Clinical examination of sheep

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ABSTRACT

Clinical examination of sheep involves the interpretation of information about both the individual and the flock within the context of the farm environment. It is an art, which relies on careful observation and the systematic collection of specific data, suggestions of which are presented in tabular format. However, interpretation is subjective with the potential for wide variation between clinicians. To ensure that the information is directly transferable, clinicians have a responsibility to use repeatable measurements and assessments wherever possible. Standard scoring systems and criteria that have been developed primarily for use in the research environment are reviewed and their relevance to the clinician is discussed. In particular, the repeatability of measures is considered.

1. Introduction

Clinical examination of sheep is the basic foundation upon which the clinician must build an investigation of disease or sub-optimal performance. There has previously been much published on this subject (Sherman and Robinson, 1983; Radostits et al., 1994; Hindson and Winter, 1995; Clarkson and Winter, 1997; Jackson and Cockcroft, 2002; West et al., 2002; Jackson, 2006); these mainly consist of opinionated reviews and recommendations based on the authors’ personal experience in clinical practice. This article aims to consider recent research and to quantify the clinical examination by highlighting specific scoring systems that have been established. It will consider the repeatability of commonly used measures.

The use of standard scoring systems with high repeatability ensures that the information gained from the clinical examination is directly transferable and this has obvious benefits in terms of flock health planning or disease surveillance, especially where computer based systems are used (Ganter, 2008; Hosie et al., 2009) or in legal disputes. However, despite emphasising standard systems and criteria, there is no implied suggestion that these are sufficient in isolation. There can be no substitute for a detailed systematic examination (Tables 1–3) by an experienced clinician, who has developed the art of interpreting the range of clinical signs displayed by sheep.

In studies comparing ante-mortem clinical diagnosis with post-mortem findings in dogs, which either had died or were euthanised, there was total disagreement in up to 40% of cases (Kent et al., 2004; Vos et al., 2005). It would not be unreasonable to expect an increased number of discrepancies in cases of individual sick sheep. This is perhaps most relevant in the context of pedigree flocks with high value individual sheep; however, sheep clinicians are usually considering a flock problem and, early in the investigation, post-mortem examinations can be undertaken and often be of great value.

When considered in the context of sheep flock health management, the detailed physical examination of the individual sheep is essential and highly relevant. However, it must not distract the clinician from essential considerations, such as the epidemiology, the gathering of a detailed history, and an examination of both the environment and...
the flock. The condition under investigation may not result in individuals that are clinically ill, but may involve a group of animals that are not reaching target performance. In this situation, it is only helpful to examine abnormal individuals if they clearly represent the whole group, though such selection is, by definition, subjective.

**2. Specific history**

Most clinical examinations begin with a complaint from the owner or shepherd and subsequently much of the

### Table 1

Information that should be included in the specific case history in sheep flocks.

<table>
<thead>
<tr>
<th>Signalment</th>
<th>How many animals in the various groups? Breed? Age? Reproductive status?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrition</td>
<td>Access to grazing? What ration? What forage? How is this fed? Trough space per sheep? Any recent changes?</td>
</tr>
<tr>
<td>Water</td>
<td>What is available? Do the sheep consume it? Where does it come from?</td>
</tr>
<tr>
<td>Environment</td>
<td>Are the sheep grazing? Size and topography of pasture? House? What flooring/bedding? What is the stocking rate? Recent weather conditions?</td>
</tr>
<tr>
<td>Recent stresses</td>
<td>Any recent transportation or visits to sales or shows? Recent gathering for management or husbandry procedures? Any mixing with ‘foreign’ sheep?</td>
</tr>
</tbody>
</table>

### Table 2

Summary of considerations by the clinician during inspection of an individual sheep from a distance.

<table>
<thead>
<tr>
<th>Behaviour</th>
<th>Is there a difference from the rest of the group? Bright/alert/dull/apathetic/quiet/irritable/excitable/ manic?</th>
</tr>
</thead>
</table>

### Table 3

Summary of issues to be addressed by the clinician in a detailed clinical examination of an individual sheep (Sherman and Robinson, 1983; Clarkson and Winter, 1997; Jackson and Cockcroft, 2002).

<table>
<thead>
<tr>
<th>General</th>
<th>Body condition score – Scale 1–5. Temperature, pulse (strong/weak/rapid), respiration.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mucous membranes</td>
<td>Assessed at eye, oral mucosa or vulval mucosa. FAMACHA® scale. Salmon – pink/pale/icteric/ hyperaemic/cyanotic? Capillary refill time – assess at gum or vulval lips &lt;2s</td>
</tr>
<tr>
<td>Lymph nodes</td>
<td>Check submandibular, parotid, retropharyngeal, prescapular, preauricular, popliteal and supramammary. Palpable/symmetrical/enlarged/discharging?</td>
</tr>
<tr>
<td>Thorax</td>
<td>Auscultation of heart at 4th to 5th intercostal space on both sides. Auscultation and ultrasonography of lungs. Wheelbarrow test.</td>
</tr>
</tbody>
</table>
investigation of specific history relies on the information they provide (Table 1). A successful outcome depends greatly on the relationship between the shepherd and the clinician and this may be jeopardised if the clinician is either tactless or judgemental. It may be necessary to test statements for accuracy, particularly those related to the sequence of events or those which may involve neglect or responsibility issues.

With the exception of valuable individual show animals or pets, the economics of the sheep industry means that a clinician is rarely consulted at the first indication of a problem. In this case, the losses to date must be determined by establishing the ‘morbidity rate’ (percentage of animals clinically affected compared to the number exposed to the same risk), the ‘case mortality rate’ (percentage of affected animals which die as a result of the condition) and the ‘population mortality rate’ (percentage of all exposed animals that die).

3. General history and environmental considerations

As a background to the collection of detailed information on the group of sheep under consideration, it is often necessary to understand something of the entire farm enterprise. However, collating such information is time consuming and the farmer may justifiably be concerned that the details are a distraction from the presenting complaint. For this reason, successful gathering of history is much aided by the prior involvement of the clinician in the preparation of a flock health plan. In addition, this emphasises the importance of maintaining local expertise, so that the farm situation can be put in context. As far as possible, the following information should be considered: the farm situation, size and layout and its elevation above sea level, geology and soil type. As far as sheep in the farm are concerned, it is important to consider group numbers, breed, age profile and the timing of lambing, as well as to understand the details of their nutrition. Also relevant, is any information about other livestock on the farm, other uses of the land or buildings, what the farm outputs are, when and how these are marketed and, most importantly, uses of the land or buildings, what the farm outputs are, any information about other livestock on the farm, other

A farm that introduces ‘foreign’ sheep into the flock (either through buying-in replacements or subsequently to grazing a group away from home) or that has potential contact with other flocks through the fence or at shows or sales is at risk of introducing a number of diseases spread from sheep to sheep. Lists of such diseases with possible control measures have previously been described (Lovatt, 2004; Hosie and Clark, 2007) and it is important that the farmer is well aware of them.

Currently, a number of farms fail to have basic quarantine procedures. Not only is this an important consideration in the initial investigation of disease, but it also has severe consequences for the successful implementation of veterinary advice on subsequent preventative measures.

4. Examination of the flock

Sheep are flock animals and the observation of a sick individual within the flock is invaluable (Table 2). Even once the ill animal has been separated from the flock, there are useful observations which should be made before the sheep is handled. Indeed, the stress of handling may quickly disrupt the respiratory rate or a lameness that may be apparent from a distance, may become masked when the sheep is subsequently handled in a closely confined situation.

In the development of indicators for the on-farm assessment of sheep welfare, researchers and their expert panel have identified eight welfare indicators that could be assessed by counting the number of affected sheep from a distance. These indicators were (a) dull demeanour, (b) dirty rear, (c) dirty belly, (d) skin irritation, (e) wool loss, (f) excessive panting, (g) coughing and (h) lameness (Phythian et al., 2009). Of these, they only found that inter-observer reliability was good for the first four, otherwise inconsistency or poor reliability were recorded. In their distant examination, there was no grading of the severity of conditions, due to the fact that their pilot studies showed low reliability associated with different scores. It should be pointed out that their observers were not all experienced clinicians, from whom one could reasonably expect higher reliability.

Various lameness scoring scales have been described. Two numerical rating systems on a scale ‘0’ (normal move-
ment) to ‘4’ (not placing a foot to the ground) have been used (Ley et al., 1989; Welsh et al., 1993). Welsh et al. (1993) and Cockcroft, 2002; Bell, 2008; Cousens et al., 2008; Roger, 2008). Normal temperature can be taken as 38.5–40 °C, indicating hyperthermia. Normal respiratory rate is approximately 20 breaths per minute (bpm), though the rate is not a useful parameter with levels up to 72 bpm (Bell, 2008) or even 123 bpm (Cousens et al., 2008) having been reported in clinically normal sheep. Ambient temperature, age, stress and exercise have a considerable effect on normal levels. Normal pulse is generally taken to be between 70 and 90 bpm, with marginally higher levels in lambs though normal levels up to 120 (adults) or 160 (lambs) have been reported (Bell, 2008).

5.3. Mouth lesions

There has been a recent comprehensive review of mouth lesions in sheep focusing on the differential diagnoses of foot-and-mouth disease (FMD) (Watson, 2004). Following the 2001 FMD outbreak in the United Kingdom, studies were made of over 19,000 heads of sheep for common lesions of the oral mucosa. A variety of mouth lesions were present, though most commonly a healing ulcer of up to 1 cm diameter was seen on the lower gum below the incisors. Trauma was identified as the most likely cause in 90% of cases, with national prevalence of such lesions estimated at approximately 1% (Watson et al., 2006); however, on individual farms up to 25% of sheep were found to have such lesions (De la Rua et al., 2001).

5.4. Mucous membrane colour

In areas of the southern hemisphere where haemorrhagia is an important disease of small ruminants, a colour chart (FAMACHA©) is commonly used to compare the degree of anaemia evident at the ocular mucous membranes. The five categories (‘1’-red non-anaemic to ‘5’-white severely anaemic) have been validated for different packed cell volumes (Vatta et al., 2001; van Wyk and Bath, 2002; Kaplan et al., 2004). This system has already proved to be a very useful tool for farmers in selective anthelmintic treatment. There are other situations, such as acute fasciolosis, where clinicians could use this system as an initial screening tool to categorise severity of illness in different individuals, though as yet this system does not appear to have been tested in Europe.

5.5. Pruritus

The ‘nibble reflex’, where a sheep responds to stimulation of the skin over the dorsal sacral area by nibbling, has been used in the clinical diagnosis of highly pruritic diseases, such as scrapie or sheep scab. A useful demonstration of this response has been described by Konold et al. (2008). Specific criteria have also been developed by the United Kingdom’s Veterinary Laboratory Agency. Within these, there are scoring systems for grading the severity of hypersensitivity (scale ‘0’–‘4’), the degree of alopecia (score ‘0’–‘3’) and the intensity of infestation (score ‘0’–‘3’) in sheep with scab, though there are no reports of repeatability of these scores (Bates, 2009).

5.6. Assessment of lung lesions

Auscultation of the lungs has long been considered an important component of clinical examination. Its clinical value has been evaluated by a recent study, which recorded lung sounds and compared them to ante-mortem ultrasonography findings and post-mortem pathological findings. Increased audibility of normal lung sounds was associated with hyperventilation, either due to toxaemia or due to management reasons, such as recent handling stress. Coarse crackles were heard in advanced cases of ovine pulmonary adenocarcinoma, though not closely associated with the actual distribution of the lesion. However, most...
notably, abnormal sounds were not detected in sheep with focal pleural abscesses, unilateral pyothorax or fibrinous pleurisy though in the latter two conditions, sounds were attenuated compared to the other, unaffected lung (Scott and Sargison, 2009; Scott et al., 2010).

5.7. Foot lesions

Foot scoring as a method of quantifying foot lesions has been used since the 1970s (Egerton and Roberts, 1971), though recent genetic studies into the resistance to foot-rot have ensured the development and evaluation of a five-point scoring system (Conington et al., 2008, 2009; Winter, 2009). This system scores from ‘0’ (normal hoof, no lesion, infection or irritation), ‘1’ (mild interdigital dermatitis), ‘2’ (more extensive interdigital dermatitis and necrotising inflammation of interdigital skin), ‘3’ (severe interdigital dermatitis and under-running of the horn of the heel and sole) to ‘4’ (severe interdigital dermatitis and under-running of the horn of the heel, sole and walls of the hoof). Following observations of 13,867 sheep, inter- and intra-observer reliabilities were reported to be high ($r = 0.87$) for this system, which would suggest it to be a valuable tool for the sheep clinician. Nevertheless, the system has been designed to include interdigital dermatitis and foot-rot only and does not take into account other foot lesions. A scoring system for locomotion is proposed in Table 4.

5.8. Udder

An evaluation system has been established for udder traits in dairy ewes with linear scale systems (score ‘1’–‘9’) for udder depth, udder attachment, teat placement, teat size and udder shape with a satisfactory repeatability (0.57–0.73) reported between observers (De la Fuente et al., 1996). Although probably more relevant to ewes rearing lambs, a simpler system with fewer categories would probably be more relevant and repeatable. Scoring systems have been developed to categorise acute ovine mastitis in specific research projects (Fthenakis, 2000) though these are probably not objective enough for widespread use in the clinical situation.

6. Ultrasonography

The use of ultrasonography as an aid to the clinical examination of sheep, has been widely reported with practical suggestions as to how the clinician can use the technique in adults to examine the thorax, abdomen, scrotum, joints, the contents of a vaginal prolapse or the distension of the bladder indicating urethral obstruction (Scott and Gessert, 1998a;b; Macrae and Scott, 1999; Scott and Gessert, 2000; Goulletou et al., 2003; Scott, 2008). Furthermore, ultrasonography can be used in lambs, in order to determine abomasal diameter and thus indicate Colostral intake (Scott et al., 1997; Scott, 2008). A 5.0 MHz linear array scanner (such as is commonly used in early pregnancy diagnosis of cattle) can be used to examine the chest or abdominal viscera up to a depth of 10 cm, with a sector scanner necessary for deeper examination.

7. Collection of samples

At the time of clinical examination, there is usually the opportunity to collect useful samples to aid diagnosis. These can include (a) blood for serological, biochemical or haematological examination, (b) pus or discharge for culture, (c) faeces for culture or the presence of fluke eggs or a count and speciation of helminth or coccidia eggs, (d) milk for somatic cell counting and/or culture and (e) skin scrapings for culture, parasitological examination or microscopic study. Recently, haematological and biochemical references values for sheep have been published by Aitken (2007) and Roger (2008). Urine can be collected by occluding the nostrils or by catheterisation. It is useful to assess colour and turbidity and to test biochemistry with a dipstick.

Semen can be collected by electro-ejaculation or, preferably, into an artificial vagina following teasing with an oestrous ewe. The initial evaluation of semen has long been associated with scoring systems that are simple to use under practice conditions. Concentration is assessed visually with consistency measured on a scale of ‘0’ (watery, insignificant numbers of spermatozoa) to ‘5’ (thick creamy, 4.5 × 10⁹ to 6.0 × 10⁹ spermatozoa/ml). Motility of sperm is assessed under low power in a microscope, without a coverslip and ranked on a scale of ‘0’ (no motion, all sperm dead) to ‘5’ (dense with rapidly moving wave motion, >90% of sperm are active) (Evans and Maxwell, 1987).

Skin scrapings taken from sheep suspected to have scab should be taken from the leading edge of scab lesion (at the most ventral and caudal edge) or if the lesion covers the whole animal, from cryptic sites (infraorbital and inguinal fossae, pinnae, crutch or perineum) (Bates, 2009).

8. Concluding remarks

The clinical examination of sheep requires a thorough and systematic approach, in order to ensure that no detail is left out. Although the development of a number of different scoring systems has taken place in research environments, there seems to be no reason why these systems (perhaps with some modification) cannot be used in clinical practice, in order to provide frameworks and encourage standardisation. Indeed, clinicians have a responsibility to use repeatable measures and assessments wherever possible. However, now is a timely place to reiterate a point made in the introduction – that scoring systems can be no substitute for the thorough attention to detail and subsequent interpretation that is required of experienced sheep clinicians. The desire to reduce the science of the clinical examination to scores that can be easily dealt with electronically must not detract from the continued importance of the essential art of clinical examination.

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References


