Short Communications

An observational study involving ewe postmortem examination at a fallen stock collection centre to inform flock health interventions

F. M. Lovatt, B. W. Strugnell

EFFECTIVE sheep flock health plans must be underpinned by flock-specific diagnostic information and should make use of wider national flock health information. However, information on disease prevalence at flock level is often incomplete. This is despite the fact that protocols to diagnose common sheep diseases are well established and cost effective.

Annual ewe mortality rates in the UK are estimated at 3–8 per cent (Johnston and others 1980, Scott 2007). The profile of diseases which contribute to mortality and involuntary culling in adult ewes in the UK flock is at present probably best estimated using Veterinary Investigation Diagnosis Analysis (VIDA) data (Gibbens and others 2008). This is generated by the Animal Health Veterinary Laboratories Agency (AHVLA) endemic disease scanning surveillance programme, which examines 500–700 ewes annually (VIDA 2012). However, the sample size, especially for carcases, is small, and the programme may have inherent biases (Nevel and Stark 2009) with under-representation of some important endemic diseases.

By law, all fallen stock from UK farms must be collected for appropriate disposal by a licensed collector. This study aimed to investigate the diagnostic potential of this material, with an emphasis on adult ewes, and to consider how such information might be applied to improve sheep health, welfare and productivity.

Between February 2012 and January 2013, a total of 106 adult ewes, collected from farms throughout the northeast of England, were examined postmortem during 11 sessions at a fallen stock collection centre. All postmortem examinations were performed by two experienced veterinary surgeons including at least one of the authors, whose competence in postmortem examination was gained during six years at AHVLA Thirsk (BWS), and 18 years' predominantly sheep practice, including field postmortem examinations (FML). All findings were discussed and agreed at the time of postmortem examinations which were performed in a lit portable cabin. No clinical history was available for any of the carcases examined. Carcases that were externally grossly autolysed or decomposed were not included. For each carcase examined, the breed, estimated age, body condition, degree of autolysis, gross postmortem findings and suspected diagnosis, were recorded. Where a diagnosis could not be confirmed on the basis of gross postmortem examination alone, further laboratory-based diagnostic testing was performed at AHVLA regional laboratories via AHVLA Thirsk. Brains were not routinely removed where no diagnosis was reached on gross findings, because this was not considered cost effective without clinical history. Results and diagnostic criteria are shown in Table 1.

A diagnosis considered sufficient to account for death was reached in 74 of 106 (69.8 per cent) cases. In nine cases (9 per cent), autolysis precluded a meaningful diagnosis. Of the cases where a positive diagnosis was made, the modal diagnosis was mastitis, with an incidence of 11 per cent of all carcases examined, with most diagnoses made between April 2012 and July 2012. It is likely that the true incidence of mastitis in the UK flock is underestimated by VIDA data (at around 0.3 per cent of all diagnosable submissions, VIDA 2012) because farmers are likely to diagnose it on the basis of gross pathology, without further testing. Incidence data based on fallen stock surveys may be more accurate for fatal mastitis, and may provide a useful overview of regional or within-flock incidence, with scope for identification of causal bacteria. If recorded and reported to farmers, data on flock-level ewe mortality attributable to mastitis from fallen stock postmortem examination could be used to assess the cost-benefit of possible intervention strategies, such as ewe nutrition or fostering policy. Estimates of flock-level incidence of mastitis ranging from 1 per cent to 15 per cent, with a case fatality rate of 4 per cent have been reported elsewhere (Winter 2001, Onnasch and others 2002). Acute liver fluke was diagnosed as the cause of death in 7 per cent of cases, though the first case was not observed until October. This is an example of a disease for which prompt diagnosis in fallen stock, as gross postmortem examination is pathognomonic, could lead to timely intervention and disease control at the farm level.

Bronchopneumonia attributable to *Pasteurella* species was diagnosed in 7 per cent and chronic suppurative pneumonia in 6 per cent of ewes. Although cases of the latter are generally considered to be sporadic, effective vaccines are available for the former, so such a diagnosis would be useful to report to the farm of origin in order to allow timely intervention.

Six ewes were diagnosed with histologically confirmed ovine pulmonary adenocarcinoma (OPA) as the cause of death in this study. OPA incidence rates in the UK flock are currently difficult to ascertain as there is no diagnostic test in the live animal. Furthermore, mortality or morbidity rates attributable to OPA are difficult to estimate because proportionately few dead or cull ewes are examined postmortem. AHVLA scanning surveillance diagnosed an average of 28 cases per year between 2006 and 2011, which is estimated to represent 0.2–0.65 per cent of all diagnosable submissions (Griffiths and others 2010), and is likely to be a significant underestimate of the prevalence of OPA mortality in the UK flock. This disease is likely to have a significant constraint on production in high-prevalence flocks, and this study has demonstrated that fallen stock material is diagnostically useful for this disease. Accreditation or flock status declaration schemes for those flocks from which breeding animals are sold, do not currently exist, but these would be useful to the potential purchasers. Such schemes could be based on an examination of fallen and cull ewes.

Johnes disease was diagnosed in six ewes (6 per cent). Johnes disease also probably contributes significantly to productivity losses on high-prevalence farms, and its incidence in the UK sheep flock is likely to be underestimated. Interestingly, of the six PCR positive cases, small intestinal mural thickening with yellow discolouration (Fig 1), characteristic of the multibacillary form of Johnes (Clarke and Little 1996), was observed in only two ewes. Gross postmortem findings in

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TABLE 1: Summary of frequency of diagnoses with diagnostic criteria

Diagnosis	Frequency	Diagnostic criteria	Notes
No diagnosis	20	No diagnosis made to account for death	
Autolysis	9	Carcase too autolysed for meaningful diagnosis	
Mastitis	*11*	Gross udder appearance only (4/11)+bacteriology: contaminants (6/11); *Mannheimia haemolytica* cultured (1/11)	All cases diagnosed between April and July
Acute fascioliasis	*8*	Gross pathology (widespread hepatic parenchymal haemorrhage, induration, destruction) only	Sudden increase in cases in mid-October
Pasteurella – type bronchopneumonia	*7*	Gross pathology (lung consolidation with enlarged tracheobronchial lymph nodes) only (1/7)+bacteriology (contaminants 1/7) or histopathology (5/7)	
Chronic suppurative pneumonia	*6*	Gross pathology (multifocal pulmonary abscessation with enlarged tracheobronchial lymph nodes) only (6/6)	
Johnes	*6*	Gross pathology thickened yellow corrugated jejunal mucosa 2/6; mildly thickened jejunal mucosa with lymphadenopathy 4/6+faeces PCR (6/6)	
OPA	*6*	Gross pathology (marked pale lung consolidation, heavy lungs, normal architecture obliterated)+histopathology (6/6)	
Neoplasia	*6*	Gross pathology only (3/6)+histopathology (3/6)	
Metritis/dystocia/obstetrical	*4*	Gross pathology only (4/4)	
Abomasitis	*2*	Gross abomasal appearance ('Morrocco leather')+negative WEC (2/2)	Suspect type II telodorsagiosis or recent PGE & anthelmintic treatment
Chronic fascioliasis	*2*	Gross pathology (hepatic fibrosis, live flukes in bile ducts) only (2/2)	
PGE	*2*	Gross pathology (diarrhoea, lymphadenopathy)+WEC (2/2)	
Poor dentition	*2*	Gross pathology only (2/2)	
Peritonitis	*2*	Gross pathology only (2/2)	Focal peritonitis (1/2), generalised peritonitis (1/2). *Salmonella* cultures negative
Acidosis	*2*	Gross pathology & rumen pH <5.5 (2/2)	Grains seen in rumen
Salmonella 61:K;1,5,7	2	Gross pathology (scour) & Salmonella cultures (2/2)	Not considered an adequate cause of death
Dosing gun injury	*2*	Gross pathology (pharyngeal abscessation) only	
Megaoesophagus	*1*	Gross pathology only	
CLA	*1*	Caseous mediastinal lymphadenopathy & *Corynebacterium Pseudotuberculosis* cultured	
Endocarditis	*1*	Gross pathology only	
Acetonaemia/fatty Liver	*1*	Gross pathology+ketonuria	
Abdominal torsion	*1*	Gross pathology only	
Chronic nephritis	*1*	Gross pathology+histopathology	
Suspect larval paramphistomum	1	Gross pathology (severe haemorrhage proximal jejunum/ duodenum) only	Not recorded as a cause of death as unconfirmed
Total	106		

Numbers in italic: considered a confirmed diagnosis and adequate cause of death
OPA, ovine pulmonary adenocarcinoma; PGE, parasitic gastroenteritis; WEC, worm egg count

other positive ewes which were likely cases of paucibacilliary Johnes, comprised mild intestinal thickening, enlarged mesenteric lymph nodes, ascites, emaciation and sometimes scour, the latter probably attributable to concurrent parasitic gastroenteritis.

Neoplasia was diagnosed with an incidence of 6 per cent. While there are some well recognised predisposing causes of neoplasia in sheep, such as the ingestion of bracken, tumours are generally seen as one-off events, responsible for less than 1 per cent of ewe deaths in a previous study on 10 Scottish sheep farms (Johnston and others 1980).

FIG 1: Typical multibacillary Johnes disease in a ewe at a fallen stock collection centre

Corynebacterium pseudotuberculosis was cultured from a caseous abscess in the tracheobronchial lymph node of one ewe. Dosing gun injuries, ruminal acidosis, focal peritonitis, vegetative endocarditis and metritis were diagnosed in a minority of ewes. Enteritis associated with *Salmonella* 61:K, 1,5,7 was seen but was not considered an adequate cause of death. Bacterial cultures were hampered by *Proteus* overgrowth in some cases, despite routine searing of surfaces and the use of charcoal transport swabs.

Veterinary practitioners sometimes perform in-field postmortem examinations, but results can be variable. A diagnostic service based on systematic postmortem examination of fallen stock could include effective training of practitioners because of the large amount of available material and likely specialisation of those engaged in it.

This study has shown that it is possible to diagnose the cause of ewe death from fallen stock. Whether used as a tool for national disease surveillance or at the farm level to inform cost-effective flock health interventions, this concept may prove invaluable for the sheep and other livestock industries, and the scope for its development is considerable.

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