Breeding soundness evaluation (BSE) of the ram and buck is an important aspect of the management of sheep and goats. In a flock setting one male may be expected to breed 50-100 females. Failure to assess his reproductive soundness prior to the onset of the breeding season could prove financially detrimental. Financial losses as the result of male infertility are primarily due to decreased lamb/kid crop or an increased rate of returns to estrus (Tsakmakidis, 2010). Return to estrus provides a rough estimate of ram or buck fertility but this assessment alone results in a prolonged lambing or kidding season with subsequent reduction of weaning weights in later born offspring. Evaluating the breeding soundness of the male small ruminant is easily performed and is an opportunity for veterinarians to increase their client’s profitability while generating additional income for the practice.

A thorough BSE begins with a general physical examination of the ram or buck. Special attention is paid to structural soundness of the feet and legs as well as body condition score (BCS). Rams that are overly thin (BCS=1 out of 5) are more likely to fail a BSE due to decreased semen quality. It has been suggested that obese rams (BCS=5 out of 5) may be less suitable for breeding due to decreased libido compounded by the negative effects that scrotal fat deposits may have on thermoregulation of the testes (Van Metre, et al., 2012).

Following physical examination, the scrotum and its contents (testes, epididymi des, and spermatic cords) should be palpated and evaluated. Normal testes should be approximately equal in size, freely movable within the scrotum, and of firm consistency. Any areas of softness or swelling within the scrotum should be noted. A decrease in tone or consistency of the testes may be attributable to season, heat stress, injury, or testicular degeneration (Ridler, et al., 2012).

Testicular ultrasound is a beneficial addition to the reproductive examination. A portable ultrasound with a linear, variable frequency (4-8.5 MHz) transducer produces an acceptable image for field evaluation. The ultrasound appearance of the testes should be homogenous with a hyperechoic line in the center of each testicle representing the mediastinum testis (Gouletsoy, et al., 2010). Increased echogenicity within the parenchyma of the testes may indicate calcification or degeneration within the testicle and is correlated with a decrease in sperm quality (Vencato, et al., 2014).

Epididymitis is a much more common finding in the ram than in the buck, with Brucella ovis being the most common causative organism. One large, retrospective study found 10% of rams...
to be seropositive to *B. ovis* (Van Metre, et al., 2012). This suggests that serology for *B. ovis* should be considered a routine component of the BSE of the ram. Clinical signs of epididymitis include swelling, heat, or pain upon palpation of the epididymides. In some rams infected with *B. ovis*, leukospermia may be the only clinical finding. Rams confirmed to be infected with *B. ovis* should be culled to facilitate eradication of the disease from the flock. Other less common conditions that may cause swelling of the epididymis or spermatic cord include sperm granulomas or varicoceles.

Scrotal circumference (SC) is widely accepted as a measure of sperm production capacity in ruminant species. It is highly heritable and an increased scrotal circumference is positively correlated to daily sperm output, age at puberty of female offspring, and ovulation and lambing rates (Kimberling and Parsons in *Current Therapy in Large Animal Theriogenology*, 2007). To accurately measure scrotal circumference, the testes should be held in the bottom of the scrotum by applying pressure to the dorsal aspect of the testes at the neck of the scrotum. The largest circumference is measured with a scrotal circumference tape. A minimum of three measurements should be taken, averaged, and the result recorded in centimeters. Minimum criteria for scrotal circumference in the ram have been established and vary by age (Table 1). These criteria are less well established for the buck, however, a range of acceptable scrotal circumference by weight has been published (Table 2).

<table>
<thead>
<tr>
<th>Weight (#)</th>
<th>Minimum SC (cm)</th>
<th>Maximum SC (cm)</th>
<th>Average (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;40</td>
<td>14</td>
<td>21.5</td>
<td>18.2</td>
</tr>
<tr>
<td>40-49</td>
<td>14</td>
<td>26</td>
<td>20.8</td>
</tr>
<tr>
<td>50-59</td>
<td>19</td>
<td>28.5</td>
<td>24.1</td>
</tr>
<tr>
<td>&gt;60</td>
<td>25</td>
<td>28</td>
<td>26.5</td>
</tr>
</tbody>
</table>

**Table 2:** Ranges of scrotal circumferences measured in 67 mixed breed bucks and reported with respect to body weight (University of Maryland Extension, 2013).

Collection of semen is best accomplished with an electroejaculator with the ram or buck is restrained in lateral recumbency or a standing position. Available equipment includes a hand held probe manufactured for use in small ruminants (Lane Ram Ejaculator, Lane Manufacturing, Inc., Denver, CO) or a bull electroejaculator (ElectroJac6, Neogen Corp., Lansing, MI) with an attachment for small ruminants. The ejaculate is typically quickly produced following stimulation. There is no need to wait for the ram to expel preseminal fluid, as one would when collecting semen from a bull, prior to collection of the semen sample. The penis is examined at the time of collection for any evidence of adhesions to the prepuce or lesions on the penis, especially ulcerative posthitis.
A small drop of the ejaculate is placed on a warm slide for evaluation of gross motility using the 10x or 20x objective. A rapid swirling pattern is indicative of excellent motility. Additionally, dilution of the sample with warm saline or lactated ringer’s solution allows for evaluation of individual progressive motility. A satisfactory breeder should have greater than 30% progressively motile sperm.

Following evaluation of motility, morphology is assessed. Dilution of the sample with saline is often necessary due to the high concentration of sperm in the semen of rams and bucks. Without dilution, evaluation of individual cells is nearly impossible in the semen sample from a fertile animal. A slide should be prepared using a drop of the diluted semen sample and eosin-nigrosin stain (Live Dead Semen Stain, Jorgensen Laboratories, Loveland, CO) and observed under oil immersion. A count of 100 cells is performed noting normal cells and those with primary and secondary abnormalities. Primary abnormalities affect the head and midpiece and are defects of spermatogenesis. Secondary defects affect the tail and are extra-gonadal, occurring during epididymal transport. Rams and bucks with greater than 80% normal morphology are considered exceptional, 50-80% normal is satisfactory, and 30-50% normal is classified as questionable. Rams with less than 30% normal morphology are classified as unacceptable. However, if there is a history of recent transportation or heat stress that may have affected semen quality, re-evaluation may be performed in 60 days to allow for another spermatogenic cycle.

It should be stressed to the client that there are limitations to the BSE. The results are only a reflection of motility and morphology of the male’s semen on the day of evaluation. No guarantee can be made with regards to long term fertility beyond the current breeding season and re-evaluation should be performed annually. Additionally, libido and ability to achieve intromission cannot be evaluated during the BSE. Assessment of these criteria may be accomplished by obtaining information from the owner regarding the behavior of the ram or buck when exposed to females in estrus. Overall, BSE of the male small ruminant is a valuable veterinary service. Clients should be encouraged to present rams or bucks for an annual BSE in an effort to maintain the highest level of reproductive performance within the flock.

References


Memon MA, Mickelsen WD, Goyal HO, 2007. Examination of the reproductive tract and evaluation of potential breeding soundness in the buck. In: Youngquist RS, Threlfall WR,


