground remained damp throughout the summer, ideal for the survival of the intermediate host of the liver fuke, the snail *Galba truncatula*.

Although in May and June the mean monthly temperatures were higher than the Northern Ireland average, the mean temperature for the period July to September, at 13.2 ˚ C, was 0.5 ˚ C lower than average. Mean temperatures of 10 ˚ C or higher are necessary both for the breeding of the intermediate host, the snail *Galba truncatula*, and for the development of fluke to occur within the snail. A temperature of 10 ˚ C is also the minimum at which fluke eggs will develop and hatch. The risk of liver fluke infection in autumn / winter 2017 was therefore assessed by AFBI as being particularly high especially in poorly drained areas.

Table 10.6: The most frequently diagnosed metabolic on *post-mortem* examinations of sheep carcases during 2017 (n= 23)

Disease	No. of cases	Percentage of total diagnoses
Acidosis	10	1.8
Twin lamb disease	7	1.2
Hypocalcaemia	3	0.5
Pregnancy toxaemia	2	0.4
Hypomagnesaemia	1	0.2

Table 10.7: The most frequently diagnosed causes of enteritis on *post-mortem* examination of sheep carcasses during 2017 (n= 158)

Disease	No. of cases	Percentage of total diagnoses
Parasitic gastroenteritis	69	12.3
Coccidiosis	24	4.3
Nematodirosis	24	4.3
Diarrhoea (no organism specified)	10	1.8
Enteritis (no organism specified)	8	1.4
Abomasitis	6	1.1
Colibacillosis – enteric	3	0.5
Colienteritis	3	0.5
Cryptosporidiosis	2	0.4
Johne's disease	2	0.4
Perforated intestine	2	0.4
Watery mouth	2	0.4
Colibacillosis enteric – K99 positive	1	0.2
Red gut	1	0.2
Tapeworm infestation	1	0.2

Table 10.8: The most frequently diagnosed causes of disease affecting the nervous system on *post-mortem* examinations of sheep carcases during 2017 (n= 27)

Disease	No. of cases	Percentage of total diagnoses
Listeriosis	15	2.7
Meningitis / encephalitis	6	1.1
Cerebrocortical necrosis	3	0.5
Encephalitis (no organism specified)	2	0.4
Brain hemorrhage	1	0.2

Table 10.9: : The clostridial diseases most frequently diagnosed on post-mortem examinations of ovine carcases by AFBI during 2017 (n= 32)

Disease	No. of cases	Percentage of total diagnoses
Pulpy kidney diseases	23	4.1
Black disease	4	0.7
Clostridial diseases (no other organism specified)	3	0.5
Enterotoxaemia	2	0.4

10.1.5 Metabolic

10.1.6 Enteritis

10.1.7 CNS

10.1.8 Clostridial diseases

The overall pattern of clostridial disease remains similar to 2016 with pulpy kidney disease the most commonly diagnosed clostridial disease in Northern Ireland. Pulpy kidney disease is caused by infection with *Clostridium perfringens* type D. It is commonly identified in fast growing lambs, typically over one month of age that are consuming high concentrate rations, or sucking ewes which are heavy in milk. Vaccination of the breeding flock and early vaccination of fast growing lambs provides the best protection and the importance of vaccination against clostridial disease in sheep flocks cannot be over-emphasised.

Chapter 11

Ovine Abortions

Foetii from 244 ovine abortions and stillbirths were examined during 2017 in Northern Ireland. (foetii from 264 abortions were examined in 2016). Significant pathogens were detected in 165 cases (67.6 %). Pathogens identified included Toxoplasma (74 cases, 30.3 %), *Chlamydophilia abortus* (44 cases, 18.0 %), *E. coli* (20 cases, 8.2 %), *Campylobacter spp* (12 cases 4.9%), *Streptococcus spp* (9 cases, 3.7 %), *Leptospira* (8 cases, 3.3 %), *Trueperella pyogenes* (5 cases, 2.0%) and *Listeria* (5 cases, 2.0 %). *Toxoplasma* continues to be the most commonly diagnosed pathogen despite vaccination being widely available. Susceptible sheep are infected following the ingestion of feed or water contaminated with oocysts which are highly resistant and can survive for long periods in moist conditions. Infection early in gestation can result in foetal death and resorption, whilst infection late in gestation can result in lambs being born normal and immune. However infection in mid gestation can result in still born lambs, weak lambs and mummified foetuses.

Table 11.1: The most frequently diagnosed causes of ovine abortion diagnosed at AFBI in 2017

Category	No. of cases	Percentage
Toxoplasma gondi	74	30.3
No significant agent identified.	67	27.5
Chlamydophilia abortus	44	18.0
E.coli	20	8.2
Campylobacter spp	12	4.9
Streptococcus spp	9	3.7
Leptospirosis	8	3.3
Arcanobacter pyogenes	5	2.0
Listeria monocytogenes	5	2.0

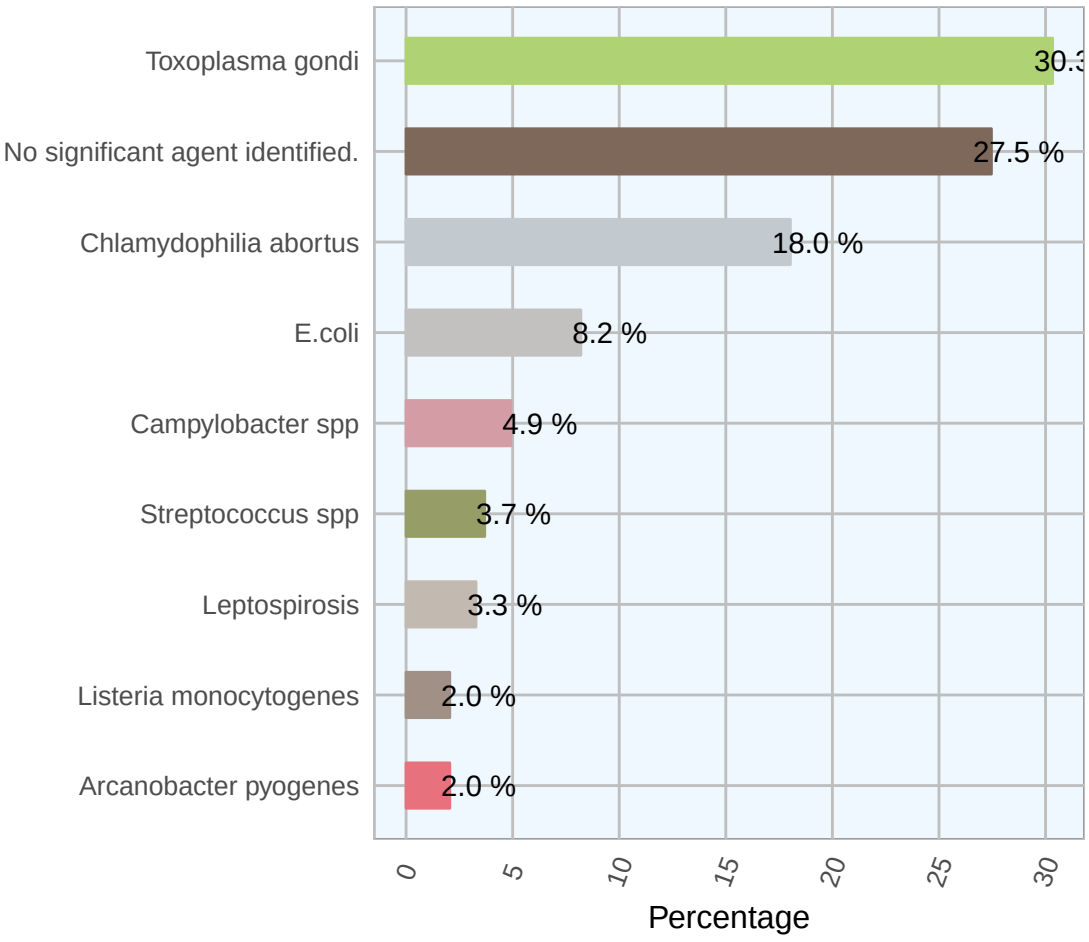


Figure 11.1: The most frequently diagnosed causes of ovine abortion diagnosed at AFBI in 2017

Chapter 12

Ovine Parasites

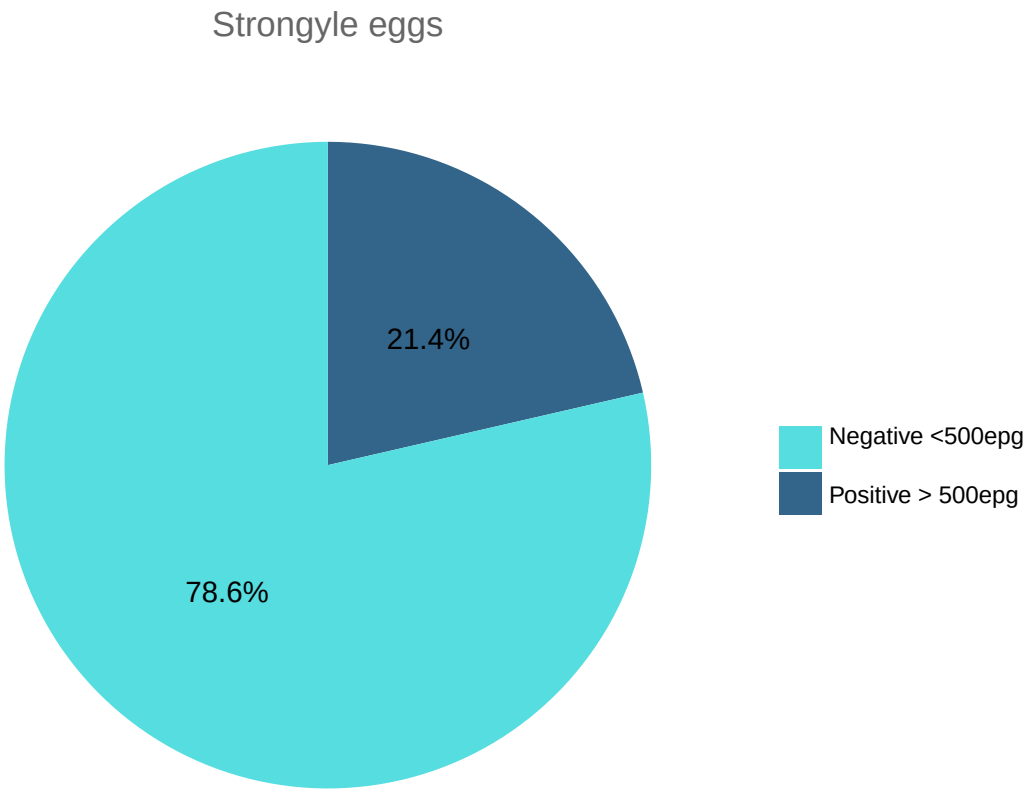


Figure 12.1: Relative frequency of detection of trichostrongyle eggs in ovine faecal samples examined in AFBI in 2017in relation to a commonly used threshold of significance- 500 eggs per gram (n=1877)

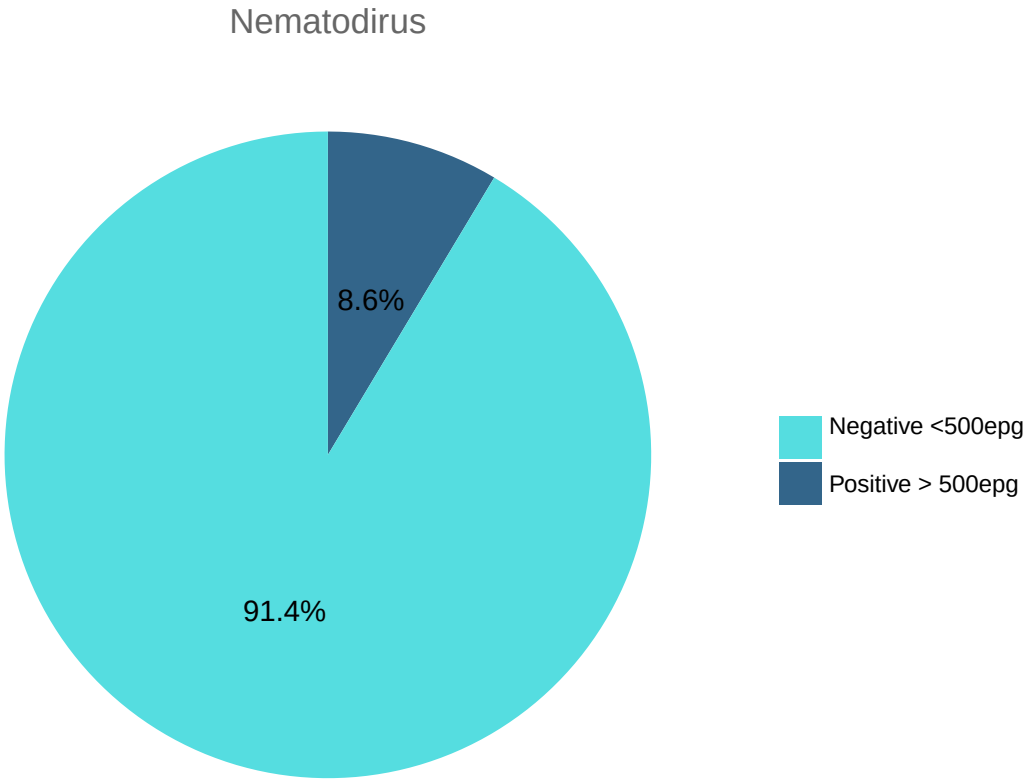


Figure 12.2: Relative frequency of detection of *Nematodirus* eggs in ovine faecal samples examined in AFBI in 2017in relation to a commonly used threshold of significance- 200 eggs per gram (n=1812)

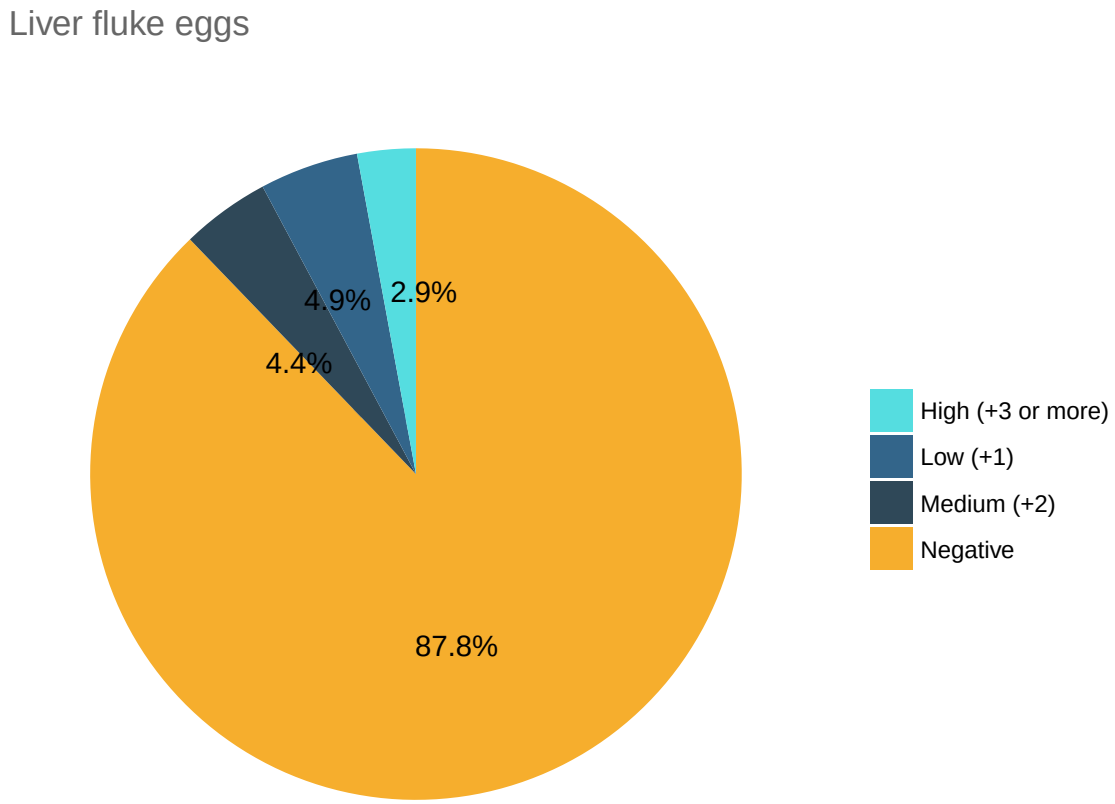


Figure 12.3: AFBI results for ovine faecal samples tested for liver fluke eggs during 2017 (n=1781)

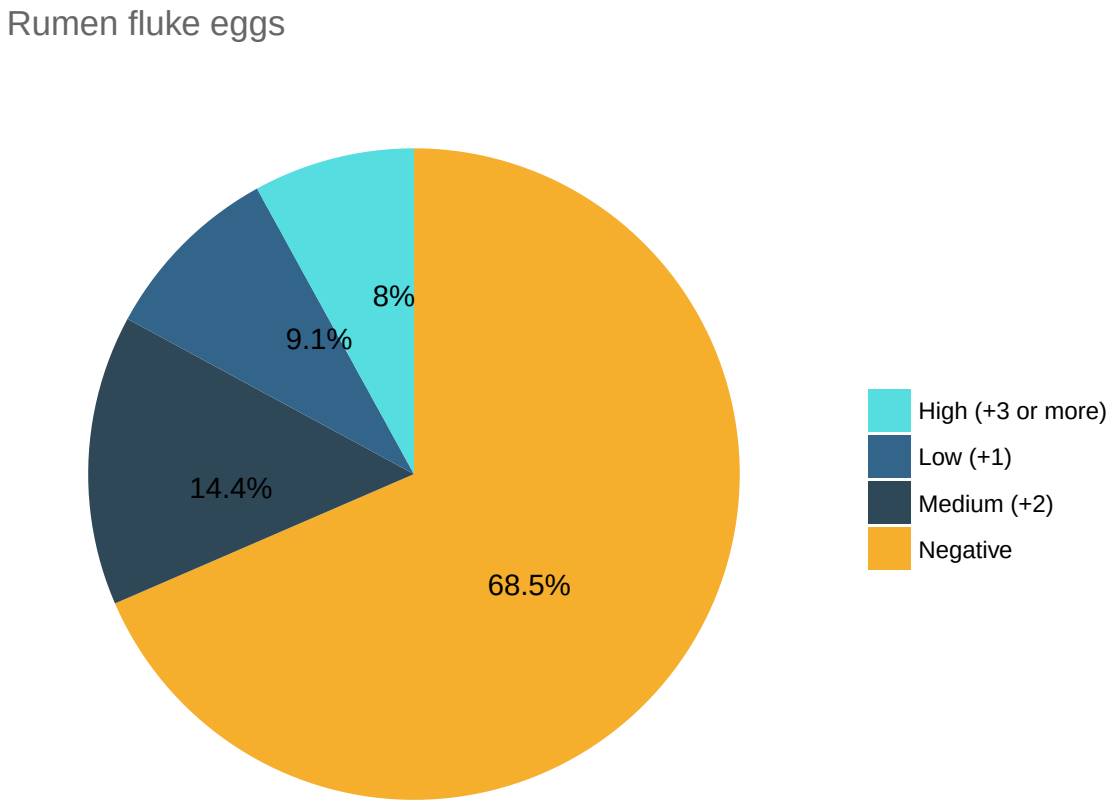


Figure 12.4: AFBI results for ovine faecal samples tested for paramphistome eggs during 2017 (n=1780)

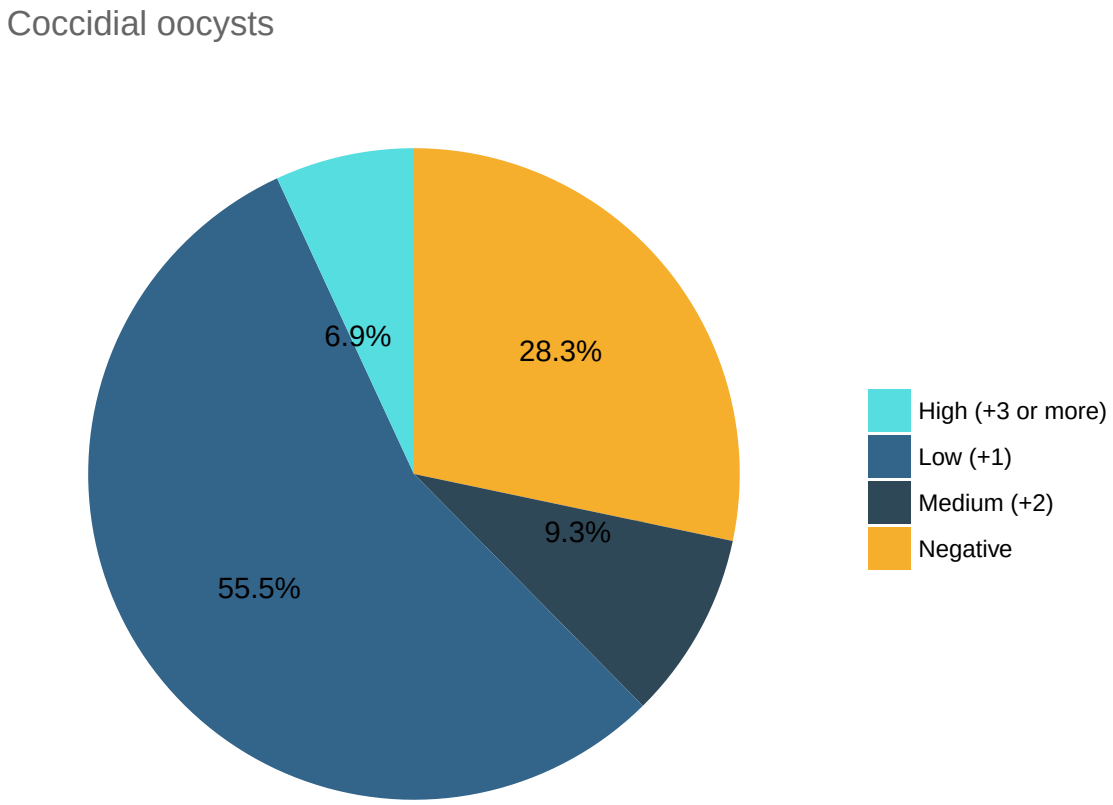


Figure 12.5: AFBI results for ovine faecal samples tested for coccidial oocysts during 2017 (n=1882)

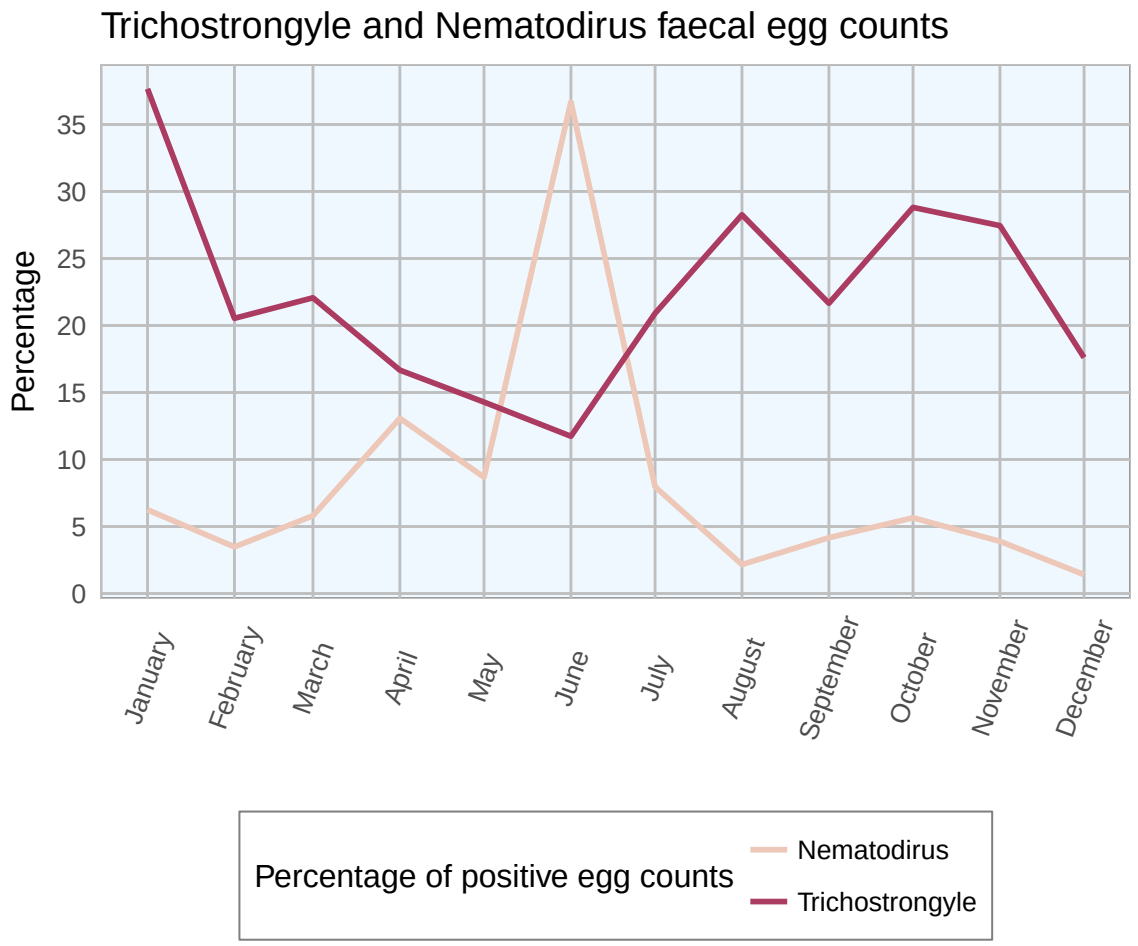


Figure 12.6: The percentage of ovine faecal samples tested by AFBI per month in 2017 with a Trichostrongyle egg count over 500 eggs per gram and a *Nematodirus* egg count over 200 eggs per gram