My flocks feed not,
My ewes breed not,
My rams speed not,
All is amiss.'
Sonnet to Sundry Notes of Music
Shakespeare
Manual of Sheep Diseases
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Preface

This book, although it has a different title, is an updated and expanded version of our previous book, Outline of Clinical Diagnosis in Sheep. It is written at a time when farmers are having to adapt to a very different political and economic environment following noticeable changes that took place during the 1990s. Perhaps the most significant of these changes is the imposition of oppressive but necessary bureaucratic controls. The setting up of the Food Standards Agency and its concerns about spongiform encephalopathies have led to the imposition of identification and marketing rules, and the National Scrapie Plan has been introduced. The 2001 epidemic of foot and mouth disease and European Union regulations have introduced identification and movement recording. These changes are here permanently.

When these regulations are superimposed on the increasing vertical integration of the sheep industry, which gives rise to the movement of millions of sheep annually, the result is a tightly controlled enterprise very different from that which has, perhaps, been one of the attractions of sheep farming in the past.

Looking ahead, the possibility of climate change may influence the pattern of production and disease, although any effects on the sheep industry may be less than on other types of livestock farming. Indeed, the high dependence of sheep farming on grassland may mean that areas of the country where grass production is currently limited by adverse climatic conditions may in future see increased output. This could, however, be offset by the arrival of diseases at present limited to southern Europe, and the spread to our country of insect vectors from southern Europe or even North Africa.

In the last few years, changes to the economics of sheep production have led to a situation where many farm animal practitioners have had neither the opportunity nor the incentive to acquire the knowledge and expertise on this species that their clients have a right to expect. Although a number of texts on sheep diseases are available, ranging from comprehensive coverage of diseases on a global basis, to shorter ones aimed at students and/or farmers, we now feel that there is a need for a text to which the practitioner can refer for information not only on diagnosis, but also on treatment and prevention strategies. This new edition, aimed particularly at the nonspecialist veterinarian, is designed to update and expand the information in the first edition to cover not only diagnosis, but also treatment and prevention of diseases and poor production in sheep. The format is, as in the first edition, based on specific and accurate diagnosis, since without this, treatment and prevention will be a lottery.
We have found it difficult to decide how much detail to include on prevention and, in particular, treatment. Sometimes these are so obvious or simple that no comment is needed, for example treatment of a simple infection with antibiotic. In other cases brief details are included at the most logical point in the text. In the case of major influences on flock productivity, new sections have been written and included as appendices. In particular, new sections have been added on nutrition (which has a significant effect on all aspects of production), health programmes and parasite control. New information is also included on poisons, zoonoses, anaesthesia and some common surgical techniques. Unless there is a particular reason, we have tried to avoid referring to specific commercial products since new products come on the market, old products disappear and drug companies merge, making this particular information soon out of date.

One further difficulty is the reclassification and name changes of some bacteria and parasites that are important in sheep – notably, *Chlamydia psittaci* is now known as *Chlamyphila abortus* and *Pasteurella haemolytica* type A as *Mannheimia haemolytica*. In the case of the latter, though, the disease it causes is still referred to as pasteurellosis. We have tried to use the most recent names, but doubtless further changes will occur.

We hope the expanded text will be of help to all veterinarians, particularly those inexperienced in dealing with sheep. We hope also that it will assist in some small way in safeguarding the health and welfare of the national flock.

Jim Hindson
Agnes Winter
Few textbooks are the result of the authors working in isolation. We are very happy to acknowledge the help and support of colleagues in the production of both this new edition and the first edition. In particular Professor Michael Clarkson and other colleagues in the Veterinary Faculty, University of Liverpool, Judith Charnley, Colne and Neil Spedding, Ripon, commented on the content of the first edition, and Charles Stone and Kate Phillips gave advice on the nutrition section of this edition. Without the help of these and other colleagues, friends and families, the production of this book would have been a much more difficult undertaking.
1 Introduction

Successful animal health care, be it for disease, welfare or economic considerations, must rest on the pillars of diagnosis, prognosis, treatment and prevention. Without a high degree of accuracy in diagnosis, prognosis becomes a lottery, treatment may well degenerate into a dependence on 'shotgun' or 'spray' therapy, and prevention may be totally misdirected.

This text has been prepared in an attempt to assist the clinician to answer accurately the questions – 'Why are my sheep too fat? too thin? too dead? - this being the starting point in most investigations. The hope is that, by starting with diagnosis and basing the sections on clinical indications rather than systems, the clinician may more readily arrive at accurate and successful solutions in the treatment and prevention of problems presented by sheep keepers.

No attempt has been made to include every possible condition that could occur at very low incidence – 'the once in a lifetime type' – since this would make the text confusing and the selection of probable causes difficult. Nor have details of underlying pathology been covered; this detail can be found in other texts (see further reading in Appendix 12) and will not normally be of direct relevance during everyday clinical problem solving.

It is impossible to produce a definitive text for any changing science. In particular, laboratory diagnostic techniques are progressing rapidly - note for example the introduction of DNA probes. This text is therefore based on widely accepted and commercially available techniques, commonly used at the time of going to press.

Special difficulties of clinical diagnosis in the sheep

For the sheep when well is often times capricious and when sick does wish to die. 

Anon

Diagnosis of the cause of a deviation from normal in any species of livestock makes special demands on the combined knowledge and experience of the clinician. The sheep does, however, present its own particular problems. The simple process of isolating the patient from its group frequently induces sufficient stress to mask any behavioural change, which is often the first indicator to the shepherd of an abnormality. Confirmation of the owner’s original complaint may not, therefore, be open to the clinician; indeed behavioural change as a primary indicator of disease cannot be relied on. The sheep, in common with some other domesticated species and with the majority of 'wild'
species, exhibits a passive or ‘dumb’ response when unpleasant external stimuli reach a certain threshold. Beyond this point, no further response will be produced even to painful stimulation and diagnosis must be based on other means. This attitude may also occur during the terminal phases of disease and is the probable origin of some people’s conviction that all sheep have a death wish.

In the diagnosis of disease in most animals, variations from normal in respiratory rate, pulse rate and temperature are commonly used early in the diagnostic procedure. None of these is of great value in the sheep, except in the very young lamb where abnormal temperature is significant. Pulse rate may be of little diagnostic value, as catching and handling usually cause a marked increase, except in animals well accustomed to regular handling. Respiration is the primary route of heat loss, so wide variations in respiratory rate occur depending on ambient temperature, length of fleece, pregnancy and other factors. Similarly, body temperature may be elevated above that generally recognised as normal, particularly in hot weather in animals carrying substantial amounts of fleece.

The clinician must be aware of these factors and must carefully evaluate deviations from normal, not placing reliance on body temperature, heart or respiratory rate alone in the absence of other signs. The value of auscultation is also limited by the presence of fleece cover, which masks the details of abnormal respiratory and heart sounds.

**Routine for clinical examination**

It is important even for the experienced clinician to have a routine procedure for the investigation of any problems. There is a very real temptation to take short cuts based either on first impressions or on previous experience of what may well mistakenly be assumed to be an identical incident.

When carrying out the initial history taking, perhaps the most essential requirement is that we keep an open mind, and it is very important to realise that the complaint the client presents may not in fact be the real one. An animal presented by the sheep keeper as suffering from constipation, for example, is most unlikely to be so affected, and in all probability the problem lies in a different body system.

In the investigation of disease in the sheep the postmortem examination (PME) is likely to play an important role – in major sheep-keeping countries such as Australia and New Zealand, the PM room is considered an essential part of the practice. Thus a routine for this technique in both the adult and the neonate, together with details of sample taking, form important parts of the text.

The following list is a suggested sequence for the examination of an individual or group, and for the building up of the necessary information on which to base a diagnosis and prognosis, treatment and prevention strategy (see also Figure 1.1):
Figure 1.1 Steps in diagnostic procedure.

- The owner's complaint.
- Description of the animal(s) – age and sex.
- Number affected – many animals, a few, or single.
- History of this incident, and in the past.
- Knowledge of the farm, client and area.
- Inspection.
- Systematic examination.
- PME where applicable.
- Specimen taking.
- Laboratory examination and results.
Diagnosis.

Prognosis.

Treatment.

Prevention.

Examination checklist

The following checklist is a suggested routine for a full clinical examination of a sheep. Obviously not all cases will require such a comprehensive examination, therefore any sections irrelevant to a particular case can be omitted. It is best to carry out as much of the examination as possible with the sheep restrained in a standing position. The animal can then be turned over and examination of the limbs, feet and ventral abdomen completed. Heavily pregnant animals should be treated with care and without turning unless essential.

Owner
Animal/s identity
Sex
Age
Inspection
   Appearance
   Behaviour
   Respiration
   Gait
   Appetite
   Faeces
   Fleece
Examination
   Temperature (normal range 39-40°C)
   Pulse (or heart rate)
   Respiratory rate
   Condition score (1-5)
   Fleece and skin
Head
   Position
   Mouth (lips, incisor teeth, gums, palate, breath)
   Jaws (palpate mandibles and molar tooth arcades)
   Nostrils (movement, discharge, breath)
   Eyes (position, conjunctiva, sclera, cornea, pupil, discharge)
   Ears (position, discharge)
   Lymph nodes (submandibular, parotid)
Neck
   Prescapular lymph nodes
Chest
   Auscultate heart and lungs
Palpate over heart
Wheelbarrow test
Abdomen
Size, shape, auscultate, palpate, ballot
Rumen movements (frequency, strength)
Urinary system
Urine
Vulva (urine staining)
Urethra (male)
Prepuce (urine crystals)
External genitalia
Male – scrotum, testicles, prepuce, penis
Female – vulva, mammary glands
Limbs
Lymph nodes (precrural and popliteal)
Joints
Feet
Nervous system
Full neurological examination if necessary

Further aids to diagnosis

Radiography may be helpful in valuable animals, particularly in the case of lameness. Modern diagnostic aids such as endoscopy and ultrasound, now widely available, may be used to investigate, for example, the larynx (endoscope) and chest, kidney, pregnant uterus, bladder, urethra and testes (ultrasound), although experience is needed in interpretation of images. Sampling of blood, urine or other body fluids is suggested where appropriate throughout the book.

Interpretation of clinical signs

In this book, each chapter tackles a clinical problem as it is likely to be presented by the client. In the forefront of the veterinarian’s mind when carrying out the initial discussion and examination will be the fact that a number of clinical entities have an obvious age distribution – lamb dysentery limited to the neonate, coccidiosis to the young lamb, and pregnancy toxaemia to the pregnant adult ewe, for example. Similarly, certain conditions are definitely group or flock problems, while others affect individuals or small numbers. For this reason certain sectors have been subdivided to reduce the amount of text the reader must follow.
2 Suboptimal reproductive performance (SORP)

In most flocks, at least 60% of the profitability is a function of litter size and stocking rate, together with lamb price. Since feeding the ewe accounts for some 90% of total feed costs in the case of the production of single lambs, and in excess of 80% in the case of twins, it is entirely understandable and right that the client be concerned by poor flock reproductive performance, and that solutions are urgently demanded from the veterinarian. Suboptimal reproductive performance will, therefore, be one of the most common complaints with which the veterinarian will be presented. In turn, the clinician must accept the responsibility to investigate, but will need great tact in presenting the solutions.

The client will probably assume in the first instance that the cause must be some ‘dread’ disease, since that absolves him or her from any blame or reflection on the management of the flock. Unfortunately for the clinician, this problem will be presented most often at lambing time when the cause may have existed some 5 months previously and treatment is not possible. Identifying what went wrong will probably be extremely difficult, and no immediate solution can be offered. The final complication is that, with very few exceptions, the cause will not be some ‘dread’ disease, but will frequently be multifactorial and difficult to identify with total conviction.

As will become apparent throughout this section, adequate nutrition is absolutely central to many of the reasons for SORP; reference should therefore be made to the separate section on nutrition (Appendix 3) whenever it is suggested that this may be implicated.

Suboptimal reproductive performance can be caused by any of the following:

- Low ovulation rates.
- Low conception rates.
- Early fetal loss/reabsorption.
- Late fetal death.
- Abortion.
- Stillbirth.
- Dystocia and prolapse.
- Poor mothering ability.
- Male infertility.
Table 2.1 highlights common causes of the problem. Abortion, dystocia and prolapse, and male infertility are dealt with in separate chapters (Chapters 3, 4 and 5).

It is essential that we start with definitions of reproductive performance. These must consider:

- Total output.
- Duration of the lambing period.
- Litter size.
- Percentage of ewes in any group failing to breed.
- Percentage of ewes in any group failing to rear lambs which they have carried to term.

**Table 2.1** Suboptimal reproductive performance.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Common causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anoestrus</td>
<td>Season</td>
</tr>
<tr>
<td></td>
<td>Nutrition</td>
</tr>
<tr>
<td></td>
<td>Lactation</td>
</tr>
<tr>
<td></td>
<td>Pregnancy</td>
</tr>
<tr>
<td>Low ovulation rate</td>
<td>Season</td>
</tr>
<tr>
<td></td>
<td>Nutrition</td>
</tr>
<tr>
<td></td>
<td>Breed</td>
</tr>
<tr>
<td>Failure to conceive</td>
<td>Male infertility</td>
</tr>
<tr>
<td></td>
<td>Abnormality of female tract</td>
</tr>
<tr>
<td>Low conception rate</td>
<td>Male:female ratio</td>
</tr>
<tr>
<td></td>
<td>Nutrition</td>
</tr>
<tr>
<td></td>
<td>Social effects</td>
</tr>
<tr>
<td>Embryonic loss</td>
<td>Genetic/chromosomal</td>
</tr>
<tr>
<td></td>
<td>Nutrition – very high, very low</td>
</tr>
<tr>
<td></td>
<td>Stress</td>
</tr>
<tr>
<td>Early fetal death</td>
<td>Infection – toxoplasmosis, border disease</td>
</tr>
<tr>
<td></td>
<td>Nutrition – sudden change</td>
</tr>
<tr>
<td></td>
<td>Stress</td>
</tr>
<tr>
<td>Late fetal loss</td>
<td>Infection – all infectious causes of abortion</td>
</tr>
<tr>
<td></td>
<td>Placental insufficiency (fetal overload)</td>
</tr>
<tr>
<td>Intrapartum fetal death</td>
<td>Management</td>
</tr>
<tr>
<td></td>
<td>Dystocia</td>
</tr>
<tr>
<td>Postpartum death</td>
<td>Dystocia</td>
</tr>
<tr>
<td></td>
<td>Management</td>
</tr>
<tr>
<td></td>
<td>Maternal factors</td>
</tr>
<tr>
<td></td>
<td>Environmental factors</td>
</tr>
<tr>
<td></td>
<td>Infection</td>
</tr>
<tr>
<td></td>
<td>Dystocia – mismothering – exposure – starvation – complex</td>
</tr>
</tbody>
</table>
Irrespective of breed, season or location there can only be one true indicator of reproductive output, the lambing percentage, i.e. the number of lambs reared per 100 ewes put to the ram. This may be a wide and rather ruthless definition and does include losses other than those strictly under consideration under the heading of SORP, but any other definition is only deluding the breeder.

When deciding what constitutes an acceptable flock performance, it is sensible to take into consideration contemporary losses in similar flocks, particularly in adverse seasons or environment, otherwise much time may be wasted looking for other causes which do not exist. There are wide variations in acceptable output, not only between breeds but within any one breed due to genetic factors. There will also be wide variations due to environmental factors. For example, output from the Scottish Blackface in high hill conditions may be as low as 60%, but the same ewes under lowland conditions might produce up to 150%.

The first essential exercise is to establish the true output upon which the client is basing the complaint, and to compare that with some known standard for the breed, season and environment. These standards must be realistic, and not taken from breed propaganda or other biased sources. The Meat and Livestock Commission (MLC) Flockplan records form a firm basis on which to begin comparisons, giving average and top third performances for a wide variety of breeds and crosses in a range of environmental conditions.

Some examples of national figures and targets are:

- Ewe deaths – national range is 4-10%, target is 2%.
- Barren ewes – national range is 4-10%, target is 2%.
- Percentage of ewes mated during first cycle – target is 80%. This figure is required to achieve a maximum duration of lambing of 4 weeks, for optimum output and management efficiency. This may seem to be a peripheral factor, but is regarded rightly by MLC as indicative of good matching of breed, season, environment and nutrition for maximum ovulation and conception rates.

(The higher figures apply to hill flocks which are unlikely to be able to achieve a very low target in adverse environmental conditions.)

The starting point in any flock investigation will be the stage in the breeding cycle at which the complaint originates, and whether the problem involves individual or many ewes, a whole group or all groups. Although male infertility is considered separately, the possibility of ram involvement in any problem must always be kept in mind.
Problems during the mating period

Early in mating period, low mating activity

Check for

- Possible pregnancy (Doppler pregnancy detector can be used from 30 days, scanner from 50 days).
- Ewe and season compatibility (e.g. Dorset Horns will breed any time, Suffolks are early breeders, Mules mid-season, Texels mid-late season, Welsh Mountain late season, Soay limited to three cycles starting in November) – see Figure 2.1.
- Nutrition of ewes (Figure 2.2) – condition score (minimum of 10-15% if large group) – see Table 2.2 for effect of condition score on litter size. Metabolic profile if necessary.
- Weaning to mating interval (minimum 5 weeks).
- Rams – breed, number, reproductive and physical soundness.
- Ram for brisket sores – may cause pain.
- Ewe immaturity (ewe lambs will not begin cycling until several weeks after mature ewes of same breed).
- Ram exhaustion if ewes are synchronised.

![Figure 2.1: Spread of oestrous activity in different breeds.](image)
Figure 2.2 Effects of nutritional deprivation on body tissues.

Treatment
If the client is aware early in the breeding season that a problem is developing, there may be opportunity to correct management, based on a correct diagnosis:

- If the mating date does not match the optimum for the breed involved, there will be little financial penalty if a later mating date is used.
- If the ewes are not in adequate body condition, feed inputs can immediately be increased, though it will take 3 weeks to produce a detectable increase in body condition score.
- If the weaning to mating interval was too short, or ewes are immature, delaying mating should improve matters in the same season.

Prevention
This should be straightforward once the reason has been identified.

Full mating activity, high return rate

Check
- Rams’ maturity and fertility (see Chapter 5).
- Male:female ratio (1:40 recommended for mature male, 1:25 for ram lamb, 1:10 if synchronised).
- Harness application (if put on incorrectly may interfere physically with mating, or too tightly can cause pain).
- Have sponges been used to synchronise? (see below).

If a problem is detected early there may be an opportunity for correction – removing and replacing immature ram lambs, increasing male:female ratio, removing poorly fitted harness.
Suboptimal reproductive performance (SORP)

High return rate with vaginal discharge

Check for
- Infectious vaginitis or balanoposthitis.
- Hygiene precautions if sponges were used.

Treatment
This may be possible if an infectious agent can be identified and appropriate antibiotic therapy instituted. It is probably wise to withdraw the ram(s) for at least one cycle to allow resolution.

Late in mating period, individuals not mated

Check for
- Pregnancy (lost or worn crayon).
- Nonremoval of sponge if synchronised (may require use of vaginoscope) - presence of characteristic vaginal discharge is a good indicator of retained sponge.
- Congenital abnormality – although it is not usual for freemartins to occur as in cattle, intersex sheep do exist, more commonly from mixed sex high multiple births. The external genitalia may be abnormal, and the teats may be much smaller than in normal females. Vaginal length can be checked by inserting a lubricated vacutainer or blunt probe.

Late in mating period, individuals repeatedly returning to service

Check for
- Excessive fatness in perineal area, or fat tail – may physically interfere with mating. Tail wool may require trimming.
- Trauma from previous lambing – vaginal adhesions (digital examination or vaginoscope).
- Genetic or hormonal abnormality.

Examination of the individual ewe is of limited economic value, although with high priced pedigree or exotic breeds it may be requested and justified in some animals. Use of a vaginoscope may allow examination of the vagina and cervix for anatomical defects or evidence of trauma. With high value animals, use of a laparoscope will allow examination of ovaries and fallopian tubes.

In most cases culling is strongly indicated as the animals will probably have poor fertility in subsequent years, as may any offspring.
Late in mating period, many not mated

*Check*
- Validity of complaint - harness fitting, crayon loss.
- If already pregnant.
- Age - if ewe lambs, possible immaturity, if shearlings, possible social factors, e.g. breed factors, likes and dislikes of rams.
- True age - may be late lambs therefore late to cycle.
- Body condition score - too fat, too thin.
- Weaning date - lactation effect if very recent.
- Rams - lameness, inexperience, low libido, small ram lambs expected to mate large ewes.

Late in mating period, high rate of returns to service

*Check*
- Male:female ratio.
- Male - sudden infertility, exhaustion, trauma, infections.
- Possible stress effect, e.g. dipping.

High rate of returns more than 30 days after first mating

*Check for*
- Stress, e.g. dipping.
- Sudden nutritional stress.
- Toxoplasmosis - rising titres.
- Border disease - rising titres.

If animals are not pregnant, correction is not indicated at this late stage of the breeding season. Very late born lambs are rarely profitable under UK conditions. It may be possible to salvage something by implementing an early breeding system the following breeding season, though nonbreeding ewes tend to become too fat, reducing productivity further. Stressors such as dipping should be avoided for at least the first 30 days after mating until implantation is well established. Likewise, nutrition should not be compromised during the same period. If an infectious agent is implicated, see relevant section in Chapter 3 on abortion.

Manipulation and monitoring of pregnancy

The sheep industry has been well served by applied research in the field of reproduction, with results that have the potential to give significantly increased outputs. These include methods to:
- Extend the breeding season with intravaginal progestagen sponges + PMSG, or by administration of melatonin.
- Synchronise ovulation within the normal breeding season with intravaginal sponges (prostaglandins may be used but may have poor results).
- Increase ovulation rates with intravaginal progestagen sponges + PMSG, or by use of breeds with high ovulation rates.
- Monitor litter size by ultrasound scanning.
- Synchronise lambing with injectable steroids (prostaglandins are not effective since maintenance of pregnancy in sheep does not depend on survival of the corpus luteum after the first 50 days).

Unfortunately severe economic restraints within the industry, together with the inherent biological inefficiency of some methods (increased periparturient lamb losses), have led to withdrawal of some products (e.g. Fecundin) and very limited use of others (Boroola and Cambridge genes for increased prolificacy; melatonin).

Some techniques have stood the test of time, particularly synchronisation with progestagen sponges and increased ovulation with PMSG. Other procedures such as laparoscopic AI with frozen semen and ET, although still in use successfully, are limited to high value pedigree units. Poor conception rates with direct vaginal AI (especially with frozen semen) have reduced its use except in high throughput, low cost commercial units using fresh semen. Welfare concerns have made transcervical AI unacceptable.

Since the financial inputs for many of these methods are considerable, requests for explanations of failure of technique or product and avoidance of any repetition are frequently met. If use of a prescription-only medicine (POM) is involved, careful advice should have been given at the time of supply; thus any discussions on unsatisfactory results should rightly be directed at the clinician in the first place.

When any POM product is supplied, the client must be directed to study the instructions and must be informed that any deviation from the instructions will preclude any complaint to the manufacturer.

Use of ultrasound scanning

In addition to manipulating ovulation rates and synchronising oestrus, monitoring for pregnancy and litter size as a management tool has become more sophisticated, but also should be subject to more rigorous scrutiny on a cost/benefit basis. Scanning can be fully justified under the following conditions:

Hill flocks
- To identify empty ewes which can then be turned back on to the hill, so as not to compete for limited resources.
- To identify any twin-bearing ewes which can then be offered optimum nutritional inputs with maximum cost benefit.

It should however be noted that there may be a problem in correlating a gather with the optimum time for scanning.

**Lowland flocks**

- To identify expected lamb numbers for each ewe, so that the flock can be split into groups requiring different types of management.
- To reduce lamb losses at parturition by having the necessary labour available.
- To identify single-bearing ewes to avoid overfeeding.
- To identify barren ewes and sell at time of high demand therefore good prices.
- In the case of ewe lambs, to identify and remove nonpregnant animals, and to identify those carrying twins for special support.

Large commercial flocks will be subject to the greatest cost/benefit analysis. As well as the direct cost of the scanning contractor, labour costs will be at least as much again. Flocks with an expected lambing rate in excess of 180% will see no cost benefit in feed saving over feeding all ewes for twins. Below that expected lambing rate, the division of the flock according to feed requirements will justify scanning costs most directly by saving on feed costs to ewes carrying singles, together with reduction in lamb losses at parturition. Scanning must not be applied too rigidly, so that a ewe carrying a single but in poor condition is recognised as requiring a higher feed input than a fat twin-bearing ewe. Common sense therefore needs to be applied with flexible pen grouping to allow for these individual variations.

**Special problems associated with manipulation of the breeding season or prolificacy**

Many sheep keepers have had disappointing results from first attempts to either synchronise or advance the breeding season, and methods of increasing lambing percentage have also produced disappointing results in some units, with either a poor response or ‘litters’ of small lambs with poor survival rate resulting.

**Forward advancement of breeding season, ewes not mating after sponge removal**

**Check**

- Breed of ewe and realistic advancement achievable. Treatment is only really worthwhile in transition from anoestrum when some ovarian activity is beginning (see Figure 2.1).
- Ram breed, libido and fertility - seasonal breeding patterns occur in some breeds more than others. Dorset, Friesland and Finn are very early, down breeds early, Texel and hill breeds late.

Poor conception rate to synchronised first service in advanced or normal breeding season

**Check**
- Timing of ram introduction - too early? too late? Recommended time is 48h after sponge removal. If introduced too early, rams may be exhausted before period of maximum fertility; if too late, will miss fertile period.
- Ewe to ram ratio, 10:1 recommended.
- Fertility of rams.
- Technique and hygiene of sponge application.
- Condition of ewes.
- Weaning to sponging interval.

Within normal breeding season, low mating activity after sponge removal

**Check**
- Rams - numbers, libido and fertility.
- Timing of ram introduction.
- Lost sponges (alters timing of oestrus).
- Retained sponges (prevents oestrus).

Too high a litter size

**Check**
- PMSG dosage. Variations in the dose response for PMSG are notorious and are the rule rather than the exception (very high doses may have a negative effect). The dose can vary between 200 and 750 units, but an average dose of 500 units is recommended as a starting point. The nearer to the normal breeding season, the lower the required dose (see Figure 2.1).

Poor response to melatonin (Regulin)

**Check**
- Breed suitability.
- Seasonal timing.
- Implant to mating interval.
Body condition and nutrition at implant, mating and throughout pregnancy.

- Sexual activity of males at time of mating – if the drug is used in males they may show a refractory period later in the season.

It is essential that a full discussion takes place before use of any of these products and that there is a clear understanding of the aims on the part of both client and clinician. Fortunately the initial overenthusiasm for these products has now faded and a much more realistic approach is taken. The most common misunderstandings are that the use of sponges, with or without PMSG, will give normal lambing rates at times of year well outside the normal breeding period, and that melatonin will synchronise oestrus. Neither of these is the case. The risk of litters from the use of sponges and PMSG in prolific breeds is also fully recognised.

Suboptimal lamb numbers

The first step must be to establish whether the complaint is justified by comparing production with similar units, the same breed, season and region. As previously stated, any problems investigated at this time will reflect events which have taken place some months before and the effects of any advice will only emerge some months in the future. It will be difficult, most of all, to establish the true nutritional status of the flock at the time of mating and conception. In addition, the clinician must at all times be aware of the client’s wish to escape any ‘blame’ for the problem. If it is established that the complaint is genuine, then the detailed analysis must establish whether the problem is due to low litter size throughout the flock, normal litter size with a high barren ewe rate, or high perinatal lamb mortality (see Chapter 8).

Low litter size

Individual animals consistently producing low numbers will not be noticed in an otherwise normal flock unless detailed recording is carried out.

Individual pedigree persistent low producers may involve a genetic factor. The tendency to buy well-grown ram lambs for breeding means that, in the absence of records to the contrary, these animals are often singles, which perpetuates low litter size.

Many ewes producing low litter size

Check for

- Age of affected animals – immaturity, old age.