

Health planning for goats

There is evidence that goat numbers are increasing in the UK in both pet and commercial settings and with that a demand for health planning and veterinary surgeons who are familiar with and comfortable advising keepers. In this article we consider the main challenges for keepers of herds of all sizes including routine procedures, parasites, lameness and some of the obstacles for veterinary surgeons such as the lack of licensed medicines and limited evidence-based medicine breadth.

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With evidence that goat numbers in the UK are increasing with a 108 000 goats recorded (a 3.2% increase in numbers of the previous annual census) (Defra, 2019), goat health planning is likely to form an increasing component of farm animal and mixed practice. Furthermore, these numbers may be an underestimate with it known that many goats appear as single animals on holdings and the majority of holdings having between 0–5 animals. There are approximately 100 holdings with more than 100 goats, but units with over 100 animals contribute around 60% of the national herd, meaning that veterinary surgeons working with goats need to be comfortable planning for large and small enterprises (see *Figure 1*). Veterinary surgeons may be asked to provide technical support for farm assurance (such as Soil Association, Kiwi Agri Food, Red Tractor). Goat units are highly variable in type ranging from pet herds, smallholder units, small commercial enterprises to large herds, and range from hair, milk to meat production.

Health planning should examine the unit and the team working on the unit, and a SWOT analysis should be conducted with the owner (strengths, weaknesses, opportunities, threats). What are the strengths of the unit? An established market, high health status, a closed herd, the skillset of the keeper? What are the weaknesses of the unit and in turn what are the opportunities which health planning can address? Lastly, what are the threats to the unit, the public and the wider industry? This could include public perception, novel diseases, exposure of the general public to zoonotic disease in petting farms etc.

Welfare indicators

The five freedoms should be considered when designing a health plan and there are some potential challenges for commercial units including: all year round housing; management of male kids; and mutilations, i.e. disbudding. Anzuino et al (2010) assessed the welfare on 24 commercial dairy units and identified key indicators including: levels of lameness and overgrown claws; udder and teat lesions; skin lesions; and pruritus. It was evident that many management factors influence goat welfare in a commercial setting, in-

cluding stocking density, hygiene and bedding accessibility, stability of social groups and management practices such as frequency of foot trimming. Maximising animal health and in turn welfare should be fundamental drivers of annual targets.

Breeding and reproduction

The doe is seasonally polyoestrous with a gestation period of 150 days. The signs of oestrus include a swollen vulva, tail wagging, vocalisation, decreased appetite and reduced milk yield in dairy animals. Oestrus lasts between 24 hours (in younger animals) to 2–3 days in older animals (Smith and Sherman, 2009), with ovulation occurring near the end of standing oestrus.

Vaginal devices including controlled internal drug releasers of progesterone have been used in goats, and the latter are licensed in other countries for use in goats (CIDR Ovis, Zoetis AUS).

To advance the breeding season, during the anoestrous season melatonin implants (Regulin, CEVA Animal Health) or light



Figure 1. Indoor managed dairy goats in a large commercial herd (photo courtesy of David Harwood).

treatment programmes can be used to mimic short day breeding. Lights can be used with 19–20 hours of light per day with a minimum of 200 Lux and then returned to normal day length. Programmes should last for 2 months and cycling will begin 6 weeks after lights are turned off.

Some units may wish to manipulate the breeding season to produce an all year round milk production profile, to advance birth of kids to supply a meat market or to synchronise for a compact kidding or artificial insemination (AI). Extended lactations (over 12 months long) are common. During the breeding season prostaglandin PGF₂-alpha can be used to trigger luteolysis and trigger oestrus. The corpus luteum is not responsive to PGF₂-alpha within 5 days of ovulation, so where a compact cycle is required, repeating at a 10 day interval should ensure luteolysis. Prostaglandin can also be used to manage cloudburst or 'hydrometra' — an accumulation of sterile fluid in the uterus in the presence of a corpus luteum. Cloudburst can be present in all types of goats, but risk factors for development include out of season breeding in high yielding dairy goats (Griffiths et al, 2004) and incidence has been documented at 21.8% in some management groups (Mialot et al, 1991; Hesselink, 1993). Routine trans-abdominal scanning pre-mating may help with identification of the cloudburst, permitting treatment and return to cyclicity. Prostaglandin can also be used to induce parturition in the case of misalliance, overdue kidding or a sick doe.

The physical examination of the buck should happen well in advance of the breeding season with typical scrotal circumference of British breeds recommended to be more than 25 cm. Poor nutrition or ill health may affect fertility. Semen collection may be indicated where there is concern about fertility, but the welfare of the male being examined should be prioritised and a physical examination should take place first to identify candidates for further examination.

Abortion agents affecting goats (and sheep) include toxoplasmosis, chlamydiosis, listeriosis, border disease and Q fever. Toxoplasmosis risk factors and epidemiology mimic those of sheep, and vaccination may be a useful tool for management, although it is off licence. Chlamydiosis may be introduced with carrier animals at purchase and abortions often happen in the second half of pregnancy. Unlike sheep, goats often abort in the same pregnancy as they become infected and can continue to shed infection in the subsequent pregnancies causing further abortions. Q fever caused by *Coxiella burnetii*, can result in late stage abortion in goats in addition to causing disease in humans. Q fever can be identified on impression smears, but given the aerosolised zoonotic risk, handling in a type III facility is required (Harwood and Muller, 2018). There may be potential risks from having mixed species on the same holding.

Vaccinations

Unlike the other main ruminant species within the UK, few vaccines against common infectious diseases are licensed for use in goats. That said, under the direction of a veterinary surgeon, appropriate use of available vaccines can and do make an important contribution to goat herd health, welfare and preventative health care planning.

The goat immune system has evolved as that of a browsing animal and does not necessarily respond to antigens in the same way, in terms of magnitude, as that of primarily grazing ruminants such as cattle and sheep (Houghton, 2005). There are many reasons for this, but for vaccines to have the desired effect, the less complex and fewer component immuno-valents contained within the vaccine, the greater the goat immune response. The 'ideal' vaccine for goats is a vaccine which contains just the antigens the goat needs protection against (Houghton, 2005). As a consequence there is increasingly common use of 4-in-1 vaccines boosted at 6 monthly intervals.

Where a licensed vaccine exists, pharmaceutical companies will have study work which establishes efficacy, safety and immunity duration information. Frequently in the UK vaccines are used that are not licensed for goats, and while it may be that these products are licensed elsewhere in the world for goats and so data exist on these elements, where it does not it is often the case that the duration of immunity and magnitude of protective immunity acquired from the vaccination is less than that of other species (Houghton, 2005). This should be borne in mind when devising vaccination protocols and herd health planning, particularly with booster intervals/frequency.

Clostridial disease is probably the number one disease that all goats in the UK should be considered for vaccination against. Ideally this should be with a multivalent vaccine that targets just the diseases of importance to the goats, and preferably not a combined vaccine that tackles another disease such as pasteurellosis as this adds to the complexity of the immune repertoire the goat is expected to respond to, diluting the goat's immune response to the antigens of significance (Houghton, 2005).

If a *Pasteurella* vaccine is required, then a separate specific vaccine would be preferable given at a 2 week interval from any other vaccine product (Houghton, 2005).

It is likely that colostral transfer of protective antibodies from vaccine immunity is at a lesser magnitude than that in other ruminants, and therefore it may be appropriate to start vaccine protocols earlier and repeat vaccination against seasonal or risk period diseases ahead of these anticipated risks/triggers to booster the immune response (Houghton, 2005, Harwood and Mueller, 2018).

Current licensed vaccinations available within the UK include vaccines against: Johnes, *Staphylococcus* spp. mastitis, Q-fever and rabies.

Castration

Goats are commonly castrated if they are to be kept as pets, retained as wethers for fibre production, or are to be kept for longer than 4–6 months for meat production to avoid 'Billy-taint' of meat (Matthews, 2016). Castration before maturity prevents the development of the male odour or unpleasant sexual behaviour such as urine spraying, and of course ensures the animal is infertile (Matthews, 2016). Early castration can however increase the risk of urolithiasis because the urethra remains relatively narrow (Matthews, 2016).

There are some subtle legal differences between the castrating of kids and lambs — kids over 2 months of age must be castrated by a veterinary surgeon using anaesthesia. Kids under 7 days of

age can be castrated via rubber ring or Burdizzo by any competent person without the use of anaesthetic (Matthews, 2016). If using rubber rings it is essential to confirm that both testicles are fully trapped within the scrotum beneath the ring, and conversely that the ring is not placed too cranially so as to trap the urethra, a useful landmark is to ensure the teats are proximal to the rubber ring (Matthews, 2016).

The surgical approaches to castration are expertly explained with superb photographs, within two texts referenced below (Matthews, 2016; Harwood and Mueller, 2018), so are not covered in detail here. However, some important points to note include:

- Kids mature rapidly and are sexually mature by 3–4 months old
- Ligation of the spermatic vessels is usually unnecessary in day old kids but is recommended in kids over a few weeks
- Older kids, even Pygmies, have relatively large testicles for the body size
- The use of emasculators is recommended for castration of adult goats
- Anaesthesia is always recommended, but only legally required in kids over 2 months of age
- It is usually convenient to castrate kids at the same time as disbudding, but beware of the risk of urolithiasis
- The authors encourage the use of non-steroidal anti-inflammatory drugs (NSAIDs) for all castrations and disbudding in line with the recently published Goat Veterinary Society (GVS) position statement on analgesia in kids (GVS, 2018).

Disbudding

RCVS clarification of the legal position in 2012 states that in the UK disbudding can only be carried out by a veterinary surgeon, using anaesthesia, and it is recommended that additional analgesia is also given (GVS, 2018; Dustan, 2019).

Disbudding is common in many UK goat herds to avoid horn-induced injuries to handlers, other goats, and to enable higher stocking densities. It is strongly advised that horned and non-horned goats are not kept together (Dustan, 2019).

The procedure should ideally be performed in goats aged between 2–7 days old, preferably no older than 10–14 days old. The horn buds erupt extremely quickly and delaying beyond 14 days greatly increases the height and width of the hard horny tissue to be removed to facilitate removal of the germinal epithelial tissues of the actual horn bud, which is of course the main target of removal (Dustan, 2019).

It is important to have the right equipment, in general calf disbudding irons have a head diameter which is too small for the complete encircling and destruction of the goat kid germinal epithelia (Figure 2). An optimal diameter is between 2–2.5 cm (Matthews, 2016; Dustan, 2019).

Anaesthesia is a prerequisite, and the GVS recommends general anaesthesia. Local anaesthetic blocks are possible but because of the multi-nerve root innervation and relative low toxic threshold to local anaesthetic agents of goats, the author finds it simpler, easier and more effective to use a general anaesthetic protocol (Dustan, 2019).

As food producing animals, and with a lack of licensed anaesthetic agents available, the principles of the cascade must be fol-



Figure 2. Wider bore disbudding irons are recommended for goat kids due to the breadth of the germinal epithelial tissue (calf on the left, kid on the right).

lowed (Box 1) to provide general anaesthesia for disbudding. The GVS has provided an anaesthetic update sheet available on request which helps to direct the individual clinician on appropriate drug choices. The authors favour a triple combination of ketamine, butorphanol and xylazine (Matthews 2016), as other injectable

Box 1. The prescribing cascade for food producing animals

A medicine can only be prescribed according to the following cascade as defined by the Veterinary Medicines Directorate. It can be dispensed if licensed:

- For a given condition in a given species
- Or if not available for the above, then a medicine licensed for a different condition in the same species, or the same condition in a different species
- Or if not available, a human medicine, or a medicine available for animals in another member state according to the Special Import Scheme
- If none of the above are available, a medicine prescribed by the veterinary surgeon responsible for treating the animal and prepared especially on this occasion (known as an extemporaneous preparation) by a veterinary surgeon, a pharmacist or a person holding an appropriate manufacturer's authorisation (ManSA)
- In an exceptional circumstance, a product may be imported from outside the EU where no authorised product exists within the EU.

Goats are considered a livestock species. All medicines prescribed for goats therefore must feature on the table of allowed substances in EU Commission Regulation 37/2010

agents such as propofol have no maximum residue level set and are therefore illegal in food producing animals.

The disbudding iron is applied to the horn growing tissue with even pressure for 2–3 seconds at a time, with a 3–4 second gap between re-application to avoid overheating the skull, meninges and causing brain damage. Immediately after removal of the horn bud the author applies a cold water soaked swab directly to the disbudding site to rapidly cool the area (*Figure 3a* and *3b*) (Dustan, 2019).

The author and GVS recommend the use of NSAIDs afterwards, and fly repellent (depending on the time of year) (GVS, 2018).

The main complications associated with disbudding include: hypothermia (kids are very prone to hypothermia and the author always prefers to have heat lamps available for kid recovery), horn re-growth following incomplete destruction of the germinal tissue rim (usually the result of a too narrow diameter iron and/or kids being too old at the time of disbudding), meningoencephalitis (as a result of prolonged iron application to skull), anaesthetic death (these are neonatal kids, xylazine recycling is a particular risk — the author prefers to have an assistant on kid-recovery duty to gently physically stimulate the kids to aid recovery) (Dustan, 2019).

Dehorning of adult goats is a very invasive procedure and is not covered in this article. Suffice to say that unless circumstances demand, this is a procedure that is best avoided and should never be undertaken lightly (*Figure 4*). For an in-growing horn it is usually sufficient and certainly preferable to regularly (every 6–9 months) remove a few centimetres off the horn tip with embryotomy wire (Harwood and Mueller, 2018).

Lameness

The trimming of small ruminants' feet has received much attention in recent years and the advice, certainly for sheep, is to do very little routine foot trimming, rather improve the environment in which the sheep must live, improve natural wear and be quick off the mark in dealing with problems. With goats, the various different management styles we have for them makes a generalised approach to foot care very difficult as the adage 'every farm is different' has never been more true or appropriate.

As a generalisation it is true that the majority of the larger goat enterprises house their goats for most of the year, frequently because of helminth or other managerial concerns. This means the opportunity for natural wear is reduced and claw overgrowth is a real problem. This necessitates some degree of routine foot trimming, but this also brings its own complications as gleaned from the sheep sector with trimming being associated with an increased risk of some forms of lameness. It is probably true that the phrase 'as often as necessary and as little as possible' reflects the approach needed for the routine foot care of housed goats.

Goats are susceptible to the same plethora of infectious lameness diseases as sheep, with much the same risk factors and treatment options advised. One note of caution — goats die from tilmicosin so avoid the use of this antibiotic in lame goats (Micotil Data Sheet, Elanco). NSAIDs are recommended.

Examination of a goat's feet is best done in the standing goat (Matthews, 2016) (they can be examined on tables if appropri-



Figure 3a. Hair clipping exposes the horn buds prior to disbudding.



Figure 3b. The germinal tissue is broad in kids. After short application of heat, cool water soaked cotton swabs can be applied to the surface to facilitate cooling before application of antibiotic spray.

ately restrained with neck collar). Goats can get very agitated if turned over, and particularly if they have horns can present a real health and safety hazard to the operator. Foot trimming equipment should be disinfected between each animal (Harwood and Mueller, 2018).



Figure 4. Some may be asked to dehorn adult goats. This should not be undertaken lightly and requires anaesthesia and radical resection. If owners insist on radical resection, it is recommended that these cases are referred to a teaching hospital/research institution.

Managing the grazing goat (including parasites)

Parasitic gastroenteritis (PGE) is an important concern for grazing goat herds and should be a top differential where there is evidence of poor thrift, reduced growth performance, scour or anaemia. This is of particular concern where goats are set-stocked on permanent pasture with minimal rotation and where anthelmintic resistance has accumulated. Goats do not acquire the same level of resistance to key strongyles as other ruminants, which means that large burdens can be accumulated and disease can present in adult goats. It is postulated that the browsing behaviour of goats has limited the opportunity for co-evolution with the goat's immune system (Figure 5). The epidemiology of PGE in goats is very similar to sheep, with the periparturient rise and the role of infected pasture as a source of infection for grazing herd mates. As a consequence of the threat to production, many commercial dairy herds in the UK are housed all year around to minimise the need for use of anthelmintics.

Worm egg counts are a valuable surveillance tools in goats but must be interpreted in the clinical context of the animal. There is considered a high correlation between kid counts and burden. However, in contrast adult counts may be suppressed by immune status, nutrition, concurrent disease and pre-patent disease production (Matthews, 2016) (Figure 6).

Goat herds are susceptible to *Haemonchus contortus* and packed cell volume and mucous membrane colour are useful indi-



Figure 5. Goat behaviour includes browsing. This behaviour is postulated to have resulted in a poor co-evolution with strongyles and provision of such material can be an advantage in goat systems to minimise exposure to larvae. It should be considered when moving goats to new enclosures as it may mean they eat poisonous plants such as rhododendron (courtesy of David Harwood).



Figure 6. A goat with severe parasitic gastroenteritis (photo by David Harwood).

cators. Regular worm egg counts are recommended (every 3 weeks in managed mobs). A licensed ivermectin pour-on is available for use in goats and sheep, however, clinicians may need to refer to the cascade to avoid repeated use of a single active family. The lack of licensed products means that dose rates need to be extrapolated from clinical experience. Benzimidazoles and macrocyclic lactones should be administered at two times the sheep dose rate and levamisole at one and a half times the sheep recommended dose rate because of its narrow therapeutic index, and its use should be avoided within 3 weeks of parturition and in youngstock. Careful calibration of all dosing equipment and weighing of animals is recommended irrespective of anthelmintic choice. Off license advice regarding withdrawal periods and informed consent should be sought. All PGE health planning advice should consider pasture risk assessment and identifying high risk areas of burden on the grazing platform, implementing a comprehensive monitoring

KEY POINTS

- Veterinary surgeons play an important role in health planning for goat herds of all sizes.
- The cascade must be adhered to, and it should be remembered that goats are considered a food producing species. All medicines used must be found on the EC list of permitted substances and their use recorded as with other species.
- Disbudding is a routine procedure veterinary surgeons are often asked to perform and the guidelines of the Goat Veterinary Society should be considered.
- Parasite management can be challenged for goats due to lack of licensed products and the relative susceptibility of goats. A health plan and pasture risk assessment can help reduce the impact.

strategy and developing an understanding of resistance status on farm.

External parasites

External parasites can be a challenge in goat units of all herd sizes with challenges of lice, chorioptes, sarcoptic mange, forage mites, psoroptic mange and demodectic mange. A simple skin examination can distinguish between key differentials and is essential to focused and targeted treatments. Lice are visible with the naked eye whereas mite and fungal infections will require deep skin scrapes and hair plucks respectively to confirm. Sarcoptic mange is a common skin differential with infection spread via fomites or animal-animal spread. Treatment is with licensed avermectin and milbemycins. Where ivermectins are used, treatment should be repeated in 7 days' time. Licensed avermectins are available for goats.

Conclusion

Goat herd health is an opportunity for practitioners to engage in herd health planning and individual medicine. A limited licensed medicine portfolio means that prescribing can be limited and require understanding and application of the cascade. **LS**

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References

- Anzuino K, Bell NJ, Bazeley KJ, Nicol CJ. Assessment of welfare on 24 commercial UK dairy goat farms based on direct observations. *Vet Rec.* 2010; 167(20):774-80. doi:10.1136/vr.c5892
- Defra. Livestock numbers in England and the UK. 2019. <https://www.gov.uk/government/statistical-data-sets/structure-of-the-livestock-industry-in-england-at-december> (accessed 4th November, 2019)
- Dustan B. Goats - disbudding and others - the practitioners survival guide. 2019. <https://www.thewebinarvet.com/webinar/the-trouble-with-goatshorns-worms-and-finally-old-age-the-practitioners-guide-to-survival> (accessed 25th October, 2019)
- Goat Veterinary Society. Should we disbud and castrate goat kids? 2018. <https://www.goatvetsoc.co.uk/goat-health/should-we-disbud-and-castrate-goat-kids/> (accessed 4th November, 2019)
- Griffiths DE, Johnston AM, Martinez T, Khalid M. A retrospective study of the incidence of cloudburst in dairy goats in the UK, and the effects of parity and unnatural breeding on these levels. *Goat Veterinary Society Proceedings Wincanton* 2004
- Harwood D, Mueller K. *Goat Medicine and Surgery*. Crc Press. 2018
- Hesselink J. Hydrometra in dairy goats: reproductive performance after treatment with prostaglandins. *Vet Rec.* 1993; 133(8):186-7. doi:10.1136/vr.133.8.186
- Matthews J. *Diseases of the Goat*. 4th. UK: Wiley Blackwell. 2016
- Houghton S. Vaccination of goats against clostridial disease. *Goat Vet Soc J.* 2005;(May):2005.
- Mialot JP, Levy I, Emery P. Ultrasonography and management of goat herds. *Recueil de Medecine Veterinaire (France)*. 1991; 168:399-406
- Smith MC, Sherman DM. *Goat medicine*. John Wiley & Sons. 2009
- GVS Vet Record position statement on analgesia and anaesthesia. News section PDF. *Vet Rec.* 2018;183:280-288
- RCVS. Position on the disbudding of goats clarified. 2012. <https://www.rcvs.org.uk/news-and-views/news/position-on-the-disbudding-of-goats-clarified/> (accessed 25th October, 2019)